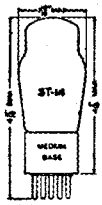


Sylvania

TYPE O1A

DETECTEUR
AMPLIFICATEUR



CARACTERISTIQUES

Tension filament CC	5,0 Volts
Courant filament	0,25 ampère
Ampoule	ST 14
Culot — Moyen 4 broches	4-D
Position de montage	Verticale

Capacité directes interélectrodes :

Grille à plaque	8,1 $\mu\mu f$
Entrée	3,1 $\mu\mu f$
Sortie	2,2 $\mu\mu f$

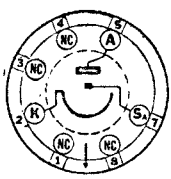
Conditions de fonctionnement et caractéristiques :

Tension filament	5,0	5,0Volts
Tension plaque	90	135 Volts
Tension grille	—4,5	—9,0 Volts
Courant plaque	2,5	3,0 ma
Résistance interne	11.000	10.000 ohms
Conductance mutuelle	725	800 μmhos
Coefficient d'amplification	8	8

APPLICATION

Le type O1A est un tube triode à usage général, pour récepteur batteries. Ce tube, peut être employé comme détecteur; sa tension plaque n'est pas critique.

Le type O1A n'est plus utilisé à présent que comme tube de remplacement dans les vieux récepteurs.

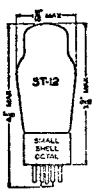


4-V

Sylvania

TYPE OA4G

RELAIS
A CATHODE FROIDE



CARACTERISTIQUES

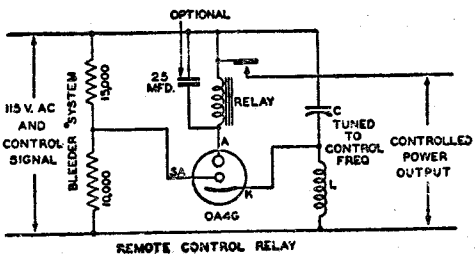
Ampoule	ST-12
Culot : octal 7 broches	4-V
Position de montage	Toutes
Tension d'amorçage d'anode (A) (anode d'amorçage reliée cathode)	225 volts min.
Tension entre anode d'amorçage et cathode (B)	70 volts min. / 90 volts max.
Courant d'anode d'amorçage pour provoquer la décharge de l'anode à 140 volts de pointe (D)	100 microampères max. (C)
Chute de tension anode d'amorçage à cathode en fonctionnement	60 volts appr.
Chute de tension en fonctionnement anode à cathode	70 volts appr.
Courant Anode à Cathode :	
Continu	25 ma. max.
Instantané	100 ma. max.
Conditions-type de fonctionnement (secteur CA) :	
Tension efficace d'anode	105-130 volts
Tension anode d'amorçage CA (pointe)	70 volts max.
Tension anode d'amorçage H. F. (pointe)	55 volts max.
Somme des tensions de pointe CA et HF d'anode d'amorçage	110 volts min.

APPLICATION

Type 0A4G est un tube rempli de gaz, à cathode froide, utilisé pour la commande à distance au moyen d'impulsions à H.F. sur la ligne d'alimentation (secteur). Ce tube peut aussi servir de régulateur de tension et d'oscillateur de relâchement.

Ce tube est composé d'une cathode, une anode et une anode d'amorçage. Les caractéristiques sont telles que sans tension sur l'anode d'amorçage, il faut une tension relativement grande (A) entre cathode et anode pour amorcer la décharge.

L'application d'un signal à une tension (B) convenable sur l'anode d'amorçage causera le flux d'un courant (C) cathode vers anode d'amorçage. Ceci produira une ardente décharge et réduira la tension (D) pour la décharge entre cathode et anode au point où le tube conduira à une tension normale du secteur. Par conséquent, il n'y a pas de nécessité d'un flux permanent de courant pendant que le circuit ne fonctionne pas.



Le circuit ci-dessus d'un relais commandé à distance constitue une application typique d'un tube 0A4G sur secteur alternatif. On notera dans le circuit que la tension entière du secteur est appliquée entre anode et cathode et qu'un système-bleeder est employé pour maintenir une tension sur l'anode d'amorçage juste au-dessous de celle requise pour la décharge. Les capacité et self C et L sont un circuit accordé pour signaux H.F. Quand un signal H.F. est transmis sur le secteur, une tension de résonance apparaît à travers la self et la capacité. La tension à travers condensateur C accroît la pointe de potentiel négatif de la cathode et accroît les potentiels entre cathode et anode d'amorçage. Une décharge entre ces deux éléments s'amorce par ces pointes. Cette décharge produit des ions libres qui permettent à la décharge de les transférer à l'anode lorsque le flux de courant de l'anode d'amorçage devient suffisant. Après ce transfert accompli, le courant passe à travers le relais.

Des précautions doivent être prises dans l'application du type 0A4G, de manière qu'avec des secteurs à tensions élevées, la tension C.A. appliquée à l'anode d'amorçage ne soit pas assez grande pour atteindre celle requise pour la décharge. Des précautions seront prises également pour s'assurer que la tension portée soit assez grande pour fonctionner à la tension la plus basse du réseau. Par conséquent, une tension minimum H.F. d'anode d'amorçage de 55 volts sera fournie.

Le tube 0A4G peut fonctionner également sur courant continu. Mais, dans ce cas, le courant d'anode continue à passer après la fin du signal puisque la tension fournie sur le circuit anodique est continue. Il faut donc prévoir un dispositif pour couper la tension d'anode ou la faire descendre, instantanément, au-dessous de 60 volts, après chaque signal.

SYLVANIA

engineering data service

electronic products

OA5

DESCRIPTION: Triggertube Type OA5

A new tube designed especially for electronic relay applications.

The SYLVANIA Type OA5 Triggertube is an inert-gas-filled internally-triggered cold cathode trigger tube specifically designed for electronic relay and switching service involving extremely high instantaneous peak currents—of the order of hundreds of amperes—at low average current levels. It utilizes a cathode structure similar to that of the widely-used Type 1D21/SN4 Strobotrons, but further improved for relay work. The OA5 is constructed so that it will be fired by positive grid pulses. The special design of this tube results in several important new features:

First, the use of a keep-alive grid among other techniques insures relatively stable triggering characteristics throughout live, a fact which will be of benefit in many varied types of equipment.

The time required to initiate the arc (delay time) has been reduced to a value of only a few microseconds. The deionization time has been decreased as well.

The trigger grid requirements have been reduced to a very low value (microamperes). Because of this fact, for example, it is possible, with high-intensity light flashes, to trigger the SYLVANIA OA5 directly from a phototube without intervening amplifiers. The tube directly bridges the gap between very low instantaneous current levels and very high instantaneous current levels.

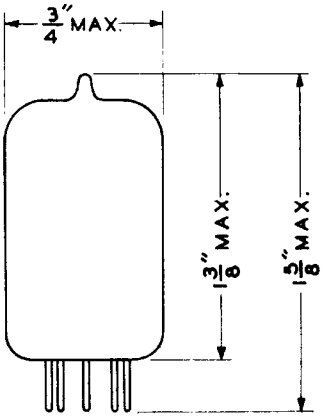
This tube is rated at anode potentials up to the high level of 1000 volts.

The SYLVANIA Type OA5 measures only 1⅝" in overall height and 11/16" in diameter.

This tube has been designed specifically for trigger tube applications and is not intended for stroboscopic applications which utilize the light flashes produced by the arc.

Among the applications for which this tube is particularly adapted is the triggering of flash tubes in electronic photoflash equipment. Firing may be readily controlled by a manual trip-switch, by built-in shutter synchronizing switches, or by a phototube. The use of a phototube in combination with the OA5 permits simultaneous control of any number of flash units without the use of interconnecting cables. Moreover, the extremely low trigger current requirements eliminate the possibility of shock and reduce the sparking of the switch contacts to a negligible degree. Another use of the SYLVANIA Type OA5 is in the triggering of such tubes as the 1D21 which are used for stroboscopic work. The OA5 is also used in depth recorder circuits. These are uses in which the OA5 triggers off other types of tubes which either handle higher output powers, or need more power to trigger them off than is available in the source of the triggering impulse, or both. These applications exemplify the versatility and usefulness of the Triggertube.

Many additional applications are expected to develop for this miniature relay tube wherever precision firing, low firing delay time, low triggering current, and relatively high anode operating potentials are important.



TYPICAL CIRCUITS

Typical circuits are shown in Figures 1, 2 and 3. The circuit of Figure 1 utilizes a battery for providing the trigger pulse voltage. In Figures 2 and 3 both the trigger grid bias and pulse voltages are derived from a bleeder across the power supply.

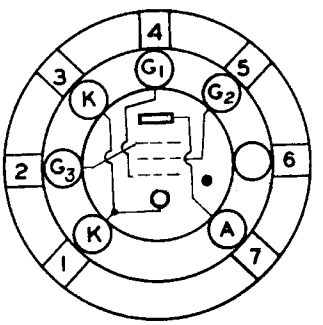


Figure 2 is a representative circuit for firing an externally triggered electroflash tube from a shutter synchronizing switch. In Figure 3 a photocell provides the triggering pulse and permits synchronized control of a number of flash units.

It should be noted that the shield grid (G2, Pin #5) is left floating in all the circuits illustrated. The shield grid may be grounded to the cathode through a 10 megohm resistor to provide a considerable increase in hold-off voltage. However, this will also require that considerably higher trigger pulse voltages be provided, together with an appreciable increase in the grid pulse (or switch) current.

Sylvania TYPE OA-5 is licensed under the tube patents of Edgerton, Germeshausen, and Grier, but no license is implied under their circuit patents.

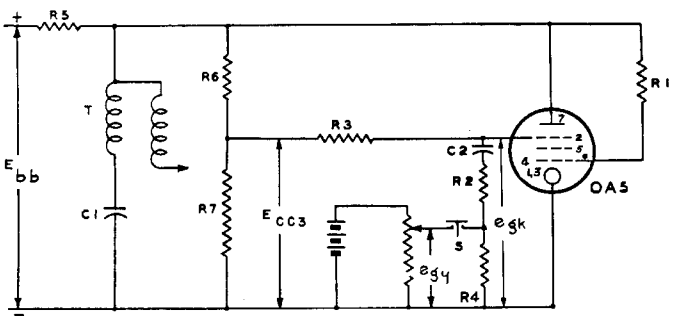


FIG. 1 Fixed Trigger Grid Bias

SYLVANIA ELECTRIC PRODUCTS, INC. ELECTRONICS DIVISION
1740 Broadway, New York 19, New York

SYLVANIA

OA5

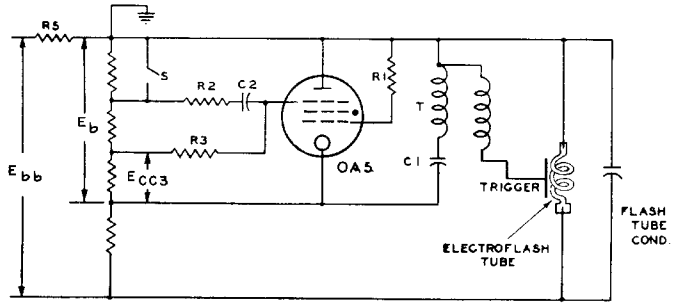


FIG. 2 Synchronous Switch Tripping Circuit

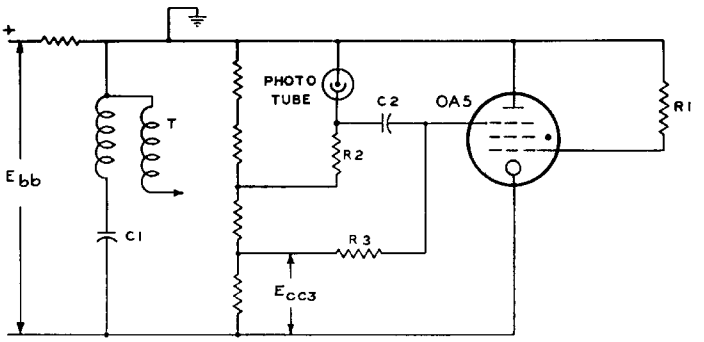


FIG. 3 Phototube Tripping Circuit

MECHANICAL SPECIFICATIONS

Bulb	T-5½
Base	Miniature button 7-pin
Mounting Position	Any
Pin Connections	(also see diagram)
Pin #1 Cathode	Pin #5 Shield Grid G2
Pin #2 Trigger Grid G3	*Pin #6 no connection
Pin #3 Cathode	Pin #7 Anode
Pin #4 Keep-alive Grid G1	

ELECTRICAL RATINGS

Hold-off voltage Note 1	1500 V.D.C. Min.
Keep-alive current	100μ a. Max.
Anode operating voltage (Eb Max.)	1000 V.D.C. Max.
Anode operating voltage (Eb Min.) Note 2	500 V.D.C. Min.
Trigger grid firing potential Note 3 (egk)	+180 V. Min.
Trigger grid bias voltage (Ecc3) Note 3	+90 Max.
Trigger grid pulse current Note 4	40μa. Max.
Discharge capacitance	0.5μfd. Max.
Power input Note 5	1.0 watt Max.
Repetition rate Note 5	
Peak cathode current Note 6	10 A. Min.
Ambient Temperature	−40°C. to +60°C.

Typical Operation (See Figures 2 and 3):

Anode voltage	750 V.
Trigger grid bias (Ecc3)	+90 V.
Trigger grid pulse voltage (egy)	95 V.
Trigger grid resistance	0.25 Megohm
Discharge condenser	0.25μfd.
Keep-alive current	50μa.

Do not use Pin #6 as tie-point terminal.

NOTE 1

Hold-off voltage is defined as the greatest anode voltage at which the tube will not fire without the application of a triggering pulse to the trigger grid. It depends on the circuit design and the voltage-current conditions. As specified above the hold-off voltage is that measured in a circuit similar to Figure 1 with a trigger grid bias voltage of 90 volts and a keep-alive current of 50μa.

NOTE 2

Operation with anode voltages as low as 350 V. is possible, but will require considerably higher trigger pulse voltages.

NOTE 3

The minimum trigger grid firing potential (egy) is defined as the minimum instantaneous grid potential required to fire the tube. This potential is the sum of the steady bias voltage (Ec3) and trigger grid pulse voltage (egy). The trigger bias voltage must have at least the value specified above, and at the same time the trigger grid pulse voltage must be such that, whatever the value chosen for the pulse voltage, the total or grid firing potential requirement of at least 180 V. total will be satisfied.

NOTE 4

As measured in a circuit similar to Figure 1 with 50μa. keep-alive current and 90 volts trigger grid bias.

NOTE 5

The maximum power input is given by $W = 1/2CV^2f$, where C is the discharge capacitance in microfarads, V is the anode voltage in kilovolts and f is the number of flashes or pulses per second. This relation also determines the maximum repetition rate.

NOTE 6

Minimum peak cathode current required to initiate arc.

MECHANICAL DATA

Bulb	ST-12
Base	B6-3, Small Shell Octal, 6-Pin
Outline	12-7
Basing	4AJ
Cathode	Cold
Mounting Position	Any

ELECTRICAL DATA

RATINGS (Absolute Values)

Average Starting Current	100 Ma	Max.
Average Time	10 Sec.	Max.
Cathode Current		
Maximum: OC3, OD3	40 Ma	
OB3	30 Ma	
Minimum	5 Ma	
Ambient Temperature Limits	−55 to +90° C	Max.
Frequency	0 cps.	Max.

CHARACTERISTICS AND TYPICAL OPERATION

	OB3	OC3	OD3	
Minimum Plate Supply Voltage, DC[1]	130	133	185	Volts
Operating Voltage, approx.	90	108	153	Volts
Starting Voltage, approx.	105	115	160	Volts
Regulation	5	2	4	Volts
Shunt Capacitor, Maximum	0.1	0.1	0.1	μf

NOTE:

1. *To assure starting throughout tube life, not less than the specified supply voltage should be provided.*
2. *OC3 and OD3, 5 to 40 Ma: OB3, 5 to 30 Ma.*

APPLICATION DATA

The Sylvania OB3, OC3 and OD3 are gas-filled, cold cathode voltage regulators characterized by a practically constant internal voltage drop across which a load requiring voltage regulation may be connected.

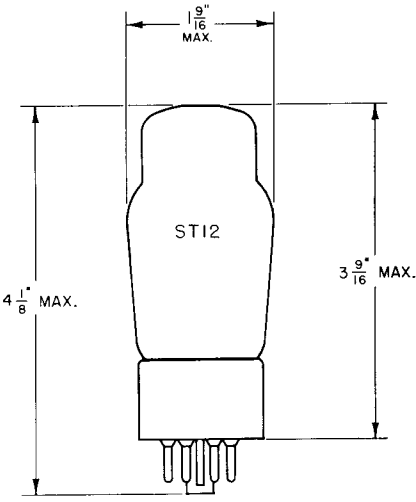
All three tubes are contained in ST-12 bulbs and employ octal bases. A jumper between Pins 3 and 7 provides the designer with several possible connections to ensure protection of associate components in case the regulator is removed from its socket.

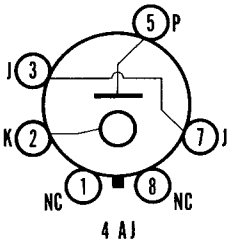
A basic circuit employing either the OB3, OC3 or OD3 is shown in Figure 1. The OB3, OC3 and OD3 are designed to provide regulated outputs of 90, 105 and 150 volts respectively.

Sufficient resistance must always be used in series with these tubes to limit the current. The value of series resistance is dependent on the maximum plate supply voltage and the ratio of current through the load to the operating current of the regulator. (The value chosen should not permit an excess of 40 Ma to flow through the tube after the starting period, 30 Ma for Type OB3.)

QUICK REFERENCE DATA

The Sylvania OB3, OC3 and OD3 are two element gas filled, cold cathode voltage regulators. They are designed to provide regulated outputs of approximately 90, 105 and 150 Volts respectively.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

NOVEMBER 1954

APPLICATION DATA CONT'D

The maximum load current that can be regulated is determined by the maximum and minimum values of supply voltage. The value of the series resistor for maximum supply voltage should be calculated as indicated above. The designer should then determine if this value of resistance will permit starting when the supply voltage falls to its minimum. If not, the calculations must be repeated using a lower load current. The higher the minimum supply voltage and the smaller the difference between minimum and maximum, the larger the current that can be regulated.

To handle more current, two or more regulators of the same type may be connected in parallel. A resistor of approximately 100 ohms should be placed in series with each regulator to equalize division of the current.

If regulation of higher voltages is necessary, two or more regulators may be connected in series, Figure 2. Voltage taps may also be taken from the junction points of the regulators. These tubes need not be the same type, the only requirement being that the current be limited so that it falls within the operating range of the combination. For example, if an OB3 and OC3 are connected in series, the current must not exceed 30 Ma.

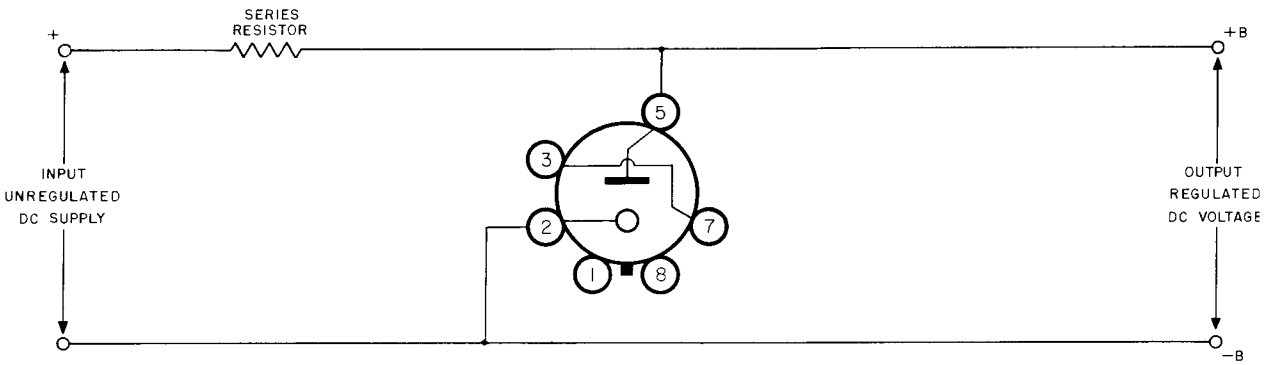


FIG. 1 — BASIC REGULATOR CIRCUIT

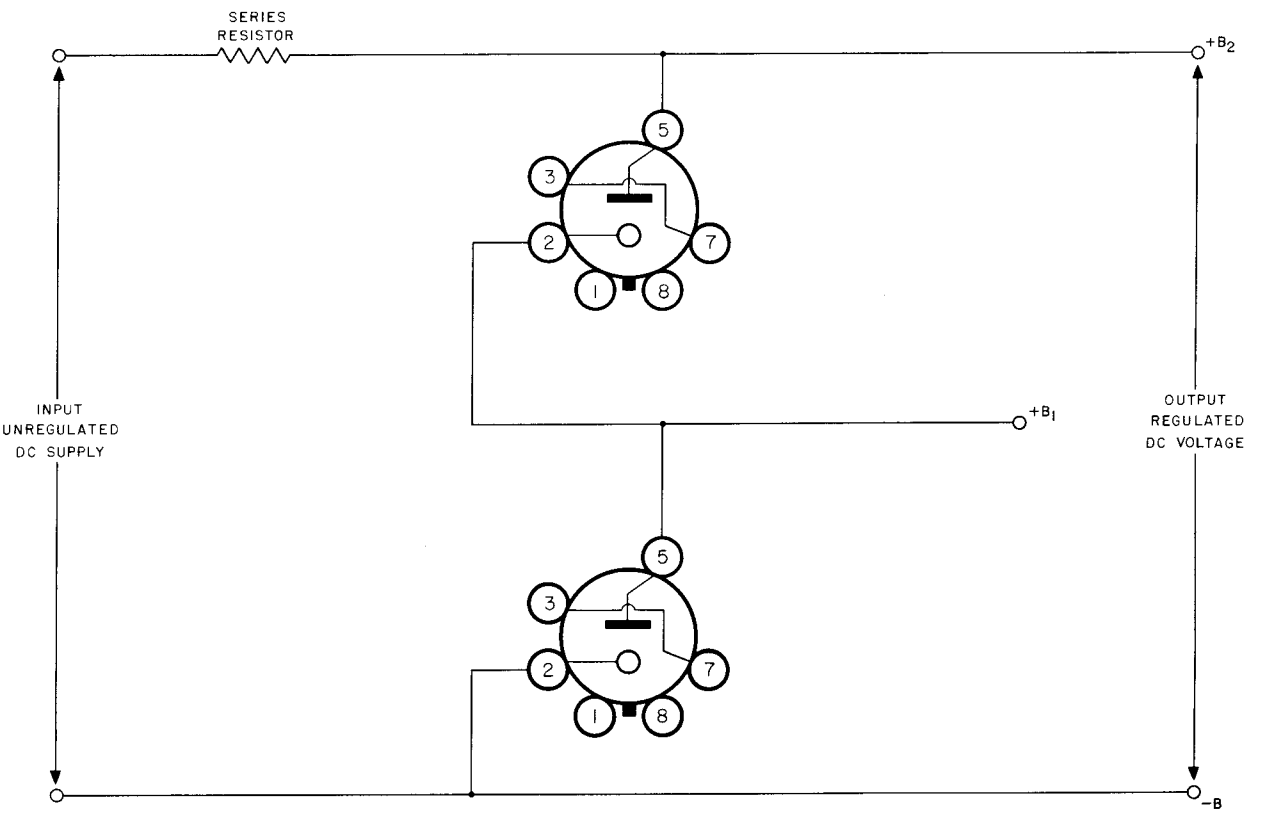
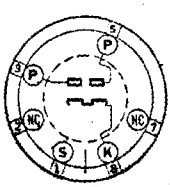


FIG. 2 — SERIES CIRCUIT FOR REGULATION OF HIGH VOLTAGES

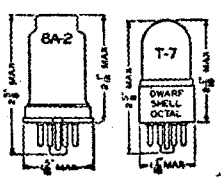


4-R

Sylvania

TYPE OZ4
TYPE OZ4G

REDRESSEUR BIPLAQUE



CARACTERISTIQUES

Ampoule (Type OZ4)	8A-2
Ampoule (Type OZ4G)	T7
Culot petit octal	4-R
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

Tension alternative efficace par plaque	350 Volts
Courant redressé	[illegible]5 ma Max. 30 ma Min.
Tension de pointe inverse	1250 Volts
Courant plaque de pointe	2[illegible] Ma Max.
Chute de voltage	24 Volts

APPLICATION

Les types S[illegible]nia OZ4 et O[illegible]4G sont [illegible] redresseurs biplaque à remplissage g[illegible]x. A[illegible] te[illegible]n de [illegible]uffage n'est nécessaire car la ca[illegible]de est à [illegible] fa[illegible] le rend intéressant pour les rec[illegible]eurs p[illegible] où l'[illegible]ie de courant est un facteur im[illegible]nt. L[illegible] de fo[illegible]ctionnement de chaque type sont id[illegible].

Les types OZ4 [illegible] OZ4G [illegible] un haut courant de pointe avec une chute co[illegible]. U[illegible] de ce type de redresseur consiste dans l'[illegible]ence H.F., [illegible]ut être radiée à moins que le type OZ4[illegible] soit b[illegible] ou [illegible] bi[illegible]ge du type OZ4 soit convenablement mis à la [illegible] correct soit prévu dans le circuit. Les [illegible] avec les redresseurs à vapeur de mercure ou [illegible] adéquats.

Les types OZ4 et OZ4G s[illegible] interchangeables dans la plupart des cas; toutefois le type OZ4 [illegible]ra être préféré dans quelques récepteurs où le blindage est nécessaire.

RADIO MANUFACTURERS ASSOCIATION

SUITE 701-4 AMERICAN BUILDING
1317 F STREET, N. W.
WASHINGTON, D. C.

SUB-COMMITTEE ON TUBE NUMBERING
A. VAN DYCK
DAVID GRIMES, CHAIRMAN
75 VARICK STREET
NEW YORK, N. Y.

October 26th, 1934.

To Tube Engineer:

RMA Tube Standardization
Release #12 re 1A1, 1C1,
1D1.

The characteristics listed below will provide you with information on three new ballast tubes having the RMA Standardization numbers 1A1, 1C1, and 1D1.

Type #.	Load Current	Load Volt.	Bat. Volt.
1A1	.470 to .510	1.8 to 2.2	2.4 to 3.2
1C1	.720 to .770	1.8 to 2.2	2.4 to 3.2
1D1	.232 to .248	1.8 to 2.2	2.4 to 3.2

Each of these tubes employs a small four pin base and an ST-12 envelope. The connections in each case being made to the normal heater or filament terminals (large pins).

This information, together with samples to follow, is provided through the courtesy of the Hygrade-Sylvania Corporation.

Very truly yours,

Chairman
Tube Numbering

eww;lg

E. I. A.
REGISTRATION
FILE

RADIO MANUFACTURERS ASSOCIATION

SUITE 701-4 AMERICAN BUILDING
1317 F STREET, N. W.
WASHINGTON, D. C.

SUB-COMMITTEE ON TUBE NUMBERING
A. VAN DYCK
DAVID GRIMES, CHAIRMAN
75 VARICK STREET
NEW YORK, N. Y.

October 29th, 1934.

To Tube Engineer:

RE: RMA Tube Standardization Release #12.

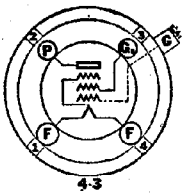
In addition to the information forwarded to you on October 26th under RMA Tube Standardization Release #12, please include the following data:

"Current drawn by load at 2 volts."

Very truly yours,

Chairman
Tube Numbering

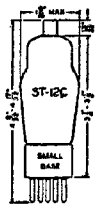
eww;lg



Sylvania

TYPE 1A4P
TYPE 1A4T

AMPLIFICATEUR H. F. A PENTE VARIABLE



CARACTERISTIQUES

Tension filament (CC)	2,0 Volts
Courant filament	0,060 ampère
Position de montage	Verticale

Capacités directes interélectrodes :

	1A4P	1A4T	
Grille à plaque	0,007	0,010	$\mu\mu f$ max.
Entrée	5	4,4	$\mu\mu f$
Sortie	11	11,0	$\mu\mu f$
Ampoule	ST 12C	ST-12C	
Culot — Petit 4 broches	4-M	4-K	

Conditions de fonctionnement et caractéristiques :

	1A4P		1A4T		
Tension filament	2,0	2,0	2,0	2,0	Volts
Tension plaque	135	180	135	180	Volts
Tension écran	67,5	67,5	67,5	67,5	Volts
Tension grille	— 3	— 3	— 3	— 3	Volts
Courant plaque	2,2	2,3	2,2	2,2	ma.
Courant écran	0,9	0,8	0,7	0,7	ma.
Résistance interne	1,0	1,0	0,35	0,6	méghoms
Conductance mutuelle	625	725	625	650	μmhos
Conductance mutuelle à —15 v. grille	15	15	15	15	μmhos

APPLICATION

Ces tubes sont des amplificateurs H.F. perfectionnés très semblables au type 34, mais ayant une caractéristique à pente variable. Les désignations « P » et « T » indiquent les constructions pentode et tétrode du type 1A4.

En général, les types 1A4P et 1A4T sont interchangeables. Les culots sont les mêmes, puisque la grille supplémentaire du type 1A4P est connectée intérieurement à l'extrémité négative du filament. Les équivalents en type « G » de ces tubes sont les types 1D5GP et 1D5GT.

Pour un fonctionnement stable en haute fréquence, les circuits d'entrée et de sortie doivent être convenablement séparés l'un de l'autre. Le blindage complet de chaque étage et un filtrage adéquat sont requis, pour prévenir l'instabilité.

La tension d'écran peut être obtenue par une prise sur la batterie ou sur un diviseur de tension. L'usage d'une résistance série n'est pas recommandé, sauf en cas de polarisation automatique.

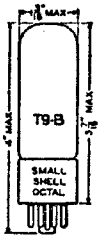
Dans le schéma-type en fin de volume, le type 1A4 est employé comme amplificateur H.F. et M.F.



Sylvania

TYPE 1A5G

PENTODE DE PUISSANCE



CARACTERISTIQUES

Tension filament	1,4 Volt
Courant filament	0,050 Ampère
Ampoule	T9-B
Culot — Petit octal 7 broches	6-X
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

Tension filament	1,4	1,4 volt
Tension plaque	85	90 volts max.
Tension grille écran	85	90 volts max.
Tension grille *	—4,5	—4,5 volts
Courant plaque	3,5	3,5 ma.
Courant grille écran	0,7	0,8 ma.
Résistance interne	0,3	0,3 mégohms
Conductance mutuelle	800	850 μmhos
Coefficient d'amplification	240	255
Impédance de charge	25.000	25.000 ohms
Puissance modulée	100	115 mw.
Distorsion harmonique totale	10	7 pour cent

* Broche n° 7 : retour au négatif du filament.

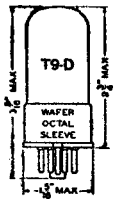
APPLICATION

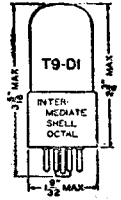
Sylvania 1A5G est un tube pentode de puissance, conçu spécialement pour être utilisé dans les postes récepteurs à faible consommation, alimentés par accus ou piles. Ce type est extrêmement économique, par suite du faible courant nécessaire en H. et B. tension. Une puissance modulée de 100 milliwatts peut être obtenue en classe A. Le filament fonctionne sous 1,4 volt 50 millis. Toutefois, le tube peut fonctionner directement sur pile 1,5 volt sans utilisation de tube ballast, grâce à la construction spéciale du tube 1A5G. D'autres sortes de batteries ou accus peuvent être utilisés, pour autant que le circuit soit équipé convenablement.

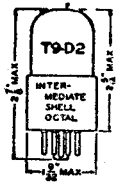
Une batterie de 90 volts est nécessaire pour les tensions plaque et grille-écran. Il est préférable de prévoir la polarisation automatique dans l'utilisation du 1A5G, puisque la tension grille sera réduite en conséquence au fur et à mesure de la chute de tension de la batterie « B ». La batterie C n'est pas nécessaire pour les récepteurs équipés avec les types de la série 1,4 volt, puisque les retours de grille des tubes H.F. et du second détecteur devraient être faits directement aux négatifs des filaments.

Si on demande plus de puissance, on peut utiliser deux tubes 1A5G en parallèle. L'impédance de charge devrait être alors de 12.500 ohms. La puissance modulée sera approximativement doublée, tandis que la distorsion harmonique totale sera à peu près la même que pour un seul tube.

Un schéma-type utilisant les tubes de la série 1,4 volt se trouve à la fin de ce Manuel. Des renseignements complémentaires seront trouvés dans l'introduction au paragraphe « Tubes sur batterie ».

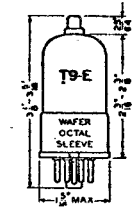


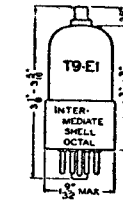


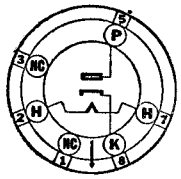


Sylvania Types « GT »

(VOIR DESCRIPTION GENERALE, PAGE N° 15)





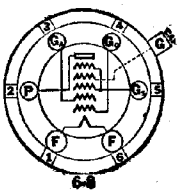


5-AA



6-AA

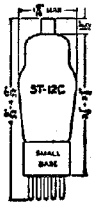
TYPE	CLASSE	Culot voir Type:	Ampoule	Chauffage Filament Volts	Chauffage Filament Amp.	USAGE	Tension Plaque Volts	Polarisation négative de grille Volts	Tension Ecran Volts	Courant Plaque Ma.	Courant Ecran Ma.	Résistance interne Ohms	Conductance mutuelle Umhos	Facteur amplification	Impédance de charge Ohms	Puissance modulée sans distortion Mw.
1A5GT	Pentode	1A5G	T9-D1	1.4	0.05	Ampl. puiss.	Mêmes caractéristiques que type 1A5G.									
1A7GT	Heptode	1A7G	T9-E	1.4	0.05	Convertisseur	Mêmes caractéristiques que type 1A7G.									
1C5GT	Pentode	1C5G	T9-D1	1.4	0.10	Ampl. puiss.	Mêmes caractéristiques que type 1C5G.									
1D8GT	Diode Triode Pentode	8-AJ	T9-E1	1.4	0.10	Détecteur Ampl. Triode Pentode puiss.	Diode se trouve au filament négatif, broche n° 7. 90 90	0.0 9.0	 90	1.1 5.0	..... 1.0	43500 200000	575 925	25	 12000	 200
1H5GT	Double Diode-Triode	1H5G	T9-E	1.4	0.05	Det. amplif.	Mêmes caractéristiques que 1H5G.									
1N5GT	Pentode	1N5G	T9-E	1.4	0.05	Ampl. H.F.	Mêmes caractéristiques que 1N5G.									
1Q5GT	Tétrode	1Q5G	T9-D1	1.4	0.10	Ampl. puiss.	Mêmes caractéristiques que 1Q5G.									
6A8GT	Heptode	6A8G	T9-E	6.3	0.30	Convertisseur	Mêmes caractéristiques que 6A8G, excepté capacités interélectrodes.									
6F5GT	Triode	6F5G	T9-E	6.3	0.30	Amplificateur	Mêmes caractéristiques que 6F5G, excepté capacités interélectrodes.									
6H6GT	Double Diode	6H6G	T9-D2	6.3	0.30	Double Diode	Mêmes caractéristiques que 6H6G.									
6J5GT	Triode	6J5G	T9-D	6.3	0.30	Amplificateur	Mêmes caractéristiques que 6J5G, excepté capacités interélectrodes.									



Sylvania

TYPE 1A6

CONVERTISSEUR DE FREQUENCE PENTAGRILLE



CARACTERISTIQUES

Tension filament	2,0 volts
Courant filament	0,060 ampère
Ampoule	ST-12C
Culot — Petit modèle 6 broches	6-L
Position de montage	Verticale

Capacités directes interélectrodes :

Grille G à plaque (avec blindage)	0,25 $\mu\mu f$
Grille G à Grille Ga (avec blindage)	0,2 $\mu\mu f$
Grille G à Grille Go (avec blindage)	0,1 $\mu\mu f$
Grille Go à Grille Ga	10,8 $\mu\mu f$
Grille G à toutes les autres électrodes (Entrée H.F.)	10,5 $\mu\mu f$
Grille Ga à toutes les autres électrodes (Sort. oscil.)	6,0 $\mu\mu f$
Grille Go à toutes les autres électrodes (Entr. oscil.)	5,0 $\mu\mu f$
Plaque à toutes les autres électrodes	9,0 $\mu\mu f$

Conditions de fonctionnement et caractéristiques :

Tension filament	2,0	2,0 volts
Tension plaque	135	180 volts max.
Tension grille de contrôle (G)	—3,0	—3,0 volts
Tension d'écran (Gs)	67,5	67,5 volts
Tension de grille anode (Ga) *	135	180 volts
Résistance de grille oscillatrice (Go)	50.000	50.000 ohms
Courant plaque	1,8	1,5 ma.
Courant grille écran	2,1	2,0 ma.
Courant de grille anode	2,0	2,5 ma.
Courant grille oscillatrice	0,15	0,2 ma.
Courant cathodique total	6,0	6,2 ma.
Résistance interne	0,4	0,5 mégohm
Conductance de conversion	275	300 μmhos
Id. à —22,5 volts grille	4	4 μmhos

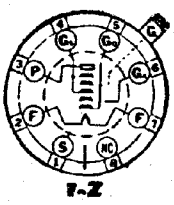
* Appliqué à travers une résistance de 20.000 ohms.

APPLICATION

Sylvania 1A6 est un tube pentagrille, oscillateur et premier détecteur, à tension filament 2 volts.

Il remplace les deux tubes séparés utilisés précédemment et fonctionne bien aux fréquences de broadcasting. Aux fréquences plus élevées, le fonctionnement est moins bon, à cause de la faible conductance mutuelle de la section oscillatrice. Pour le récepteur à gammes d'ondes très étendues, on utilisera de préférence le tube 1C6 qui est similaire au tube 1A6, mais dont le filament absorbant 120 ma. assure une émission électronique plus abondante et, par conséquent, une conductance mutuelle plus grande.

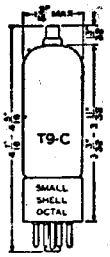
Les données concernant l'application des tubes 1A6, 1C6, 1D7G et 1C7G comme convertisseur de fréquence, sont les mêmes (voir application type 1C6).



Sylvania

TYPE 1A7G

CONVERTISSEUR DE FREQUENCE PENTAGRILLE



CARACTERISTIQUES

Tension filament	1,4 Volt
Courant filament	0,050 ampère
Ampoule	T9-C
Culot — Petit octal 8 broches	7-Z
Position de montage	Toutes

Capacités directes interélectrodes* :

Grille G à plaque	0,3 $\mu\mu$f
Grille G à grille Ga	0,26 $\mu\mu$f
Grille G à grille Go	0,12 $\mu\mu$f
Grille Go à grille Ga	0,9 $\mu\mu$f
Grille G à toutes autres électrodes (entrée H. F.)	6,5 $\mu\mu$f
Grille Ga à toutes autres électrodes excepté Go (sort. osc.)	4,6 $\mu\mu$f
Grille Go à toutes autres électrodes excepté Ga (ent. osc.)	4,0 $\mu\mu$f
Plaques à toutes autres électrodes	11,0 $\mu\mu$f

* Suivant standards RMA avec blindage connecté au négatif du filament.

Conditions limites de fonctionnement. (Voir page 9) :

Tension filament C. C.	1,4 Volt
Courant filament	0,050 Ampère
Tension plaque	90 Volts max.
Source tension grille écran (Gs)	90 Volts max.
Tension grille anode (Ga)	90 Volts max.
Tension grille écran (Gs)**	55 Volts max.
Courant cathodique total	3 ma. max.

Conditions de fonctionnement et caractéristiques :

Tension filament CC	1,4 Volt
Tension plaque	90 Volts
Tension grille écran **	45 Volts
Tension grille anode	90 Volts
Tension grille contrôle (G) ***	0 Volt
Résistance grille oscillatrice (Go)	0,2 mégohm
Résistance interne	0,6 mégohm
Courant plaque	0,55 ma.
Courant grille écran	0,6 ma.
Courant grille anode	1,2 ma.
Courant grille oscillatrice	0,035 ma.
Courant cathodique total	2,4 ma.
Conductance de conversion à 0 volt grille	250 μmhos
Idem à — 2 volts grille	50 μmhos
Idem à — 3 volts grille	5 μmhos

** Obtenu de préférence en utilisant une résistance de 70.000 ohms convenablement by-passée en série dans la batterie de 90 volts.

*** Une résistance d'au moins 1 mégohm doit être dans le retour de grille au négatif du filament broche n° 7.

APPLICATION

Sylvania type 1A7G est un convertisseur de fréquence pentagrille conçu spécialement pour être utilisé dans les postes récepteurs à faible consommation alimentés par accus ou piles. Ses usages sont similaires à ceux d'autres convertisseurs pentagrilles, tels les types 1C7G et 1D7G, mais les différences dans les caractéristiques et conditions de fonctionnement doivent être prises en considération pour assurer un rendement optimum. Le filament fonctionne sous 1.4 volt 50 millis. Toutefois, le tube peut fonctionner directement sur pile 1,5 volt sans intercaler de tube ballast grâce à la construction spéciale du tube. D'autres sortes de batteries ou accus peuvent être utilisés pour autant que le circuit soit équipé convenablement.

Une batterie B de 90 volts est nécessaire pour les tensions de plaque, grille-écran et grille d'anode. Une résistance de 70000 ohms doit être mise en série dans la grille-écran. Malgré que la polarisation de la grille soit inutile, le retour de grille devrait être fait soit à l'A. V. C. soit à travers une résistance de 1 mégohm convenablement by-passée.

Un schéma-type utilisant les tubes de la série 1,4 volt se trouve à la fin du manuel. Des renseignements complémentaires seront trouvés dans l'introduction, au paragraphe « Tubes sur batterie ».

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 1AF4

PENTODE

MECHANICAL DATA

Style	miniature
Cathode	coated filament
Bulb	T-5 1/2
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Maximum Diameter	3/4 inch
Maximum Overall Length	2 1/8 inches
Maximum Seated Height	1 7/8 inches
Basing	6AR-0-1&5

Pin Connections:

Pin 1 .. negative filament, internal shield, grid #3	Pin 4 .. no connection
Pin 2 .. plate	Pin 5 .. (same as Pin 1)
Pin 3 .. grid #2	Pin 6 .. grid #1
	Pin 7 .. positive filament

Mounting Position ..... any

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES

	without shield	*with shield*(1)	
Grid to Plate, maximum	.008	.008	μμf
Input: gl to (f+g2+g3+i.s.)	3.8	3.8	μμf
Output: p to (f+g2+g3+i.s.)	7.5	7.6	μμf

RATINGS -- *Design Center Values*

Filament Voltage(2)	1.4	volts
Maximum Plate Voltage (dc)	110	volts
Maximum Grid #2 Supply Voltage (dc)	110	volts
Maximum Grid #2 Voltage (dc)	90	volts
Maximum Positive Grid #1 Voltage (dc)	0	volts
Maximum Cathode Current	2.5	milliamps

CHARACTERISTICS

Filament Voltage	1.4	1.4	volts
Filament Current	25	25	milliamps
Plate Voltage (dc)	67.5	90	volts
Grid #2 Voltage (dc)	67.5	90	volts
Grid #1 Voltage (dc)	0	0	volts
Plate Resistance	2.0	1.8	megohms
Transconductance	825	950	micromhos
Plate Current	1.0	1.65	milliamps
Grid #2 Current	0.3	0.5	milliamps
Grid #1 Voltage, for 10 micromhos transconductance	-2.5	-3.5	volts

(1) Shield #316 connected to Pins 1 & 5.

(2) For power-line operation the filament voltage is centered at 1.4 volts for normal line voltage (117 volts).

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 1AF5

DIODE PENTODE

MECHANICAL DATA

Style	miniature
Cathode	coated filament
Bulb	T- 5 1/2
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Maximum Diameter	3/4 inch
Maximum Overall Length	2 1/8 inches
Maximum Seated Height	1 7/8 inches
Basing	6AU-0-0

Pin Connections:

Pin 1 .. negative filament, grid #3	Pin 4 .. grid #2
Pin 2 .. no connection	Pin 5 .. pentode plate
Pin 3 .. diode plate	Pin 6 .. grid #1
	Pin 7 .. positive filament

Mounting Position ..... any

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES

	without shield	*with shield*(1)	
Grid to Plate	0.2	0.2	μμf
Input: gl to (f+g3+g2)	2.3	2.5	μμf
Output: p to (f+g3+g2)	2.4	4.3	μμf
Diode Plate to Grid #1, maximum	.03	.03	μμf

RATINGS -- *Design Center Values*

Filament Voltage(2)	1.4	volts
Maximum Plate Voltage (dc)	110	volts
Maximum Grid #2 Voltage (dc)	110	volts
Maximum Positive Grid #1 Voltage (dc)	0	volts
Maximum Cathode Current	2.5	milliamps
Maximum Diode Current (continuous operation)	0.25	milliamps

CHARACTERISTICS

Filament Voltage	1.4	1.4	volts
Filament Current	25	25	milliamps
Plate Voltage (dc)	67.5	90	volts
Grid #2 Voltage (dc)	67.5	90	volts
Grid #1 Voltage (dc)	0	0	volts
Plate Resistance	2.3	2.0	megohms
Transconductance	500	600	micromhos
Plate Current	0.7	1.1	milliamps
Grid #2 Current	0.25	0.4	milliamps
Grid #1 Voltage, for 10 micromhos transconductance..	-2.5	-3.5	volts
Average Diode Current, at 10 volts dc	0.7	0.7	milliamps

(1) Shield #316 connected to Pin 1.

(2) For power-line operation the filament voltage is centered at 1.4 volts for normal line voltage (117 volts).

Release No. 633

January 26, 1948

SYLVANIA ELECTRIC PRODUCTS INC.

Type 1B27

The Type 1B27 is a TR gas switching tube of the separate cavity type, with a tuning mechanism built into the tube. The type is designed primarily for operation in the vicinity of 3000 Mc but the region of operation is dependent on the external cavity.

Electrical Data - General

Tuning Range*	2600 to 3000	Mc
Leakage Power** (at 5 Kw, 1000 pps, 0.5 u sec.):		
zero keep-alive current	40	mw max.
100 uAdc keep-alive current	25	mw max.
Intrinsic Q (at zero keep-alive current)	2250	min.
Keep-Alive Interaction (at 200 uAdc)	0.1	db max.
Recovery Time (at 50 Kw; 3 db down)	5	u sec. max.
Frequency Change with Temperature (0 to 100°C)	0 to-10	Mc
Keep-Alive Voltage Drop (at 100 uAdc)	415 to 525	Vdc
Keep-Alive Ignition Time	5.0	sec. max.
Keep-Alive Starting Voltage	-750	Vdc max.

Mechanical Data - General

Number of Keep-Alive Electrodes	One	
Net Weight (approximate)	2	oz.
Mounting Position	Any	
Mounting	In External Cavity	
Dimensions	(See Outline Drawing)	

Ratings

Maximum Transmitter Peak Power	150	Kw
Keep-Alive Supply Voltage (open circuit)	-750 to -1,000	Vdc
Keep-Alive Current	100 to 200	uAdc
Ambient Temperature Range (non-operating)	-40 to +100	°C

* With fixed cavity, using tuning mechanism on tube. Region of operation depends on cavity.

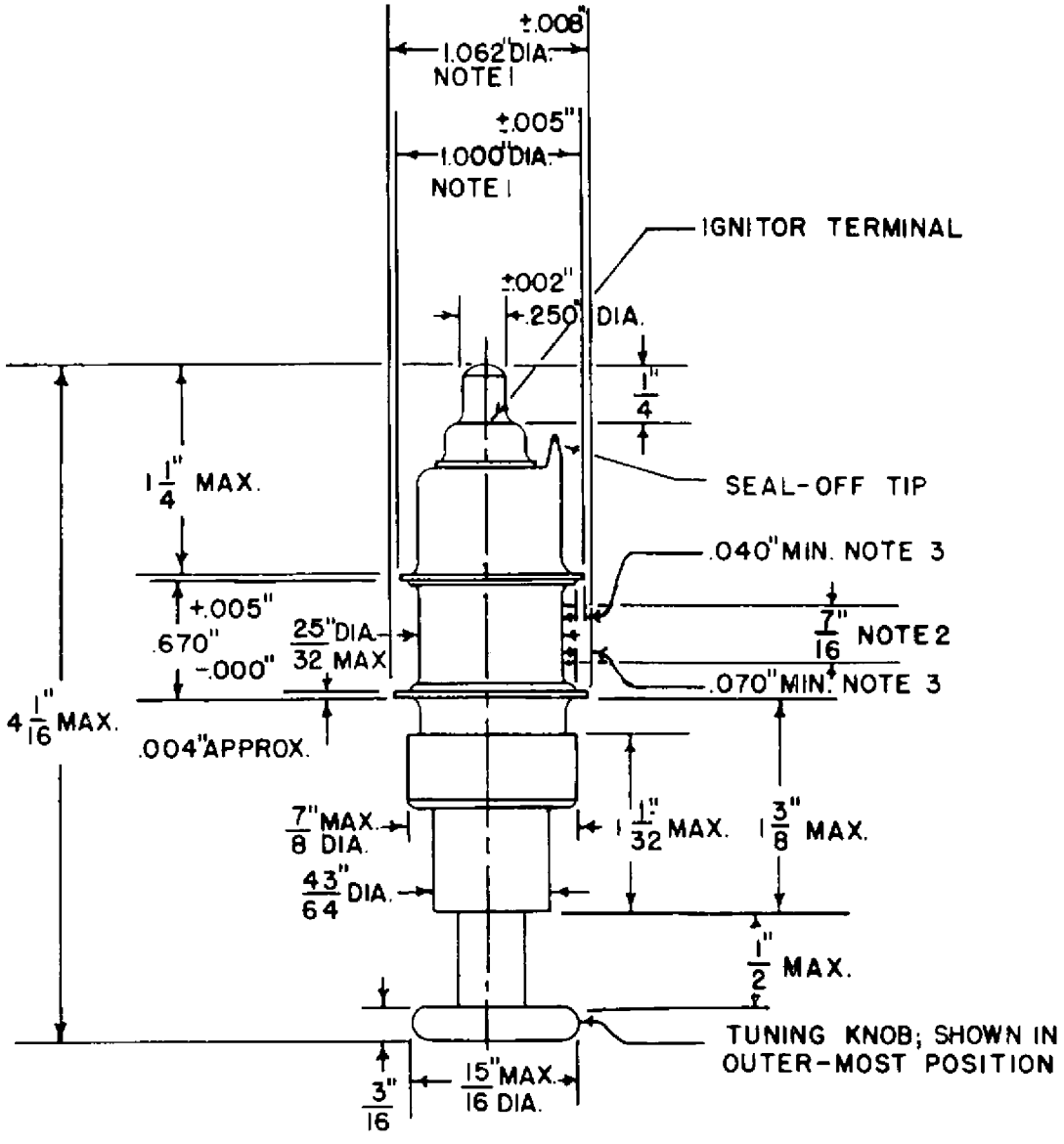
** Total averaged over pulse.

mo 12/15/47

SYLVANIA ELECTRIC PRODUCTS INC.

OUTLINE DRAWING

TYPE 1B27



NOTE 1. CONTACT DISCS CONCENTRIC WITH RESPECT TO EACH OTHER WITHIN $\frac{1}{64}$"

NOTE 2. CYLINDRICAL LENGTH LOCATED CENTRALLY BETWEEN CONTACT DISCS.

NOTE 3. CONTACT PORTION OF DISC.

12-18-47

Release No. 610

October 15, 1947

SYLVANIA TYPE 1B40

The 1B40 is an argon filled gas switching tube of the separate cavity type.

Electrical Data - General

Ignition Voltage	250 volts max.
Keep-Alive Current with 300 Vdc and a 0.47 Meg. limiting resistor	180 microamps. min., 320 microamps max.
Leakage Power at frequency of 1050 mc. 500 watts peak input power, 1000 pps pulse repetition frequency, 1.0 usec pulse width.	0.7 micro watts (continuous) max.
Insertion Loss at 1080 mc.	1.0 db max.

Mechanical Data - General

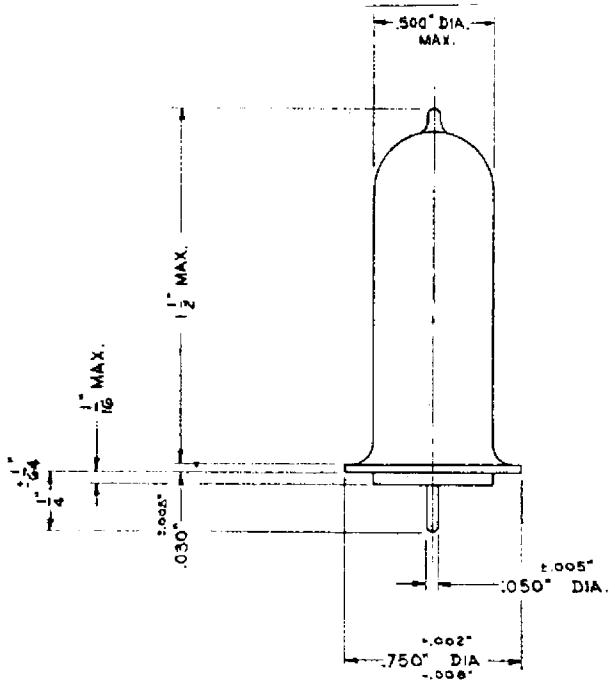
Mounting Position	Any
Number of Ignitors	One

Ambient Temperature Range (Non-Operating) -40°C min. to 100°C max.

Dimensions

See drawing.

NOTE: This tube is obsolete and manufacturing facilities are no longer available.



Release No. 615

October 30, 1947

SYLVANIA ELECTRIC PRODUCTS INC.

Type 1B43

The 1B43 is a gas filled spark gap tube.

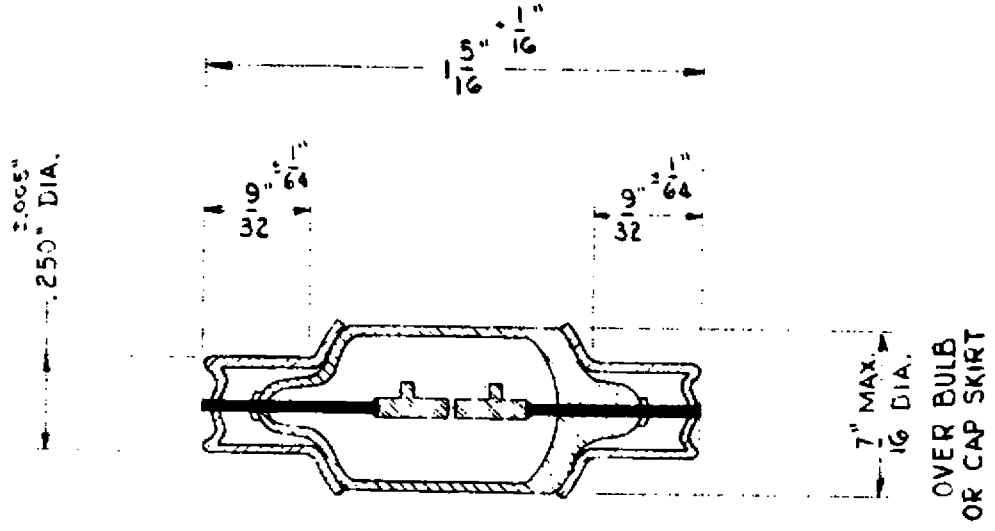
Electrical Data - General

Ignition Voltage	200 to 400	Vdc
Inter-electrode Capacity	0.3	µµf

Mechanical Data - General

Number of Electrodes	Two	
Mounting Position	Any	
Ambient Temperature Range	-40 to +100	°C
Dimensions	(See Drawing)	

This type is considered obsolete and the manufacturing equipment is no longer available.



NOTE
TERMINAL CAPS SHALL BE NICKEL PLATED & SHALL BE CONCENTRIC WITH EACH OTHER WITHIN 1/32".

TECHNICAL DATA

1B46

Sylvania

T E N T A T I V E

TYPE 1B46

Miniature Voltage Regulator

Glow Discharge

PHYSICAL SPECIFICATIONS

Cathode: Cold

Base: Bayonet Candelabra, Double Contact

Bulb: T-4, Metal Shell

Dimensions: As per Outline

Mounting Position: Any

BASE PIN CONNECTIONS

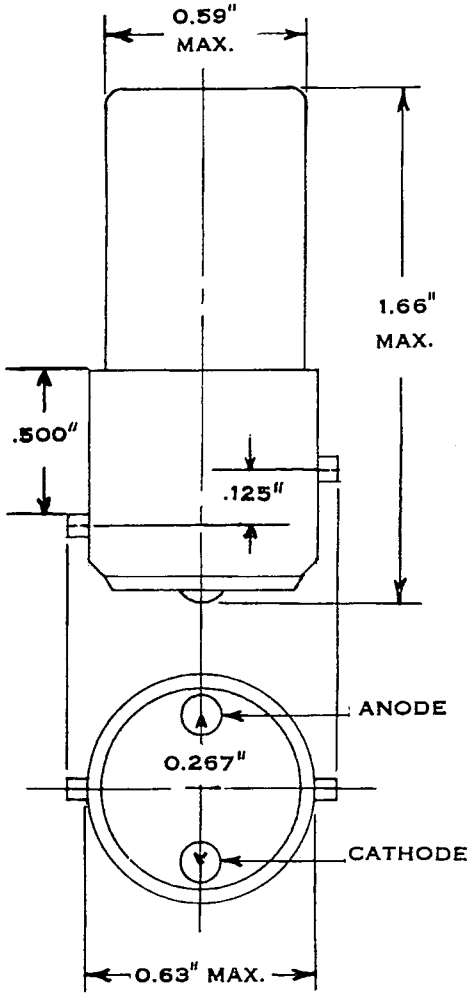
As Per Outline

Ratings and Characteristics

Maximum Starting Voltage	225	Vdc
Maximum Operating Voltage	85	Vdc
Minimum Operating Voltage	79	Vdc
Maximum Operating Current	2.0	mAdc
Minimum Operating Current	1.0	mAdc
Maximum Regulation*	3.0	Vdc

Typical Operating Conditions and Characteristics

Anode Supply Voltage	250	Vdc
Operating Current	1.0 - 2.0	mAdc
Operating Voltage (Approx.)	82	Vdc
Series Protective Resistance (Approx.)**	15,000	ohms



* Regulation is maximum voltage variation with tube operating within specified current range.

**Value shown is for a typical circuit. Sufficient resistance must alway be used in series with the tube to limit the current through the tube to 2.0 mAdc under continuous (steady - state) operation.

from RMA release # 477, March 11, 1946

TECHNICAL DATA

1B47

Sylvania

T E N T A T I V E

TYPE 1B47

Miniature Voltage Regulator

Glow Discharge

PHYSICAL SPECIFICATIONS

Cathode: Cold

Base: Bayonet Candelabra, Double Contact

Bulb: T-4, Metal Shell

Dimensions: As per Outline

Mounting Position: Any

BASE CONNECTIONS

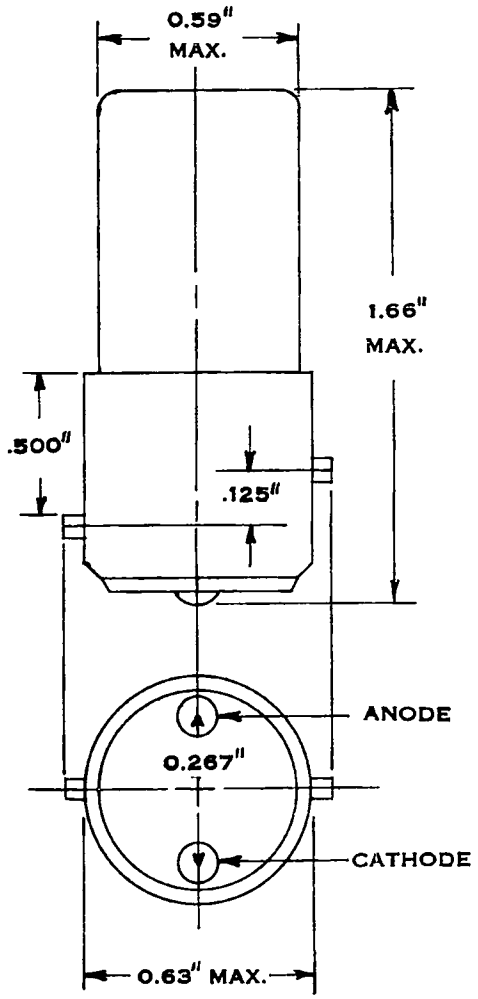
As Per Outline

Ratings and Characteristics

Maximum Starting Voltage	225	Vdc
Maximum Operating Voltage	90	Vdc
Minimum Operating Voltage	75	Vdc
Maximum Operating Current	2.0	mAdc
Minimum Operating Current	1.0	mAdc
Maximum Regulation*	3.0	Vdc

Typical Operating Conditions and Characteristics

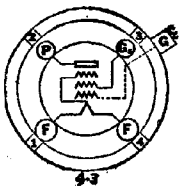
Anode Supply Voltage	250	Vdc
Operating Current	1.0 - 2.0	mAdc
Operating Voltage (Approx.)	82	Vdc
Series Protective Resistance (Approx.)**	15,000	ohms



* Regulation is maximum voltage variation with tube operating within specified current range.

**Value shown is for a typical circuit. Sufficient resistance must alway be used in series with the tube to limit the current through the tube to 2.0 mAdc under continuous (steady - state) operation.

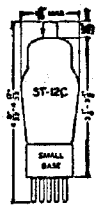
from RMA release # 477, March 11, 1946



Sylvania

TYPE 1B4P

AMPLIFICATEUR H. F. A GRILLE ECRAN



CARACTERISTIQUES

Tension filament CC	2,0 volts
Courant filament	0,060 ampère
Ampoule	ST-12C
Culot — Petit modèle 4 broches	4-M
Position de montage	Verticale

Capacités directes interélectrodes :

Grille à plaque (avec blindage)	0,007 $\mu\mu$f max.
Entrée	5,0 $\mu\mu$f
Sortie	11,0 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension filament	2,0	2,0 volts
Tension plaque	135	180 volts
Tension écran	67,5	67,5 volts
Tension grille	—3	—3 volts
Courant plaque	1,6	1,7 ma.
Courant écran	0,7	0,6 ma.
Résistance interne (appr.)	1,5	1,5 mégohm
Conductance mutuelle	560	650 μmhos
Tension de grille pour courant plaque de 0,... ma.	—6	—6 volts

APPLICATION

Sylvania 1B4 est un tube amplificateur H.F. à pente fixe perfectionné, ayant des caractéristiques très semblables au type 32. Ce tube à grille écran peut être employé comme amplificateur H.F., B.F. ou comme détecteur.

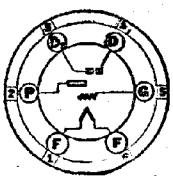
L'ampoule ST12 du tube 1B4 est de dimensions plus réduites que l'ampoule ST14 du tube 32.

C'est un tube à grande impédance qui doit travailler avec une grande impédance de charge, si l'on veut obtenir une amplification raisonnable.

Il est nécessaire de blinder suffisamment le tube et les circuits associés, pour réduire au minimum les couplages électrostatiques ou magnétiques. L'entrée et la sortie de chaque tube doivent être bien isolées électriquement.

Le type 1B4 peut fonctionner comme détecteur couplé par résistance au premier tube amplificateur B.F. La résistance de charge dans le circuit plaque varie entre 150.000 et 300.000 ohms. La grille écran peut être alimentée à travers une résistance en série, de valeur telle que la tension écran soit inférieure à la moitié de la tension plaque. Un meilleur tube à utiliser comme second détecteur et premier étage B.F. est le type 1B5/25S.

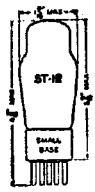
Le type « G » équivalant au type 1B4P est le tube 1E5GP.



Sylvania

TYPE 1B5/25S

DOUBLE DIODE TRIODE



CARACTERISTIQUES

Tension filament (CC)	2,0 Volts
Courant filament	0,06 ampère
Ampoule	ST 12
Culot — Petit modèle 6 broches	6 M
Position de montage	verticale

Capacités directes interélectrodes (section triode) :

Grille à plaque	3,6 $\mu\mu$f
Entrée	1,6 $\mu\mu$f
Sortie	1,9 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A (Section triode)

Tension filament	2,0 Volts
Tension plaque	135 Volts max.
Courant plaque	0,8 ma
Résistance interne	35,000 ohms
Tension grille	—3 Volts
Conductance mutuelle	575 μmhos
Cœfficient d'amplification	20

APPLICATION

Sylvania 1B5/25S est un tube double diode triode de la série 2 volts. Depuis l'apparition de ce tube sous le numéro 25S, de grands perfectionnements ont été introduits dans sa structure, sans cependant changer d'une manière appréciable ses caractéristiques.

Dans le tube actuel, les diodes sont placées en-dessous de la triode. Les plaques des diodes sont cylindriques; chacune d'elles entoure une extrémité du filament.

Le type 1B5/25S trouve un grand champ d'application comme détecteur diode, combiné avec un amplificateur B. F. triode et pour fournir la tension de contrôle automatique de volume, L'indépendance des deux diodes, ainsi que de la triode, permet l'utilisation d'une grande variété de schémas.

Pour l'amplification, la section triode est couplée à la diode par une capacité de couplage ordinaire; la grille est reliée par une résistance de fuite de 1 mégohm à la tension de polarisation.

Il est à remarquer qu'il existe une différence de 2 volts entre les deux sections du filament utilisées dans les deux diodes.

Cette particularité peut être utilisée ou non, suivant le schéma choisi pour le retour du courant plaque des diodes. Ci-dessous une brève description de quelques circuits importants.

Pour l'A. V. C. non différé, la plaque diode entourant l'extrémité négative du filament est seule employée. Le retour, pour cette plaque, est fait au pôle négatif du filament. La tension d'A. V. C. est obtenue à la manière ordinaire.

Lorsque l'on désire un A. V. C. différé, le schéma suivant est recommandé : la diode entourant l'extrémite positive du filament est utilisée pour la détection, le retour de plaque se faisant au pôle positif de la basse tension. L'autre diode est employée pour l'A.V.C., son retour s'effectuant au pôle négatif de la tension de polarisation.

Si l'on désire un A.V.C. plus différé que celui fourni par ce dernier circuit, on utilisera le suivant : la diode de l'extrémité négative du filament est utilisée pour la détection, le retour se faisant au moins basse tension. L'autre diode fournit la tension d'A. V. C., son retour se faisant au pôle négatif de la tension de polarisation. La diode d'A. V. C. a ainsi une polarisation de 2 volts supérieure à la tension de polarisation appliquée.

D'autres schémas peuvent encore être imaginés. Des circuits différents de ceux précédemment décrits peuvent être désirables, mais leur nature dépend des caractères spécifiques du reste du circuit du récepteur.

Release No. 615

October 30, 1947

SYLVANIA ELECTRIC PRODUCTS INC.

Type 1B50

The 1B50 is a tunable TR gas switching tube of the integral cavity type for the 6550 Mc range.

Electrical Data - General

Tuning Range	6000 to 7100	Mc
Leakage Power* (at 200 Kw)	60	mw max.
Insertion Loss (at 6550 Mc)	1.5	db max.
Keep-Alive Interaction (at 100 μAdc)	0.2	db max.
Recovery Time (at 200 kw; 3 db down)	12	μsec. max.
Loaded Q (at zero keep-alive current)	350	max.
Frequency Change with Temperature (0 to 100°C)	0 to -40	Mc
Keep-Alive Voltage Drop (at 100 μAdc)	300 to 450	Vdc
Keep-Alive Ignition Time	5.0	sec. max.
Keep-Alive Starting Voltage	-750	Vdc max.

Mechanical Data - General

Number of Keep-Alive Electrodes	One	
Net Weight (approximate)	13	oz.
Mounting Position	Any	
Mounting	(See Note 1)	
Dimensions	(See Drawing)	

Ratings

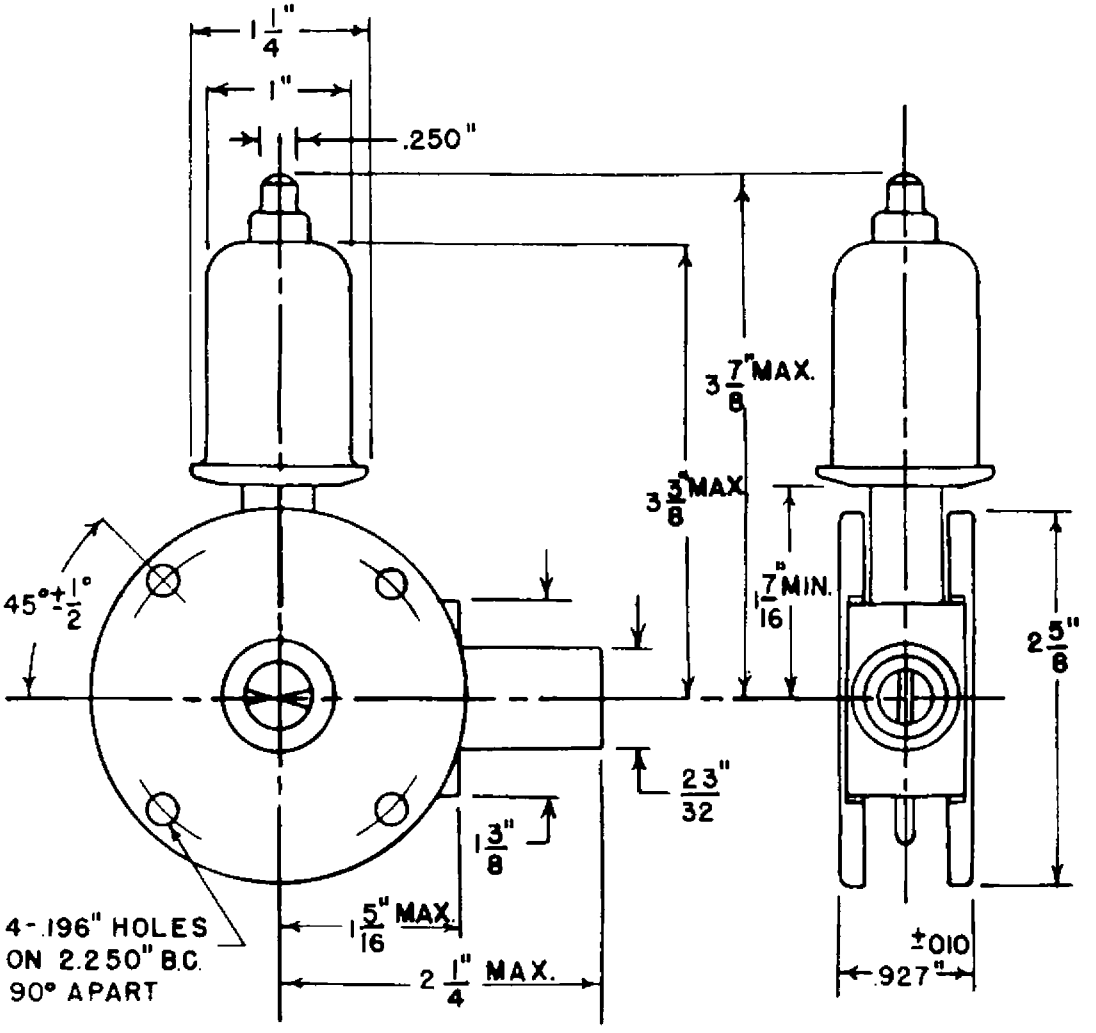
Maximum Transmitter Peak Power	300	Kw
Keep-Alive Supply Voltage (open circuit)	-750 to -1000	Vdc
Keep-Alive Current	100 to 200	μAdc
Ambient Temperature Range	-40 to +100	°C

*total power averaged over pulse

(Note 1) Between std. R.F. choke
Flanges in 3/4" x 1 1/2" O.D.
-.064" W.T. Std. Waveguide

10/9/47

SYLVANIA ELECTRIC PRODUCTS INC.
OUTLINE DRAWING
TYPE 1B50



TECHNICAL DATA

1B51

Sylvania

T E N T A T I V E

TYPE 1B51

Anti-TR Gas Switching Tube

PHYSICAL SPECIFICATIONS

Envelope: Metal

Dimensions: As Per Outline

Ionizable Medium: Argon

No. of Electrodes: Two

Mounting Position: Any

Ratings and Characteristics

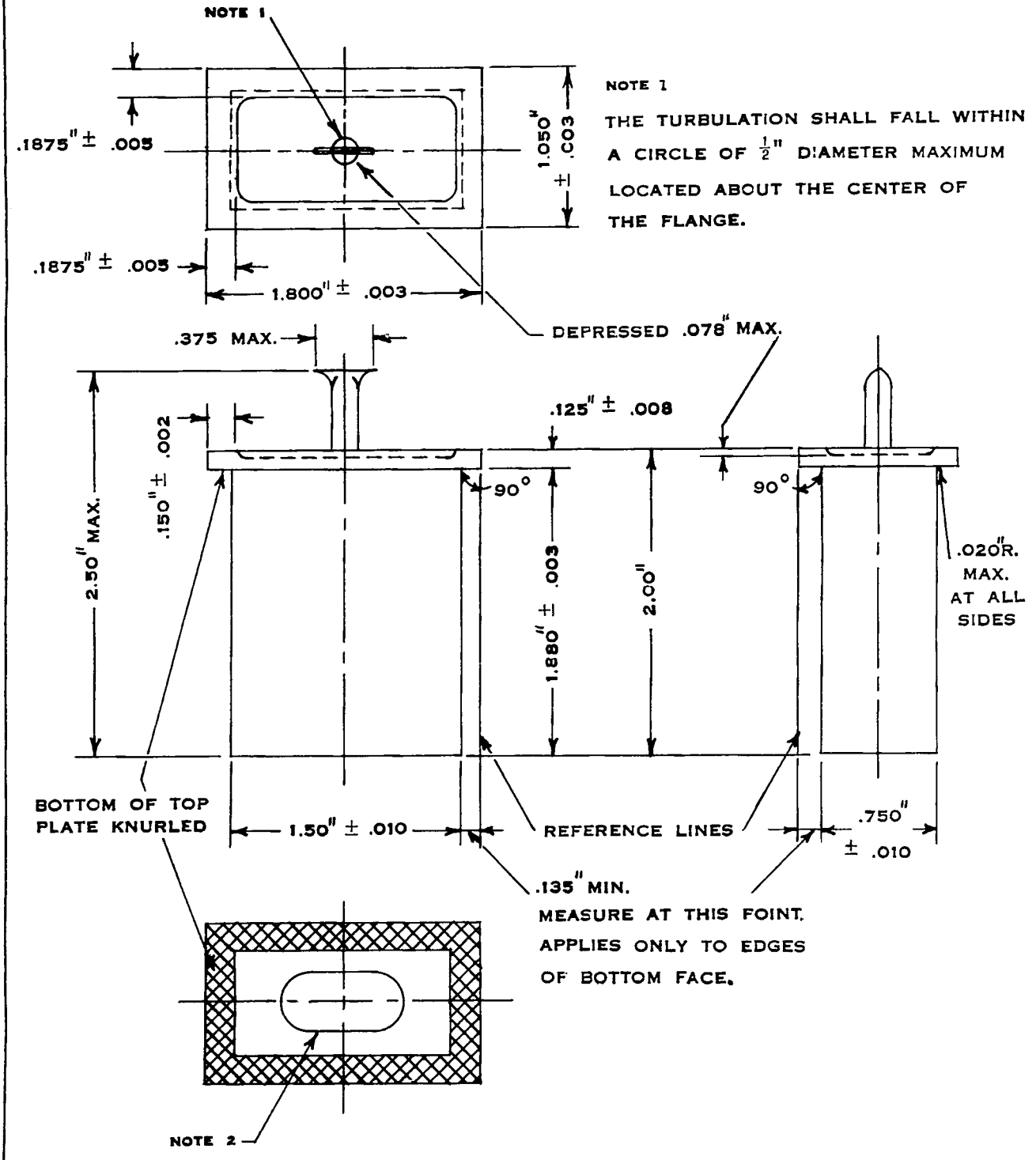
Center Frequency		6425	Mc
Operating Frequency Range		6225-6625	Mc
Minimum Transmitter Peak Power		100	kw
Minimum Voltage Standing Wave Ratio at Center Frequency		11	
Tuning Susceptance	(B/YO)	±0.06	
Maximum Equivalent Conductance	(G/YO)	0.1	
Maximum Loaded Q	(QL)	6.5	
Firing Time		10	sec
Arc Loss		0.5	db
Ambient Temperature Range		-50 to +100°	C

from RMA release #501, June 15, 1946

SYLVANIA ELECTRIC PRODUCTS INC.

OUTLINE DRAWING

TYPE 1B51



NOTE 1

THE TURBULATION SHALL FALL WITHIN A CIRCLE OF $\frac{1}{2}$" DIAMETER MAXIMUM LOCATED ABOUT THE CENTER OF THE FLANGE.

NOTE 2

CENTERLINE OF WINDOW SHALL COINCIDE WITH CORRESPONDING CENTERLINES OF BOX WITHIN 0.015" MEASURED IN PLANE OF WINDOW.

May 27, 1946

TECHNICAL DATA

1B52

Sylvania

T E N T A T I V E

TYPE 1B52

Anti-TR Gas Switching Tube, Fixed Tuned

PHYSICAL SPECIFICATIONS

Envelope: Metal

Dimensions: As Per Outline

Ionizable Medium: Argon

No. of Electrodes: Two

Mounting Position: Any

Ratings and Characteristics

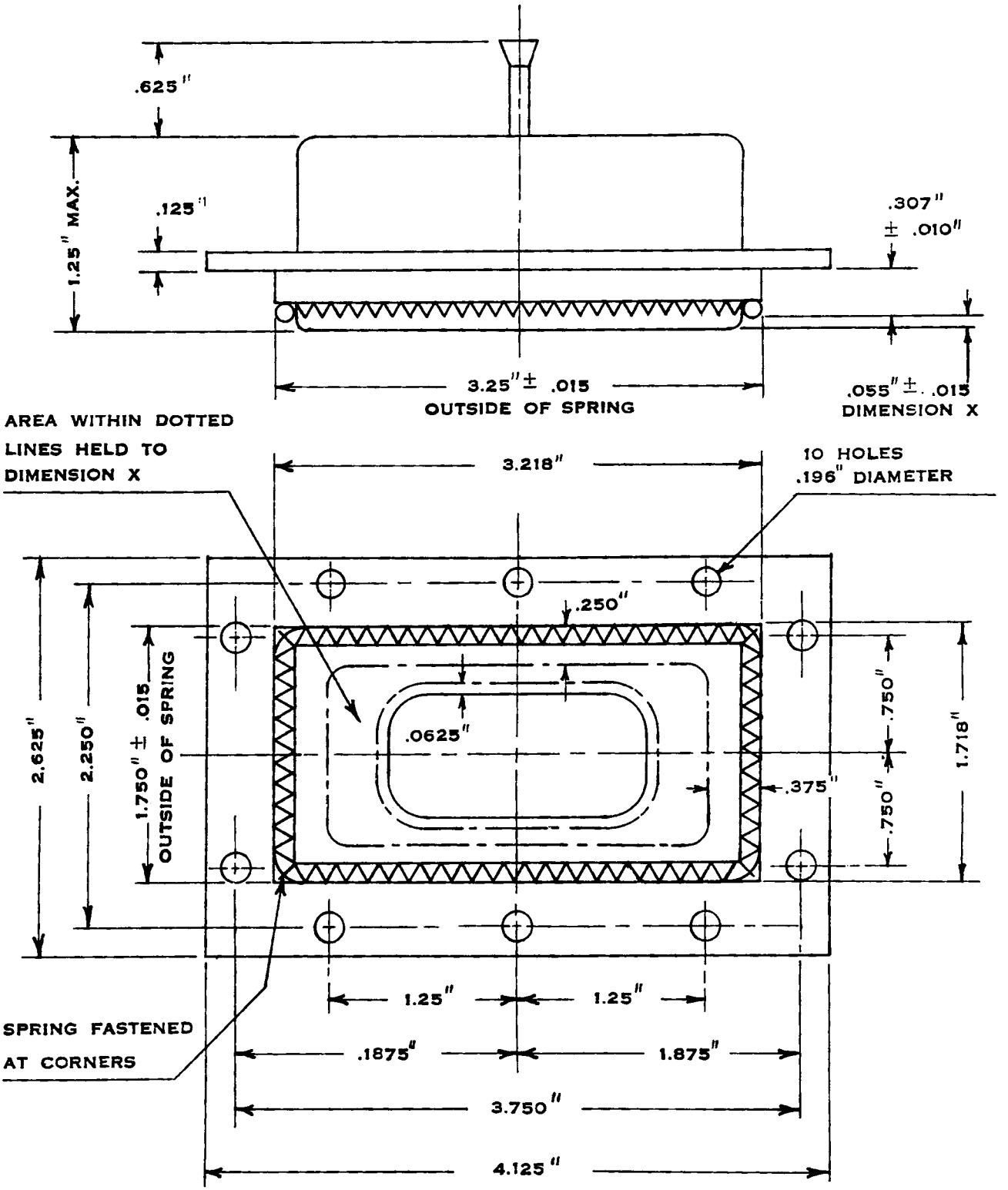
Center Frequency		3625	Mc
Operating Frequency Range		3540-3710	Mc
Minimum Transmitter Peak Power		20	kw
Minimum Voltage Standing Wave Ratio at Center Frequency		21	
Tuning Susceptance	(B/YO)	±0.05	
Maximum Equivalent Conductance	(G/YO)	0.05	
Maximum Loaded Q	(QL)	5.5	
Ambient Temperature Range		-50 to +100°	C

from RMA release # 501, June 15, 1946

SYLVANIA ELECTRIC PRODUCTS INC.

OUTLINE DRAWING

TYPE 1B52



May 27, 1946

TECHNICAL DATA

1B53

Sylvania

T E N T A T I V E

TYPE 1B53

Anti-TR Gas Switching Tube, Fixed Tuned

PHYSICAL SPECIFICATIONS

Envelope: Metal

Dimensions: As Per Outline

Ionizable Medium: Argon

No. of Electrodes: Two

Mounting Position: Any

Ratings and Characteristics

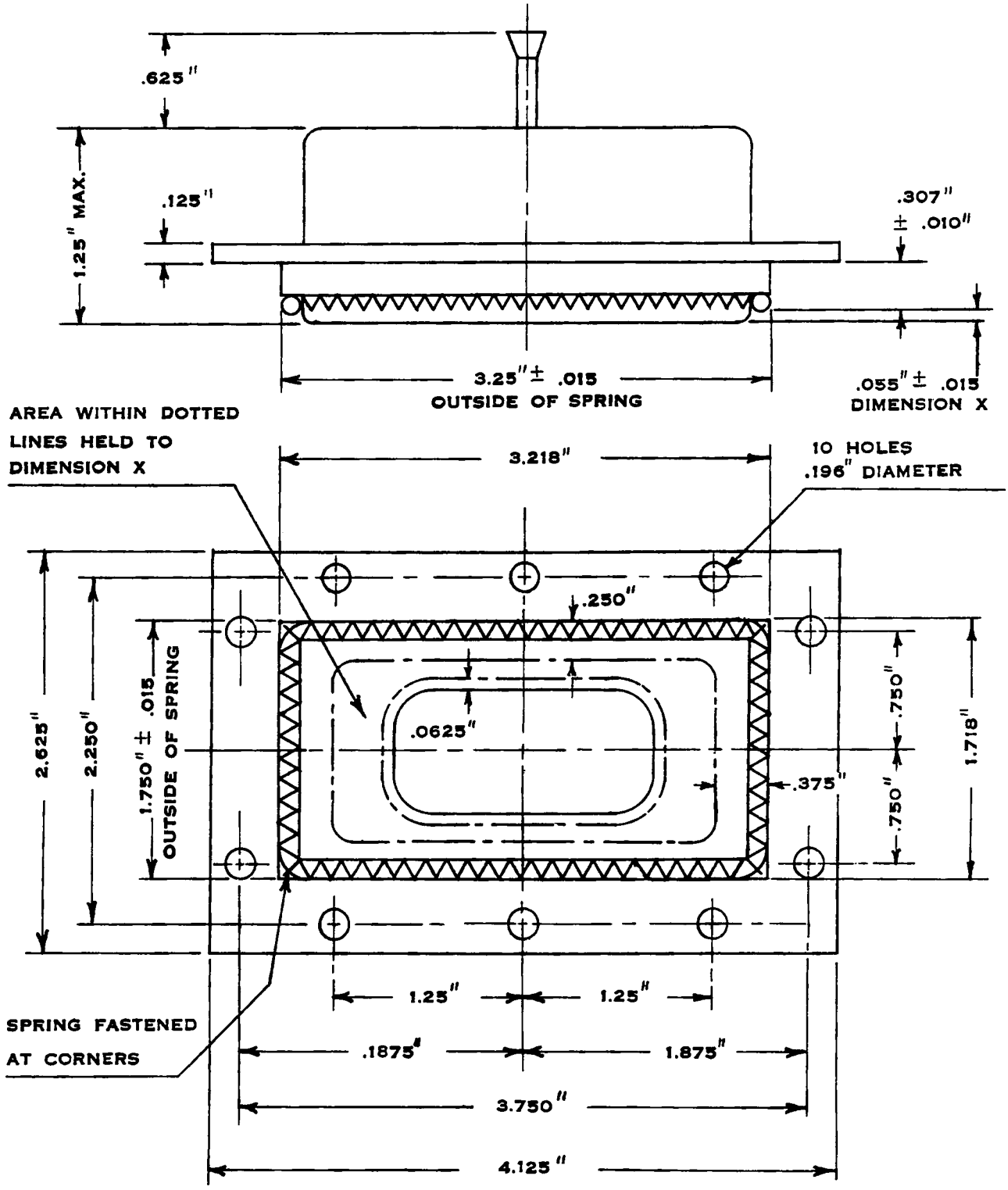
Center Frequency		3479	Mc
Operating Frequency Range		3390-3560	Mc
Minimum Transmitter Peak Power		20	kw
Minimum Voltage Standing Wave Ratio at Center Frequency		21	
Tuning Susceptance	(B/YO)	±0.05	
Maximum Equivalent Conductance	(G/YO)	0.05	
Maximum Loaded Q	(QL)	5.5	
Ambient Temperature Range		-50 to +100°	C

from RMA release # 509, July 10, 1946

SYLVANIA ELECTRIC PRODUCTS INC.

OUTLINE DRAWING

TYPE 1B53



May 27, 1946

Release No. 633

January 26, 1948

SYLVANIA ELECTRIC PRODUCTS INC.

Type 1B54

The Type 1B54 is a broad-band, non-tunable Pre-TR gas switching tube of the integral cavity type for the 3550 Mc region.

Electrical Data - General

Operational Band	3400 to 3700	Mc
Low-Level Input V.S.W.R. (matched load, over operational band)	1.30	max.
Insertion Loss	0.4	db max.

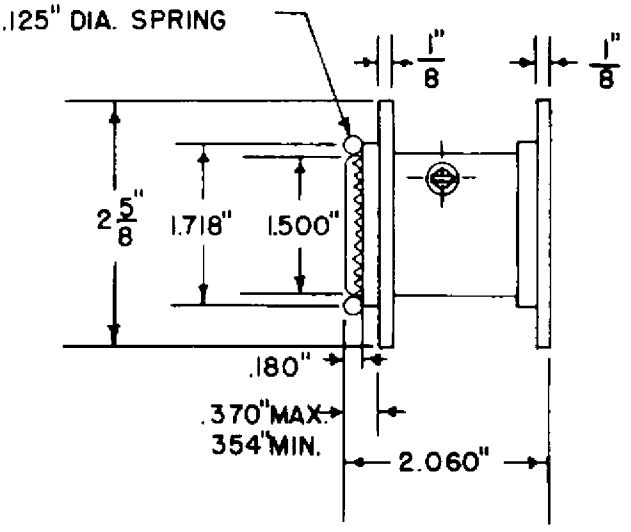
Mechanical Data - General

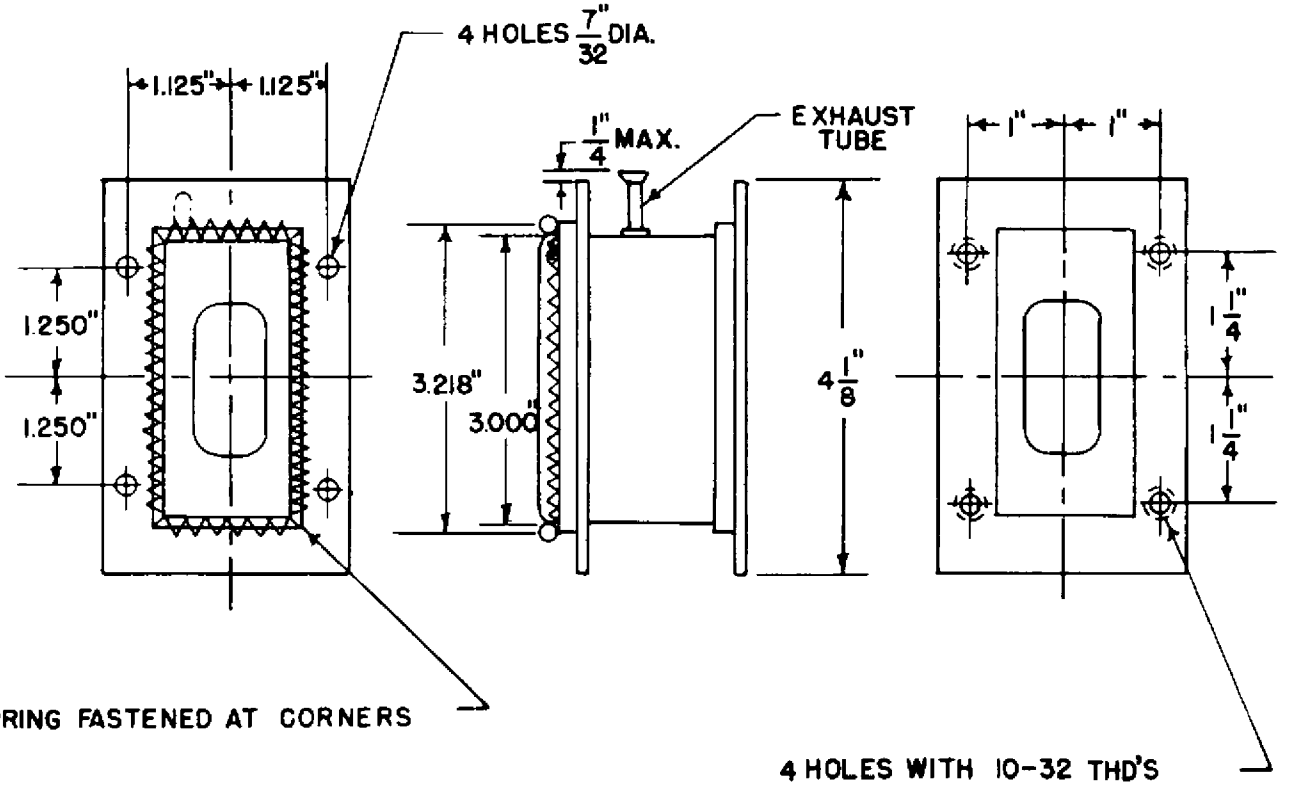
Dimensions	(See Outline Drawing)	
Mounting Position	Any	
Net Weight (approximate)	1	lb.

Ratings

Maximum Transmitter Peak Power	1000	Kw
Minimum Transmitter Peak Power	10	Kw
Ambient Temperature Range	-55 to +100	°C

SYLVANIA ELECTRIC PRODUCTS INC.
OUTLINE DRAWING
TYPE 1B54





12-17-47

SYLVANIA

JETEC Registration Data

TYPE 1B55

TR SWITCHING TUBE

The Type 1B55 is a broad-band TR switching tube designed to decouple effectually the receiver from a common transmitting and receiving antenna during a transmitting period. It is an integral cavity type with an operational band of 3,360 to 3,740 megacycles.

ELECTRICAL DATA

Operational Band(1)	3360 to 3740 mc	Ignitor Open Circuit Supply Voltage(dc)	-500 to -700 volts
Transmitter Peak Power(min.)	10 kw	Leakage Power(max.)(3)	40 mw
Ignitor Voltage Drop:(2)		Insertion Loss(max.)(4)	0.7 db
Minimum	275 volts	Ignitor Interaction(max.)(5)	0.3 db
Maximum	425 volts	Recovery Time(max.)(6)	15 µsec
Spike Leak Energy(3)	0.3 erg		

MECHANICAL DATA

Mounting Position	any	Ambient Temperature Range (non operating)	-40 to +100 °C
Number of Ignitors	one		
Outline	Page 2		

Notes

NOTES

(1) With a Voltage Standing Wave Ratio of 1.9 maximum. The Voltage Standing Wave Ratio is 1.4 maximum in the frequency range of 3,390 to 3,710 megacycles.

(2) With ignitor current of 200 microamperes.

(3) With peak power of 50 ±10 kilowatts, pulse repetition rate of 1,000 pulses per second, frequency at 3,550 mc,

(3) (Continued) pulse duration of 1.0 ±0.15 and 0.5 ±0.15 microseconds, and ignitor current of 200 microamperes dc.

(4) At 3,550 megacycles and zero ignitor current.

(5) At 3,550 megacycles and 200 microamperes ignitor current.

(6) At 750 kilowatts peak power and 3 db down.

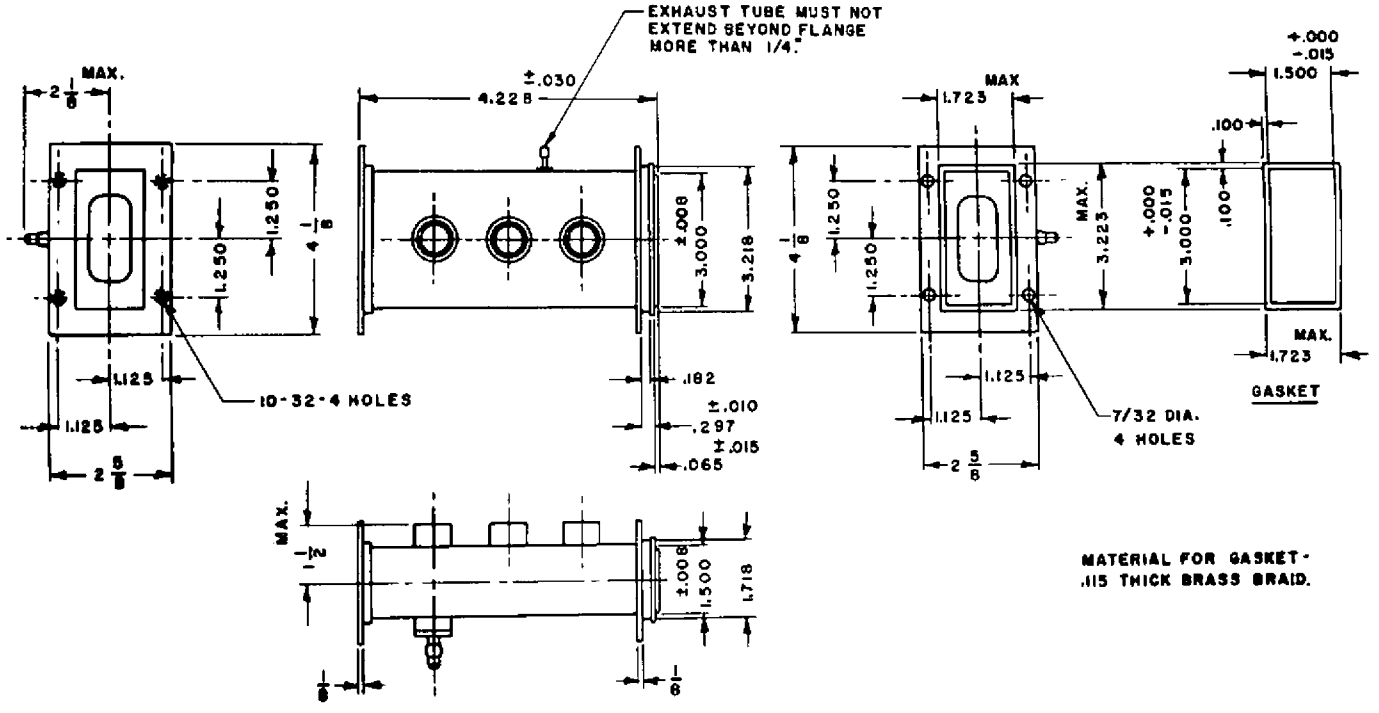
(See Page 2 for Outline)

2-15-54 SYLVANIA ELECTRIC PRODUCTS INC. 1740 Broadway New York 19, New York 1B55-R-1

from RETMA release #1283, Feb. 26, 1954

SYLVANIA

OUTLINE



ELECTRON TUBE
TYPE 1B55

TECHNICAL DATA

1B59

Sylvania

T E N T A T I V E

TYPE 1B59

Glow Modulator

PHYSICAL SPECIFICATIONS

Cathode: Cold
Base: Intermediate Shell Octal, 2-Pin
Bulb: T-9, Coated, with clear top
Diameter: 1 5/16" Max.
Overall Length: 3¼" Max.
Seated Height: 2 21/32" Max.
Mounting Position: Any

BASE PIN CONNECTIONS

Pin 3 - Cathode
Pin 7 - Anode

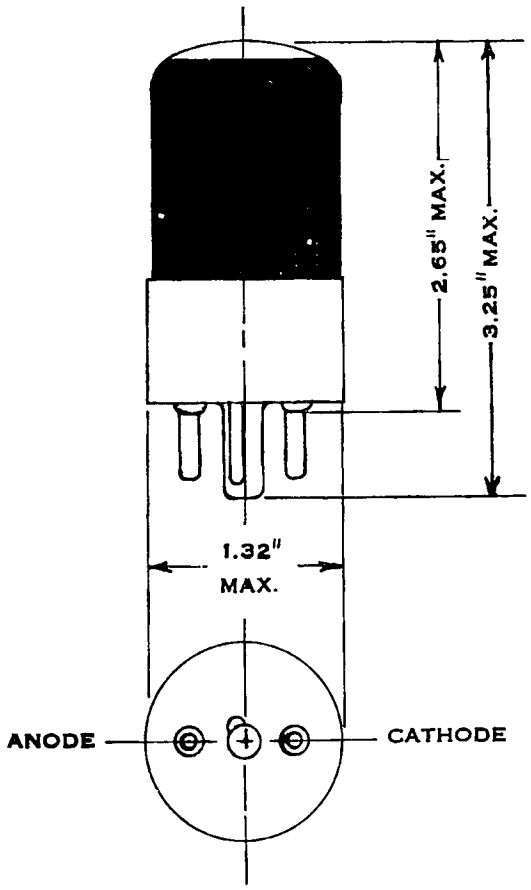
RMA BASING NO. _____

Ratings and Characteristics

Maximum Starting Voltage	225	Vdc
Maximum Operating Voltage	140	Vdc
Maximum Operating Current	35	mAdc
Minimum Operating Current	5	mAdc
Modulating Frequency Range	15-15000	cps
Useful Light Range	3500-6500	A

Typical Operating Conditions and Characteristics

Anode Supply Voltage	250	Vdc
Operating Current	30	mAdc
Series Protective Resistance (Approx.)	3000	ohms



from RMA release # 477, March 11, 1946

Release No.615

October 30, 1947

SYLVANIA ELECTRIC PRODUCTS INC.

Type 1B60

The 1B60 is a tunable TR gas switching tube of the integral cavity type for the 9300 Mc Range.

Electrical Data

Tuning Range	8490 to 9600	Mc
Leakage Power* (at 10 Kw)	30	mw max.
Insertion Loss (at 8490 Mc)	0.85 to 1.50	db
Keep-Alive Interaction (at 100 μAdc)	0.2	db max.
Recovery Time (at 10 kw; 3 db down)	4	μsec. max.
Loaded Q (at zero keep-alive current)	350	max.
Frequency Change with Temperature (0 to 100° C)	0 to -20	Mc
Keep-Alive Voltage Drop (At 100 μAdc)	325 to 450	Vdc
Keep-Alive Ignition Time	5.0	sec. max.
Keep-Alive Starting Voltage	-750	Vdc max.

Mechanical Data - General

Number of Keep-Alive Electrodes	One	
Net Weight (Approximate)	5	oz.
Mounting Position	Any	
Mounting	(See Note 1)	
Dimensions	(See Drawing)	

Ratings

Maximum Transmitter Peak Power	80	Kw
Keep-Alive Supply Voltage (open circuit)	-750 to -1000	Vdc
Keep-Alive Current	100 to 200	μAdc
Ambient Temperature Range	-40 to +100	oC

*total power averaged over pulse

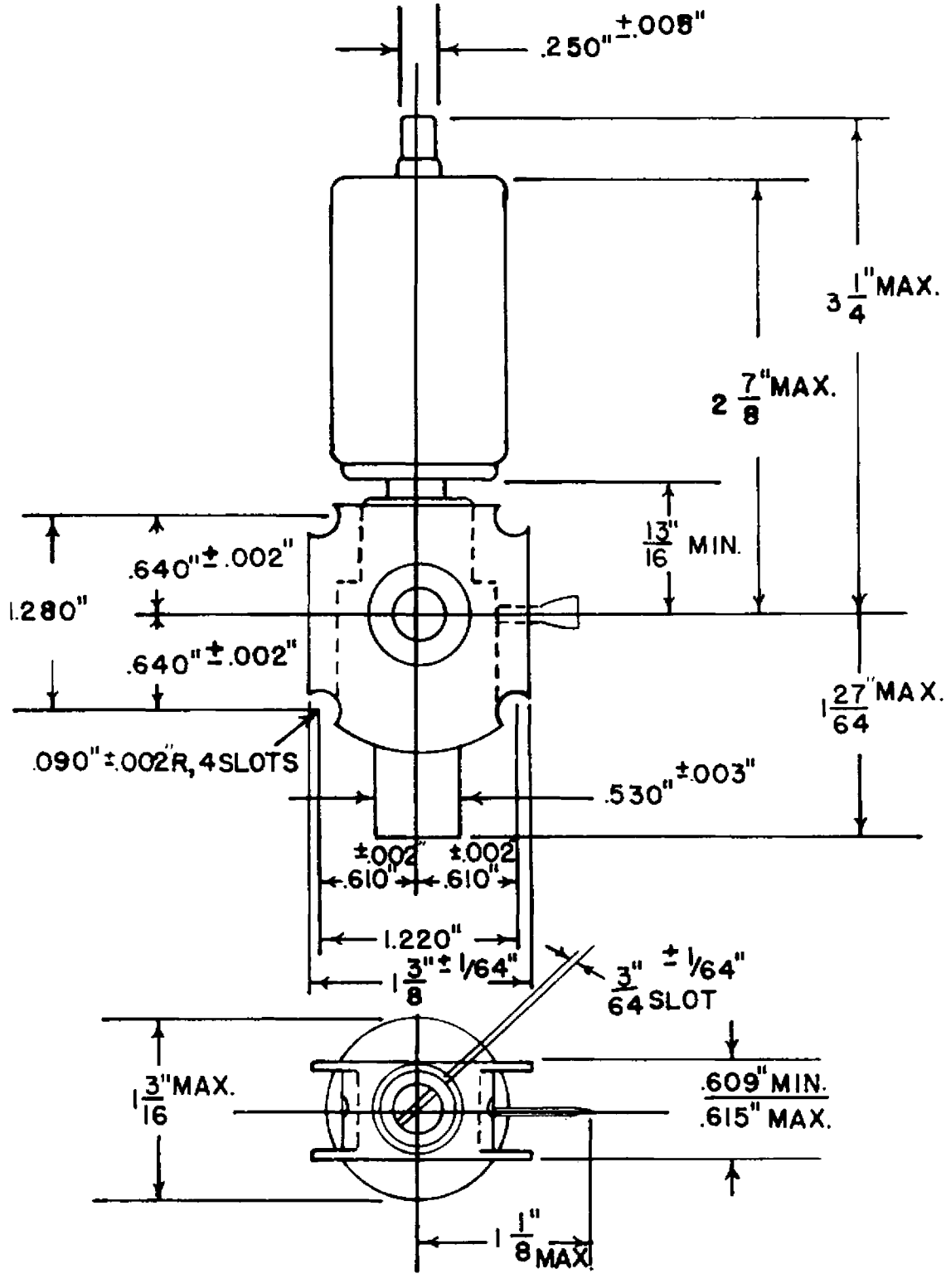
(Note 1) Between std. Rectangular R.F. choke flanges in std. 4" x 9" I.D. Waveguide

10/9/47

SYLVANIA ELECTRIC PRODUCTS INC.

OUTLINE DRAWING

TYPE 1860



TECHNICAL DATA

1B62

Sylvania

PHYSICAL SPECIFICATIONS

Dimensions: As per Outline

Mounting Position: Any

Finish: Gold or Silver Plate on External Parts of Discs Except Edges.

T E N T A T I V E

TYPE 1B62

Gas Switching Tube, External Cavity

Ratings and Characteristics

Maximum Ignitor Current	200	uAdc
Maximum Average Dissipation	1.0	W
Maximum Peak Dissipation	100	W
Maximum Ignitor Open Circuit Voltage	-1000	Vdc
Minimum Ignitor Open Circuit Voltage	-800	Vdc
*Maximum Tuning Frequency	3330	Mc
*Minimum Tuning Frequency	2800	Mc
Temperature Range	0° - 100°	C
Recovery Time Range for 3 db Loss	5-12	us

Typical Operating Conditions and Characteristics

Negative Ignitor Voltage	750	Vdc
Ignitor Current	85	uAdc
Series Protective Resistance	4	Meg

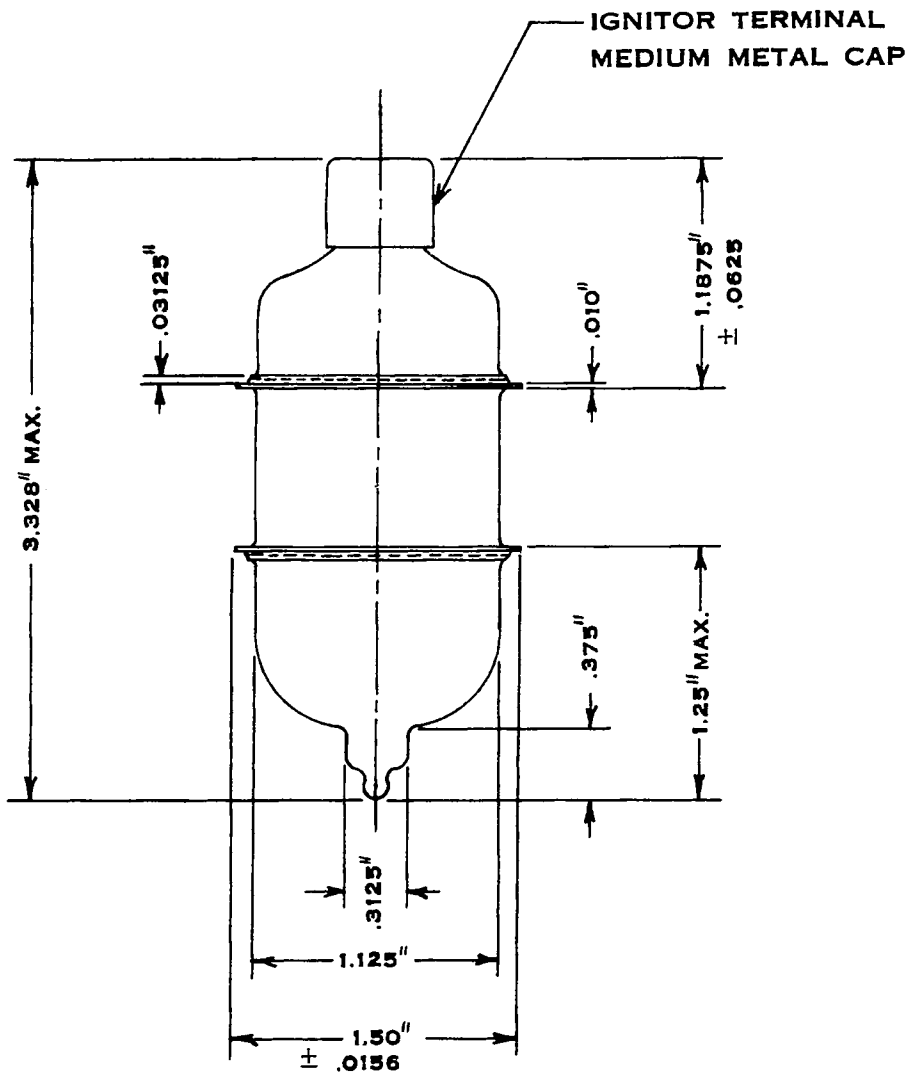
*Measured in tunable cavity

from RMA release # 480, March 25, 1946

SYLVANIA ELECTRIC PRODUCTS INC.

OUTLINE DRAWING

TYPE 1B62



25 February 1946

TECHNICAL DATA

1B63

Sylvania

T E N T A T I V E

TYPE 1B63

Band Pass TR Tube, X Band

PHYSICAL SPECIFICATIONS

Dimensions: As per Outline

Ionizable Medium: Argon and Water Vapor

No. of Electrodes: Two

No. of Keep-Alive Electrodes: One

Mounting Position: Any

Ratings and Characteristics

Center Frequency	9000	Mc
Band Pass Range (VSWR 1.75 Max.)	8615-9430	Mc
Minimum Keep-Alive Supply Voltage	600	Vdc
Maximum Keep-Alive Current	200	uAdc
Minimum Keep-Alive Current	100	uAdc
Maximum Keep-Alive Firing Time	5.0	sec.
Keep-Alive Voltage Drop at 150 uAdc	300	Vdc
Maximum Keep-Alive Interaction	0.2	db
Maximum Insertion Loss Over Band	0.75	db
Maximum Recovery Time (at 6 db)	2.0	us
Maximum Leakage Energy Per Pulse*	0.15	ergs
Maximum Leakage Power**	50	mw
Transmitter Average Power	300	W
Temperature Range	-40° to + 100°	C

* Energy per pulse measured in spike

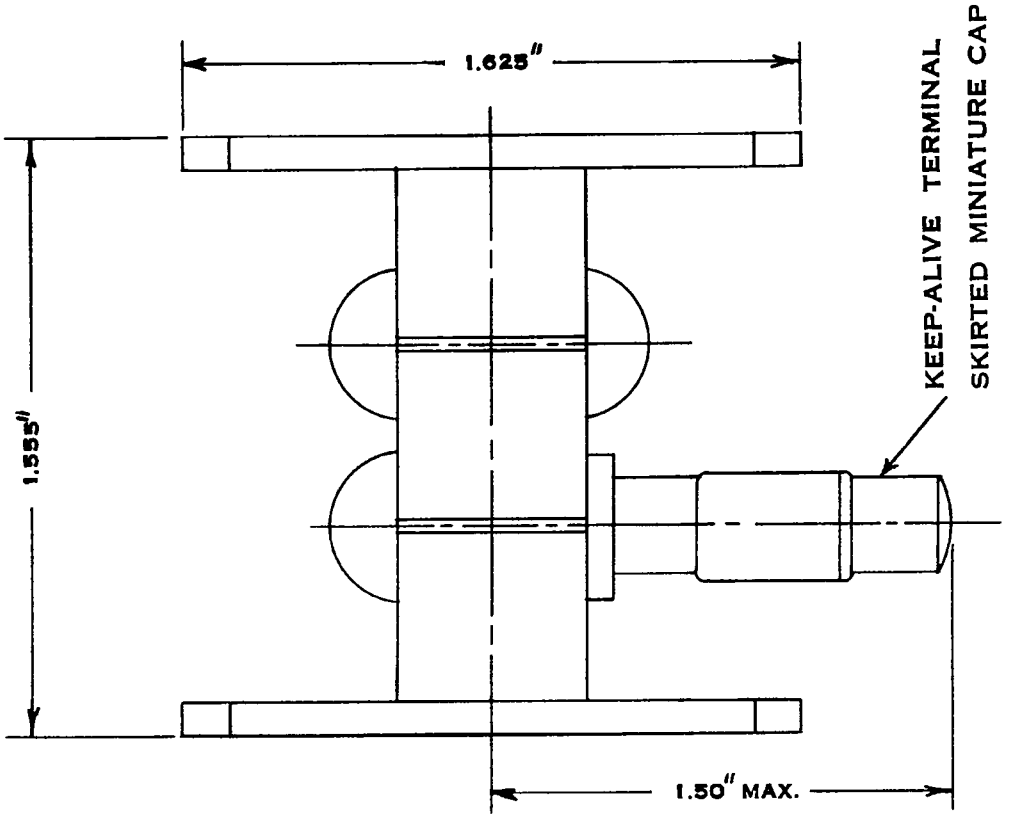
**Leakage Power measured over flat portion of pulse

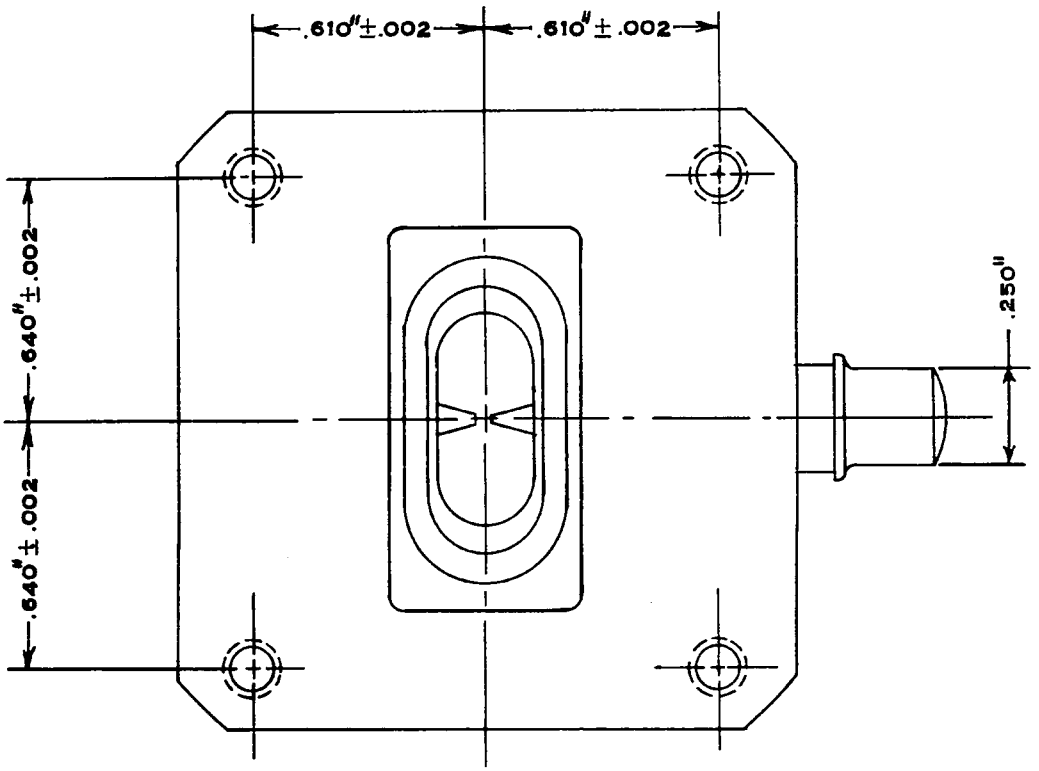
from RMA release # 489, April 25, 1946

SYLVANIA ELECTRIC PRODUCTS INC.

OUTLINE DRAWING

TYPE 1B63





5 April 1946

SYLVANIA

engineering data service
electronic division

SYLVANIA
1B63A

DESCRIPTION

Sylvania Type 1B63A is a fixed-tuned broad band transmit-receive tube which allows the same antenna to be used for transmitting and receiving microwave energy. It is designed for use with the Sylvania type 1B35A or 1B37A ATR.

FREQUENCY RANGE	8490 to 9578 mc

IGNITOR CHARACTERISTICS

Ignitor Open Circuit Voltage	—650 Vdc min.
Ignitor Current	100 μa
Ignitor Tube Drop	200 to 375 volts

LOW POWER LEVEL UNFIRED CHARACTERISTICS

Insertion Loss	0.7 db max.
Ignitor Interaction	0.2 db max.

HIGH POWER LEVEL FIRED CHARACTERISTICS

Leakage Power (Flat) (40 kw)	40 mw max.
Spike Leakage Energy (40 kw)	0.2 erg
Recovery Time	4 μsec @ 3 db
Arc Loss (4 kw)	0.8 db max.
Position of VSW minimum	0.065" ± .007"

TEMPERATURE AND MECHANICAL CHARACTERISTICS

Ambient Temperature Range (non-operative): —40° to +100°C
Mounting: Between standard rectangular rf choke flanges in 0.400" x 0.900" ID 0.050" WT waveguide.

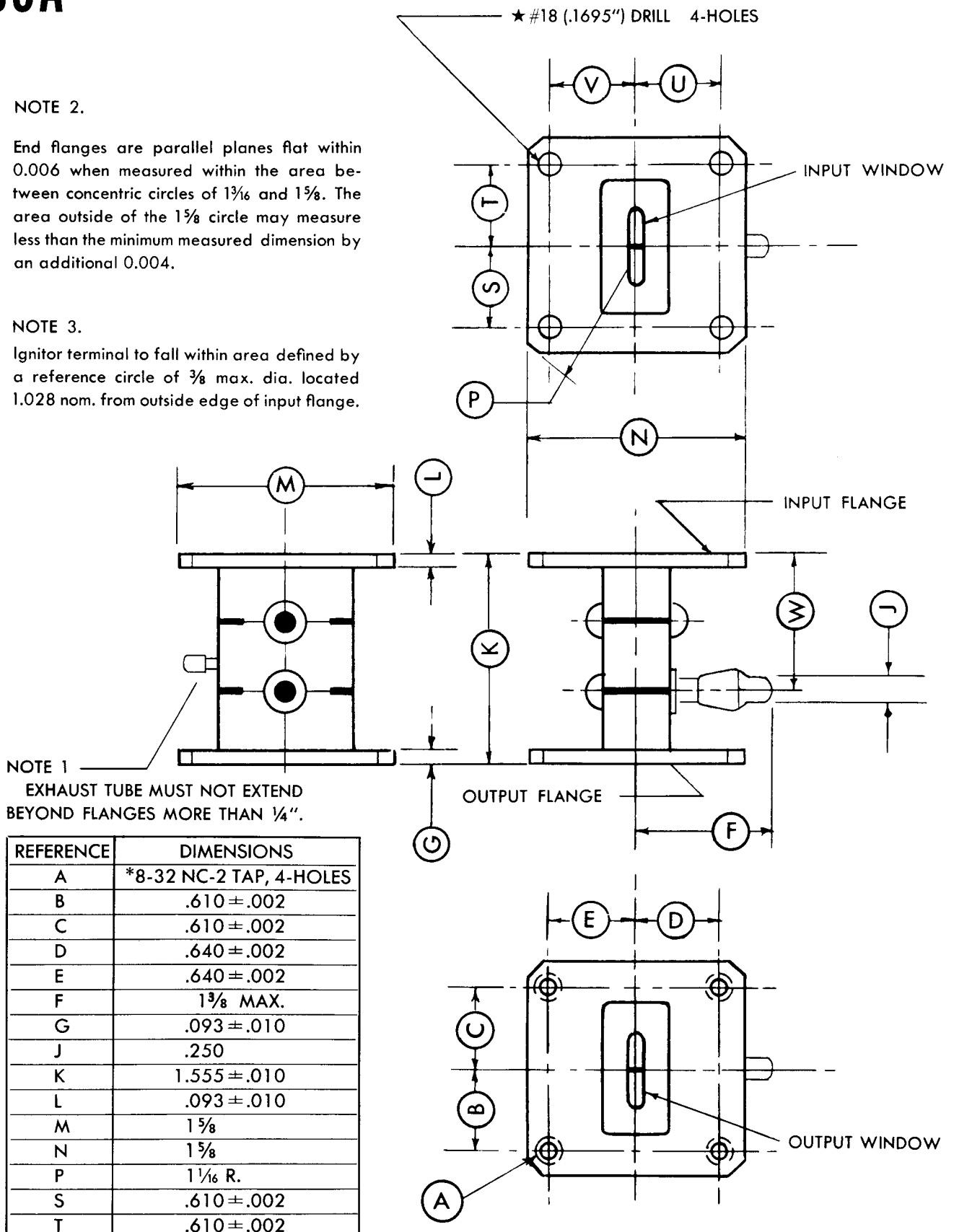
SYLVANIA ELECTRIC PRODUCTS INC. ELECTRONICS DIVISION
1740 Broadway, New York 19, New York

NOTE 2.

End flanges are parallel planes flat within 0.006 when measured within the area between concentric circles of 1 3/16 and 1 5/8. The area outside of the 1 5/8 circle may measure less than the minimum measured dimension by an additional 0.004.

NOTE 3.

Ignitor terminal to fall within area defined by a reference circle of 3/8 max. dia. located 1.028 nom. from outside edge of input flange.



REFERENCE	DIMENSIONS
A	*8-32 NC-2 TAP, 4-HOLES
B	.610±.002
C	.610±.002
D	.640±.002
E	.640±.002
F	1 3/8 MAX.
G	.093±.010
J	.250
K	1.555±.010
L	.093±.010
M	1 5/8
N	1 5/8
P	1 1/16 R.
S	.610±.002
T	.610±.002
U	.640±.002
V	.640±.002
W	1.028 NOM.

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SYLVANIA

1B63B

MECHANICAL DATA

Ambient Temperature Range (Non-Operative)	−40 to +100 Degrees C
Mounting	Between Standard Rectangular R F Choke Flanges in 0.400″ x 0.900″ I D x 0.050″ Wall Waveguide

ELECTRICAL DATA

Frequency Range	8490 to 9578 mc

IGNITOR CHARACTERISTICS

Ignitor Open Circuit Voltage	−650 Volts d c Min
Ignitor Current	100 μa
Ignitor Voltage Drop	200 to 375 Volts

LOW POWER LEVEL UNFIRED CHARACTERISTICS

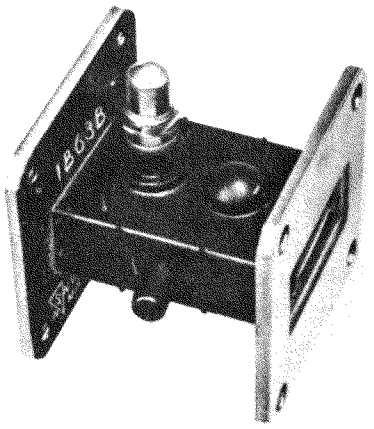
Insertion Loss	0.7 db Max.
Ignitor Interaction	0.2 db Max.

HIGH POWER LEVEL FIRED CHARACTERISTICS

(Flat) Leakage Power (40 KW)	40 mw Max.
Spike Leakage Energy (40 KW)	0.2 erg
Recovery Time (200 KW)	10 μsec at 3 db
Arc Loss (4 KW)	0.8 db Max.
Position of VSW Minimum	0.065 ± .007 Inch

QUICK REFERENCE DATA

The Sylvania Type 1B63B is a long life fixed-tuned broad band transmit-receive tube which is equivalent to and interchangeable with the Type 1B63A. It is designed for use with the Sylvania Type 1B35A or the 1B37A. The 1B63B is rated for 1000 hours life as against the 500-hour rating of the 1B63A.



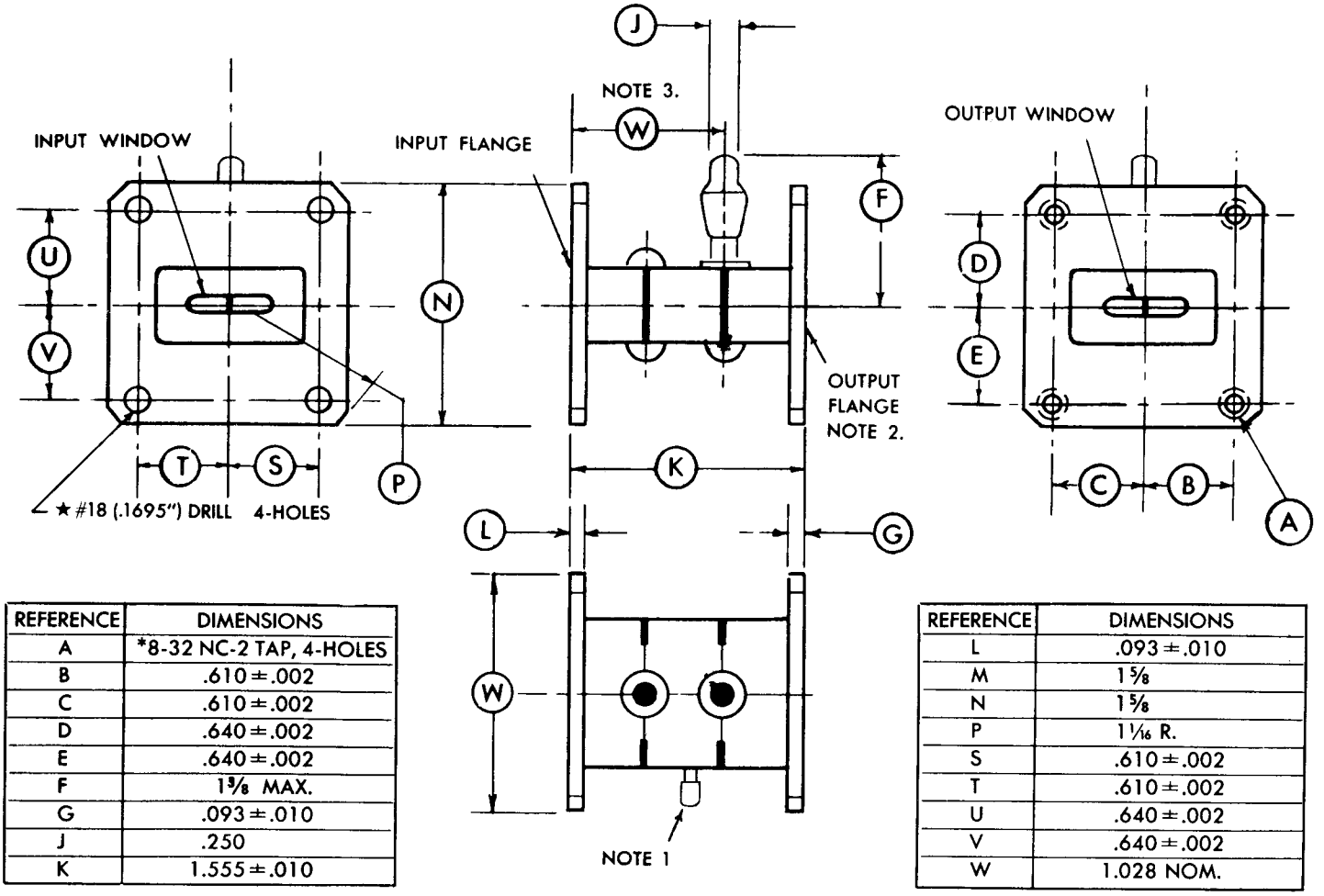
SYLVANIA ELECTRIC PRODUCTS INC.
ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

8-53-52

SYLVANIA

1B63B



REFERENCE	DIMENSIONS
A	*8-32 NC-2 TAP, 4-HOLES
B	.610 ± .002
C	.610 ± .002
D	.640 ± .002
E	.640 ± .002
F	1⅜ MAX.
G	.093 ± .010
J	.250
K	1.555 ± .010

REFERENCE	DIMENSIONS
L	.093 ± .010
M	1⅝
N	1⅝
P	1 1/16 R.
S	.610 ± .002
T	.610 ± .002
U	.640 ± .002
V	.640 ± .002
W	1.028 NOM.

DIAGRAM NOTES:

1. *The exhaust tube must not extend beyond the flanges more than ¼ inch.*
2. *The end flanges are parallel planes flat within 0.006" when measured within the area between concentric circles of 1-3/16" and 1⅜". The area outside of the 1⅜" circle may measure less than the minimum measured dimension by an additional 0.004".*
3. *The ignitor terminal falls within an area defined by a reference circle of ⅜" max. diameter located 1.028" nom. from the outside edge of the input flange.*

TECHNICAL DATA

1B64

Sylvania

T E N T A T I V E

TYPE 1B64

Miniature Voltage Regulator

Glow Discharge

PHYSICAL SPECIFICATIONS

Cathode: Cold

Base: Bayonet Candelabra, Double Contact

Bulb: T-4, Metal Shell

Dimensions: As per Outline

Mounting Position: Any

BASE CONNECTIONS

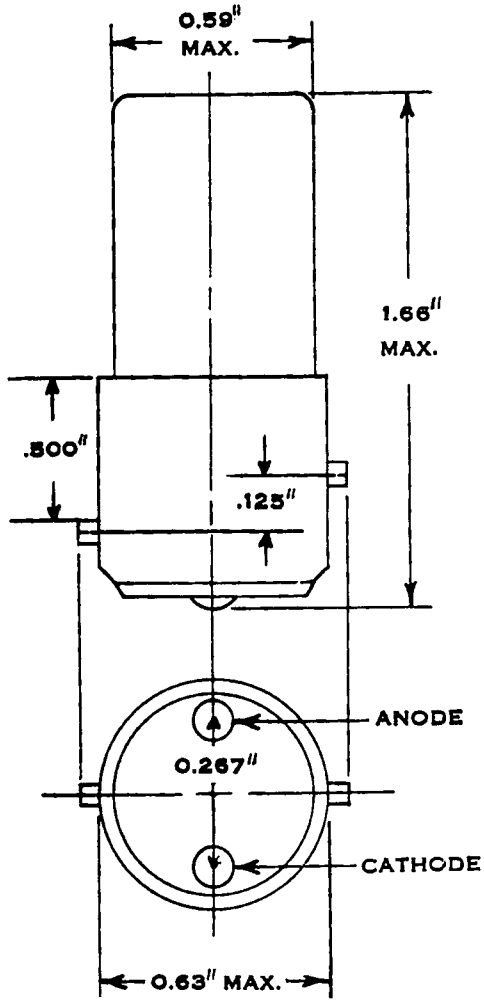
As Per Outline

Ratings and Characteristics

Maximum Starting Voltage	225	Vdc
Maximum Operating Voltage	75	Vdc
Minimum Operating Voltage	65	Vdc
Maximum Operating Current	2.0	mAdc
Minimum Operating Current	1.0	mAdc
Maximum Regulation*	3.0	Vdc

Typical Operating Conditions and Characteristics

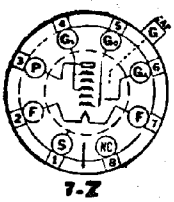
Anode Supply Voltage	250	Vdc
Operating Current	1.0-2.0	mAdc
Operating Voltage (Approx.)	70	Vdc
Series Protective Resistance (Approx.)**	15,000	ohms



* Regulation is maximum voltage variation with tube operating within specified current range.

**Value shown is for a typical circuit. Sufficient resistance must alway be used in series with the tube to limit the current through the tube to 2.0 mAdc under continuous (steady - state) operation.

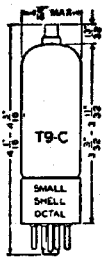
from RMA release # 477, March 11, 1946



Sylvania

TYPE 1B7G

CONVERTISSEUR DE FREQUENCE PENTAGRILLE



CARACTERISTIQUES

Tension filament CC.	1,4 volt
Courant filament	0,100 ampère
Ampoule	T9-C
Culot — Petit octal 8 broches	7-Z
Position de montage	Toutes

Capacités directes interélectrodes :

Grille G à plaque *	0,34 $\mu\mu f$
Grille G à grille Ga *	0,26 $\mu\mu f$
Grille G à grille Go *	0,12 $\mu\mu f$
Grille Go à grille Ga	0,9 $\mu\mu f$
Grille G à toutes autres électrodes (Entrée H.F.)	7,0 $\mu\mu f$
Grille Ga à toutes autres électrodes excepté Go (sort. osc.)	4,2 $\mu\mu f$
Grille Go à toutes autres électrodes excepté Ga (ent. osc.)	4,0 $\mu\mu f$
Plaque à toutes autres électrodes	7,5 $\mu\mu f$

* Blindage du tube connecté au négatif du filament.

Conditions limites de fonctionnement. (Voir page 9) :

(en convertisseur)

Tension filament CC.	1,4 volt
Courant filament	0,100 ma.
Tension plaque	90 volts max.
Source tension grille écran (Gs)	90 volts max.
Tension grille anode (Ga)	90 volts max.
Tension écran	55 volts max.
Courant cathodique total	5,0 ma. max.

Conditions de fonctionnement et caractéristiques :

Tension filament CC.	1,4 volt
Tension plaque	90 volts
Tension grille écran **	45 volts
Tension grille anode	90 volts
Tension grille de contrôle (G) ***	0 volt
Résistance grille oscillatrice (Go)	0,2 mégohm
Résistance interne	0,35 mégohm
Courant plaque	1,5 ma.
Courant grille-écran	1,3 ma.
Courant grille anode	1,6 ma.
Courant grille oscillatrice	0,035 ma.
Courant cathodique total	4,4 ma.
Conductance de conversion pour 0 volt grille contrôle	350 μmhos
Conductance de conversion pour —14 volts grille contrôle	2 μmhos

** Obtenu de préférence en utilisant une résistance de 30,000 ohms convenablement by-passée en série dans la batterie de 90 volts.

*** Une résistance d'au moins 1 mégohm doit être dans le retour de grille au négatif du filament, broche n° 7.

APPLICATION

Sylvania 1B7G est un convertisseur de fréquence pentagrille conçu spécialement pour être utilisé dans les postes récepteurs à faible consommation alimentés par accus ou piles. Les applications sont similaires à celle du type 1A7G, quoiqu'il existe des différences de caractéristiques principalement dans le courant du filament et dans la pente. Le filament fonctionne sous 1,4 volt 100 millis. Toutefois, le tube peut fonctionner directement sur pile 1,5 volt sans intercaler de tube ballast, grâce à sa construction spéciale. D'autres sortes de batterie A peuvent être utilisées pour autant que le circuit soit équipé convenablement.

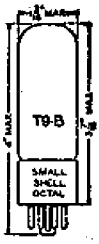
Une batterie B de 90 volts est nécessaire pour les tensions de plaque, grille-écran et grille d'anode. Une résistance de 30000 ohms doit être mise en série dans la grille-écran.. Malgré que la polarisation de grille soit inutile, le retour de grille devrait être fait soit à l'A. V. C., soit à travers une résistance de 1 mégohm convenablement by-passée. (Voir en fin de volume schéma-type utilisant les tubes de la série 1.4 volt.)



Sylvania

TYPE 1C5G

PENTODE AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension filament CC.	1,4 volt
Courant filament	0,100 ampère
Ampoule	T9-B
Culot — Petit octal 7 broches	6-X
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

Tension filament	1,4	1,4 volt
Tension plaque	83	90 volts
Tension grille écran	83	90 volts.
Tension négative de grille	—7,0	—7,5 volts
Courant plaque	7,0	7,5 ma.
Courant grille écran	1,6	1,6 ma.
Résistance interne	110,000	115,000 ohms
Conductance mutuelle	1,500	1,500 μmhos
Facteur d'amplification	165	180
Impédance de charge	9,000	8,000 ohms
Puissance modulée	200	240 milliwatts
Distortion harmonique totale	10	10 pour cent

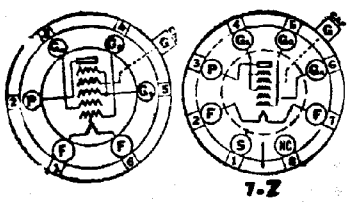
APPLICATION

Sylvania type 1C5G est un pentode amplificateur de puissance conçu spécialement pour être utilisé dans les postes récepteurs à faible consommation, alimentés par accus ou piles. Le tube 1C5G donnera une puissance modulée de 200 milliwatts en classe A avec une tension plaque et grille écran de 83 volts et une polarisation automatique de —7 volts. Le filament fonctionne sous 1,4 volt 100 millis. Toutefois, le tube peut fonctionner directement sur pile 1,5 volt sans intercaler de tube ballast, grâce à sa construction spéciale. D'autres sortes de batteries A peuvent être utilisées, pour autant que le circuit soit convenablement équipé.

Il est à noter que le courant filament et la puissance modulée sont le double de ceux du tube 1A5G. Le type 1C5G sera donc utilisé de préférence lorsqu'on désire plus de puissance.

Une batterie B de 90 volts est nécessaire pour les tensions de plaque et de grille écran. Il est préférable de prévoir la polarisation automatique du type 1C5G, puisque la tension grille sera réduite en conséquence au fur et à mesure de la chute de tension de la batterie B. La batterie C n'est pas nécessaire pour les récepteurs équipés avec les types de la série 1,4 volt, puisque les retours de grille des tubes H.F. et du second détecteur peuvent être faits directement aux négatifs des filaments.

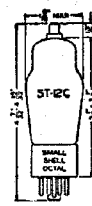
(Voir en fin de volume schéma-type utilisant les tubes de la série 1,4 volt.) Il existe également d'autres renseignements dans l'introduction, au paragraphe « Tubes Batterie ».



Sylvania

TYPE 1C6
TYPE 1C7G

CONVERTISSEURS PENTAGRILLE



CARACTERISTIQUES

Tension filament	2 Volts
Courant filament	0,12 ampère
Ampoule	ST 12 C
Culot petit modèle 6 broches (type 1C6)	6-L
Culot octal 8 broches (1C7G)	7-Z
Position de montage	verticale

Capacités directes interélectrodes :	1C6	1C7G	
Grille G à plaque (avec blindage)	0,3	0,26	$\mu\mu$f
Grille G à grille Ga (avec blindage) ...	0,3	0,32	$\mu\mu$f
Grille G à grille Go (avec blindage) ...	0,15	0,11	$\mu\mu$f
Grille Go à grille Ga	1,5	1,2	$\mu\mu$f
Grille G à toutes les autres électrodes (Entrée H.F.)	10,0	10,0	$\mu\mu$f
Grille Ga à toutes les autres électrodes (Sortie osc.)	6,0	5,5	$\mu\mu$f
Grille Go à toutes les autres électrodes (Entrée osc.)	6,0	4,8	$\mu\mu$f
Plaque à toutes les autres électrodes ...	10,0	14,0	$\mu\mu$f

Conditions de fonctionnement et caractéristiques :		
Tension filament	2	2 Volts
Tension plaque	135	180 Volts max.
Tension grille de contrôle (G)	—3	—3 Volts
Tension grille écran (Gs)	67,5	67,5 Volts
Tension grille anode (Ga) (à travers résistance de 20,000 ohms)	135	180 Volts
Résistance de grille oscillatrice	50,000	50,000 omhs
Courant plaque	1,3	1,5 ma
Courant grille écran	2,5	2,0 ma
Courant grille anode	3,1	4,0 ma
Courant grille oscillatrice	0,20	0,20 ma
Courant cathodique total	7,10	7,7 ma
Résistance interne	0,60	0,70 mégohm
Conductance de conversion	400	460 μmhos
Id. — —14 V. grille de contrôle	4	4 μmhos

APPLICATION

des types 1A6, 1C6, 1C7G et 1D7G
comme convertisseurs de fréquence.

Sylvania 1C6 et 1C7G sont des tubes perfectionnés de la série 2 volts oscillateur-détecteur pentagrille à grande conductance de conversion. Ils sont spécialement désignés pour les récepteurs batteries toutes ondes, et fonctionnent d'une manière satisfaisante jusqu'à des fréquences de 20-24 mégahertz, pourvu que les bobinages et les circuits y soient bien adaptés. Ces tubes remplissent les fonctions d'oscillateur modulateur à conductance de conversion variable.

Le remplacement du type 1A6 par le type 1C6 n'est possible que si le tube ballast ou la résistance en série dans les filaments peuvent être changés pour pouvoir supporter le supplément de courant de 0.06 ampère demandé par le 1C6 ou le 1C7G.

Les tensions appliquées à la plaque et à la grille anode doivent être plus élevées que celle appliquée à l'écran. En aucun cas, le courant total de cathode ne peut dépasser la valeur indiquée au tableau des caractéristiques.

La courbure de la caractéristique des tubes 1C6 ou 1C7G est semblable à celle des tubes à pente variable, ce qui permet de les utiliser avantageusement au réglage de la sensibilité du récepteur.

La capacité grille n° 4-plaque est quelque peu plus grande que dans les tubes à grille écran.

Il en résulte que si la fréquence intermédiaire (M. F.) se rapproche de la fréquence incidente (H. F.) des effets de réaction peuvent apparaître. Si la fréquence intermédiaire est plus basse que la fréquence incidente, de la dégénération peut prendre naissance;

ces effets deviennent d'autant plus grands que la capacité dans le circuit plaque est plus faible. Dans des cas extrêmes, la neutralisation peut être utilisée avec avantage; la sur-neutralisation produit, naturellement, l'effet contraire : la régénération.

Si la fréquence intermédiaire est plus grande que la fréquence incidente, des phénomènes de régénération peuvent se produire et causer l'instabilité du fonctionnement. En général, la capacité d'accord du circuit M. F. de plaque doit être supérieure à 50 $\mu\mu$f

Hygrade Sylvania CORPORATION

TECHNICAL DATA

Sylvania 2 Volt "G" Tubes

A new group of 2 volt tubes, consisting of eight types, is now made available by Hygrade Sylvania Corporation. These tubes are identical with some of the more popular 2 volt standard glass tubes, with the exception of the bases and top caps. The bases are of the octal type with locating lug and the top caps are of the miniature style. The ST-12 size of bulb is used for this group with the exception of Type 1F5G which is enclosed in an ST-14 bulb.

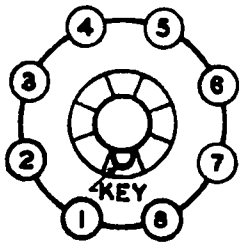
The characteristics, operating conditions, and circuit application of these tubes are identical to equivalent standard 2 volt glass tubes with the exception of the filament current for Type 1J6G. The filament current for this type is 240 milliamperes as compared to 260 milliamperes for the equivalent Type 19. Reference, therefore, may be made to data on equivalent glass tubes for additional information on this group of "G" tubes. Ballast tubes equipped with octal type bases will be made available to handle the requirements for various combinations of these new tubes and dial lamps.

It will be noted, in the base pin arrangement, that pin number 1 is open, having no connection. It is suggested that the contact for that pin be grounded, thus providing future means for metal tube replacement, if desired. The other open pins located on the bases are provided for uniformity in bases and not for future purposes.

The following table lists the complete 2 volt "G" group, showing base pin arrangements and equivalent standard glass types. Additional data may be obtained by referring to the data on equivalent types in the Sylvania Technical Manual.

OCTAL BASE "G" TYPES	EQUIVALENT TYPE	BASE PIN ARRANGEMENT 1	2	3	4	5	6	7	8	TOP CAP
1C7G	1C6	NC	F+	P	G_3G_5	G_1	G_2	F-	NC	G_4
1D5G	1A4	NC	F+	P	G_2	NC	--	F-	NC	G_1
1D7G	1A6	NC	F+	P	G_3G_5	G_1	G_2	F-	NC	G_4
1E5G	1B4	NC	F+	P	G_2	NC	--	F-	NC	G_1
1F5G	1F4	NC	F+	P	G_2	G_1	--	F-	NC	--
1H4G	30	NC	F+	P	NC	G_1	--	F-	NC	--
1H6G	1B5/25S	NC	F+	P	D(+)	D(-)	G	F-	NC	--
1J6G*	19	NC	F+	P_1	G_1	G_2	P_2	F-	NC	--

*Filament Current 240 milliamperes as compared to 260 milliamperes for Type 19.



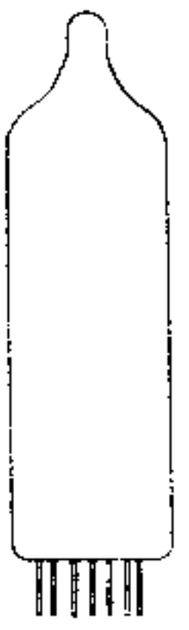
Bottom View of Base

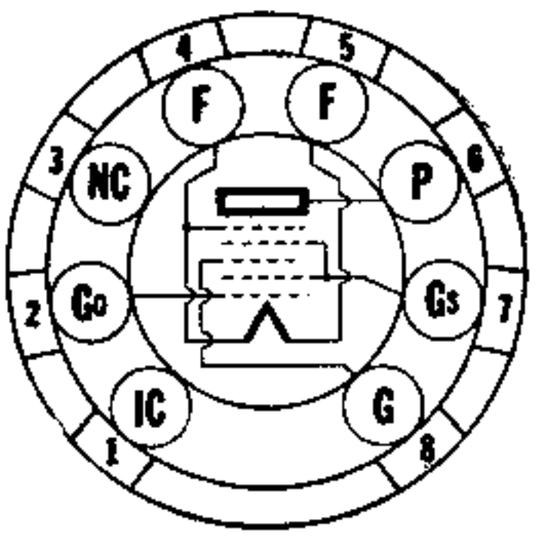
from RMA release #70, May 4, 1936

5-1-36

1C8 Sylvania Type

PENTAGRID CONVERTER





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TENTATIVE DATA

PHYSICAL SPECIFICATIONS

Base	Flexible Leads
Bulb	T-3
Minimum Lead Length	1¼"
Maximum Bulb Length	1½"
Mounting Position	Any

RATINGS

Filament Voltage DC	1.25 Volts
Maximum Plate Voltage	30 Volts
Maximum Screen Voltage	30 Volts

Direct Interelectrode Capacitances

	Unshielded	Shielded*
Control Grid to all other Electrodes	6.5	6.5 μμf
Control Grid to Plate	0.3	0.25 μμf. Max.
Plate to all other Electrodes	4.6	4.0 μμf.
Oscillator Grid to Control Grid	0.2	0.2 μμf. Max.
Oscillator Grid to all other Electrodes	2.6	2.4 μμf.
Oscillator Grid to Screen Grid	1.6	1.6 μμf.
Screen Grid to Control Grid	5.5	5.5 μμf

With **0.405" diameter shield connected to negative filament.*

TYPICAL OPERATION

Filament Voltage DC	1.25 Volts
Filament Current	.040 Ampere
Plate Voltage	30 Volts
Screen Supply Voltage**	30 Volts
Grid Voltage	0 Volts
Plate Current	0.32 Ma.
Screen Current	0.75 Ma.
Plate Resistance	0.3 Megohm
Conversion Conductance	100 μmhos
Oscillator Grid Resistance	0.1 Meg.
Oscillator Grid Current	30 μa.
Control Grid Voltage for Gc = 5 μmhos approx.	−6.5 Volts

***Screen voltage applied through **10,000** ohms resistor properly bypassed.*

Oscillator Characteristics***

Anode Grid Current	3.0 Ma.
Mutual Conductance	700 μmhos
Amplification Factor	3.5

****In a non-oscillating condition with plate and screen voltage of **30** volts, and **0.0** volts on the oscillator and control grids.*

APPLICATION

Sylvania Type 1C8 is a converter tube for use in very small radio sets. The other types required for a normal set complement and designed for use with it are Types 1Q6 (Diode Pentode), 1V5 (Output Pentode) and 1W5 (RF Pentode).

This type corresponds in service and circuit requirements to Type 1R5 except for optimization of the performance at low voltages. The tinned leads permit direct soldering into the circuit to permit great reduction in size of completed equipment, or may be cut off for use in a socket designed for this purpose.

When used on battery supply the filament voltage must never exceed 1.5 volts. For AC-DC power line operation, the design center is 1.2 volts.

RADIO MANUFACTURERS ASSOCIATION

SUITE 701-4 AMERICAN BUILDING
1317 F STREET, N. W.
WASHINGTON, D. C.

SUB-COMMITTEE ON TUBE NUMBERING

E. W. WILBY, CHAIRMAN
711 FIFTH AVENUE
NEW YORK, N. Y.

September 21st, 1936

To Tube Engineers:

Re: RMA Tube Standardization
Release #90 Errata and
Substitution.

This release replaces the letter forwarded to you on September 15th regarding the commercial release by the Hygrade-Sylvania Corporation of two ballast tube types designated as

1D2 having a 1 volt drop and a current rating of 420ma.

1E2 having a 1 volt drop and a current rating of 660ma.

These tubes are enclosed in an ST-12 envelop and based with a 6 pin base; the connections follow:

Pins #1 and #6 blank
#2 and #5 ballast resistor ends
#3 and #4 jumper connections

As the one volt ballast tube type is well known throughout the tube industry, it is believed that the forwarding of samples will not be necessary.

Very truly yours,

Edward W Wilby

Chairman
Tube Numbering

eww:lg

SYLVANIA ELECTRIC

RTMA Registration Data

TYPE 1D3

TRIODE

The Type 1D3 is a subminiature low-mu triode capable of operation in the uhf region.

MECHANICAL DATA

Style	subminiature
Cathode	coated filament
Bulb	T-3
Base	K8-1,(1) Subminiature Button--Flexible Leads
Outline	3-2
Maximum Bulb Diameter	0.400 inch
Maximum Overall Bulb Length	1.500 inches
Minimum Lead Length	1.500 inches
Mounting Position	any
Basing	8DN

Lead Connections:

Lead 1 .. grid	Lead 5 .. filament (+)
Lead 2 .. no connection	Lead 6 .. no connection
Lead 3 .. no connection	Lead 7 .. no connection
Lead 4 .. filament (−)	Lead 8 .. plate

ELECTRICAL DATA

GENERAL

Direct Interelectrode Capacitances:		
Grid to Plate	2.6	μμf
Input	1.0	μμf
Output	1.0	μμf
Filament Voltage (ac or dc)	1.25	volts
Filament Current	300	milliamps

RATINGS -- *Absolute System*

Filament Voltage (ac or dc)	1.25 (± 15%)	volts
Maximum Plate Voltage (dc)	110	volts
Maximum Plate Current (dc)	22	milliamps

CHARACTERISTICS

Conditions:		
Filament Voltage (ac or dc)	1.25	volts
Plate Voltage (dc)	90	volts
Grid Voltage (dc)	-5.0	volts
Plate Current (dc)	12.5	milliamps
Transconductance	3,400	micromhos
Amplification Factor	8.7	
Grid Voltage for 10 μamps Plate Current	-25	volts

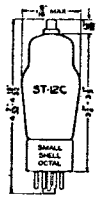
(1) With 1.500 inches Minimum Lead Length as specified above.



Sylvania

TYPE 1D5GP
TYPE 1D5GT

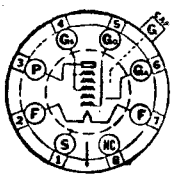
AMPLIFICATEURS H. F. A PENTE VARIABLE



CARACTERISTIQUES

Tension filament CC.	2,0 volts
Courant filament	0,060 ampère
Ampoule	ST-12C
Capuchon	Miniature
Culot — Petit octal 7 broches	5-R ou 5-Y
Position de montage	verticale

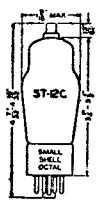
Pour toutes les autres caractéristiques, conditions de fonctionnement et applications se référer au type 1A4.



Sylvania

TYPE 1D7G

CONVERTISSEUR PENTAGRILLE



CARACTÉRISTIQUES

Tension filament CC.	2,0 volts
Courant filament	0,06 ampère
Ampoule	ST-12C
Capuchon	Miniature
Culot — Petit octal 8 broches	7-Z
Position de montage	Verticale

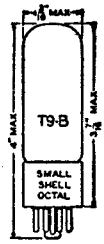
Pour toutes les autres caractéristiques, conditions de fonctionnement et applications se référer au type 1A6. Voir également l'application du type 1A6.



Sylvania

TYPE 1E4G

TRIODE POUR USAGE GENERAL



CARACTERISTIQUES

Tension filament CC.	1,4 volt
Courant filament	0,050 ampère
Ampoule	T-9-B
Culot — Petit octal 7 broches	5-S
Position de montage	Toutes

Capacités directes interélectrodes :

Grille à plaque	2,4 $\mu\mu f$
Grille à filament	2,4 $\mu\mu f$
Plaque à filament	6,0 $\mu\mu f$

Conditions de fonctionnement et caractéristiques :

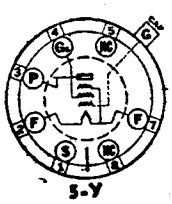
Tension filament	1,4	1,4 volt
Tension plaque	90	90 volts
Tension négative de grille *	0	—3 volts
Courant plaque	4,5	1,5 volts
Résistance interne	11,000	17,000 ohms
Conductance mutuelle	1,325	825 μmhos
Facteur d'amplification	14,5	14

* Broche n° 7 retour au négatif du filament.

APPLICATION

Sylvania type 1E4G est un triode pour usage général, conçu pour utilisation dans les récepteurs à faible consommation, alimentés sur piles ou accus. Ses caractéristiques en font un tube oscillateur idéal.

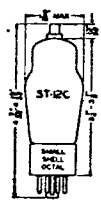
Le filament fonctionne sous 1,4 volt 50 millis. Toutefois, le tube peut fonctionner directement sur pile 1,5 volt sans intercaler de tube ballast, grâce à sa construction spéciale. D'autres sortes de batteries A peuvent être utilisées, pour autant que le circuit soit équipé convenablement. Le retour de grille devrait être fait au pôle négatif du filament, de préférence à travers une résistance. D'autres informations concernant les tubes de la série 1,4 volt seront trouvées au préambule de ce volume (Tubes batterie) et au schéma-type *in fine*.



Sylvania

TYPE 1E5GP

AMPLIFICATEUR H. F.
A GRILLE ECRAN



CARACTERISTIQUES

Tension filament CC	2,0 volts
Courant filament	0,06 ampère
Ampoule	ST-12C
Connexion	Miniature
Culot — Petit octal 7 broches	5-Y
Position de montage	Verticale

Pour toutes les autres caractéristiques, conditions de fonctionnement et applications se référer au type 1B4P.

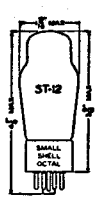


8-C

Sylvania

TYPE 1E7G

DOUBLE PENTODE
AMPLIFICATEUR
DE PUISSANCE



CARACTERISTIQUES

Tension filament CC.	2,0 volts
Courant filament	0,240 ampère
Ampoule	ST-12
Culot — Petit octal 8 broches	8-C
Position de montage	Verticale

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A (une section) :

Tension filament	2,0	2,0 volts
Tension plaque	90	135 volts max.
Tension grille écran	90	135 volts max.
Tension grille *	—3,0	—4,5 volts
Courant plaque (signal zéro)	3,8	7,5 ma.
Courant écran (signal zéro)	1,1	2,2 ma.
Résistance interne (approx.)	0,34	0,26 mégohm
Conductance mutuelle	1,150	1,425 μmhos
Puissance modulée	110	290 milliwatts
Distortion	5,5	4,5 pour cent

AMPLIFICATEUR CLASSE A (Push-Pull) (deux sections):

Tension filament	2,0 volts
Tension plaque	135 volts max.
Tension grille écran	135 volts max.
Tension grille *	—7,5 volts
Courant plaque (signal zéro)	7,0 ma. (appr.)
Courant plaque (signal maximum)	10,5 ma. (appr.)
Courant écran (signal zéro)	2,0 ma. (appr.)
Courant écran (signal maximum)	3,5 ma. (appr.)
Tension de pointe (B.F.) grille à grille	15 volts
Impédance de charge plaque à plaque	24,000 ohms
Puissance modulée	0,575 watt
Distortion harmonique totale	5,5 pour cent

* Retour pôle négatif filament.

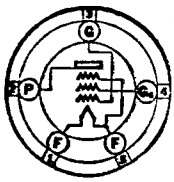
APPLICATION

Le tube Sylvania 1E7G est un amplificateur de puissance constitué par deux pentodes et est destiné à être utilisé dans l'étage final de récepteurs sur batteries. Ce tube, muni d un culot octal, possède une grande sensibilité et procure en classe A une puissance modulee considerable avec peu de distorsion. Ces caractéristiques ainsi que la faible consommation du filament (240 ma. contre 260 ma. pour les types 19 et 35) et des plaques et ecrans (6,5 ma.), rendent possible la construction d un etage final économique.

Couple par transformateur à un tube 1H6G, le type 1E7G peut fournir la puissance indiquee en classe A. Quoique la resistance de charge optimum par section soit de 16.000 ohms, la valeur recommandee de la charge de plaque à plaque pour le fonctionnement push-pull est 24.000 ohms. Cependant cette valeur n est pas critique, car la caracteristique de charge est presque horizontale jusqu'à 30.000 ohms.

Si une puissance supplementaire est désirée, le tube 1E7G peut être surexcité dans une certaine mesure. Par exemple, en classe AB une puissance de 1.1 watt approximativement peut être obtenue avec moins de 10 p.c. de distorsion et un courant total de grille d'environ 200 microamperes. Un tube 1H6G est capable de fournir assez de puissance pour réaliser cette performance, sans étage B.F. supplementaire.

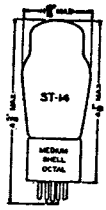
Il peut être désirable d'employer un tube 1H4G comme tube d'attaque pour le 1E7G. Dans ce cas, le transformateur interétage doit être changé, car l'impedance de plaque du tube 1H4G est à peu près trois fois celle du tube 1H6G. Avec un tube 1H6G dans l'étage d'attaque, les grilles ne peuvent pas devenir trop positives à cause de la distorsion due au courant de grille. Avec un tube 1H4G la tension d'excitation peut être plus elevée.



Sylvania

TYPE 1F4
TYPE 1F5G

PENTODE DE PUISSANCE



CARACTERISTIQUES

Tension filament CC.	2,0 volts
Courant filament	0,120 ampère
Ampoule	ST-14
Culot — Moyen 5 broches (1F4)	5-K
Octal 7 broches (1F5G)	6-X
Position de montage	Verticale

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A1.

Tension filament CC.	2,0	2,0 volts
Tension plaque	90	135 volts max.
Tension grille écran	90	135 volts max.
Tension grille (retour au — filament)	—3	—4,5 volts
Courant plaque	4,0	8,0 ma.
Courant grille écran	1,1	2,4 ma.
Résistance interne (approximative) ...	0,24	0,2 mégohm
Conductance mutuelle	1,400	1,700 μmhos
Tension de pointe grille B.F.	3	4,5 volts
Impédance de charge	20,000	16,000 ohms
Puissance modulée	0,110	0,310 watt
Distortion harmonique totale	6	5 pour cent

AMPLIFICATEUR CLASSE AB1 (Push-Pull).
(Les valeurs sont pour deux tubes.)

Tension filament CC.	2,0 volts
Tension plaque	180 volts max.
Tension grille écran	180 volts max.
Tension négative de grille	—7,5 volts
Courant plaque (signal zéro)	19 ma.
Courant écran (signal zéro)	5,5 ma.
Courant ecran (signal max.)	7,0 ma.
Courant plaque (signal max.)	21 ma.
Tension pointe B.F. grille à grille	15 volts
Impédance de charge (P. à P.)	20,000 ohms
Puissance modulée	1,25 watt
Distorsion harmonique totale	4,5 pour cent

APPLICATION

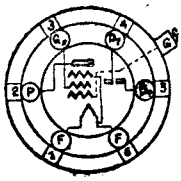
Sylvania types 1F4 et 1F5G sont des nouveaux tubes de sortie destinés aux récepteurs batteries. Ces tubes sont très sensibles et fournissent une puissance de sortie considérable. Leurs caractéristiques ainsi que la faible consommation du filament en font des tubes de sortie économiques.

Un couplage par résistance capacité peut être utilisé, le tube fonctionnant en classe A. Quoique la résistance de charge optimum soit de 16,000 ohms, il est possible d'employer des valeurs plus basses, jusqu'à 12.500 ohms sans affecter sérieusement le bon fonctionnement du tube. Il en résulte simplement une légère diminution de la puissance de sortie et une augmentation d'un à deux pour cent de distorsion.

Ce tube peut être également couplé à un tube pilote convenable permettant d'augmenter la puissance de sortie, la grille atteignant la région positive des potentiels; dans ce cas, la distorsion est quelque peu augmentée. Par exemple, avec une 1B5 comme second détecteur et premier amplificateur B.F., on peut obtenir du tube 1F4 une puissance de 525 milliwatts avec une distorsion totale de 12 %, la tension d'attaque étant de 0,5 volt.

Le montage push-pull peut également être employé. En classe A, deux tubes 1F4 peuvent fournir 800 milliwatts avec 5 % de distorsion.

En classe AB, avec un tube pilote du type 30, la puissance de sortie est 1,4 watt avec 12 % de distorsion. Sous cette charge, le courant total de grille de deux 1F4 est de 210 microampères environ.

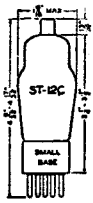


7-AD

Sylvania

TYPE 1F6
TYPE 1F7G

DOUBLE DIODE PENTODES



CARACTERISTIQUES

Tension filament	2,0 volts
Courant filament	0,06 ampère
Ampoule	ST-12C
Culot (1F6)	6-W
Culot (1F7G) octal 8 broches	7-AD
Position de montage	Verticale

Capacités directes interélectrodes :

Grille à plaque	0,007	$\mu\mu$f max.
Entrée	4	$\mu\mu$f
Sortie	9	$\mu\mu$f

Conditions de fonctionnement et caractéristiques :

SECTION PENTODE : AMPLIFICATEUR H.F. ET M.F.

Tension filament	2,0 volts
Tension plaque	180 volts
Tension grille écran	67,5 volts
Tension grille	—1,5 volt
Courant plaque	2,2 ma.
Courant grille écran	0,7 ma.
Résistance interne (approximative)	1 mégohm
Cœfficient d'amplification (approx.)	650
Conductance mutuelle	650 μmhos
Conductance mutuelle (polarisation —12 volts)	20 μmhos

SECTION PENTODE : Amplificateur B.F. (couplé par résistance)

Tension d'alimentation anodique	135	135	135	volts
Tension d'alimentation écran	135	135	135	volts
Résistance plaque	0,25	0,25	0,25	mégohm
Résistance de grille écran	0,1	0,9	0,8	mégohm
Tension CC. grille	—1,0	—1,5	—2,0	volts
Tension de pointe B.F. de grille	0,64	0,63	0,62	volt
Courant plaque (signal nul)	0,42	0,42	0,42	ma.
Courant plaque (signal max.)	0,34	0,34	0,34	ma.

Résistance de charge (voir application).

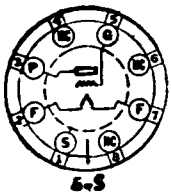
Résistance de grille	1,0	0,5	1,0	0,5	1,0	0,5	mégohm*
Tension de pointe de sortie	30,8	28	29,4	26,6	28	25,2	volts**
Distorsion totale	5	5	5	5	5	5	pour cent
Amplification de tension	48	43	47	42	46	41	

* Pour le tube suivant.

** Aux bornes de la résistance de charge.

APPLICATION

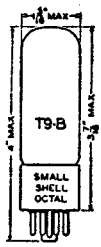
Sylvania 1F6 et 1F7G sont deux tubes doubles diode pentode pour récepteur sur batteries 2 volts. Ces tubes trouvent de nombreuses applications comme détecteur diode et amplificateur pentode et pour assurer la tension de contrôle de volume automatique. Les circuits classiques sont applicables à la section pentode du type 1F6 utilisé en amplificateur H.F. ou M.F. La section pentode peut également être utilisée en amplificateur B.F. à couplage par résistances pour procurer un gain élevé. La résistance de charge comprend la résistance plaque, le condensateur de couplage et la résistance de grille du tube suivant. Les données détaillées pour ce service sont données dans le tableau ci-dessus.



Sylvania

TYPE 1G4G

TRIODE AMPLIFICATEUR DE TENSION



CARACTERISTIQUES

Tension filament CC.	1,4 volt
Courant filament	0,050 ampère
Ampoule	T9-B
Culot — Petit octal 7 broches	5-S
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

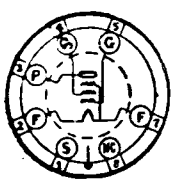
Tension filament	1,4 volt
Tension plaque	90 volts max.
Tension négative de grille (retour au — filament)	—6 volts
Courant plaque	2,3 ma.
Facteur d'amplification	8,8
Conductance mutuelle	825 μmhos

APPLICATION

Sylvania type 1G4G est un tube triode d'usage général, conçu spécialement pour utilisation dans les postes batterie à faible consommation. Les caractéristiques électriques en font un excellent pilote pour un étage de sortie en classe B utilisant le type 1G6G. Fonctionnant en classe A, le 1G4G donnera assez de puissance pour exciter le 1G6G à la puissance modulée de 450 milliwatts, malgré leur faible consommation.

Le filament fonctionne sous 1,4 volt 50 millis. Toutefois, le tube fonctionnera directement sur une pile de 1,5 volt sans intercaler de tube ballast, étant donnée sa construction spéciale. D'autres sortes de batteries A peuvent être employées si le circuit est convenablement arrangé. Le retour de grille devrait être fait au pôle négatif du filament.

Voir également les autres renseignements sur les types 1,4 volt au début du Manuel, au paragraphe « Tubes batterie ».

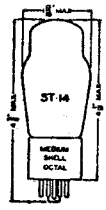


Sylvania

TYPE 1G5G

PENTODE DE PUISSANCE

DEUX VOLTS



CARACTERISTIQUES

Tension filament	2,0 volts
Courant filament	0,120 ampère
Ampoule	ST-14
Culot octal 7 broches	6-X
Position de montage	verticale

Conditions de fonctionnement et caractéristiques :

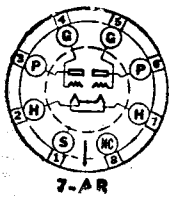
Tension filament	2,0 volts
Tension plaque	90 volts
Tension écran	90 volts
Tension grille	—6 volts
Courant plaque	8,5 ma.
Courant écran	2,7 ma.
Résistance interne	135,000 ohms
Conductance mutuelle	1,500 μmhos
Coefficient d'amplification	200
Résistance de charge	8,500 ohms
Puissance modulée	300 milliwatts
Distorsion harmonique totale	9 pour cent

APPLICATION

Le type Sylvania 1G5G est un nouveau tube pentode de puissance à filament alimenté sous 2 volts, spécialement conçu pour fonctionner avec une tension de plaque de 90 volts, en classe A, avec couplage par résistance.

La résistance de charge optimum est 8.500 ohms pour une tension plaque de 90 volts ; cependant une résistance un peu plus grande n'affecte pas sérieusement le fonctionnement et est au contraire avantageuse lorsque, en vieillissant, la batterie donne une tension plaque inférieure à 90 volts.

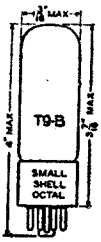
Pour des puissances plus grandes, le montage push pull peut être utilisé, avec une résistance de charge inférieure au double de celle nécessaire pour un tube, car les harmoniques pairs sont annulés.



Sylvania

TYPE 1G6G

AMPLIFICATEUR DE PUSSANCE CLASSE B



CARACTERISTIQUES

Tension filament CC.	1,4 volt
Courant filament	0,100 ampère
Ampoule	T9-B
Culot — Petit octal 8 broches	7-AB
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A (chaque Triode) :

Tension filament	1,4 volt
Tension plaque	90 volts
Tension grille	0 volt
Courant plaque	1,0 ma.
Résistance interne	45,000 ohms
Conductance mutuelle	675 μmhos
Facteur d'amplification	30

AMPLIFICATEUR CLASSE B :

Tension filament	1,4 volt
Tension plaque	90 volts max.
Tension grille	0 volt
Courant plaque, par plaque (signal zéro)	1 ma.
Courant plaque de pointe, par triode	20 ma. max.
Impédance de charge (plaque à plaque)	12,000 ohms
Puissance modulée (voir application)	450 milliwatts
Distortion approximative	5 pour cent

APPLICATION

Sylvania 1G6G est un amplificateur classe B batterie de la série 1,4 volt, consistant en 2 triodes dans la même ampoule. Conçu pour fonctionner sans polarisation négative des grilles, le courant total de plaque (signal à zéro) n'atteint que 2 millis seulement.

Un tube pilote 1G4G, sous les tensions recommandées, donnera assez de puissance pour exciter le 1G6G jusqu'à la puissance modulée de 450 milliwatts. Dans aucune circonstance, on ne peut permettre que le courant de plaque dépasse (en pointe) 20 ma. par section de triode, car le fonctionnement continu à un tel niveau diminuerait considérablement la vie du tube. A la puissance indiquée de 450 milliwatts, le courant de pointe ne dépassera pas la valeur maximum.

Le filament fonctionne sous 1,4 volt 50 millis. Toutefois, le tube fonctionnera directement sur une pile de 1,5 volt sans

intercaler de tube ballast, étant donnée sa construction spéciale. D'autres sortes de batteries A peuvent être employées si le circuit est convenablement arrangé. Le retour de g devrait être fait au pôle négatif du filament.

Voir également les renseignements d'ordre général sur les tubes de la série 1,4 volt au début du Manuel, au paragraphe « Tubes batterie ».

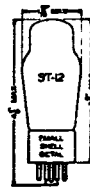


5-S

Sylvania

TYPE 1H4G

DETECTEUR AMPLIFICATEUR



CARACTERISTIQUES

Tension filament CC.	2,0 volt
Courant filament	0,06 ampère
Ampoule	ST-12
Culot — Petit octal 7 broches	5-S
Position de montage	Verticale

Pour toutes les autres caractéristiques, conditions de fonctionnement et applications se référer au type 30.

TECHNICAL DATA

1H4GT

Sylvania

TYPE 1H4GT

LOW MU TRIODE

RATINGS

Filament Voltage DC	2.0	Volts
Filament Current	60	Ma.
Maximum Plate Voltage	180	Volts
Maximum Peak Plate Current	50	Ma.

**Horizontal operation permitted if pins 2 and 7 are in vertical plane.*

PHYSICAL SPECIFICATIONS

Style	GT
Base Intermediate Shell	7-Pin
Bulb	T9
Diameter	1 5/16" Max.
Overall Length	3 5/16" Max.
Seated Height	2 3/4" Max.
Mounting Position	Vertical*

BASE PIN CONNECTIONS

Pin 1 - No Connection
Pin 2 - + Filament
Pin 3 - Plate
Pin 4 - No Connection
Pin 5 - Grid
Pin 6 - Omitted
Pin 7 - - Filament
Pin 8 - No Connection

RMA Basing 5S-0-0

TYPICAL OPERATING CONDITIONS

Class A Amplifier

Filament Voltage	2.0	2.0	2.0	Volts
Filament Current	60	60	60	Ma.
Plate Voltage	90	135	180	Volts
Grid Voltage⊕	-4.5	-9.0	-13.5	Volts
Amplification Factor	9.3	9.3	9.3	
Plate Resistance	11,000	10,300	10,300	Ohms
Transconductance	850	900	900	μmhos
Plate Current	2.5	3.0	3.1	Ma.

⊕The DC resistance in the grid circuit should not exceed 2 megohms.

Class B Amplifier (2 Tubes)

Plate Voltage	157.5	Volts
Grid Voltage	-15	Volts
Plate Current (Zero Signal)	1.0	Ma.
Load Resistance (Plate to Plate)	8000	Ohms
Maximum Input Power	260	Mw.
Power Output#	2.1	Watts
Total Distortion (Approx.)	6	%

#Obtained by use of a Type 1H4GT transformer coupled driver having 157.5 volts plate supply and -11.3 volts grid bias. Plate load is 18,000 ohms. Transformer ratio primary to half secondary is 1.165.

Biased Detector⊙

Plate Voltage	90	135	180	Volts
Grid Voltage	-9.0	-13.5	-18.0	Volts
Plate Current (No Signal)	Adjust to 0.2 Ma.			

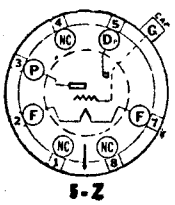
⊙May also be used as a grid leak detector with 45 volts plate supply and 1 to 5 megohms grid leak with grid return to + Filament.

CIRCUIT APPLICATION

Sylvania Type 1H4GT is the same as the well known Type 1H4G, except for the smaller GT bulb. Electrical characteristics are the same as those for Type 30.

from RMA release # 623, Dec. 1, 1947

OCTOBER 17, 1947 COMMERCIAL ENGINEERING DEPARTMENT
Sylvania Electric Products Inc., Emporium, Pennsylvania
PRINTED IN U.S.A.

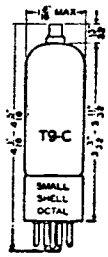


5-Z

Sylvania

TYPE 1H5G

DIODE-TRIODE



CARACTERISTIQUES

Tension filament CC.	1,4 volt
Courant filament	0,050 ampère
Ampoule	T9-C
Capuchon	Miniature
Culot	5-Z
Position de montage	Toutes

Capacités directes interélectrodes :

Grille à plaque	1,1 $\mu\mu$f
Grille à filament	0,35 $\mu\mu$f
Plaque à filament	4,0 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension filament	1,4 volt
Tension plaque	90 volts
Tension grille (retour au — filament)	0 volt
Courant plaque	0,15 ma.
Résistance interne	0,24 mégohm
Conductance mutuelle	275 μmhos
Facteur d'amplification	65

APPLICATION

Sylvania type 1H5G est un diode-triode, conçu spécialement pour récepteurs batterie à faible consommation. C'est un de la série 1,4 volt. Le tube 1H5G peut être utilisé comme un détecteur diode combiné avec un triode B.F. et pour assurer le voltage nécessaire de l'A.V.C. Le facteur d'amplification de la section triode est considérablement plus élevé que celui de n'importe quel autre triode batterie. La section triode doit être couplée par résistance à la section diode utilisant un con-

densateur ordinaire de couplage et une haute résistance de grille. On n'utilisera pas de pile de polarisation, le retour de grille se faisant au pôle négatif du filament.

Le filament fonctionne sous 1,4 volt 50 millis. Toutefois, le tube fonctionnera directement sur une pile de 1,5 volt sans intercaler de tube ballast, étant donnée sa construction spéciale. D'autres sortes de batteries A peuvent être employées si le circuit est convenablement arrangé. Une batterie B de 90 volts est nécessaire pour la tension plaque.

On trouvera en fin de volume un schéma-type utilisant le 1H5G. Voir également les renseignements d'ordre général sur les tubes de la série 1,4 volt dans les premières pages du Manuel, au paragraphe « Tubes batterie ».



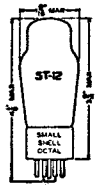
7-AA

Sylvania

TYPE 1H6G

DUO DIODE

TRIODE



CARACTERISTIQUES

Tension filament CC.	2,0 volts
Courant filament	0,06 ampère
Ampoule	ST-12
Culot — Petit octal 8 broches	7-AA
Position de montage	Verticale

Pour toutes les autres caractéristiques, conditions de fonctionnement et applications se référer au type 1B5/25S.

TECHNICAL DATA

1H6GT

Sylvania

TYPE 1H6GT

DUODIODE MEDIUM-MU TRIODE

PHYSICAL SPECIFICATIONS

Style	GT
Base	Intermediate shell Octal 8 Pin
Bulb	T9
Diameter	1 5/16" Max.
Overall Length	3 5/16" Max.
Seated Height	2 3/4" Max.
Mounting Position	Vertical*

BASE PIN CONNECTIONS

Pin 1 - No Connection
Pin 2 - + Filament
Pin 3 - Plate
Pin 4 - Diode No. 2 ⊕
Pin 5 - Diode No. 1
Pin 6 - Grid
Pin 7 - - Filament
Pin 8 - No Connection

RMA Basing 7AA-O-6

RATINGS

Filament Voltage DC ±10%	2.0	Volts
Filament Current	60	Ma.
Maximum Plate Voltage	135	Volts

**Horizontal operation is permitted if the plane of pins 2 and 7 is vertical.*
⊕Diode No. 2 is at the positive end of the filament and Diode No. 1 at the negative end.

Direct Interelectrode Capacitances#:

Grid to Plate	3.5	μμf.
Input	1.6	μμf.
Output	1.9	μμf.

#With no external shield.

TYPICAL OPERATING CONDITIONS

Class A Operation Triode Section

Filament Voltage	2.0	Volts
Filament Current	60	Ma.
Plate Voltage	135	Volts
Grid Voltage	-3.0	Volts
Plate Resistance	35,000	Ohms
Transconductance	575	μmhos
Amplification Factor	20	
Plate Current	0.8	Ma.

Diode Units

The difference in voltage between the two diode units may be used to obtain different signal delay effects when used in AVC circuits. No. 1 diode will give the normal minimum delay.

CIRCUIT APPLICATION

Sylvania Type 1H6GT is electrically equivalent to Type 1H6G, except for the smaller bulb. The characteristics are also identical with those of Type 185.

from RMA release # 623, Dec. 1, 1947

OCTOBER 17, 1947 COMMERCIAL ENGINEERING DEPARTMENT
Sylvania Electric Products Inc., Emporium, Pennsylvania
PRINTED IN U.S.A.

1J1

BALLAST TUBE

Characteristics

Voltage Drop	1 volt
Current Capacity	0.62 amp.
Envelope Size	ST-12
Base	Small 4 pin

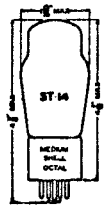
from RMA release #48, Sept. 25, 1935
sponsored by Hygrade-Sylvania Corp.



Sylvania

TYPE 1J5G

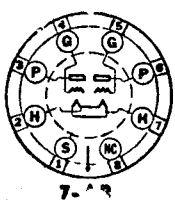
PENTODE DE PUISSANCE
DEUX VOLTS



CARACTERISTIQUES

Tension filament	2,0 volts
Courant filament	0,120 ampère
Ampoule	ST-14
Culot — Moyen octal 7 broches	6-X
Position de montage	Verticale

Pour les autres caractéristiques et les applications voir type 950 dont type 1J5G est l'équivalent.

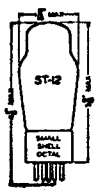


7-AB

Sylvania

TYPE 1J6G

AMPLIFICATEUR CLASSE B



CARACTERISTIQUES

Tension filament CC.	2,0 volts
Courant filament	0,24 ampère
Ampoule	ST 12
Culot — Petit octal 8 broches	7-AB
Position de montage	Verticale

Pour toutes les autres caractéristiques, conditions de fonctionnement et applications se référer au type 19 (excepté le courant filament qui est de 0,260 ampère dans le type 19).

RADIO MANUFACTURERS ASSOCIATION

SUITE 701-4 AMERICAN BUILDING
1317 F STREET, N. W.
WASHINGTON, D. C.

SUB-COMMITTEE ON TUBE NUMBERING

E. W. WILBY, CHAIRMAN
711 FIFTH AVENUE
NEW YORK, N. Y.

May 27th, 1936

To Tube Engineer:

Re: RMA Tube Standardization
Release #74. Correction

Please refer to our Release #74 regarding ballast tube types, which read:

1R1G (540 milliamperes, octal base)
1T1G (560 milliamperes, octal base)
1K1 (550 milliamperes, octal base)

The following is correct:

1R1G (540 milliamperes, octal base)
1T1G (560 milliamperes, octal base)
1K1 (550 milliamperes, old 4 pin base)

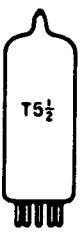
Thank you.

Very truly yours,

Edward L. Wilby

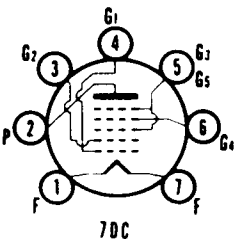
Chairman
Tube Numbering

ewwjlg



SYLVANIA TYPE 1L6

PENTAGRID CONVERTER



7DC

MECHANICAL DATA

Bulb	T-5 ½, Outline 5-2
Base	Miniature Button 7-Pin
Basing	7DC
Mounting Position	Any

ELECTRICAL DATA

FILAMENT CHARACTERISTICS

Filament Voltage D C	1.4 Volts
Filament Current	50 Ma

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[1]	Unshielded
Grid No. 4 to Plate	0.36	0.46 μμf Max
Grid No. 2 to Grid No. 4	0.24	0.24 μμf
Grid No. 1 to Grid No. 4	0.19	0.19 μμf
R F Input: g4 to All	7.5	7.5 μμf
Oscillator Input: g1 to All except g2	2.2	2.2 μμf
Oscillator Output: g2 to All except g1	2.6	2.6 μμf
Mixer Output: Plate to All	12.0	7.0 μμf
Grid No. 1 to Plate	0.10	0.15 μμf Max

MAXIMUM RATINGS (Design Center Values)

Plate Voltage	110 Volts
Grid No. 3 and 5 Voltage	65 Volts
Grid No. 3 and 5 Supply Voltage	110 Volts
Grid No. 2 Voltage (Oscillator Plate)	110 Volts
Total Cathode Current	4.0 Ma

TYPICAL OPERATION

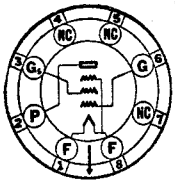
Plate Voltage	90 Volts
Grid No. 2 Voltage (Anode Grid)	90 Volts
Grid No. 3 and 5 Voltage[2]	45 Volts
Grid No. 4 Voltage (Control Grid)	0 Volts
Plate Current	0.5 Ma
Grid No. 3 and 5 Current	0.6 Ma
Grid No. 2 Current (Anode Grid)	1.2 Ma
Grid No. 1 Current (Osc. Grid)	0.035 Ma
Total Cathode Current	2.35 Ma
Grid No. 4 Circuit Resistance	1.0 Megohm
Grid No. 1 Circuit Resistance	0.2 Megohm
Conversion Transconductance	
Grid No. 4 at 0 Volts	300 μmhos
Grid No. 4 at -3.5 Volts (approx.)	10 μmhos
Oscillator Transconductance[3]	550 μmhos

NOTES:

1. External shield No. 316 connected to Pin 1.
2. Obtained preferably by using a properly by-passed dropping resistor of from 45,000 to 75,000 ohms in series with the B supply.
3. Not oscillating with E_{c1} = 0 V, E_b = 90 V, E_{c3} and 5 = 45 V, E_{c2} = 90 V, E_{c4} = 0 V.

APPLICATION

Sylvania Type 1L6 is a miniature type pentagrid converter designed for use in low drain battery operated receivers. It is similar in construction and application to Types 1A7GT and 1LA6. The small size and low current requirements recommend it for use in small portable receivers.

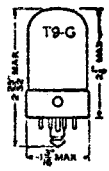


5-AD

Sylvania

TYPE 1LA4

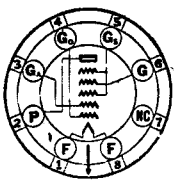
PENTODE
DE PUISSANCE



CARACTERISTIQUES

Tension filament CC.	1,4 volt
Courant filament	0,050 ampère
Ampoule	T9-G
Culot : LOKTAL 8 broches	5-AD
Position de montage	Toutes

Type Sylvania 1LA4 est, dans la série Loktal, le tube correspondant du type 1A5G et les applications sont identiques.

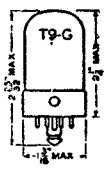


7-AK

Sylvania

TYPE 1LA6

CONVERTISSEUR DE FREQUENCE PENTAGRILLE



CARACTERISTIQUES

Tension filament CC.	1,4 volt
Courant filament	0,050 ampère
Ampoule	T9-G
Culot : LOKTAL 8 broches	7-AK
Position de montage	Toutes

Type Sylvania 1LA6 est, dans la série Loktal, le tube correspondant du tube 1A7G, à l'exception de quelques petites différences, notamment la résistance interne qui est pour le 1LA6 de 750,000 ohms. Pour les applications, voir type 1A7G.

from RMA release #227

Release #227

January 24, 1940

HYGRADE SYLVANIA CORPORATION

TECHNICAL DATA

SYLVANIA TYPE 1LB6

Pentagrid Mixer

TENTATIVE RATINGS AND CHARACTERISTICS

Filament Voltage (Nominal)	1.4 volts
Filament Current (Nominal)	0.05 ampere

Direct Interelectrode Capacitances:*

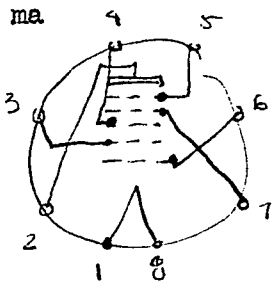
Grid G_1 to Grid G_3	0.2 uuf. Max.
Grid G_1 to Plate	0.1 uuf. Max.
Grid G_3 to Plate	0.2 uuf. Max.
Grid G_1 to all other Electrodes	3.8 uuf.
Grid G_3 to all other Electrodes	8.0 uuf.
Plate to all other Electrodes	7.0 uuf.

* With tube shield (RMA Standard M8-308) connected to negative filament.

OPERATING CONDITIONS AND CHARACTERISTICS

Mixer Operation

Filament Voltage	1.4 volts
Plate Voltage	90 volts Max.
Screen Voltage (Grids #2 and #4)	67.5 volts Max.
Signal Grid Voltage (Grid #1)	0 volts
Oscillator Grid Voltage (Grid #3)	0 volts
Suppressor (Grid #5)	Connected to negative filament
Peak Oscillator Grid Voltage Applied to Grid #3	10 min. volts
Plate Resistance	2 megohms approx.
Conversion Conductance E_{c1} = 0	100 umhos
Conversion Conductance E_{c1} = -4.5	5 umhos
Plate Current	0.40 ma
Screen Grid Current	2.2 ma



Base - "Loktal"	8 pin
Bulb - T-9	
Max. Overall Length	2 25/32"
Max. diameter	1 3/16"
Max. seated height	2 1/4"

BASING:

Pin #1 - Filament	Pin #5 - Grid #5
Pin #2 - Plate	Pin #6 - Grid #1
Pin #3 - Grid #2	Pin #7 - Grid #4
Pin #4 - Grid #3	Pin #8 - -Filament

EAX

JAN 22 1940

TECHNICAL DATA

1LF3

Sylvania

TYPE 1LF3

MEDIUM MU TRIODE

RATINGS AND CHARACTERISTICS

Maximum Filament Voltage		
Battery Operation, must never exceed	1.6	Volts
Design Center for AC-DC Power Line Operation	1.3	Volts
Maximum Plate Voltage	110	Volts
Maximum Grid Current at -3 Volts	0.1	ua.
Direct Interelectrode Capacitances:*		
Grid to Plate	1.7	uuf.
Input	1.7	uuf.
Output	3.0	uuf.

*With 1 5/16" diameter shield (RMA Std. M3-308) connected to negative filament.

PHYSICAL SPECIFICATIONS

Style	Lock-In
Base	Lock-In 8-Pin
Bulb	T-9
Diameter	1 3/16" Max.
Seated Height	2 1/4" Max.
Overall Length	2 25/32" Max.
Mounting Position	Any

BASE PIN CONNECTIONS

Pin 1 - Positive Filament
Pin 2 - Plate
Pin 3 - No Connection
Pin 4 - No Connection
Pin 5 - Internal Connection
Pin 6 - Grid
Pin 7 - No Connection
Pin 8 - Negative Filament

RMA Basing 4AA-L-0

TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS

Filament Voltage	1.4	1.4	Volts
Filament Current	50	50	Ma.
Plate Voltage	90	90	Volts
Grid Voltage*	0	-3	Volts
Plate Current	4.5	1.4	Ma.
Plate Resistance	11,200	19,000	Ohms
Mutual Conductance	1300	760	umhos
Amplification Factor	14.5	14.5	

*Negative filament return to Pin No. 8.

CIRCUIT APPLICATION

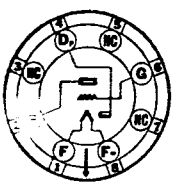
Sylvania Type 1LF3 is a lock-in triode having the same characteristics as Type 1LE3, to which reference should be made for curves and resistance coupled amplifier data.

It is intended for applications critical for grid current.

Commercial Engineering Department
Sylvania Electric Products Inc., Emporium, Pennsylvania

3/26/48

from RMA release # 648, April 10, 1948

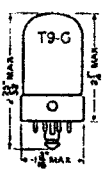


5-AG

Sylvania

TYPE 1LH4

DIODE-TRIODE



CARACTERISTIQUES

Tension filament CC.	1,4 volt
Courant filament	0,050 ampère
Ampoule	T9-G
Culot : LOKTAL 8 broches	5-AG
Position de montage	Toutes

Type Sylvania 1LH4 est, dans la série Loktal, le tube correspondant du type 1H5G et les applications sont identiques.

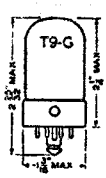


7-AO

Sylvania

TYPE 1LN5

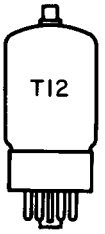
PENTODE H.F.



CARACTERISTIQUES

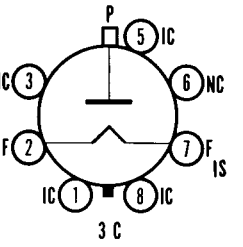
Tension filament CC.	1,4 volt
Courant filament	0,050 ampère
Ampoule	T9-G
Culot : LOKTAL 8 broches	7-AO
Position de montage	Toutes

Type Sylvania 1LN5 est, dans la série Loktal, un tube pentode H.F. dont les caractéristiques sont presque équivalentes à celles du type 1N5G (courant plaque 1,6 ma.; résistance interne 1,1 mégohm; facteur d'amplification 880). Pour les applications, se référer au type 1N5G.



SYLVANIA TYPE 1N2A

HV HALF-WAVE RECTIFIER



MECHANICAL DATA

Bulb	T-12
Base[1]	B7-227, Short Medium Shell Octal, 7-Pin
Cap	C1-34
Outline	See Drawing
Basing[1]	3C
Cathode	Coated Filament
Mounting Position	Any

ELECTRICAL DATA

FILAMENT CHARACTERISTICS AND RATINGS

Average Characteristics	**Parallel Operation**
Filament Voltage[2]	1.25 Volts
Filament Current	200 Ma
Ratings (Design Maximum Values)	**Min.-Max.**
Filament Voltage[3]	1.05-1.45 Volts

DIRECT INTERELECTRODE CAPACITANCE

Plate to Filament and Internal Shield	1.4 $\mu\mu$f

RATINGS (Design Maximum System)

Flyback Voltage Rectifier[4]

Inverse Plate Voltage	
Total D C and Peak	28,000 Volts Max.
D C	24,000 Volts Max.
Peak Plate Current	50 Ma Max.
Average Plate Current	0.5 Ma Max.

CHARACTERISTICS

Tube Drop for Ib = 7 Ma (approx.)	100 Volts

NOTES:

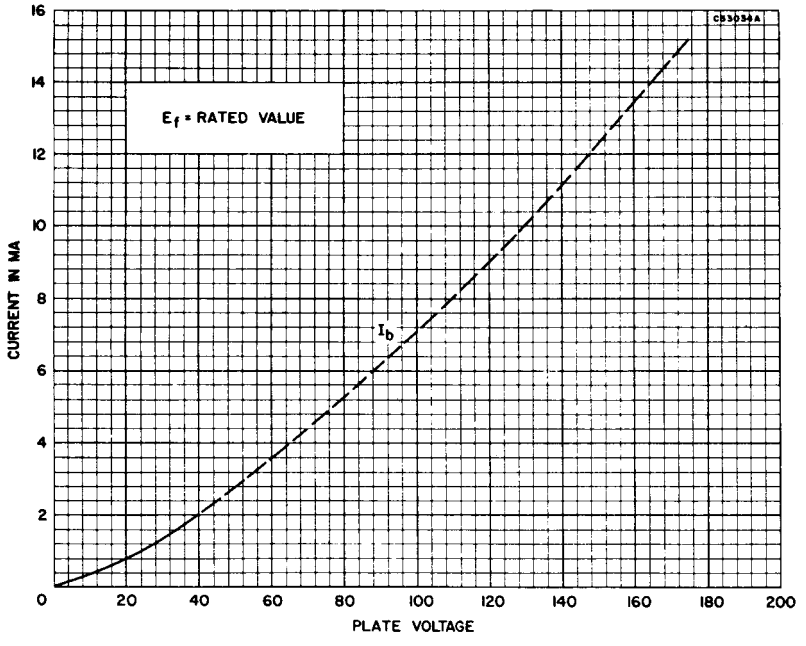
1. Socket terminals 1, 3, 4, 5, 6 and 8 may be connected to terminal 7 or to a corona shield which connects to terminal 7. Terminals 4 and 6 may be used as tie points at or near filament potential.
2. The equipment shall be designed that the filament voltage is centered at the specified bogey value.
3. Filament supply variations shall be restricted to maintain filament voltage within the specified values.
4. For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations; Federal Communications Commission," the duty cycle of the voltage pulse must not exceed 15 per cent of one scanning cycle.

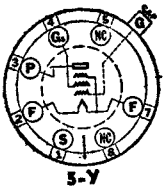
APPLICATION

The Sylvania Type 1N2A is a filamentary half-wave diode intended for service as the high voltage rectifier in television receivers and other high voltage rectifier applications.

SYLVANIA TYPE 1N2A (Cont'd)

AVERAGE PLATE CHARACTERISTICS

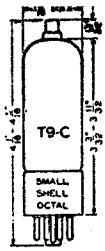




Sylvania

TYPE 1N5G

PENTODE H.F.



CARACTERISTIQUES

Tension filament CC.	1,4 volt
Courant filament	0,050 ampère
Ampoule	T9-C
Capuchon	Miniature
Culot — Petit octal 7 broches	5-Y
Position de montage	Toutes

Capacités directes interélectrodes :

Grille à plaque (avec blindage)	0,007 $\mu\mu$f max.
Grille à toutes électrodes excepté plaque	2,2 $\mu\mu$f
Plaque à toutes électrodes excepté grille G ...	9,0 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension filament	1,4 volt
Tension plaque	90 volts
Tension grille écran	90 volts
Tension grille (retour - filament)	0 volt
Courant plaque	1,2 ma.
Courant grille écran	0,3 ma.
Résistance interne (approx.)	1,5 mégohm
Conductance mutuelle	750 μmhos
Facteur d'amplification	1160
Conductance mutuelle à — 3,2 volts	50 μmhos
Conductance mutuelle à —4 volts	5 μmhos

APPLICATION

Sylvania type 1N5G est un tube pentode H.F., conçu spécialement pour récepteurs batterie à faible consommation comme amplificateur H.F., M.F. ou B.F. Il peut être utilisé dans les circuits d'A.V.C. grâce à sa pente moyenne. Type 1N5G est un tube à haute impédance et il doit être employé comme tel si l'on recherche une amplification H.F. maximum.

Le filament fonctionne sous 1,4 volt 50 millis. Toutefois, le tube fonctionne directement sur pile de 1,5 volt sans intercaler de tube ballast, grâce à sa construction spéciale. D'autres sortes de batteries A peuvent être utilisées si le circuit est équipé convenablement.

Une batterie B de 90 volts est nécessaire pour les tensions de plaque et d'écran. La pile de polarisation C n'est pas nécessaire, puisque le retour de grille se fait soit par l'A.V.C., soit à travers une résistance de 1 mégohm convenablement by-passée.

A la fin du volume on trouvera un schéma-type utilisant les tubes de la série 1,4 volt et des renseignements d'ordre général seront consultés dans l'introduction, au paragraphe « Tubes batterie ».

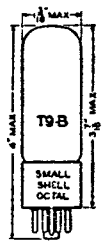


7-AM

Sylvania

TYPE 1N6G

DIODE-PENTODE AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension filament CC.	1,4 volt
Courant filament	0,050 ampère
Ampoule	T9-B
Culot — Petit octal 8 broches	7-AM
Position de montage	Toutes

TYPE 1N6G (suite)

Conditions de fonctionnement et caractéristiques :

Tension filament	1,4 volt
Tension plaque	90 volts
Tension grille écran	90 volts
Tension grille (retour au-filament)	—4,5 volts
Courant plaque	3,1 ma.
Courant grille écran	0,6 ma.
Résistance interne (approx.)	0,3 mégohm
Conductance mutuelle	800 μmhos
Impédance de charge	25.000 ohms
Puissance modulée *	100 milliwatts

* Avec signal d'un voltage de 3,5 (r-m-s) volts.

APPLICATION

Sylvania type 1N6G est un tube batterie à faible consommation avec ampoule standard T-9 et le culot octal. Ce tube contient une diode et une pentode de puissance arrangée de telle sorte que la diode serve directement de pilote à la pentode.

La section diode est placée au — du filament (broche 7). La section pentode a des caractéristiques bien similaires à celles du type 1A5G. Type 1N6G permet un fonctionnement économique, spécialement dans les récepteurs batterie à gain H.F. relativement élevé et à puissance modulée moyenne.

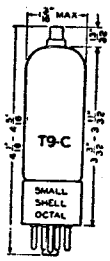
Le filament fonctionne sous 1,4 volt 50 millis. Toutefois, le tube fonctionne directement sur pile 1,5 volt sans intercaler de tube ballast, grâce à sa construction spéciale. D'autres batteries A peuvent être utilisées moyennant équipement convenable du circuit chauffage. Pour renseignements d'ordre général sur les tubes de la série 1,4 volt, voir Introduction, au paragraphe « Tubes batterie ».



Sylvania

TYPE 1P5G

PENTODE H.F.



CARACTERISTIQUES

Tension filament CC.	1,4 volt
Courant filament	0,050 ampère
Ampoule	T9-C
Capuchon	miniature
Culot — Petit octal 7 broches	5-Y
Position de montage	Toutes

Capacités directes interélectrodes :

Grille G à plaque (avec blindage)	0,007 $\mu\mu f$
Entrée : G à (F + Gs + G3)	2,2 $\mu\mu f$
Sortie : P à (F + Gs + G3)	10 $\mu\mu f$

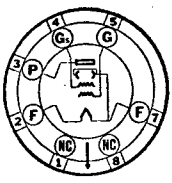
Conditions de fonctionnement et caractéristiques :

Tension filament	1,4 volt
Tension plaque	90 volts
Tension écran	90 volts
Tension grille (retour au — filament)	0 volt
Courant plaque	2,3 ma.
Courant écran	0,7 ma.
Résistance interne (approx.)	0,8 mégohm
Conductance mutuelle	750 μmhos
Conductance mutuelle à — 12 volts polar.	10 μmhos

APPLICATION

Sylvania type 1P5G est un tube batterie à faible consommation du type pentode H.F. pouvant être utilisé comme amplificateur H.F., M.F. ou B.F. Ce tube a une pente plus forte que le type 1N5G, mais ils ont tous deux le même culot.

Le filament fonctionne sous 1,4 volt 50 millis. Toutefois, le tube fonctionnera directement sur pile 1,5 volt sans intercaler de tube ballast, grâce à sa construction spéciale. D'autres sortes de batteries A peuvent être utilisées moyennant équipement convenable du circuit chauffage. Voir également au début du Manuel renseignements d'ordre général sur les types de la série 1,4 volt, au paragraphe « Tubes batterie ».

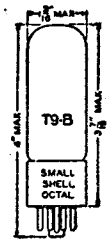


6-AF

Sylvania

TYPE 1Q5G

AMPLIFICATEUR DE PUISSANCE A ELECTRONS DIRIGEES



CARACTERISTIQUES

Tension filament CC.	1,4 volt
Courant filament	0,100 ampère
Ampoule	T9-B
Culot — Petit octal 7 broches	6-AF
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

Tension filament	1.4	1.4 volt
Tension plaque	85	90 volts max.
Tension grille écran	85	90 volts max.
Tension négative de grille	—4,5	—4,5 volts
Tension de pointe signal B. F.	4,5	4,5 volts
Courant plaque (signal zéro)	8,2	9,5 ma.
Courant écran (signal zéro)	1,4	1,6 ma.
Conductance mutuelle	1.950	2.100 μmhos
Impédance de charge	8.000	8.000 ohms
Puissance modulée	225	270 milliwatts
Distorsion harmonique totale	9	7,5 pour cent.

APPLICATION

Sylvania type 1Q5G est un tube amplificateur de puissance à électrons dirigés, sur batterie à faible consommation. A part une sensibilité de puissance accrue résultant de l'alignement des grilles, le rendement du tube est très similaire à celui du type 1C5G, en puissance modulée.

Le filament fonctionne sous 1,4 volt 100 millis. Toutefois, le tube fonctionnera directement sur pile de 1,5 volt sans intercaler de tube ballast, grâce à sa construction spéciale. D'autres sortes de batteries A peuvent être utilisées moyennant équipement convenable du circuit de chauffage.

Une batterie B de 90 volts est nécessaire pour fournir les tensions plaque et grille écran. Il est préférable de prévoir la polarisation automatique du type 1Q5G, puisque la tension négative de grille sera réduite au fur et à mesure de la chute de tension de la batterie B.

Voir également dans l'Introduction d'autres renseignements d'ordre général concernant les tubes de la série 1,4 volt, au paragraphe « Tubes batterie ».

TECHNICAL DATA

1Q6

Sylvania

TYPE 1Q6

DIODE PENTODE

RATINGS AND CHARACTERISTICS

Filament Voltage	1.25	Volts
Maximum Plate Voltage	100	Volts
Maximum Screen Voltage	100	Volts
Maximum Cathode Current	2.0	Ma.
Maximum Diode Drop for 0.5 Ma.	10	Volts

Direct Interelectrode Capacitances:	Unshielded	Shielded*	
Cgp	0.12	0.085	µµf.
Cin	1.60	1.80	µµf.
Cout	2.00	4.20	µµf.
Cgl-d	0.15	0.15	µµf. Max.

**With 0.405" Diameter Shield Connected to Negative Filament*

from RMA release #467A, Jan. 31, 1947

PHYSICAL SPECIFICATIONS

Style	T-3
Base	Flexible Leads
Bulb	T-3
Diameter	0.400" Max.
Lead Length	1.25" Min.
Overall Bulb Length	1.5" Max.
Mounting Position	Any

BASE PIN CONNECTIONS

Pin 1 - No Connection
Pin 2 - Control Grid
Pin 3 - No Connection
Pin 4 - Neg. Fil. & Supp.
Pin 5 - Positive Filament
Pin 6 - Diode Plate
Pin 7 - Pentode Plate
Pin 8 - Screen Grid

RMA Basing 8C0-0-0

OPERATING CONDITIONS AND CHARACTERISTICS

Filament Voltage DC	1.25	1.25	Volts
Filament Current	0.04	0.04	Ampere
Plate Voltage	30	67.5	Volts
Screen Voltage	30	67.5	Volts
Grid Voltage	0	0	Volts
Plate Current	.33	1.6	Ma.
Screen Current	.09	0.4	Ma.
Plate Resistance	0.5	0.4	Megohm
Mutual Conductance	330	600	µmhos
Voltage Gain (approx.)	30 (1)	60 (2)	

(1) With Rc2 = 2.2 megohms Rb = 1.0 megohms Rcf = 4.7 megohms
(2) With Rc2 = 3.9 megohms Rb = 1.0 megohms Rcf = 4.7 megohms

CIRCUIT APPLICATION

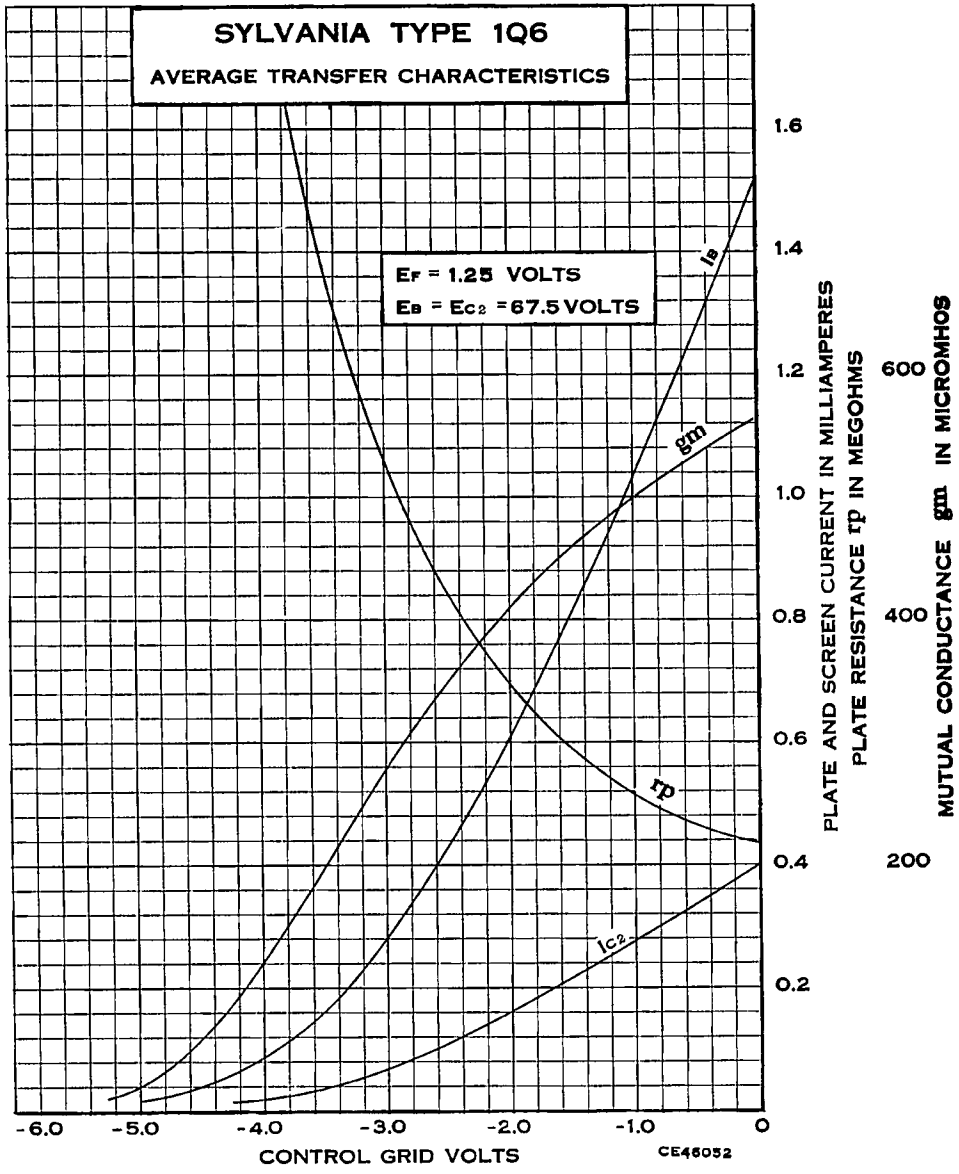
Sylvania Type 1Q6 is a diode audio pentode tube suitable for use in very small radio sets or amplifiers. The other types required for a normal set complement and designed for use with it are Types 1C8 (Converter), 1W5 (RF Pentode Amplifier) and 1V5 (Output Pentode).

This type corresponds in service and circuit design to Types 1LD5 and 1S5 but is rated for use at lower voltages. The gains are comparable considering the reduced size and voltages. For a diode load curve, reference should be made to that given for Sylvania Type 1LD5.

The tinned leads permit direct soldering into the circuit and permit great reduction in size of completed equipment. The small size and light weight permit use under severe mechanical conditions and in locations where larger tubes could not be considered.

COMMERCIAL ENGINEERING DEPARTMENT
Sylvania Electric Products Inc., Emporium, Pennsylvania
PRINTED IN USA

NOV. 29, 1946


SYLVANIA TYPE 1Q6
AVERAGE TRANSFER CHARACTERISTICS
EF = 1.25 VOLTS
EB = Ec2 = 67.5 VOLTS
Ib
gm
rp
Ic2
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
600
400
200
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
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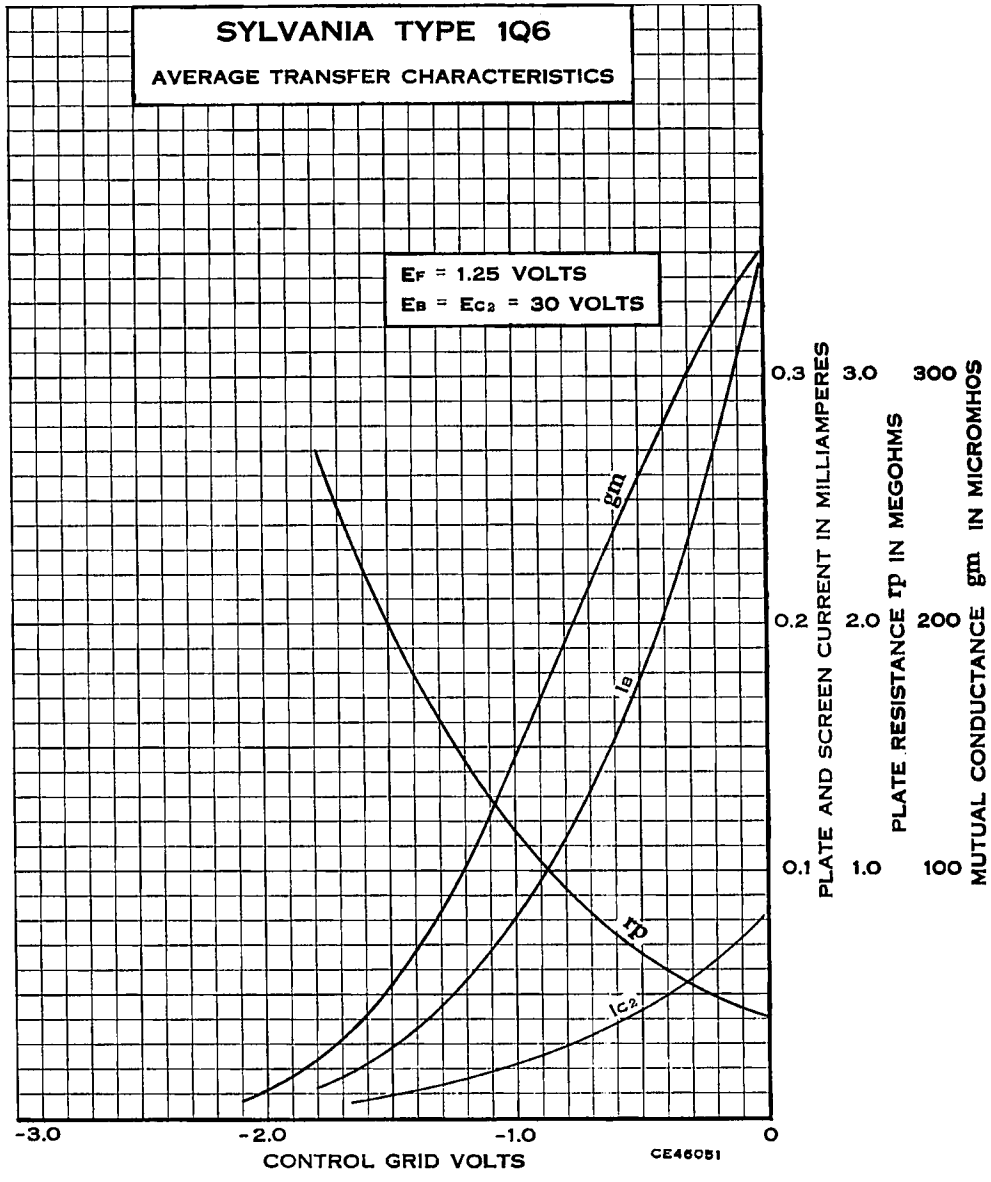
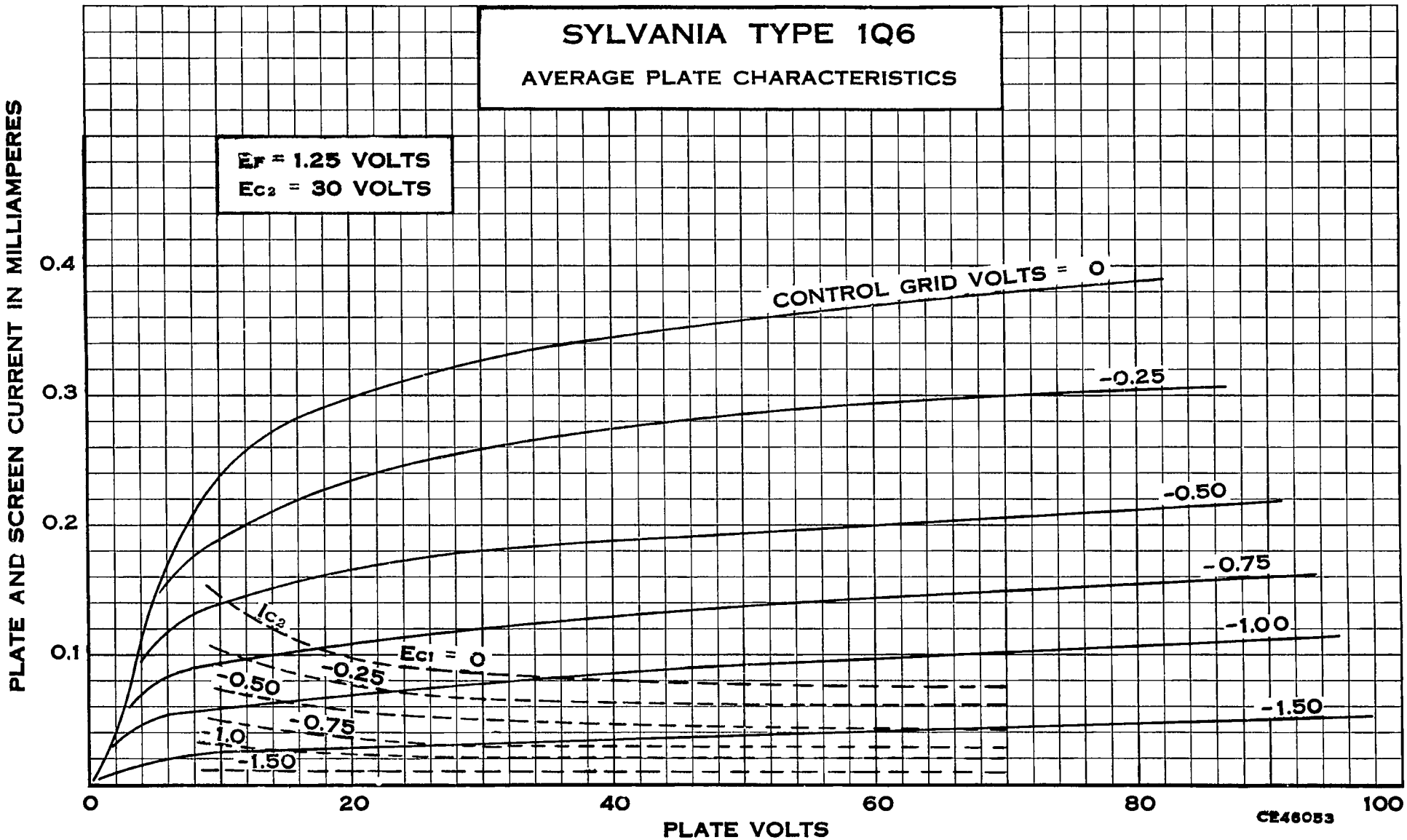
CONTROL GRID VOLTS
CE46052
PLATE AND SCREEN CURRENT IN MILLIAMPERES
PLATE RESISTANCE rp IN MEGOHMS
MUTUAL CONDUCTANCE gm IN MICROMHOS


SYLVANIA TYPE 1Q6
AVERAGE TRANSFER CHARACTERISTICS
EF = 1.25 VOLTS
EB = Ec2 = 30 VOLTS
gm
Ib
rp
Ic2
0.3
0.2
0.1
3.0
2.0
1.0
300
200
100
-3.0
-2.0
-1.0
0
CONTROL GRID VOLTS
CE46051
PLATE AND SCREEN CURRENT IN MILLIAMPERES
PLATE RESISTANCE rp IN MEGOHMS
MUTUAL CONDUCTANCE gm IN MICROMHOS


SYLVANIA TYPE 1Q6
AVERAGE PLATE CHARACTERISTICS
Ef = 1.25 VOLTS
Ec2 = 30 VOLTS
PLATE AND SCREEN CURRENT IN MILLIAMPERES
0.4
0.3
0.2
0.1
0
20
40
60
80
100
PLATE VOLTS
CONTROL GRID VOLTS = 0
-0.25
-0.50
-0.75
-1.00
-1.50
Ic2
Ec1 = 0
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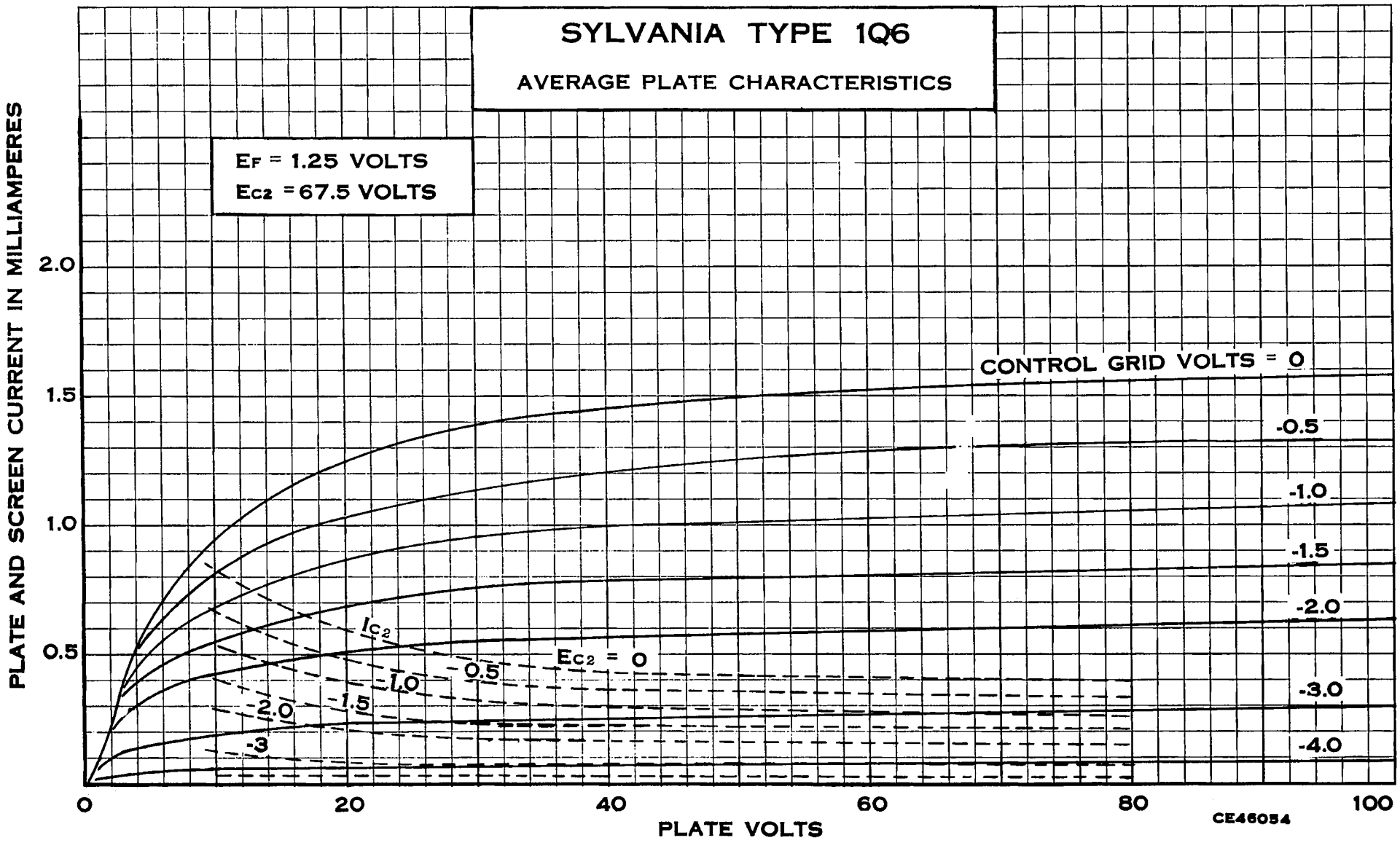
-0.50
-0.75
-1.0
-1.50
C246053


SYLVANIA TYPE 1Q6
AVERAGE PLATE CHARACTERISTICS
EF = 1.25 VOLTS
Ec2 = 67.5 VOLTS
PLATE AND SCREEN CURRENT IN MILLIAMPERES
2.0
1.5
1.0
0.5
0
20
40
60
80
100
PLATE VOLTS
CONTROL GRID VOLTS = 0
-0.5
-1.0
-1.5
-2.0
-3.0
-4.0
Ic2
Ec2 = 0
0.5
1.0
1.5
2.0
3
CE46054

RMA Release # 322

Feb. 1, 1943

1R4/1294
June 25, 1945

SYLVANIA ELECTRIC PRODUCTS INC.

Technical Data

TYPE 1R4/1294

Cathode Type High Frequency Diode

Physical Specifications

Coated Unipotential Cathode

Bulb	T-9
Base	Lock-In 8 pin
Maximum Diameter	1-3/16"
Maximum Overall Length	2-25/32"
Maximum Seated Height	2-1/4"

Pin Connections:

Pin 1 = Heater	Pin 5 = No connection
Pin 2 = Internal Shield	Pin 6 = No connection
Pin 3 = No connection	Pin 7 = Cathode
Pin 4 = Plate	Pin 8 = Heater

Ratings

Heater Voltage (ac or dc)	1.4	volts
Heater Current	0.150	ampere
Maximum AC Plate Voltage	117	volts
Maximum DC Output Current	1.0	ma.
Tube Voltage Drop, measured with applied DC at 2 ma.	8	volts
Resonant Frequency	1500	meracycles

Direct Interelectrode Capacitances *

Plate to Cathode	.36	uuf
Plate to Cathode + Heater and Internal Shield + Shell	1.6	uuf
Cathode to Heater, Shell and Internal Shield	1.9	uuf

* without or with RMA Tube shield M8-308 connected to cathode.

HEA:df
1-25-43

#78

RADIO MANUFACTURERS ASSOCIATION

SUITE 701-4 AMERICAN BUILDING
1317 F STREET, N. W.
WASHINGTON, D. C.

SUB-COMMITTEE ON TUBE NUMBERING

E. W. WILBY, CHAIRMAN
711 FIFTH AVENUE
NEW YORK, N. Y.

June 17th, 1936.

To Tube Engineer:

RMA Tube Standardization
Release #78 re 1S1G.

This release relates to the standardization of a glass envelop octal based ballast tube of the 1 volt 660 milliampere rating designated as

1S1G,

The basing of this tube is as follows:

Pin #1	no connection	#5	no connection
#2	resistor	#7	resistor
#3	no connection	#8	no connection

The over-all length of the ballast tube is 3-3/4 inches.

This information is furnished you through the courtesy of the Hygrade-Sylvania Corporation.

Very truly yours,

Edward W Wilby

Chairman
Tube Numbering

eww;lg

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 1S6

DIODE PENTODE

Mechanical Data

Cathode	coated filament
Outline Drawing	see other side
Maximum Diameter	0.400 inches
Maximum Bulb Overall Length	1.500 inches
Bulb	T-3
Base	subminiature button - flexible leads
Mounting Position	any

Lead Connections:

Lead 1 .. pentode plate	Lead 5 .. positive filament
Lead 2 .. no connection	Lead 6 .. diode plate
Lead 3 .. grid #1	Lead 7 .. no connection
Lead 4 .. negative filament, grid #3	Lead 8 .. grid #2

Electrical Data

RATINGS

Filament Voltage	1.25 volts
Maximum Plate Voltage	100 volts
Maximum Grid #2 Voltage	100 volts
Maximum Cathode Current (pentode section)	2.0 ma
Maximum Diode Current (continuous operation)	0.25 ma

CHARACTERISTICS

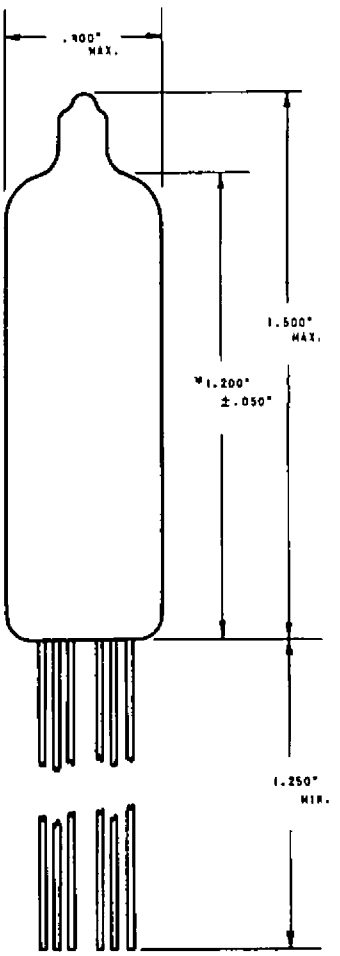
Filament Voltage (dc)	1.25	1.25	1.25 volts
Filament Current	40	40	40 ma
Plate Voltage	30	45	67.5 volts
Grid #2 Voltage	30	45	67.5 volts
Grid #1 Voltage	0	0	0 volts
Plate Current	0.33	0.75	1.6 ma
Grid #2 Current	0.10	0.21	0.4 ma
Plate Resistance	0.5	0.5	0.4 megohm
Transconductance	330	475	600 umhos
Average Diode Current (with 10 volts dc)	1.5	1.5	1.5 ma

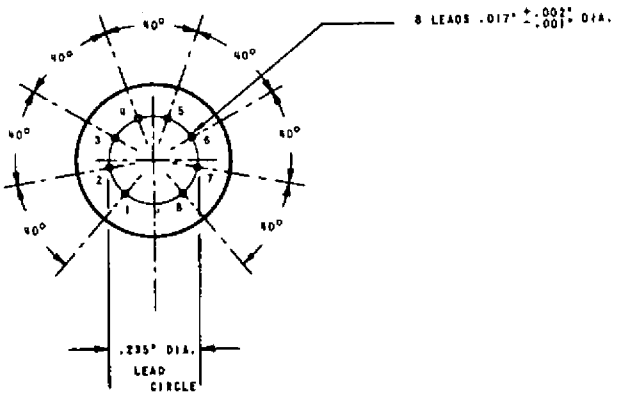
from RMA release #730, Jan. 18, 1949

SYLVANIA ELECTRIC

OUTLINE

TYPE 1S6





* MEASURED FROM BASE SEAT TO BULB-TOP LINE AS DETERMINED BY RING GAUGE OF .210" +.000" -.001" I.D.

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 1U6

PENTAGRID CONVERTER

MECHANICAL DATA

Style	miniature
Cathode	coated filament
Bulb	T-5 1/2
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Maximum Diameter	3/4 inch
Maximum Overall Length	2 1/8 inches
Maximum Seated Height	1 7/8 inches
Basing	7CD-0-0

Pin Connections:

Pin 1 .. negative filament
Pin 2 .. plate
Pin 3 .. grid #2
Pin 4 .. grid #1
Pin 5 .. grid #3 and grid #5
Pin 6 .. grid #4
Pin 7 .. positive filament

7DC

Mounting Position ..... any

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES

	without shield	*with shield*(1)	
Grid #4 to Plate	0.4	0.4	μμf
Grid #4 to Grid #2	0.2	0.2	μμf
Grid #4 to Grid #1	0.2	0.2	μμf
Grid #1 to Grid #2	0.8	0.8	μμf
Grid #4 to All Other Electrodes	8.0	8.0	μμf
Grid #2 to All Except Grid #1	2.2	2.4	μμf
Grid #1 to All Except Grid #2	2.0	2.2	μμf
Plate to All Other Electrodes	7.0	12.0	μμf

RATINGS -- *Design Center Values*

Filament Voltage(2)	1.4	volts
Maximum Plate Voltage (dc)	110	volts
Maximum Grid #3 and Grid #5 Supply Voltage (dc)	110	volts
Maximum Grid #3 and Grid #5 Voltage(3) (dc)	65	volts
Maximum Grid #2 Voltage (dc)	110	volts
Maximum Cathode Current	4.0	milliamps
Minimum Grid #4 Circuit Resistance	1.0	megohm

(1) Shield #316 connected to Pin 1.

(2) For power-line operation the filament voltage is centered at 1.4 volts for normal line voltage (117 volts).

(3) Obtained by using a by-passed voltage dropping resistor in series with the plate supply voltage, or by equivalent means.

TYPE 1U6

CHARACTERISTICS[4]

Filament Voltage	1.4	1.4	volts
Filament Current	25	25	milliamps
Plate Voltage (dc)	67.5	90	volts
Grid #3 and Grid #5 Voltage (dc)	45	45	volts
Grid #2 Voltage (dc)	67.5	90	volts
Grid #4 Voltage (dc)	0	0	volts
Grid #1 Resistor	0.2	0.2	megohm
Plate Resistance	0.55	0.60	megohm
Plate Current	0.5	0.55	milliamp
Grid #3 and Grid #5 Current	0.6	0.55	milliamp
Grid #2 Current	0.95	1.1	milliamps
Grid #1 Current	0.028	0.035	milliamp
Total Cathode Current	2.1	2.2	milliamps
Conversion Transconductance	260	275	micromhos
Grid #4 Voltage for Conversion Transconductance Cut-Off[5]	-3	-3	volts
Oscillator Transconductance, with 0 volts on grids #1 and #4		475	micromhos

(4) Grid #1 ..... oscillator grid.
Grid #2 ..... oscillator anode.
Grids #3 & #5 ... screen.
Grid #4 ..... signal.

(5) Approximately 10 micromhos.

TECHNICAL DATA

IV5

Sylvania

TYPE IV5

OUTPUT PENTODE

RATINGS AND CHARACTERISTICS

Filament Voltage DC	1.25	Volts
Maximum Plate Voltage	100	Volts
Maximum Screen Voltage	100	Volts
Maximum Cathode Current	5.0	Ma.

PHYSICAL SPECIFICATIONS

Style	T-3
Base	Flexible Leads
Bulb	T-3
Diameter	0.400" Max.
Lead Length	1.25" Min.
Overall Length	1.5" Max.
Mounting Position	Any

BASE PIN CONNECTIONS

Pin 1 - No Connection
Pin 2 - Control Grid
Pin 3 - No Connection
Pin 4 - Negative Filament ≠ Suppressor
Pin 5 - Positive Filament
Pin 6 - No Connection
Pin 7 - Plate
Pin 8 - Screen Grid
RMA Basing 8CP-D-0

OPERATING CONDITIONS AND CHARACTERISTICS

Filament Voltage DC	1.25	1.25	1.25	Volts
Filament Current	.040	.040	.040	Ampere
Plate Voltage	30	45	67.5	Volts
Screen Voltage	30	45	67.5	Volts
Grid Voltage	-2.0	-3.0	-4.5	Volts
Plate Current	0.50	1.0	2.0	Ma.
Screen Current	0.10	0.2	0.40	Ma.
Plate Resistance	.200	.175	.150	Megohm
Mutual Conductance	450	600	750	µmhos
Load Resistance	50,000	40,000	25,000	Ohms
Power Output	5	15	50	Milliwatts
Total Harmonic Distortion	10	10	10	o/o

CIRCUIT APPLICATION

Sylvania Type IV5 is an Output Pentode suitable for use in very small radio sets or amplifiers. The other types required for a normal set complement and designed for use with it are Types 1C8 (Converter), 1Q6 (Diode Pentode) and 1W5 (RF Pentode).

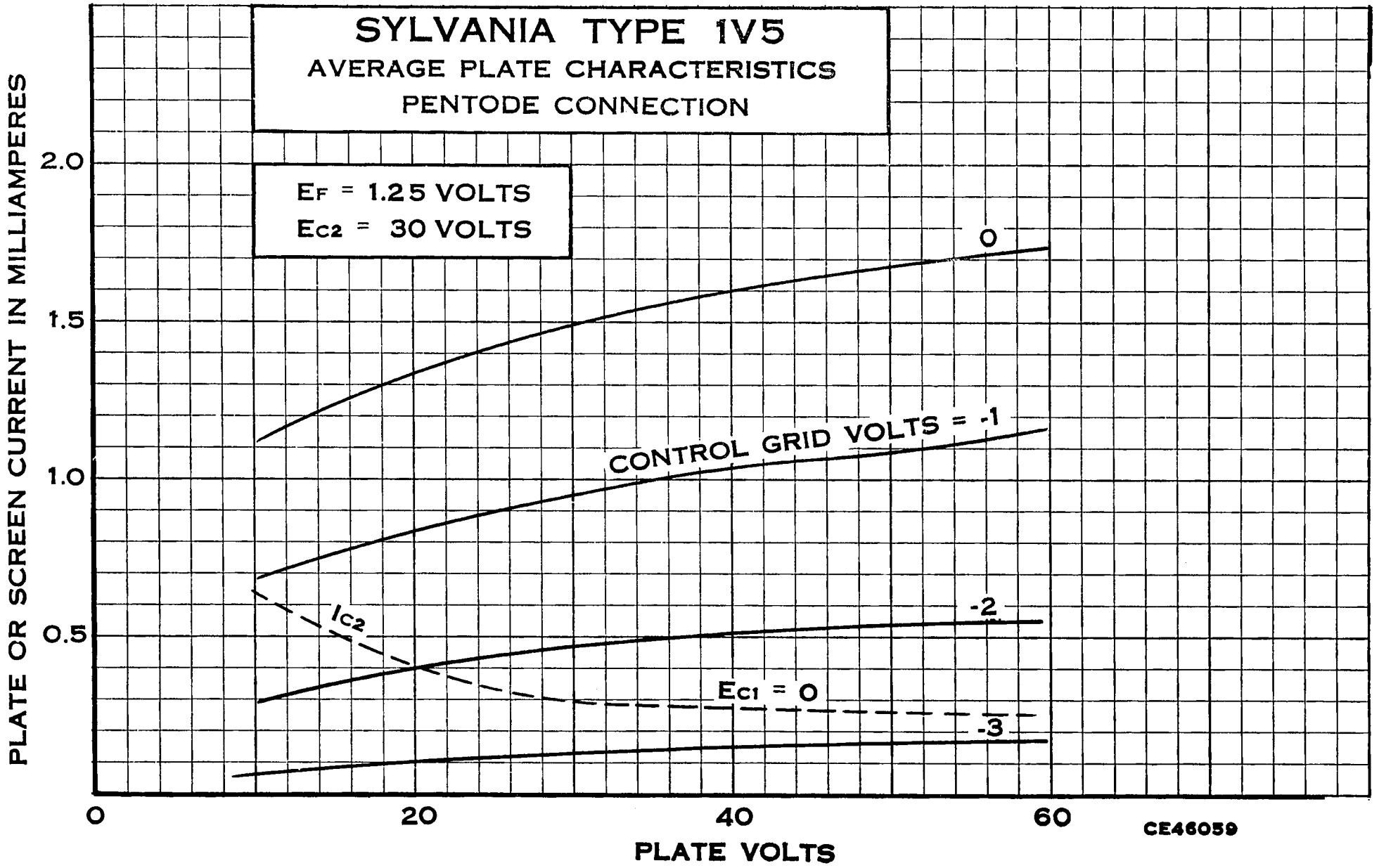
This type corresponds in service and circuit requirements to Type 1LA4 except for the improved plate current economy.

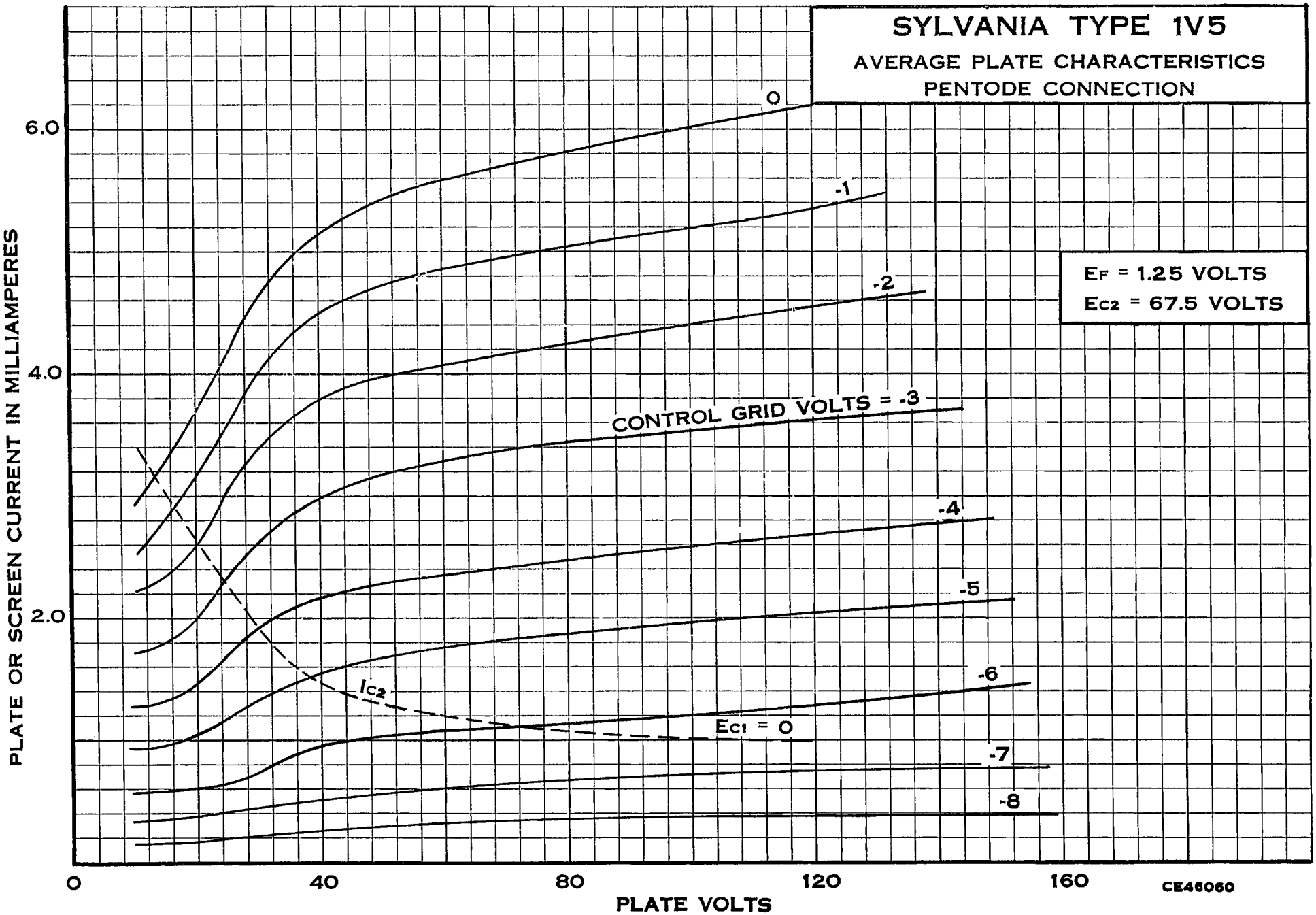
When used on battery supply the filament voltage must never exceed 1.5 volts. For AC-DC power line operation, the design center is 1.2 volts.

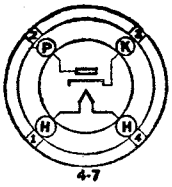
The tinned leads permit direct soldering into the circuit and permit great reduction in size of completed equipment, or may be cut off for use in a socket designed for this purpose.

from RMA release #467A,
Jan. 31, 1947

COMMERCIAL ENGINEERING DEPARTMENT
Sylvania Electric Products Inc., Emporium, Pennsylvania
DEC. 18, 1946 PRINTED IN USA


SYLVANIA TYPE 1V5
AVERAGE PLATE CHARACTERISTICS
PENTODE CONNECTION
EF = 1.25 VOLTS
Ec2 = 30 VOLTS
PLATE OR SCREEN CURRENT IN MILLIAMPERES
2.0
1.5
1.0
0.5
0
20
40
60
PLATE VOLTS
0
CONTROL GRID VOLTS = -1
-2
-3
Ic2
Ec1 = 0
CE46059

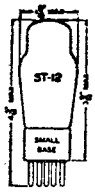

SYLVANIA TYPE 1V5
AVERAGE PLATE CHARACTERISTICS
PENTODE CONNECTION
EF = 1.25 VOLTS
Ec2 = 67.5 VOLTS
0
-1
-2
CONTROL GRID VOLTS = -3
-4
-5
-6
-7
-8
Ic2
Ec1 = 0
6.0
4.0
2.0
0
40
80
120
160
PLATE OR SCREEN CURRENT IN MILLIAMPERES
PLATE VOLTS
CE46060



Sylvania

TYPE 1V

REDRESSEUR
UNE ALTERNANCE



CARACTERISTIQUES

Tension de chauffage (CC. ou CA.)	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12
Culot — Petit modèle 4 broches	4-G
Position de montage	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension de chauffage CC. ou CA.	6,3 volts
Courant de chauffage	0,3 ampère
Tension CC. chauffage à potentiel cathode ...	500 volts max.
Tension de pointe inverse	1.000 volts max.
Chute de tension dans le tube (courant plaque 90 ma.)	20 volts

Conditions de fonctionnement et caractéristiques :
(entrée condensateur)

Tension de chauffage *	6,3	6,3	6,3 volts
Tension plaque CA. (RMS)	117	150	325 volts max.
Courant redressé	45	45	45 ma. max.
Impédance de charge	0	30	75 ohms. min.

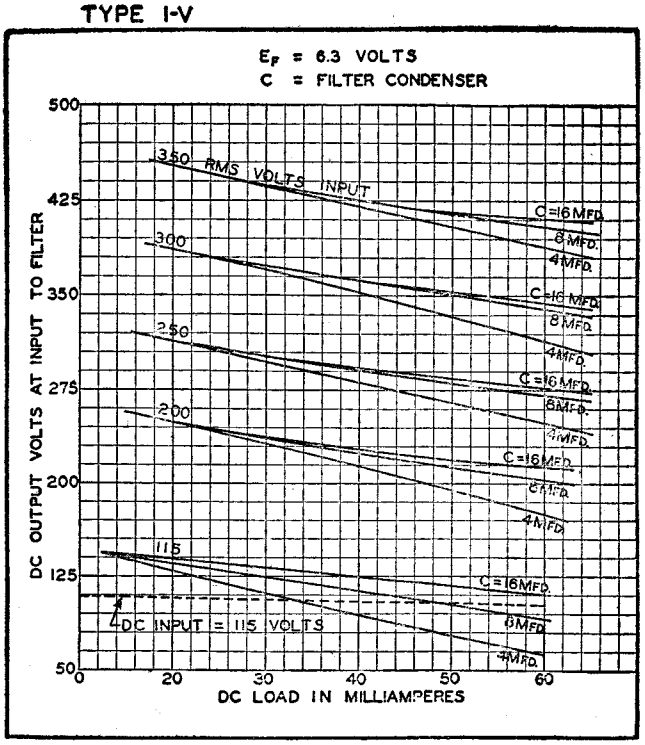
* La différence de tension CC. entre le filament et la cathode ne doit pas dépasser 500 volts.

Note : Pour les courbes de redressement, voir fin de volume.

APPLICATION

Le tube 1-V est destiné à être utilisé sur de petits récepteurs devant fonctionner sur courant alternatif ou continu ou sur batteries. Ces différents fonctionnements sont rendus possibles par la présence d'un commutateur convenable groupant les filaments en série, pour le fonctionnement sur réseau alternatif ou continu et en parallèle pour le fonctionnement sur batteries.

TYPE 1-V


E_F = 6.3 VOLTS
C = FILTER CONDENSER
DC OUTPUT VOLTS AT INPUT TO FILTER
DC LOAD IN MILLIAMPERES
350 RMS VOLTS INPUT
300
250
200
115
C=16MFD.
8MFD.
4MFD.
DC INPUT = 115 VOLTS
500
425
350
275
200
125
50
0
20
30
40
50
60

RADIO MANUFACTURERS ASSOCIATION

SUITE 701-4 AMERICAN BUILDING
1317 F STREET, N. W.
WASHINGTON, D. C.

SUB-COMMITTEE ON TUBE NUMBERING

E. W. WILBY, CHAIRMAN
711 FIFTH AVENUE
NEW YORK, N. Y.

January 17, 1938

To Tube Engineer:

RMA Tube Standardization
Release #127 1W1.

The ballast tube type 1W1 on which tentative data was forwarded to tube manufacturers on November 5th is, as of today, being commercially released by the Hygrade-Sylvania Corporation.

This ballast tube has an ST12 envelope with a standard 4 pin base. It has a voltage drop of 1 volt and a current capacity of 660 ma. The resistance element is connected across the terminal pins 1 and 3.

Very truly yours
Edward E. Wilby

Chairman
Tube Numbering

eww/ms

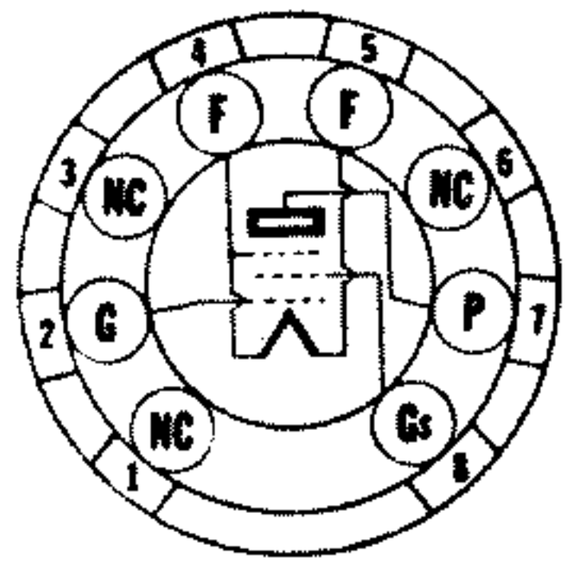
E. I. A.
REGISTRATION
FILE

PLATE VOLTS

1W5 Sylvania Type

SHARP CUT-OFF RF PENTODE





8CP-0-0

PHYSICAL SPECIFICATIONS

Base	Flexible Leads
Bulb	T-3
Minimum Lead Length	1¼"
Maximum Bulb Length	1½"
Mounting Position	Any

RATINGS

Filament Voltage DC	1.25 Volts
Maximum Plate Voltage	100 Volts
Maximum Screen Current	100 Volts

Direct Interelectrode Capacitances

	Unshielded	Shielded*
Grid to Plate	.012	.01 μμf. Max.
Input	2.2	2.3 μμf.
Output	3.4	3.5 μμf.

**With 0.405" diameter shield connected to negative filament. Leads numbering 1, 3 and 6 must be grounded to obtain these values.*

TYPICAL OPERATION

Filament Voltage DC	1.25	1.25 Volts
Filament Current	.040	.040 Ampere
Plate Voltage	30	67.5 Volts
Screen Voltage	30	67.5 Volts
Grid Voltage	0	0 Volts
Plate Current	0.42	1.85 Ma.
Screen Current	0.16	0.75 Ma.
Plate Resistance (Approx.)	0.7	0.7 Megohm
Mutual Conductance	430	735 μmhos
Control Grid Voltage for Ib = 10 μa. (Approx.)	—2.0	—5.0 Volts

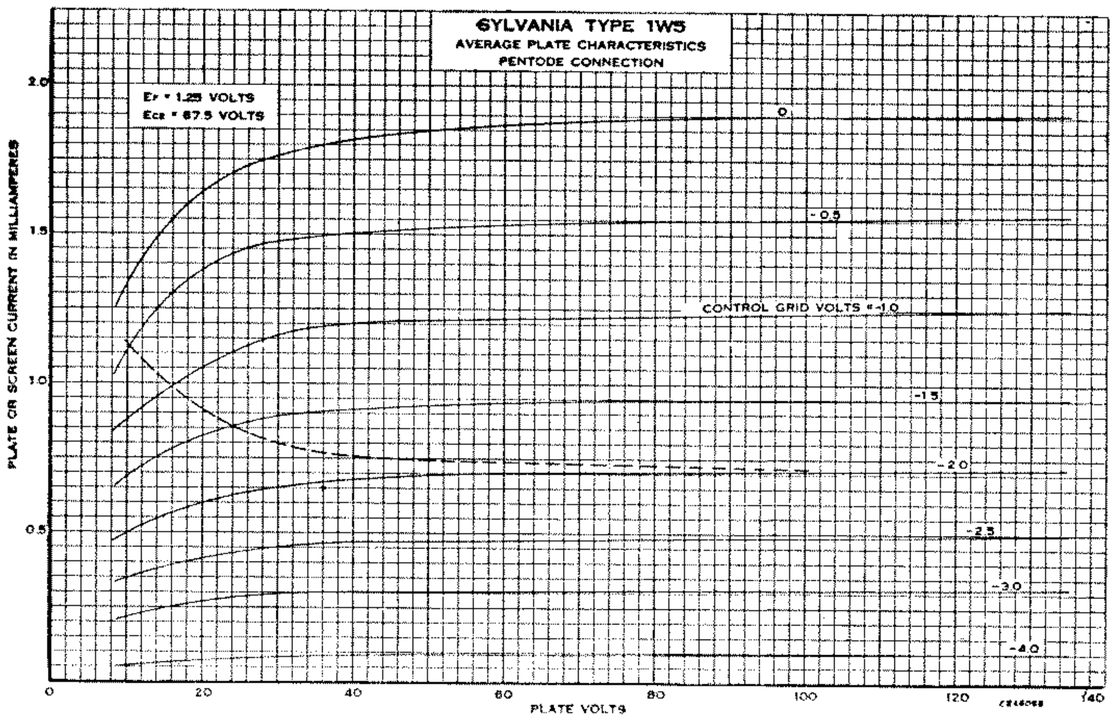
APPLICATION

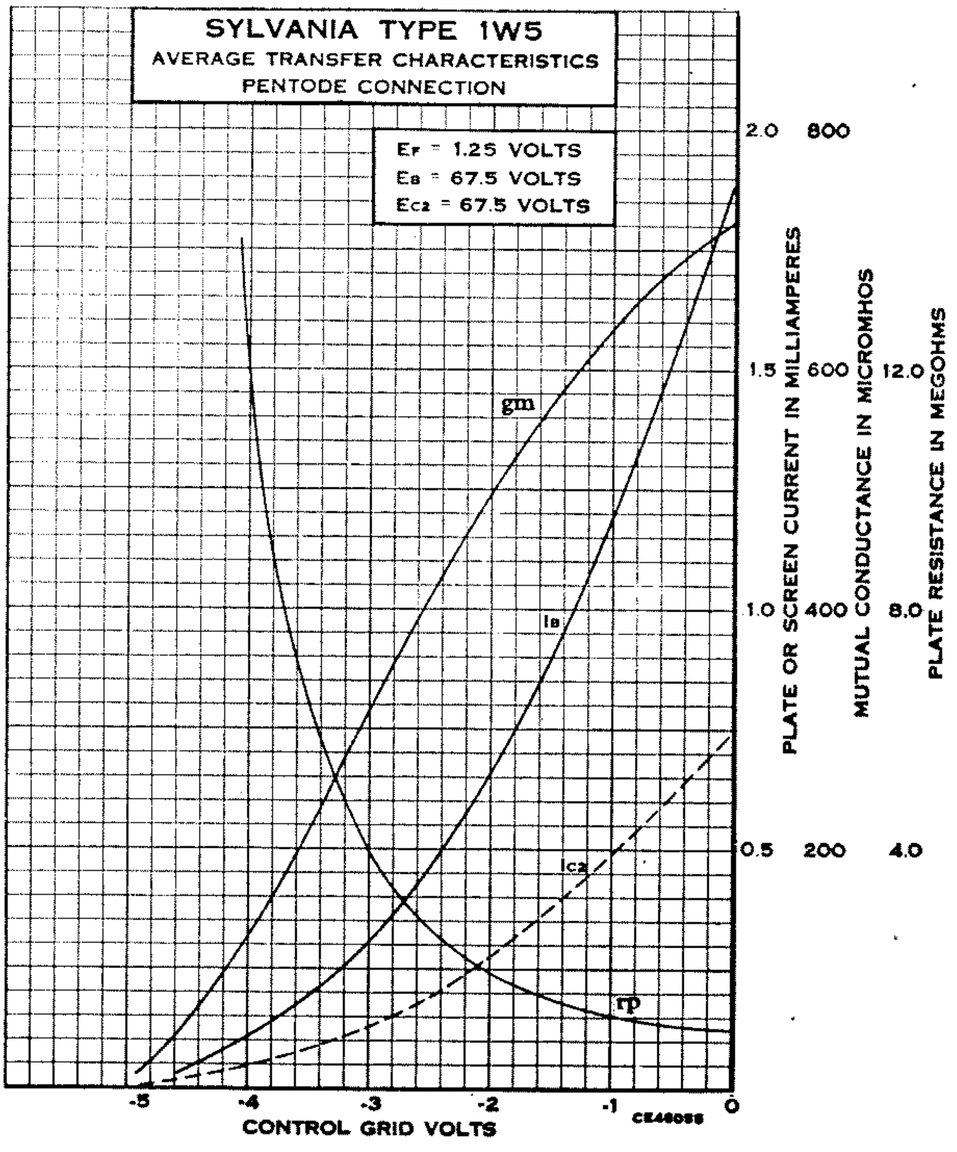
Sylvania Type 1W5 is an RF Pentode tube suitable for use in very small sets or amplifiers. The other types required for a normal set complement and designed for use with it are Types 1C8 (Converter), 1Q6 (Diode Pentode) and 1V5 (Output Pentode).

This type corresponds in service and circuit design to Type 1LN5 and will operate satisfactorily with standard radio components.

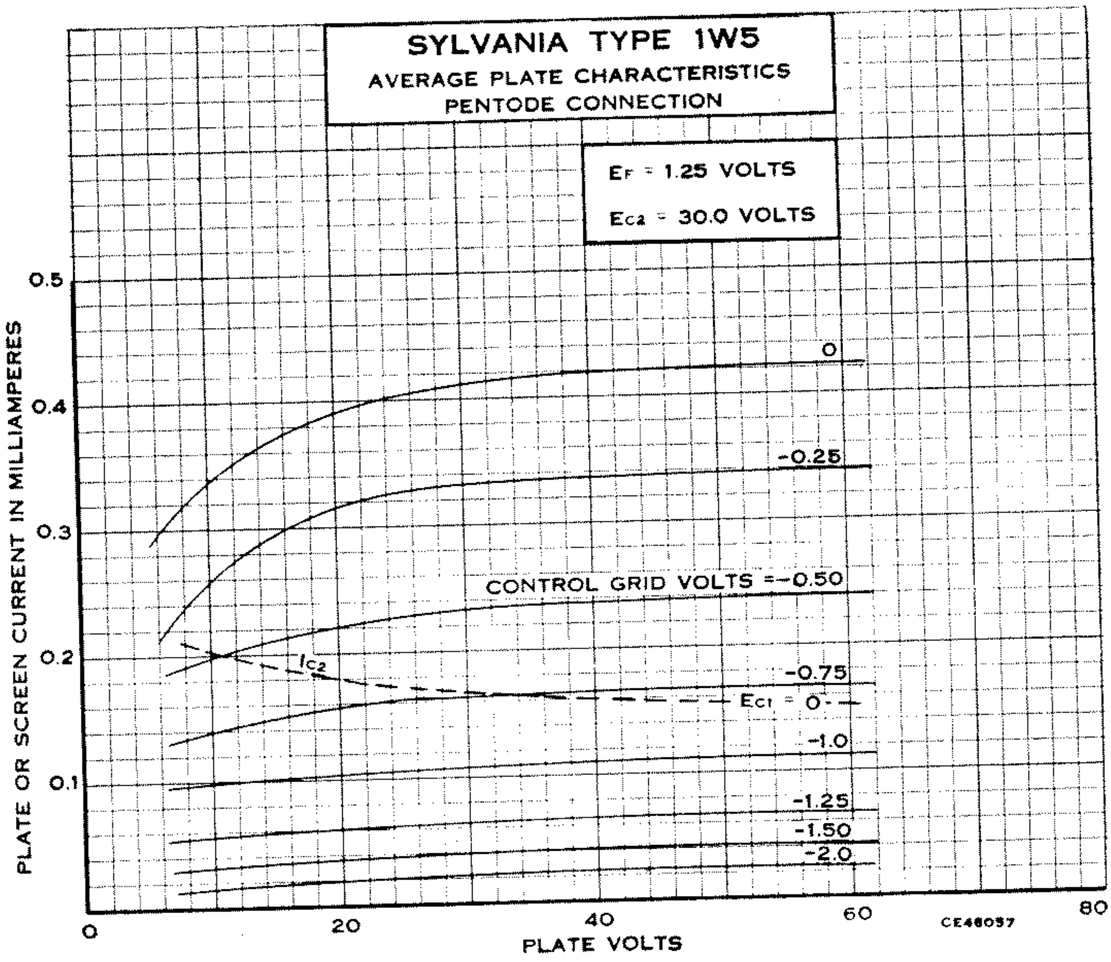
When used on battery supply the filament voltage must never exceed 1.5 volts. For AC-DC power line operation, the design center is 1.2 volts.

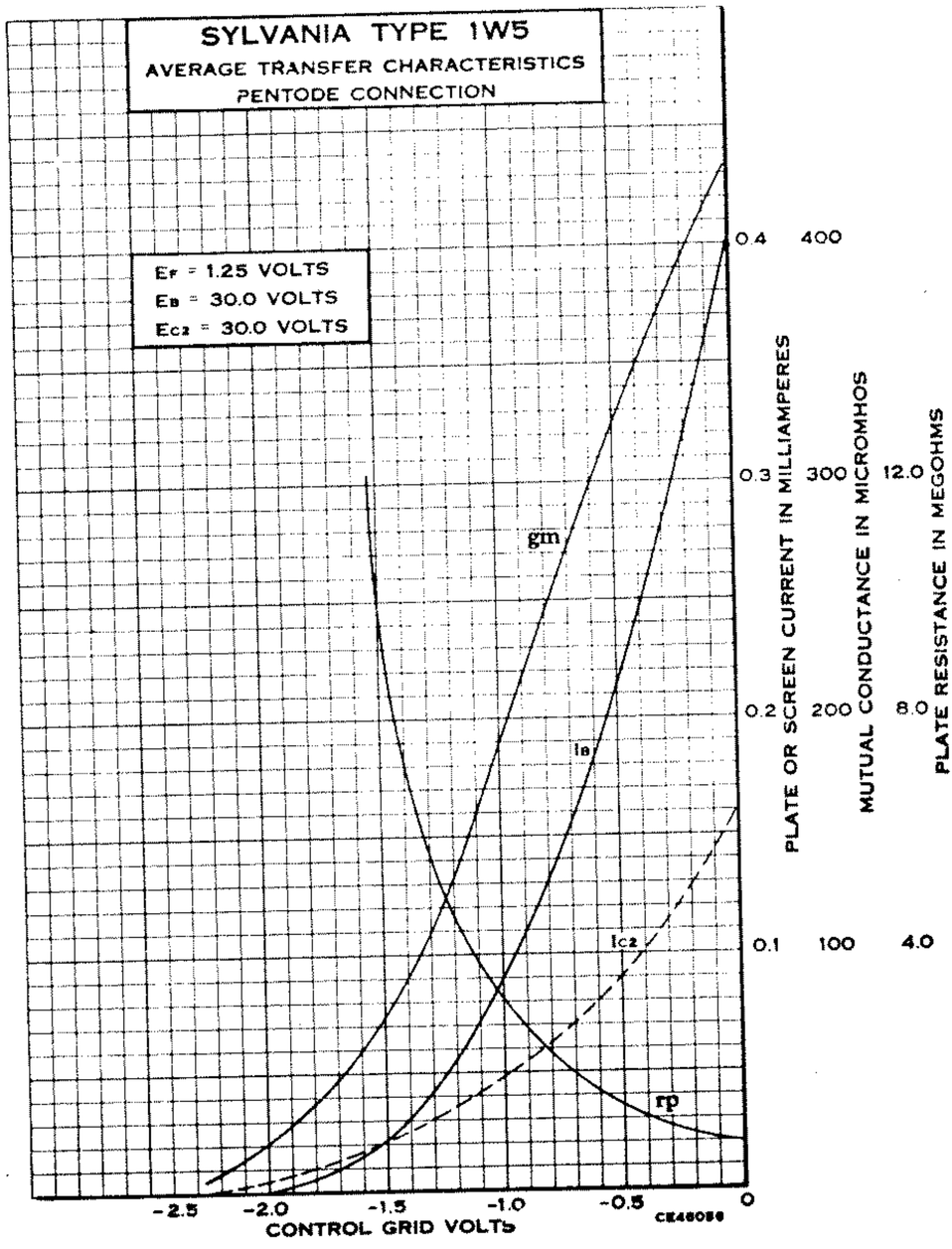
The tinned leads permit direct soldering into the circuit to permit great reduction in size of completed equipment, or may be cut off for use in a socket designed for this purpose. The small size and light weight permit use under severe mechanical conditions and in locations where larger tubes could not be considered.


SYLVANIA TYPE 1W5
AVERAGE PLATE CHARACTERISTICS
PENTODE CONNECTION
Ef = 1.25 VOLTS
Ec2 = 67.5 VOLTS
0
-0.5
CONTROL GRID VOLTS = -1.0
-1.5
-2.0
-2.5
-3.0
-4.0
PLATE OR SCREEN CURRENT IN MILLIAMPERES
2.0
1.5
1.0
0.5
0
20
40
60
80
100
120
140
PLATE VOLTS
CE44088


SYLVANIA TYPE 1W5
AVERAGE TRANSFER CHARACTERISTICS
PENTODE CONNECTION
Ef = 1.25 VOLTS
Eb = 67.5 VOLTS
Ec2 = 67.5 VOLTS
gm
Ib
Ic2
rp
-5
-4
-3
-2
-1
0
CONTROL GRID VOLTS
CE44088
2.0
1.5
1.0
0.5
800
600
400
200
12.0
8.0
4.0
PLATE OR SCREEN CURRENT IN MILLIAMPERES
MUTUAL CONDUCTANCE IN MICROMHOS
PLATE RESISTANCE IN MEGOHMS

1W5 (Cont.)


SYLVANIA TYPE 1W5
AVERAGE PLATE CHARACTERISTICS
PENTODE CONNECTION
Ef = 1.25 VOLTS
Ec2 = 30.0 VOLTS
PLATE OR SCREEN CURRENT IN MILLIAMPERES
0.5
0.4
0.3
0.2
0.1
0
-0.25
CONTROL GRID VOLTS =-0.50
Ic2
-0.75
Ec1 = 0
-1.0
-1.25
-1.50
-2.0
0
20
40
60
80
PLATE VOLTS
CE46057


SYLVANIA TYPE 1W5
AVERAGE TRANSFER CHARACTERISTICS
PENTODE CONNECTION
Ef = 1.25 VOLTS
Eb = 30.0 VOLTS
Ec2 = 30.0 VOLTS
gm
Ib
Ic2
rp
0.4
0.3
0.2
0.1
400
300
200
100
12.0
8.0
4.0
PLATE OR SCREEN CURRENT IN MILLIAMPERES
MUTUAL CONDUCTANCE IN MICROMHOS
PLATE RESISTANCE IN MEGOHMS
-2.5
-2.0
-1.5
-1.0
-0.5
0
CONTROL GRID VOLTS
CE46058

RADIO MANUFACTURERS ASSOCIATION

SUITE 701-4 AMERICAN BUILDING
1317 F STREET, N. W.
WASHINGTON, D. C.

RMA SUB-COMMITTEE ON TUBE LIMITS

STUART W. SEELEY, CHAIRMAN
711 FIFTH AVENUE
NEW YORK, N. Y.

September 11, 1936

To Tube Engineer:

RMA Tube Standardization Release
#89 re tube types 1Y1 and 1Z1.

This is to announce the commercial release by the Hygrade Sylvania Corporation of two one-volt glass enveloped four-pin ballast tubes designated as follows:

1Y1 having a current rating of 540 ma.

1Z1 having a current rating of 900 ma.

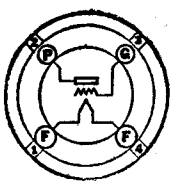
As the one-volt ballast tube type is well known throughout the tube industry, it is believed that the forwarding of samples will not be necessary.

Very truly yours,

Edward W Wilkes
Chairman
Tube Numbering

eww:mm

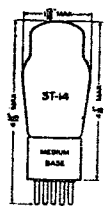
E. I. A.
REGISTRATION
FILE



Sylvania

TYPE 2A3

TRIODE DE PUISSANCE



CARACTERISTIQUES

Tension filament CA. ou CC.	2,5 Volts
Courant filament	2,5 ampères
Position de montage	Verticale

Pour les autres caractéristiques et les applications, voir type 6A3.

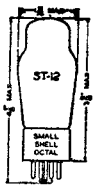


5-S

Sylvania

TYPE 2A4G

THYRATRON
A REMPLISSAGE D'ARGON



CARACTERISTIQUES

Tension filament	**2,5 volts**
Courant filament	2,5 ampères
Ampoule	ST-12
Culot : petit octal 8 broches	5-S
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

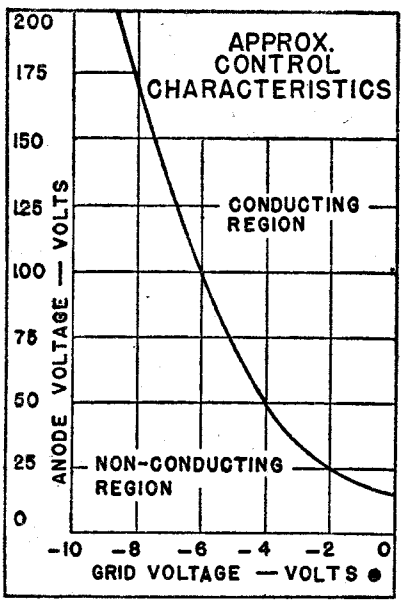
Tension filament	2,5 volts

Tension maximum d'Anode (Instantanée) :

En avant	200 volts
Inverse	200 volts
Tension maximum entre n'importe quelles électrodes	250 volts

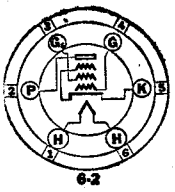
Courant maximum d'Anode :

Pointe	1,25 ampère
Moyenne	0,10 ampère
Temps moyen maximum	45 secondes
Chute de tension dans le tube	15 volts
Temps démarrage à froid	2 secondes



APPLICATION

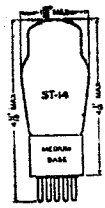
Sylvania type 2A4G est un tube thyratron, à cathode chaude, rempli d'argon, à grille unique, particulièrement utile dans les applications où la constance des caractéristiques est nécessaire même avec de grandes variations dans la température ambiante. La broche + du filament est au n° 2 du culot octal type G et le — arrive à la broche n° 7. La tension maximum permise entre deux quelconques des électrodes est de 250 volts.



Sylvania

TYPE 2A5

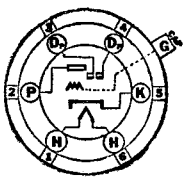
AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension de chauffage (CA. ou CC.)	2,5 volts
Courant de chauffage	1,75 ampère
Position de montage	Toutes

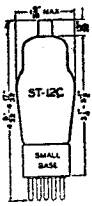
Pour les autres caractéristiques et les applications, voir type 42.



Sylvania

TYPE 2A6

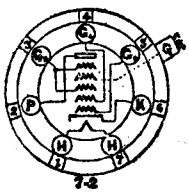
DOUBLE DIODE
TRIODE A MU ELEVE



CARACTERISTIQUES

Tension de chauffage (CC. ou CA.)	2,5 volts
Courant de chauffage	0,8 ampère
Position de montage	Toutes

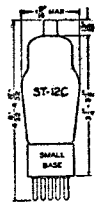
Pour les autres caractéristiques et les applications, voir type 75.



Sylvania

TYPE 2A7

CONVERTISSEUR PENTAGRILLE



CARACTERISTIQUES

Tension de chauffage	2,5 volts
Courant de chauffage	0,8 ampère
Position de montage	Toutes

Pour les autres caractéristiques et les applications, voire type 6A7.

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2AP1A

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic
Phosphor	P1
Fluorescence	Green
Persistence	Medium
Faceplate	Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5.5 $\mu\mu$f
Grid to All Other Electrodes	8.0 $\mu\mu$f
Between Deflecting Plates 1-2[1]	0.6 $\mu\mu$f
Between Deflecting Plates 3-4[1]	1.1 $\mu\mu$f
Deflecting Plate 1 to All Other Electrodes Except DP2	8.0 $\mu\mu$f
Deflecting Plate 2 to All Other Electrodes Except DP1	4.6 $\mu\mu$f
Deflecting Plate 3 to All Other Electrodes Except DP4	7.5 $\mu\mu$f
Deflecting Plate 4 to All Other Electrodes Except DP3	6.0 $\mu\mu$f

MECHANICAL DATA

Minimum Useful Screen Diameter	1¾ Inches
Base	Small Shell Magnal 11-Pin
Basing	11L

RATINGS

MAXIMUM RATINGS (Absolute Values)

Anode No. 2 Voltage	1,100 Volts dc
Anode No. 1 Voltage	550 Volts dc
Grid Voltage	
Negative Value	125 Volts
Positive Value	0 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	125 Volts
Heater Positive with Respect to Cathode	10 Volts
Peak Voltage Between Anode No. 2 And any Deflection Plate	660 Volts

RECOMMENDED OPERATING CONDITIONS

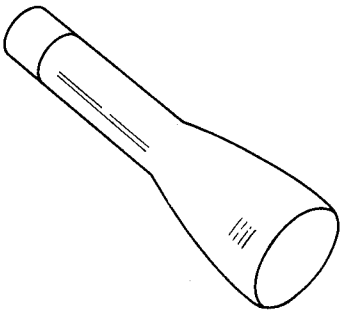
Anode No. 2 Voltage[2]	1,000 Volts dc
Anode No. 1 Voltage for Focus	137 to 300 Volts dc
Grid Voltage Required for Cutoff[3]	-30 to -90 Volts dc
Deflection Factor	
Deflecting Plates 1-2[4]	230 Volts dc/Inch
Deflecting Plates 3-4[5]	196 Volts dc/Inch

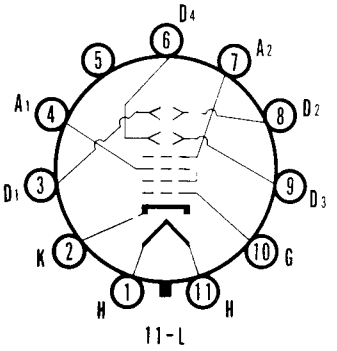
CIRCUIT VALUES

Grid Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5.0 Megohms Max.

QUICK REFERENCE DATA

Special Purpose Tube
2" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus





11-L

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM PENNSYLVANIA

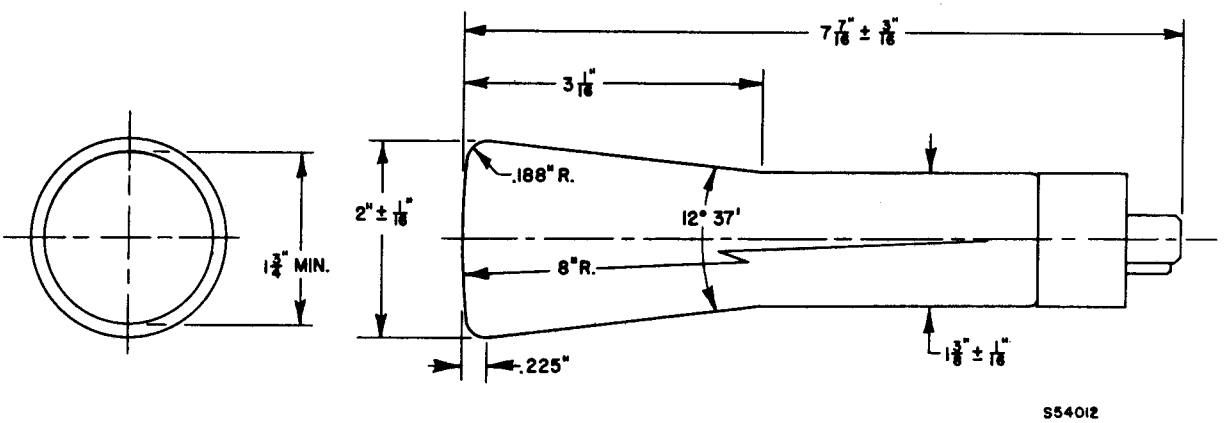
JULY, 1954

SYLVANIA

2AP1A

NOTES:

1. *Deflecting Plate 1 is Pin No. 3*
   Deflecting Plate 2 is Pin No. 8
   Deflecting Plate 3 is Pin No. 9
   Deflecting Plate 4 is Pin No. 6
2. *Brilliance and definition decrease with decreasing Anode No. 2 Voltage. In general, Anode No. 2 Voltage should not be less than 500 volts.*
3. *Visual extinction of undeflected focused spot.*
4. *Deflecting Plates 1-2 are nearer the screen.*
5. *Deflecting Plates 3-4 are nearer the base.*



from RTMA release #993,
July 6, 1951

SYLVANIA ELECTRIC

RTMA Registration Data

TYPE 2B5

DOUBLE TRIODE

The Type 2B5 is a subminiature double triode capable of operation up to 150 megacycles as a voltage amplifier.

MECHANICAL DATA

Style	subminiature
Cathode	coated filament
Bulb	T-3
Base	E8-10, Subminiature Button--Flexible Leads
Outline	3-2
Maximum Diameter	0.400 inch
Maximum Overall Bulb Length	1.50 inches
Minimum Lead Length	1.50 inches
Mounting Position	any
Basing	8DP

Lead Connections:

Lead 1 -- #2 plate
Lead 2 -- filament tap*
Lead 3 -- #2 grid
Lead 4 -- filament (-)
Lead 5 -- filament (+)
Lead 6 -- #1 grid
Lead 7 -- filament tap*
Lead 8 -- #1 plate

ELECTRICAL DATA

GENERAL

Direct Interelectrode Capacitances:

	Shielded**	Not Shielded
Grid to Plate (Section 1)	1.2	1.2 uuf
Grid to Plate (Section 2)	1.2	1.2 uuf
Input (Section 1)	0.9	0.8 uuf
Input (Section 2)	0.9	0.7 uuf
Output (Section 1)	1.9	0.8 uuf
Output (Section 2)	2.2	0.9 uuf
Grid to Grid	0.044	0.046 uuf
Plate to Plate	0.5	0.7 uuf

	Series Operation***	Parallel Operation
Filament Voltage	2.4	1.2 volts
Filament Current	130	260 milliamps

* Negative filament terminal for parallel operation.

** External shield of 0.405 inch diameter connected to pin 4.

*** For series operation of filament a shunting resistor must be connected between pins 4 and 2 (or 7). The resistor value should be such that the voltage across the shunted section is equal to the voltage between pins 5 and 2. Under these conditions the total filament current will be as indicated.

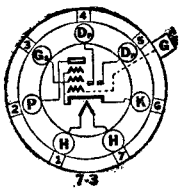
TYPE 2B5

RATINGS—Design Center System

Maximum Plate Voltage (dc)	110	volts
Maximum Plate Dissipation (each section)	0.55	watts
Maximum Grid Voltage (dc):		
Positive	0	volts
Negative	-20	volts
Maximum Cathode Current (dc)	5	milliamps

CHARACTERISTICS (each section, parallel filament operation)

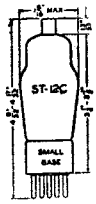
Conditions:		
Filament Voltage	1.2	volts
Plate Voltage (dc)	90	volts
Grid Voltage (dc)	-1.0	volts
Plate Current	2.6	milliamps
Transconductance	1,150	micromhos
Amplification Factor	21.5	
Plate Resistance	18,700	ohms
Grid Voltage for 10 uamps Plate Current	6.0	volts



Sylvania

TYPE 2B7

DOUBLE DIODE
PENTODE A GAIN ELEVE



CARACTERISTIQUES

Tension de chauffage CA. ou CC.	2,5 volts
Courant de chauffage	0,8 ampère
Position de montage	Toutes

Pour les autres caractéristiques et les applications, voir type 6B7.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflecting Method	Electrostatic	
Phosphor	2BP1	2BP11
Fluorescence	Green	Blue
Phosphorescence	—	—
Persistence	Medium	Short
Faceplate	Clear	

*In addition to the types shown, the 2BP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10 % Ampere
Direct Interelectrode Capacitances	
Grid to All Other Electrodes	8 μμf
Between Deflecting Plates 1-2[1]	2 μμf
Between Deflecting Plates 3-4[1]	2 μμf
Deflecting Plate 1 to All Other Electrodes	9 μμf
Deflecting Plate 2 to All Other Electrodes	7 μμf
Deflecting Plate 3 to All Other Electrodes	7 μμf
Deflecting Plate 4 to All Other Electrodes	7 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	$1\frac{3}{4}$ Inches
Overall Length	$7\frac{5}{8} \pm \frac{3}{16}$ Inches
Bulb	J16A
Base (Small Shell Duodecal 10-Pin or 12-Pin)	B10-75 or B12-43
Basing	12E
Weight (Approx.)	¼ Pound

With D1 positive with respect to D2, the spot is deflected toward Pin No. 4; with D3 positive with respect to D4, the spot is deflected toward Pin No. 1.

The plane through the tube axis and Pin No. 4 may vary from the trace produced by D1 and D2 by an angular tolerance (measured about the tube axis) of 10°

The angle between D1-D2 and D3-D4 traces is 90° ± 3°

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

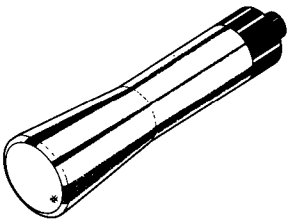
Anode No. 2 Voltage	2750 Volts	dc
Anode No. 1 Voltage	1100 Volts	dc
Grid Voltage		
Negative Bias Value	220 Volts	
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	140 Volts	
Heater Positive with Respect to Cathode	140 Volts	
Peak Voltage Between Anode No. 2 and Any Deflection Plate	550 Volts	

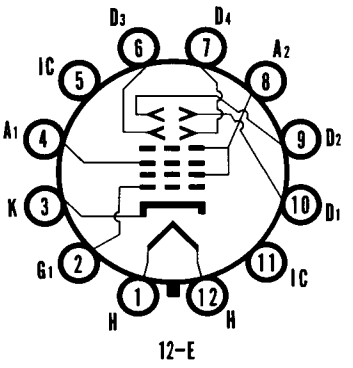
TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage[2]	1000	2000 Volts	dc
Anode No. 1 Voltage for Focus	150-280	300-560 Volts	dc
Max. Grid Voltage Required for Cutoff[3]	−67.5	−135 Volts	dc
Deflection Factors:			
Deflecting Plates 1-2[4]	115 to 155	230 to 310 Volts	dc/Inch
Deflecting Plates 3-4[5]	74 to 100	148 to 200 Volts	dc/Inch
Spot Position (Undeflected)[6]		5 mm	

QUICK REFERENCE DATA

Oscilloscope Tube
2″ Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus





12-E

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
MARCH, 1962

File Under
SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

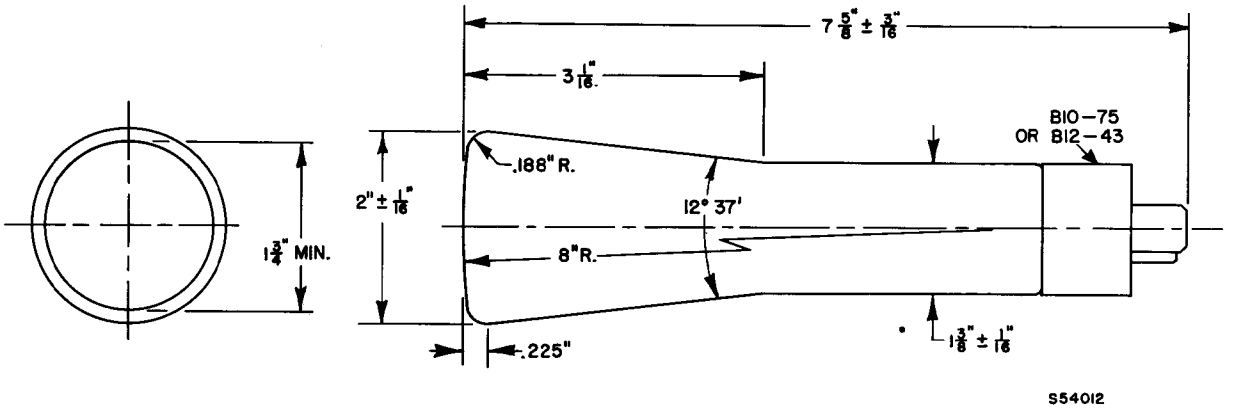
CIRCUIT VALUES

Grid Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5.0 Megohms Max.

NOTES:

1. *Deflecting Plate 1 is Pin No. 10*
   Deflecting Plate 2 is Pin No. 9
   Deflecting Plate 3 is Pin No. 6
   Deflecting Plate 4 is Pin No. 7
2. *Brilliance and definition decrease with decreasing Anode No. 2 Voltage. In general, Anode No. 2 Voltage should not be less than 500 volts.*
3. *Visual extinction of undeflected focused spot.*
4. *Deflecting Plates 1-2 are nearer the screen.*
5. *Deflecting Plates 3-4 are nearer the base.*
6. *The center of the undeflected, focused spot, will fall within a circle having a 5.0 mm radius concentric with the center of the tube face.*

OUTLINE



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2C36

MECHANICAL DATA

Maximum Overall Length	2.38 Inches
Maximum Overall Diameter	1.01 Inches

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES

Grid to Plate	1.90 $\mu\mu$f
Grid to Cathode	1.20 $\mu\mu$f
Plate to Cathode	0.38 $\mu\mu$f

RATINGS

Heater Voltage (a c or d c)	6.3 Volts
Heater Current	400 Ma
Maximum Plate Dissipation	5.0 Watts
Maximum Seal Temperature	175° C
Maximum Plate Voltage (Pulsed)	1500 Volts
Maximum Operating Frequency	5000 Mc

CHARACTERISTICS

Conditions: (E_b = 180 volts d c, R_k = 400 ohms)

Transconductance	4500 μmhos
Amplification Factor	25
Plate Current	12.0 Ma

TYPICAL OPERATING CONDITIONS

UHF Oscillator — Plate Pulse Modulated

	1000 Mc[1]	2000 Mc[2]	3000 Mc[2]	4000 Mc[2]	5000 Mc[2]	
Heater Voltage	6.3	6.3	6.3	6.3	6.3	Volts
Peak Plate Voltage	1000	1200	1200	1200	1200	Volts
Peak Plate Current	900	900	900	900	900	Ma
Grid Voltage	0	0	0	0	0	Volts
Pulse Repetition Frequency	2000	1000	1000	1000	1000	PPS
Pulse Width	2.0	1.0	1.0	1.0	1.0	μsec.
Peak Power Output	250	200	175	150	15-20	Watts
Grid Voltage for I_b = 10μa	−28	−28	−28	−28	−28	Volts

NOTES:

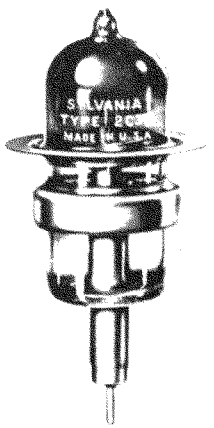
1. *In Sylvania Fixed Frequency Cavity.*
2. *In Amerac Type 192 Tunable Cavity designed for frequency range.*

APPLICATION DATA

The Sylvania Type 2C36 was designed for use as a pulse-modulated oscillator at frequencies up to 1750 mc. The 2C36 has a built-in internal feedback circuit between cathode and anode and fits into a concentric circuit. A small amount of adjustable, external feedback is generally necessary in order to obtain optimum power output at any given frequency. A feedback probe between the output and input lines may be used. With plate-pulse modulation the grid may be operated at zero bias, eliminating the necessity of insulating the cathode from the grid in the input-line plunger.

QUICK REFERENCE DATA

The Sylvania Type 2C36 is a UHF triode oscillator designed for service at frequencies up to 1750 mc. Operation with good power at frequencies with up to 5000 mc. is possible with the Amerac Type 192 Cavity.



SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

8-54-7

OUTLINE DRAWING

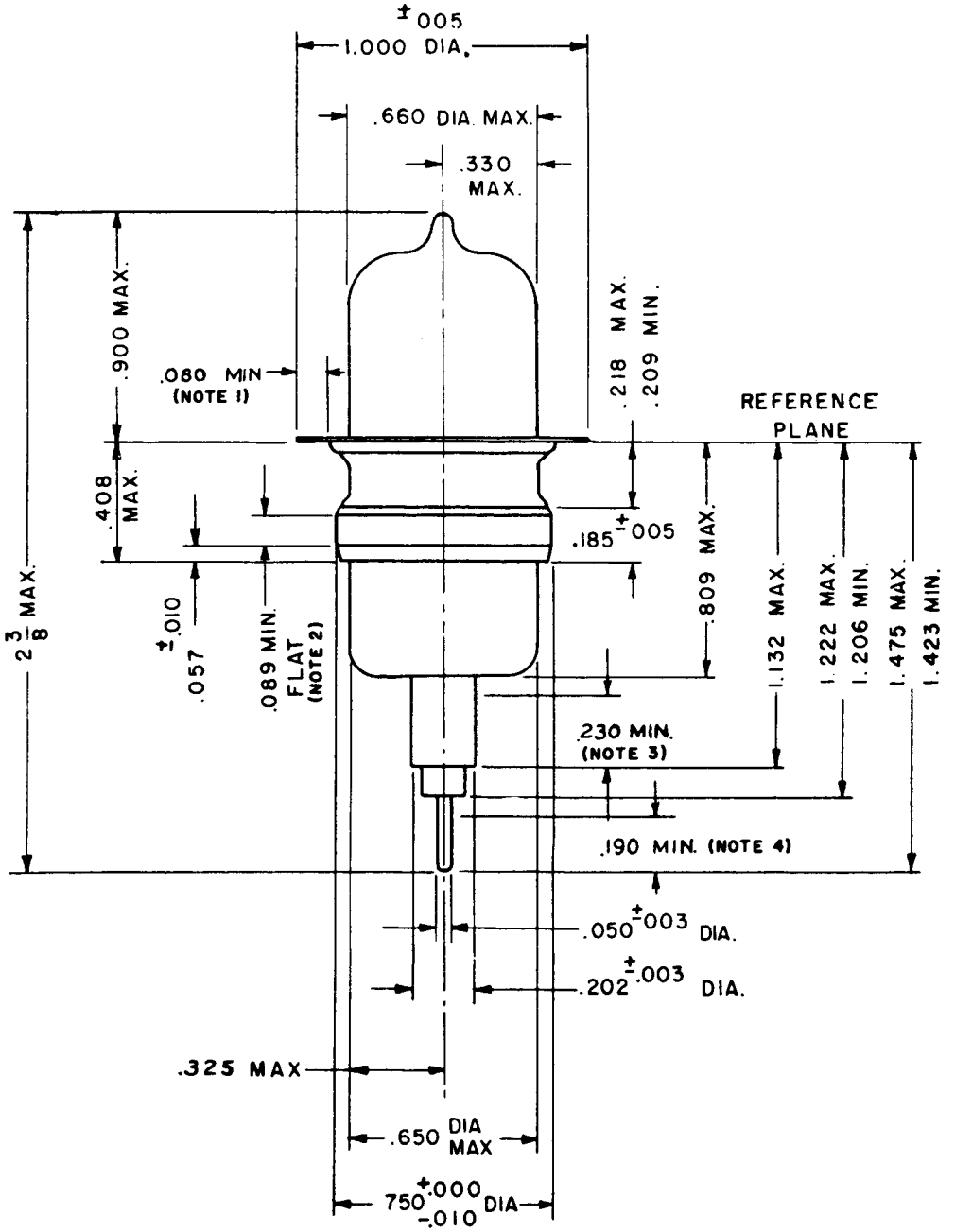


DIAGRAM NOTES:

1. *Plate contact area.*
2. *Grid contact area.*
3. *Cathode and filament contact area.*
4. *Filament contact area.*

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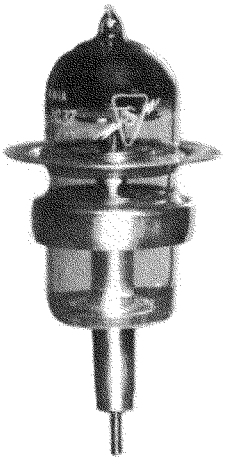
2C37

DESCRIPTION: ULTRA-HIGH-FREQUENCY GENERAL PURPOSE TRIODE

TYPE 2C37



This type was designed primarily for use as a c. w. oscillator at frequencies up to 3300 mc. It can also be used for amplifier and frequency-multiplier applications.

The 2C37 is similar in appearance to the 2C36, but has no internal feedback.

RATINGS AND CHARACTERISTICS

ELECTRICAL RATINGS

Heater voltage (A.C. or D.C.)	6.3 volts
Heater current	0.4 amperes
Maximum plate voltage	350 volts D.C.
Maximum plate dissipation	6.0 watts
Maximum seal temperature	175 degrees C.
Maximum operating frequency	3300 megacycles
Direct Interelectrode Capacitances (Average)	
Grid-plate	1.35 microfarads
Grid-cathode	1.30 microfarads
Plate-cathode	.025 microfarads

TUBE CHARACTERISTICS

CONDITIONS

Heater voltage	6.3 volts
Heater current	0.4 amperes
Plate voltage	180 volts D.C.
Cathode bias resistor	400 ohms
Plate current	12.0 milliamperes D.C.
Transconductance	4500 micromhos
Amplification factor	25
Grid voltage for 1_b = 10 microamperes D.C.	—28.0 volts D.C.

TYPICAL OPERATING CONDITIONS

(1) UHF Oscillator CW

Plate voltage	150 V DC
Plate current	15 ma DC
Grid resistor	3000 ohms
Frequency	1000 mc
Power output	500 mw

(2) UHF Oscillator CW

Plate voltage	150 V DC
Plate current	25 ma DC
Grid resistor	100 ohms
Cathode resistor*	100 ohms approx.
Frequency	3300 mc
Power output	200 mw min.

**Adj. for rated plate current*

(3) UHF Oscillator CW

Plate voltage	200 V DC
Plate current	25 ma DC
Grid resistor	100 ohms
Cathode resistor*	100 ohms approx.
Frequency	3300 mc
Power output	450 mw min.

**Adj. for rated plate current*

(4) Pulse Operation

Plate voltage (peak)*	1500 volts
Frequency	3300 mc
Power output (peak)*	175 watts
Peak emission**	1500 ma min.

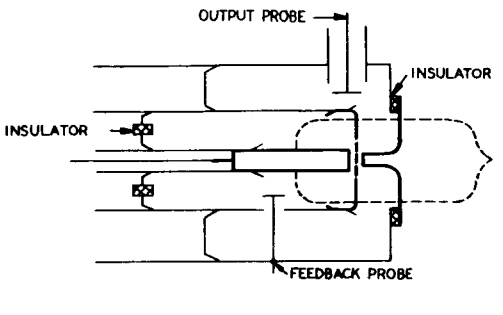
**Test Conditions:* Pulse width = 1 μsec
Pulse rep. rate = 2000 pps.

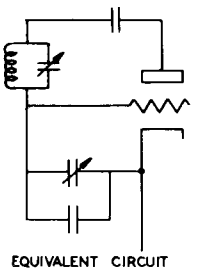
***Test Conditions:* Plate voltage (peak) = 100V.
Pulse width = 3 μsec
Pulse rep. rate = 500 pps.

SYLVANIA ELECTRIC PRODUCTS INC. ELECTRONICS DIVISION
1740 Broadway, New York 19, New York

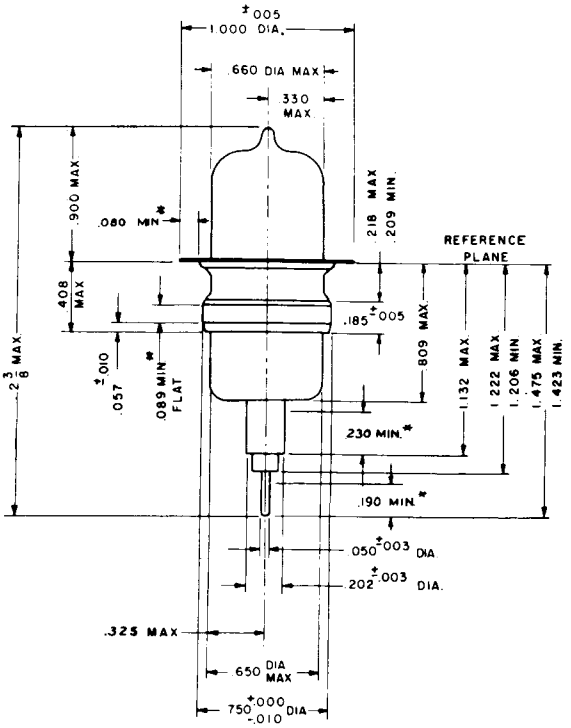
SYLVANIA

2C37



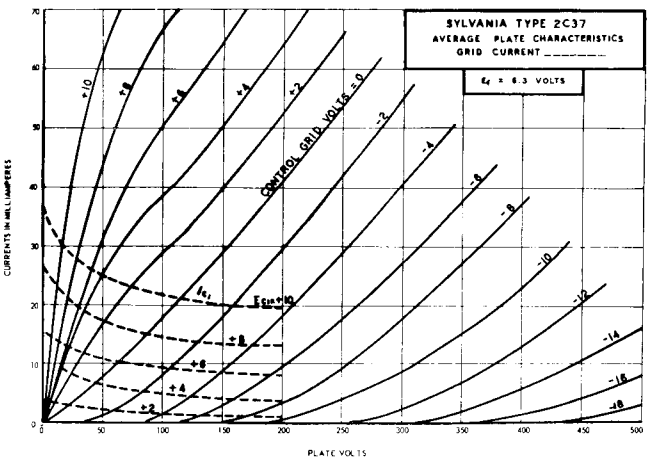


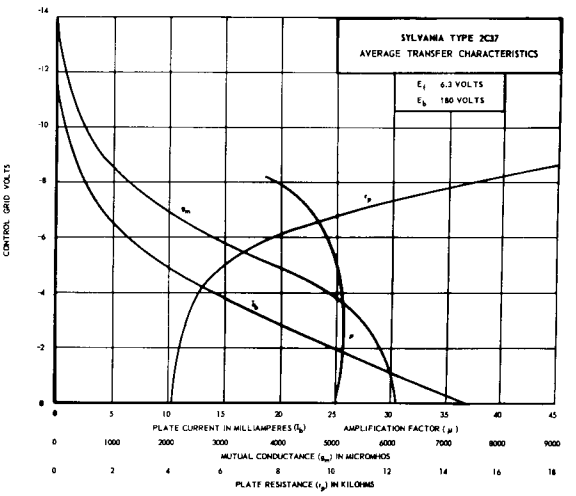
A TYPE 2C37 IN A TYPICAL QUARTER-WAVE CONCENTRIC-LINE CIRCUIT. AN EXTERNAL PROBE PROVIDES THE FEEDBACK NECESSARY FOR OSCILLATION. IF THE TUBE IS USED AS AN AMPLIFIER, THE FEEDBACK PROBE MAY BE REMOVED AND A LOOP OR PROBE CONNECTED TO THE INPUT LINE.



*CONTACT AREA

OUTLINE DRAWING





MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7BN
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	600 Ma
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	25 Volts Max.
Heater Negative with Respect to Cathode	100 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

Grid No. 1 to Plate	0.026 $\mu\mu$f
Grid No. 1 to (k + Shield Grid)	2.4 $\mu\mu$f

RATINGS (Absolute Values)

Peak Forward Plate Voltage	650 Volts Max.
Peak Inverse Plate Voltage	1300 Volts Max.
Cathode Current	
Peak	500 Ma Max.
Average	100 Ma Max.
Surge (0.1 Sec. Max. Duration)	10 Amperes Max.
Averaging Time	30 Sec. Max.
Negative Grid No. 1 Voltage (Control Grid)	
Before Conduction	100 Volts Max.
During Conducton	10 Volts Max.
Positive Grid No. 1 Current	
Plate Positive	10 Ma Max.
Plate Negative	10 Ma Max.
Negative Grid No. 2 Voltage (Shield Grid)	
Before Conduction	100 Volts Max.
During Conduction	10 Volts Max.
Positive Grid No. 2 Current (Shield Grid)	
Plate Positive	10 Ma Max.
Plate Negative	10 Ma Max.
Ambient Temperature Limits	−75 to +90° C Max.

CHARACTERISTICS

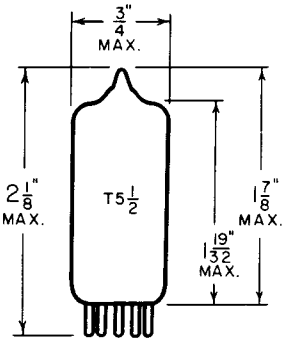
Cathode Heating Time, Min.	10 Sec.
Deionization Time, Approx.[1]	
E_{c1} = −100 Volts DC	35 μsec.
E_{c1} = −11 Volts DC	75 μsec.
Ionization Time, Approx.	0.5 μsec.
Plate Voltage Drop	8 Volts
Critical Grid No. 1 Current, Max.	
E_{bb} = 460 Volts RMS	0.5 μa

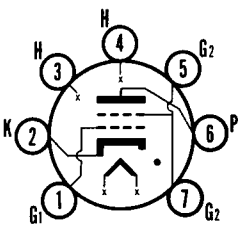
NOTE:

1. *E_{bb} = 125 Volts DC, I_b = 100 Ma DC, and R_g = 1000 Ohms.*

QUICK REFERENCE DATA

The Sylvania Type 2D21 is a miniature four element thyratron with negative control characteristics designed for use in relay applications. The 2D21 features a high control ratio essentially independent of temperature over a wide range, low grid to plate capacitance and low grid current.





7BN

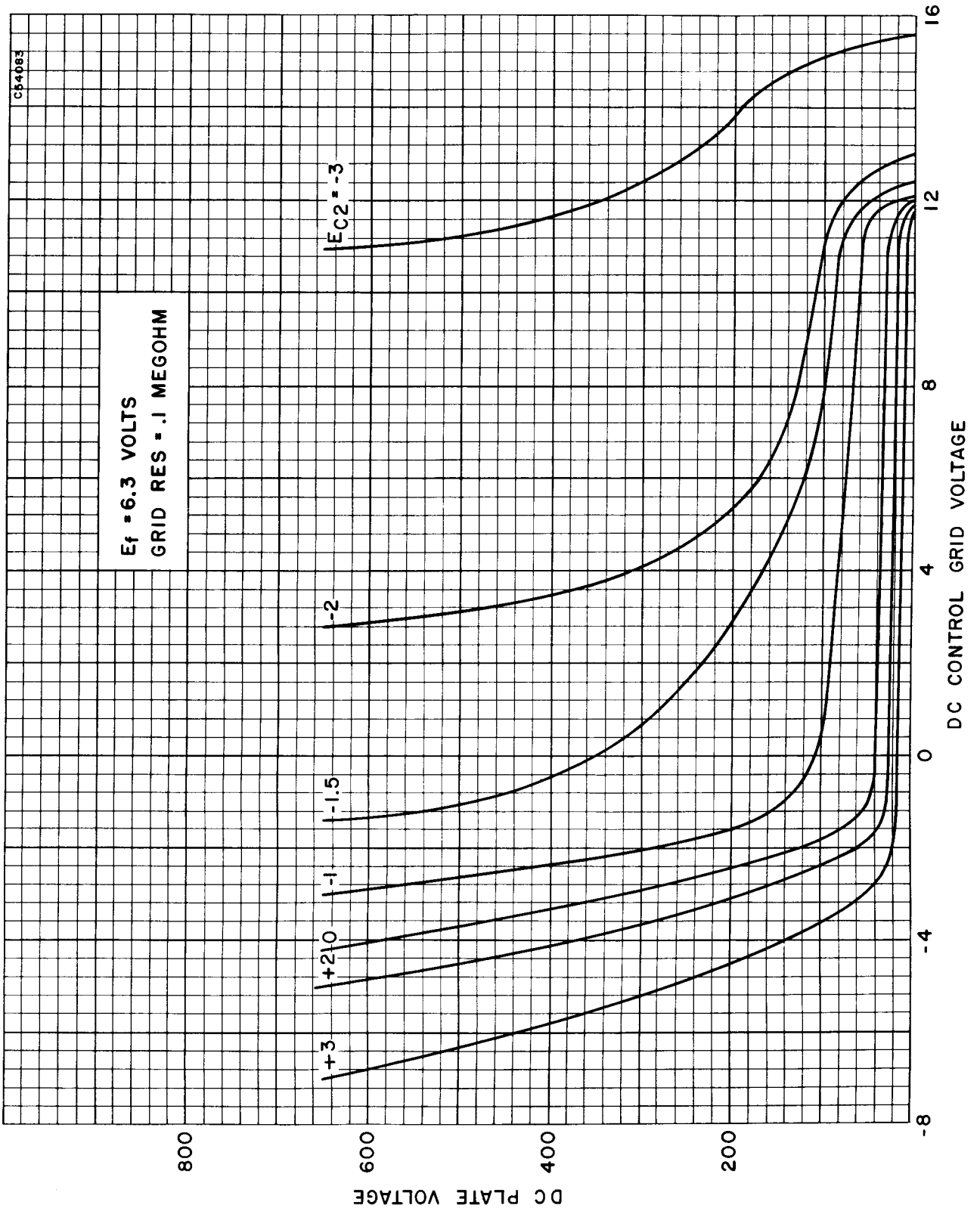
SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

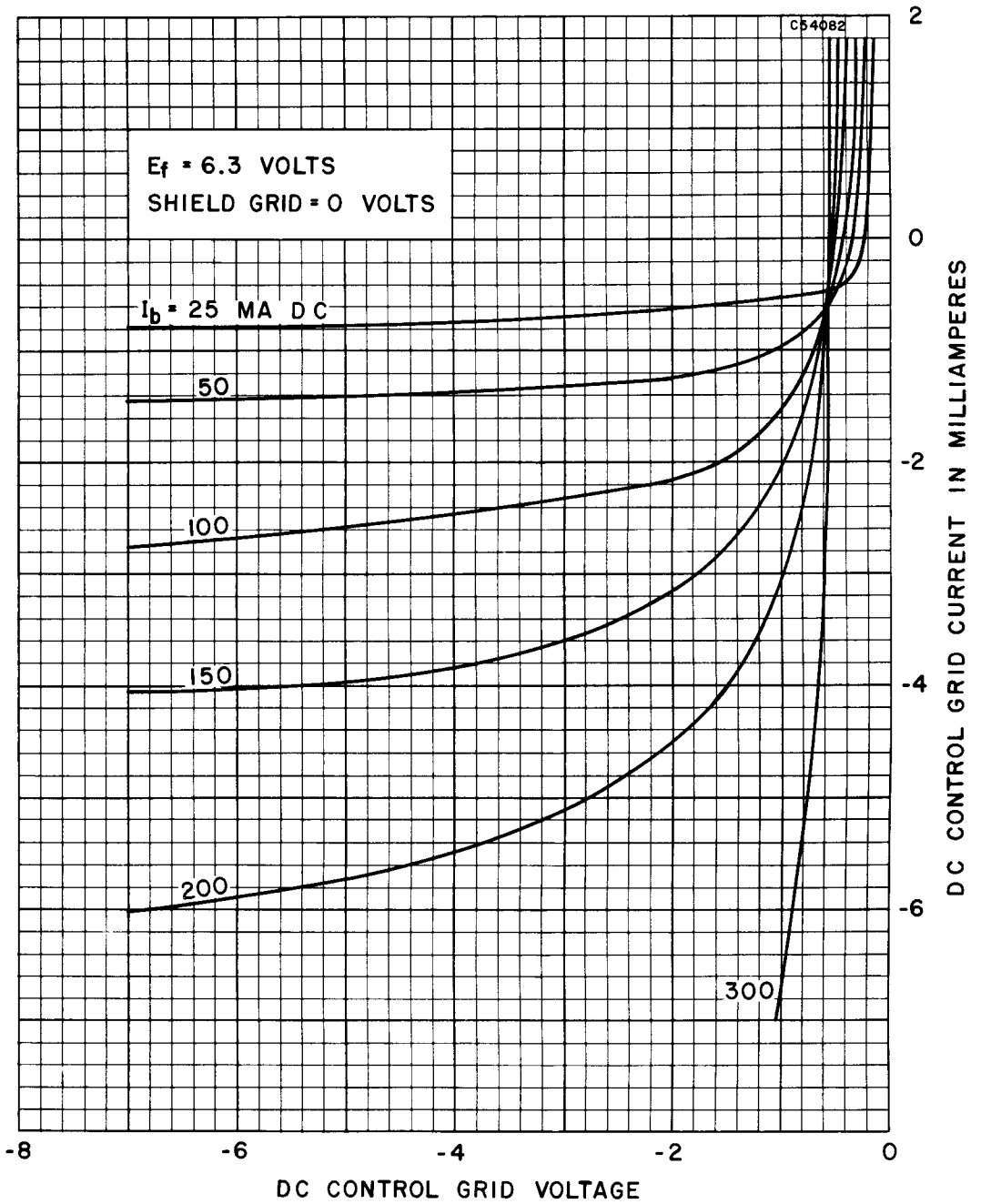
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

NOVEMBER 1954

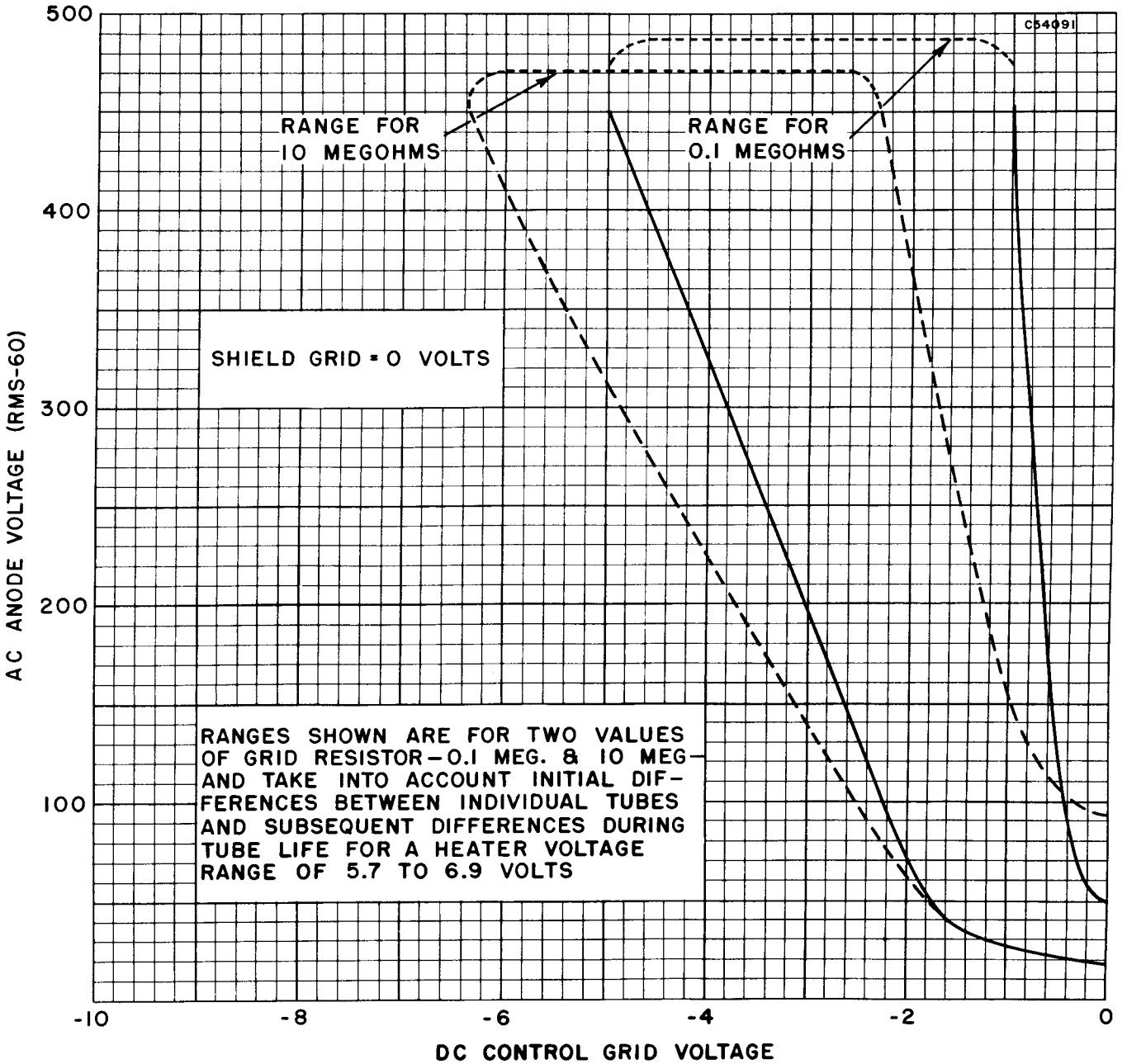
AVERAGE CONTROL CHARACTERISTICS



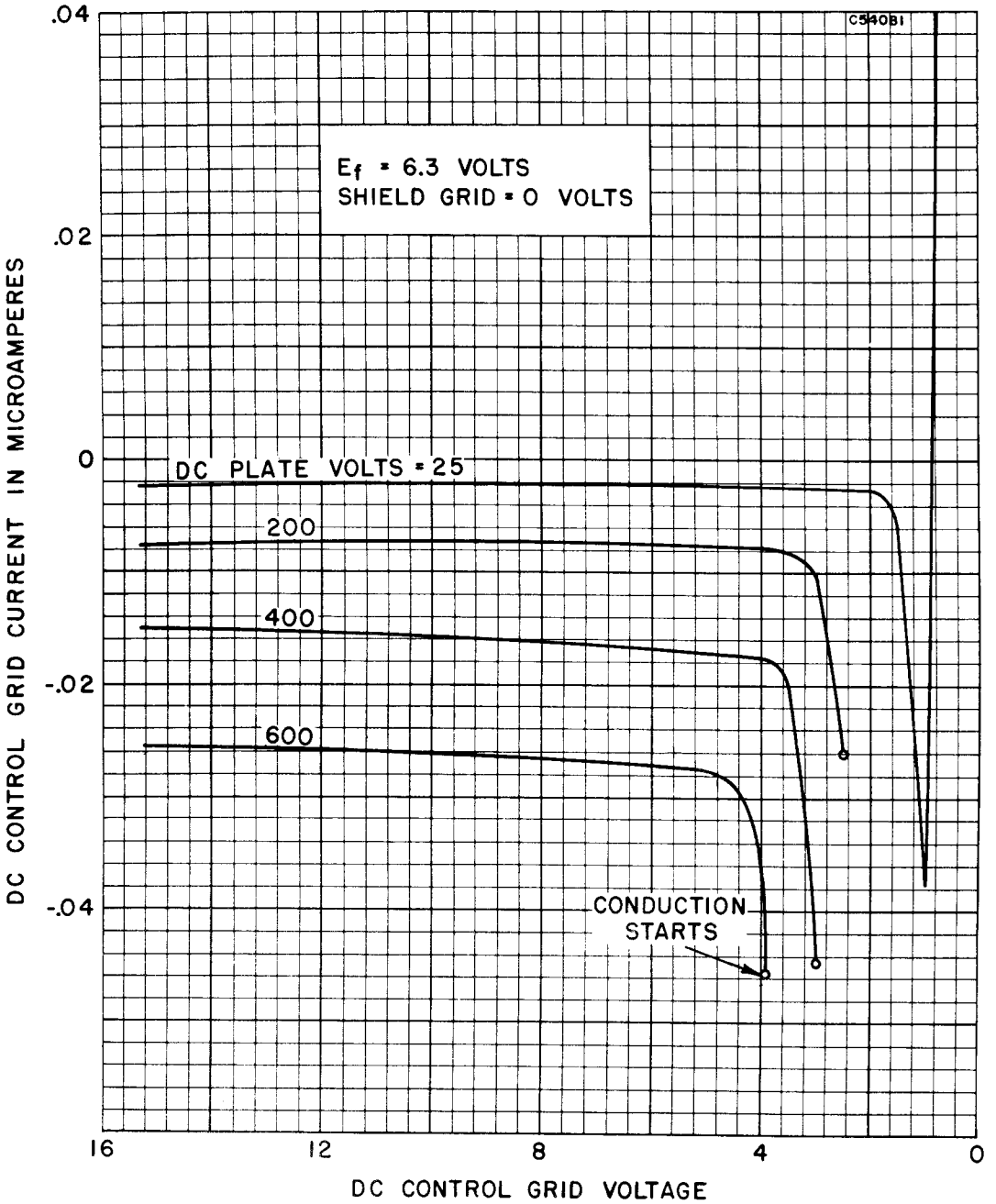
AVERAGE GRID CHARACTERISTICS
DURING ANODE CONDUCTION

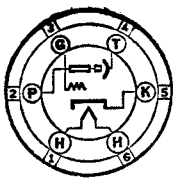


OPERATIONAL RANGE OF CRITICAL GRID VOLTAGE



AVERAGE GRID CHARACTERISTICS
BEFORE ANODE CONDUCTION

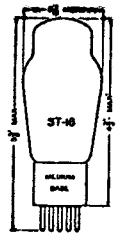




Sylvania

TYPE 2E5

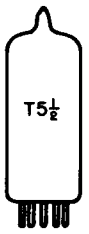
INDICATEUR D'ACCORD



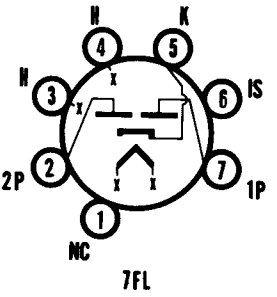
CARACTERISTIQUES

Tension de chauffage CA. ou CC.	2,5 volts
Courant de chauffage	0,8 ampère
Position de montage	Toutes

Pour autres caractéristiques et les applications, voir type 6E5



SYLVANIA TYPE 2EN5



MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7FL
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	2.1 Volts
Heater Current	450 Ma
Heater Warm-up Time[1]	11 Seconds
Heater-Cathode Voltage (Design Maximum Values)[2]	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts
Heater Positive with Respect to Cathode	
D C	100 Volts
Total D C and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[3]	Unshielded
Plate Input (Each Section)	3.8	3.7 $\mu\mu$f
Plate to Plate	3.8	1.3 $\mu\mu$f Max.

MAXIMUM RATINGS (Design Maximum Values)[2]

Diode Current for Continuous Operation (Each Plate)	5.0 Ma

CHARACTERISTICS

Voltage Drop at I_b = 20 Ma (Each Plate)[4]	5.0 Volts

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
2. Design-maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.
3. Shield No. 316 connected to Pin 6.
4. Test condition only.

APPLICATION

The Sylvania Type 2EN5 is a miniature double diode well suited for phase comparator applications. The 2EN5 features controlled heater warm-up time and is intended for use in television receivers employing a 450 Ma series heater string.

SYLVANIA

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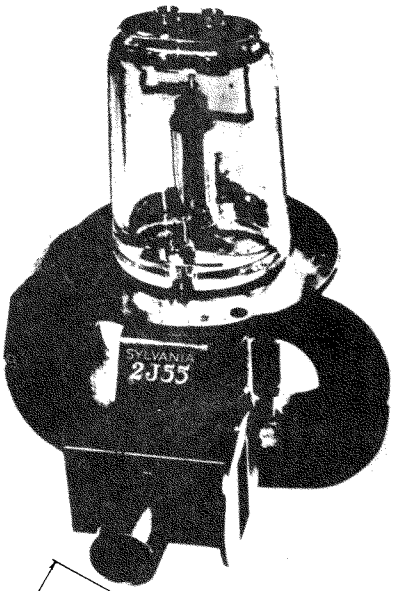
2J55

DESCRIPTION:

The Sylvania 2J55 is a fixed frequency (centered at 9375 mc.) pulsed magnetron featuring a compact construction, high stability, and adaptability to a wide range of applications in the X-Band.

Typical applications are search and navigational radars.



*MAXIMUM RATINGS:

Filament voltage	6.3—10%
Peak Anode Voltage	16 kv.
Av. Power Input	180 watts
Duty Cycle	.001
Pulse Duration	2.5 μ sec.

*The above ratings are not intended to be applied simultaneously; they represent maximum values for each paramenter and should serve as a guide to the system designer.

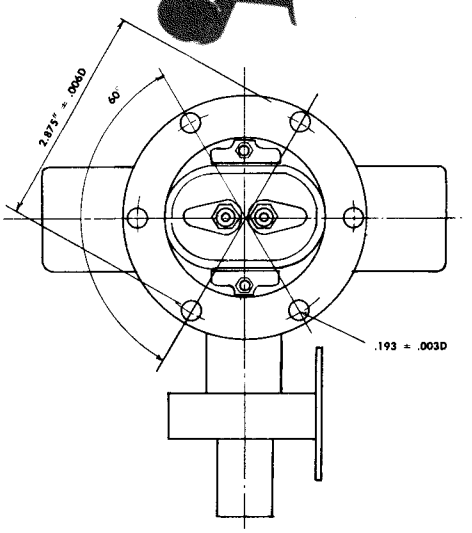
TYPICAL OPERATING CONDITIONS:

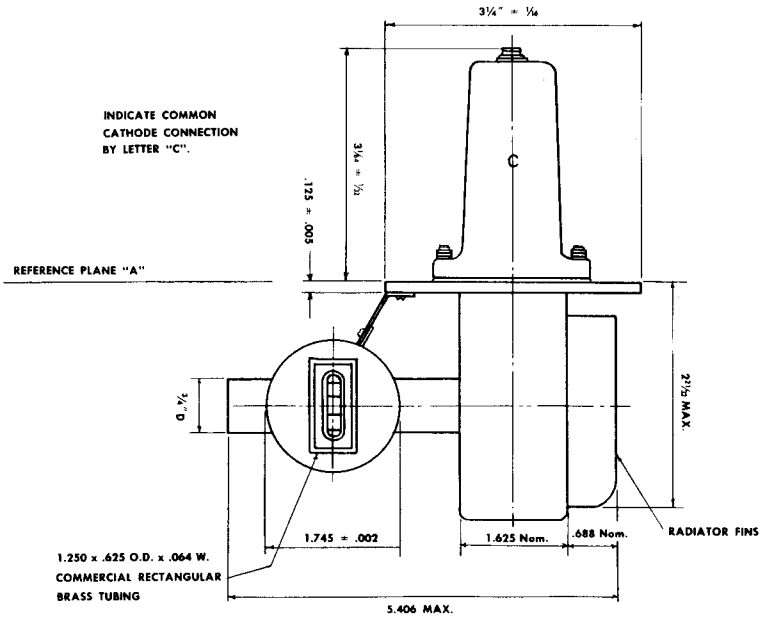
Warm-up Time	120 sec.
Filament Voltage	* * 0
Pulse Repetition Rate	1.0 μ sec.
Peak Anode Voltage	12 kv.
Peak Anode Current	12 amp.
Peak Power Output	45 kw.

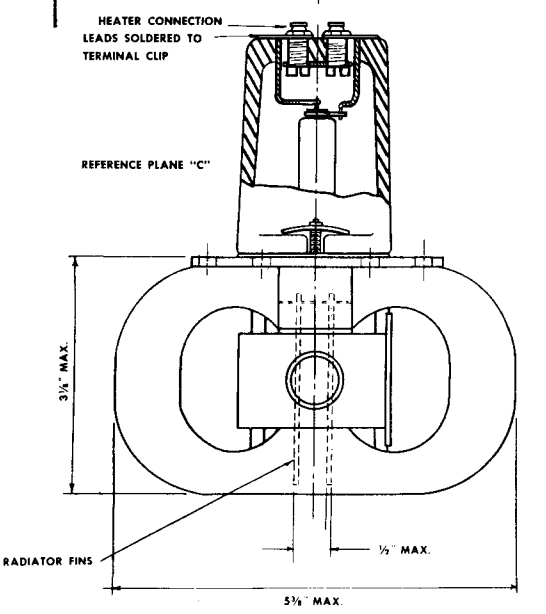
**6.3 volts applied during warm-up

$$E_f = 6.3\sqrt{1-\frac{P_i}{150}}$$

Therefore $E_f = O$ if P_i is greater than 150.







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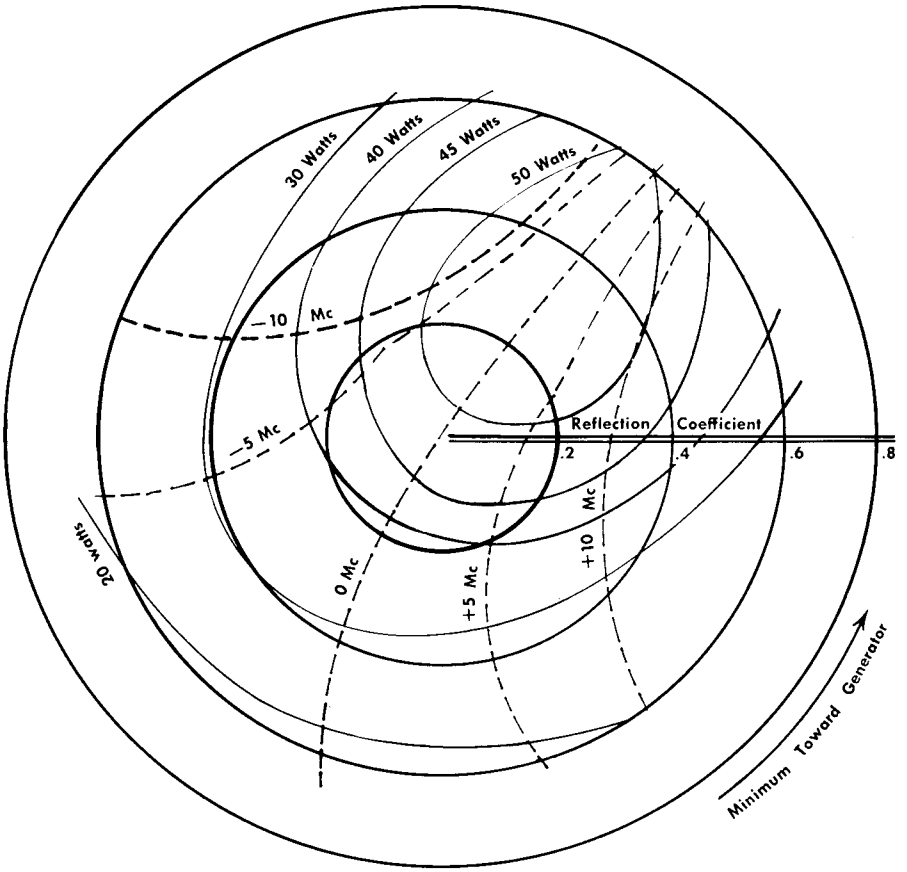
1740 Broadway, New York 19, New York

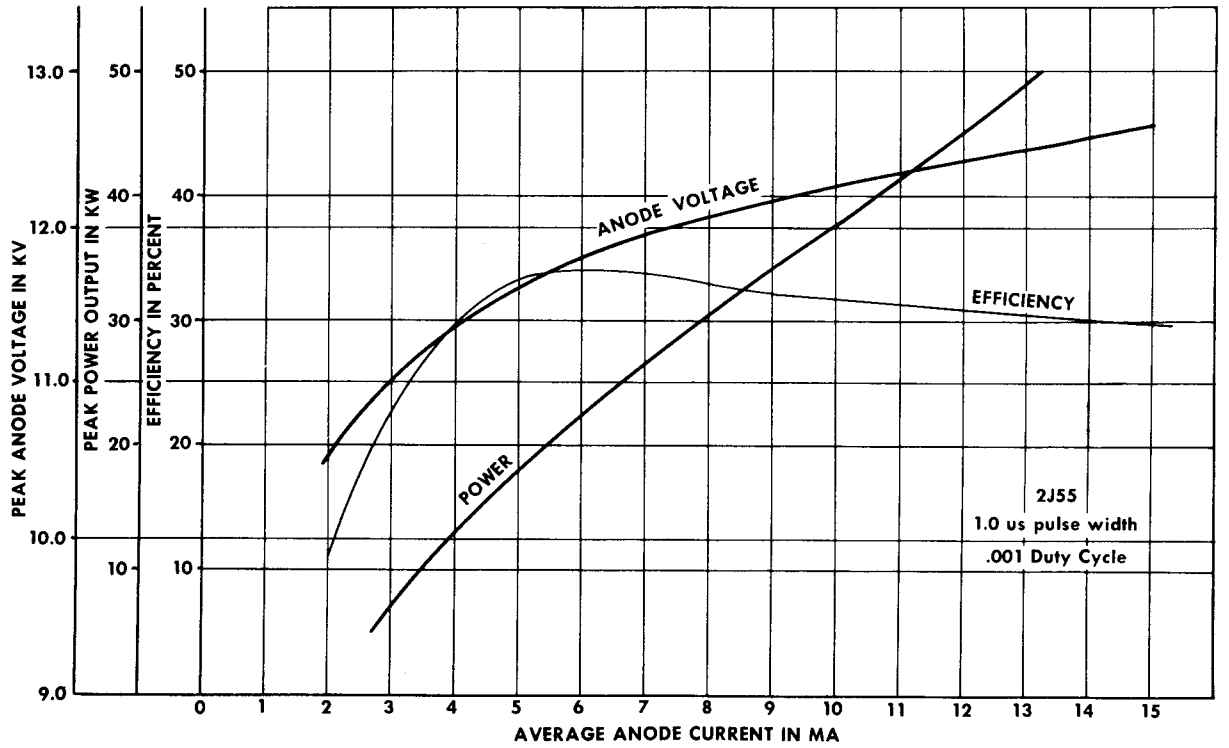
SYLVANIA

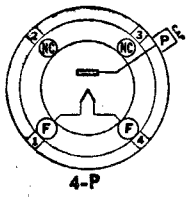
2J55

2J55 Rieke Diagram

Iav = 12 ma.
Pulse width = 1 us
Duty Cycle = .001
Double Line Indicates
Flange Position



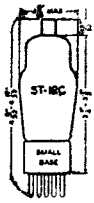




Sylvania

TYPE 2X2/879

REDRESSEUR DEMI-ONDE A HAUTE TENSION



CARACTERISTIQUES

Tension filament	2,5 volts
Courant filament	1,75 ampère
Ampoule	ST-12C
Culot — Petit 4 broches	4-P
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

Tension filament	2,5 volts
Tension efficace CA plaque	4,500 volts max.
Tension inverse de pointe	12,500 volts max.
Courant plaque de pointe	100 ma. max.
Courant redressé (service permanent)	7,5 ma. max.

APPLICATION

Sylvania type 2X2/879 est un redresseur pour haute tension et faible courant, utilisé surtout avec les tubes à rayons cathodiques dans les travaux de télévision.

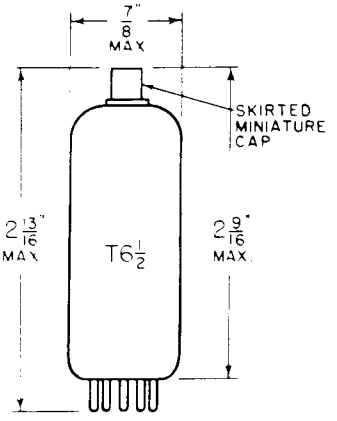
Le tube est muni d'un filament oxydé et d'une seule plaque. La connexion plaque sort au sommet du tube. Le culot est du type standard 4 broches, avec les broches n° 1 et n° 4 correspondant au filament.

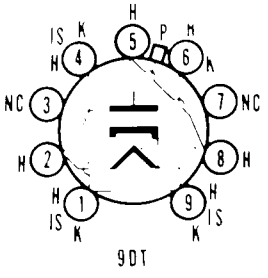
En service, type 2X2/879 fournira du courant redressé dans les applications conçues pour une haute tension et un faible courant. Durant le fonctionnement, l'ampoule devient très chaude et une ventilation convenable sera ménagée en conséquence.

Type 2X2/879 remplacera généralement les redresseurs types 879, H2—10 et 143D.

QUICK REFERENCE DATA

The Sylvania Type 3A2 is a miniature, half-wave rectifier employing an indirectly heated cathode. It is designed for use as a high voltage rectifier in television receivers.





MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Cap	C1-33, Skirted Miniature
Outline	See Drawing
Basing	9DT
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage, AC	3.15 Volts
Heater Current	220 Ma

DIRECT INTERELECTRODE CAPACITANCES (Approx.)

Plate to Heater, Cathode and Internal Shield	1.0 $\mu\mu$f

RATINGS (Design Center Values)

Pulsed Rectifier Service[1]

Peak Inverse Plate Voltage	18000 Volts	Max.
Peak Plate Current	80 Ma	Max.
Average Plate Current	1.5 Ma	Max.

NOTES:

1. *For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations: Federal Communications Commission", the duty cycle of the voltage pulse must not exceed 15% of one horizontal scanning cycle.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

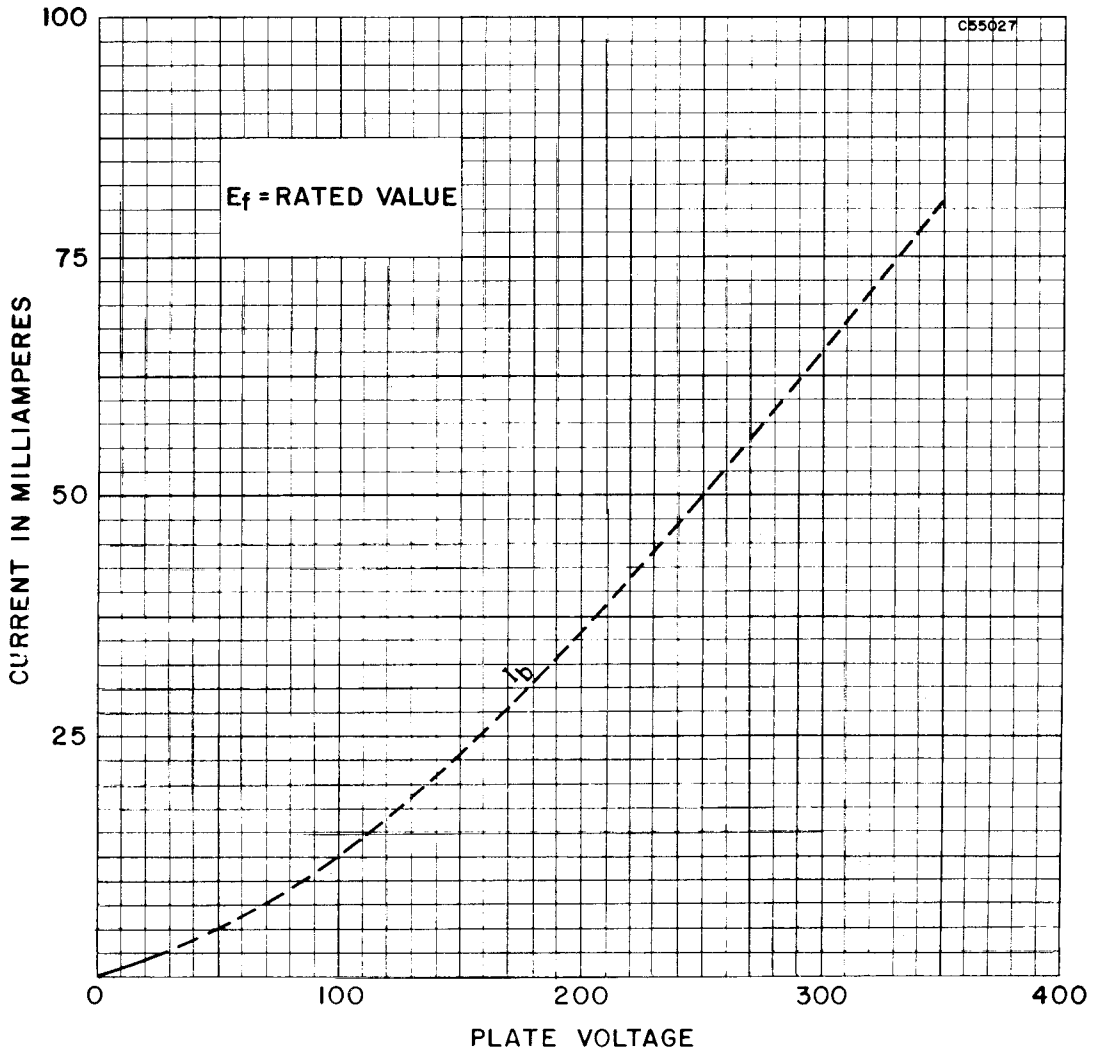
SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

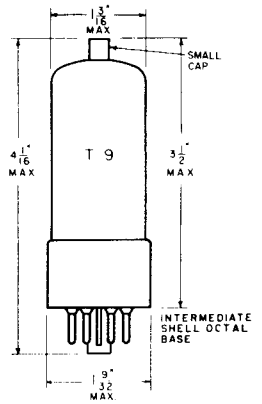
APRIL 1955

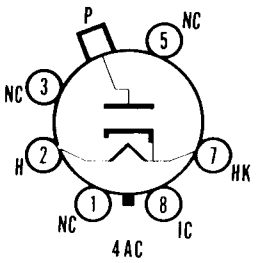
AVERAGE PLATE CHARACTERISTICS



QUICK REFERENCE DATA

The Sylvania Type 3A3 is a half-wave, high voltage rectifier contained in a T-9 envelope. It is designed for application as a high voltage rectifier in television receivers.





MECHANICAL DATA

Bulb	T-9
Base	B6-8, Intermediate Shell Octal, 6-Pin
Top Cap	C1-1, Small
Outline	See Drawing
Basing	4AC
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage, AC	3.15 Volts
Heater Current	220 Ma

DIRECT INTERELECTRODE CAPACITANCES (Approx.)

Plate to Heater, Cathode and Internal Shield	1.5 $\mu\mu$f

RATINGS (Design Center Values)

Pulsed Rectifier Service[1]

Peak Inverse Plate Voltage	30000 Volts	Max.
Peak Plate Current	80 Ma	Max.
Average Plate Current	15 Ma	Max.

NOTES:

1. *For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations; Federal Communications Commission", the duty cycle of the voltage pulse must not exceed 15% of one horizontal scanning cycle.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

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RADIO TUBE DIVISION
EMPORIUM, PA.

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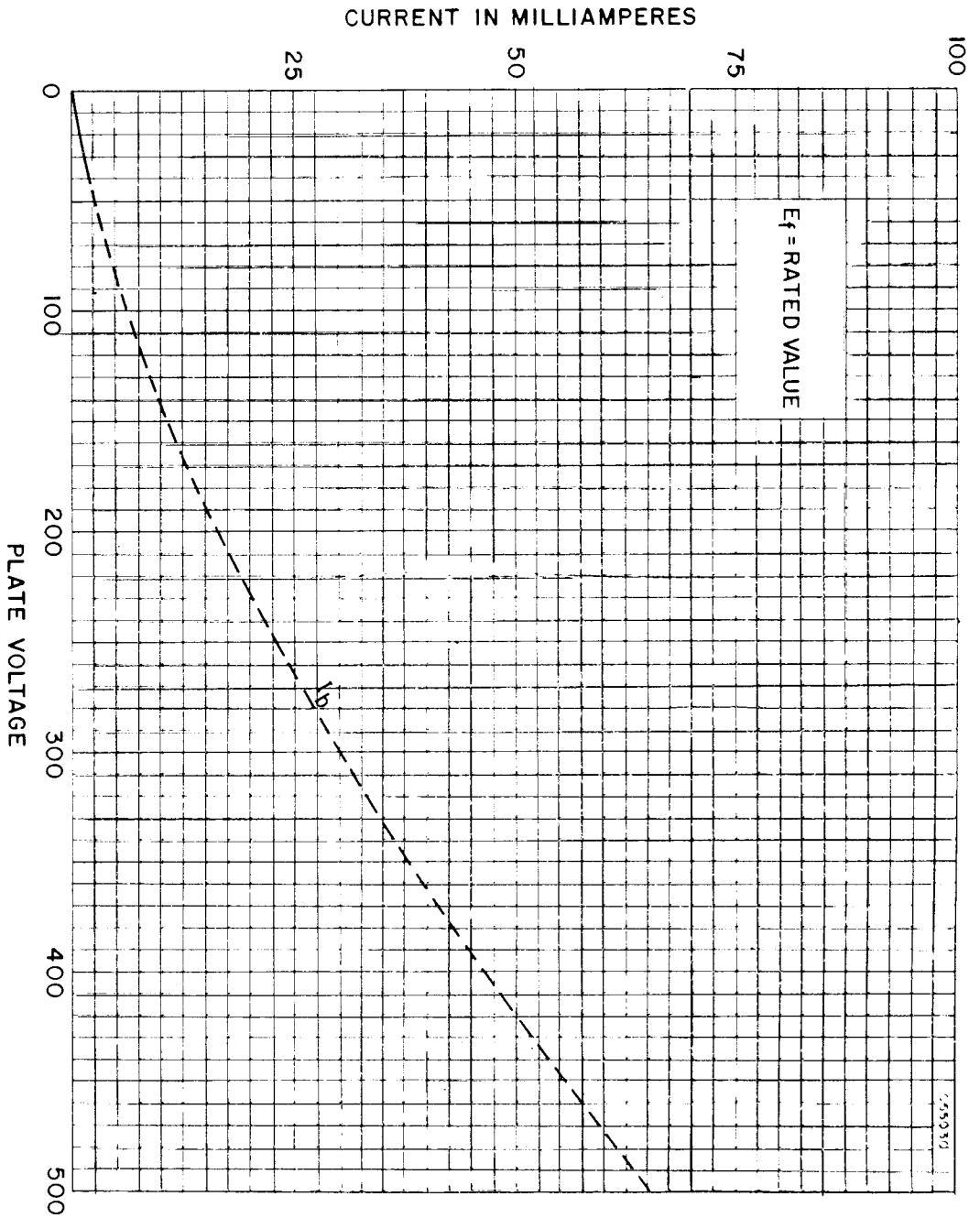
AVERAGE PLATE CHARACTERISTICS



SYLVANIA

engineering data service

SYLVANIA
3ACP1A
3ACP-A*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic

Types*	Fluorescence	Phosphorescence	Persistence
3ACP1A	Green	.....	Medium
3ACP2A	Blue-Green	Green	Long
3ACP7A	Blue-White	Yellow	Long
3ACP11A	Blue	.....	Short
3ACP12A	Orange	Orange	Medium Long

Faceplate . . . . . Flat, Clear

**In addition to the types shown, the 3ACP-A can be supplied with several other screen phosphors.*

ELECTRICAL DATA

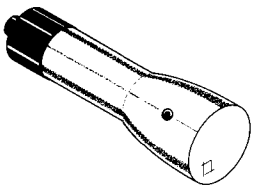
Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Ampere
Direct Interelectrode Capacitances (Maximum)	
Cathode to All Other Electrodes	4.2 μμf
Grid to All Other Electrodes	5.5 μμf
Between Deflecting Plates 1-2	2.1 μμf
Between Deflecting Plates 3-4	1.5 μμf
Deflecting Plate 1 to All Other Electrodes	5.8 μμf
Deflecting Plate 2 to All Other Electrodes	5.8 μμf
Deflecting Plate 3 to All Other Electrodes	4.5 μμf
Deflecting Plate 4 to All Other Electrodes	4.5 μμf

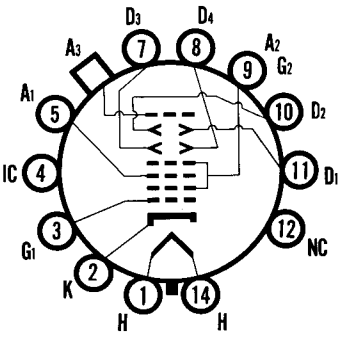
MECHANICAL DATA

Minimum Useful Screen Diameter	2.68 Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Bulb	J24V
Base (Medium-Shell Diheptal 12-Pin)	B12-37
Basing	14J
Base Alignment	
D1-D2 trace aligns with Pin No. 5 and Tube Axis	±10 Degrees
Positive Voltage on D1 deflects beam approx. toward Pin No. 5	
Positive Voltage on D3 deflects beam approx. toward Pin No. 2	
Angle between traces D1-D2 and D3-D4	90 ±1 Degrees
Bulb Contact alignment	
J1-22 contact aligns with D1-D2 trace	±10 Degrees
J1-22 contact on same side as Pin No. 5	

QUICK REFERENCE DATA

3" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Close Tolerances
Flat Face Plate
Post Deflection Acceleration





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SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products, Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JULY, 1959

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 3 Voltage	6600	Volts	dc
Anode No. 2 Voltage	2200	Volts	dc
Ratio Anode No. 3 to Anode No. 2 Voltage[1]	3.0		
Anode No. 2 Input (Av. except for 3ACP12A)	6.0	Watts	
Anode No. 1 Voltage (Focusing Electrode)	1650	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	220	Volts	dc
Positive Bias Value	0	Volts	dc
Positive Peak Value	0	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	
Peak Voltage Between Anode No. 2 and Any Deflection Plate	600	Volts	

TYPICAL OPERATING CONDITIONS[2]

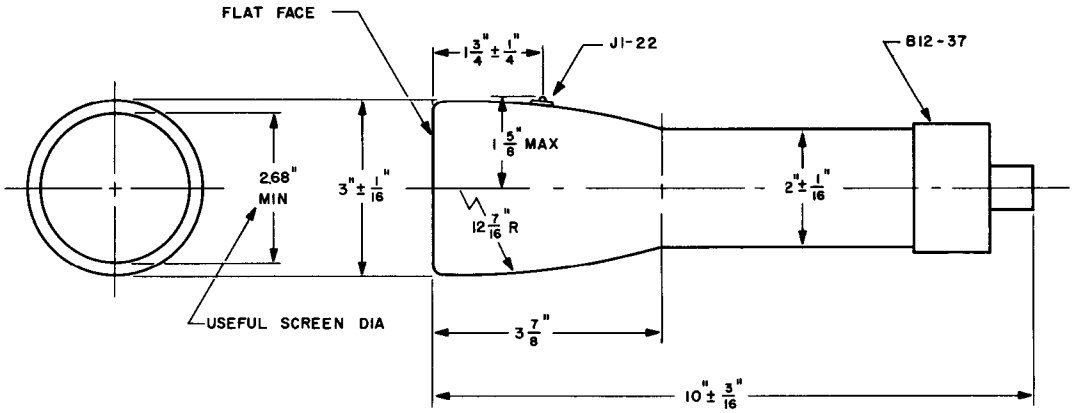
Anode No. 3 Voltage	4000	Volts	dc
Anode No. 2 Voltage	2000	Volts	dc
Anode No. 1 Voltage for Focus	390 to 550	Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−45 to −75	Volts	dc
Anode No. 3 Current[4]	500	μa	dc Min.
Cathode Current[5]	125	μa	dc Max.
Cathode Current[6]	600	μa	dc Max.
Deflection Factor			
Deflecting Plates 1-2	175 to 205	Volts	dc/Inch
Deflecting Plates 3-4	138 to 158	Volts	dc/Inch
Deflection Factor Uniformity[7]	2%	Max.	
Pattern Distortion[8]	2%	Max.	
Modulation at Anode No. 3 Current = 25 μAdc[7]	21	Volts	dc Max.
Modulation at Anode No. 3 Current = 200 μAdc[7] (Except 3ACP12A)	45	Volts	dc Max.
Line Width "A" at Anode No. 3 Current = 5 μa (3ACP12A)	.012	Inches	Max.
Line Width "A" at Anode No. 3 Current = 50 μAdc[7] (Except 3ACP12A)	.016	Inches	Max.
Line Width "A" at Anode No. 3 Current = 200 μAdc[7] (Except 3ACP12A)	.028	Inches	Max.
Light Output at Anode No. 3 Current = 100 μAdc[9]			
3ACP1A	80	Foot Lamberts	Min.
3ACP11A	35	Foot Lamberts	Min.
Spot Position (Focused and Undeflected)[10] Within a 3/16 Inch Radius Circle			

CIRCUIT VALUES

Grid Circuit Resistance	1.5	Megohms	Max.
Deflection Circuit Resistance[11]	1.0	Megohms	Max.

NOTES:

1. *These types are designed for optimum performance when operating at EB3/EB2 ratio of 2.0.*
2. *Type 3ACP12A can be severely and permanently damaged if current density is allowed to rise too high. Test and operate at minimum usable currents.*
3. *Visual extinction of undeflected focused spot.*
4. *At EG1 = 0 V dc.*
5. *At IB3 = 50 μa dc.*
6. *At IB3 = 200 μa dc.*
7. *Per MIL-E-1 specifications.*
8. *All portions of a raster pattern, adjusted so its widest points just touch the sides of a 1.938 inch square, will fall within the area bounded by the 1.938 inch square and an inscribed 1.862 inch square.*
9. *Measured in accordance with MIL-E-1 specifications using a raster size of 1 7/8 x 1 7/8 inches. The P11 phosphor is measured with a photronic cell without eye correction.*
10. *Centered with respect to tube face and with tube shielded. Connect deflecting plates to Anode No. 2.*
11. *It is recommended that the deflecting electrode circuit resistance be approximately equal. Higher resistance values up to five megohms may be used for low beam current operation.*



S 58058

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CHARACTERISTICS

GENERAL DATA

Focusing Method				Electrostatic
Deflection Method				Electrostatic
Types*	**3ADP1**	**3ADP2**	**3ADP7**	**3ADP11**
Fluorescence	Green	Blue-Green	Blue-White	Blue
Phosphorescence	.....	Green	Yellow	.....
Persistence	Medium	Long	Long	Short
Faceplate				Flat, Clear

**In addition to the types shown, the 3ADP- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

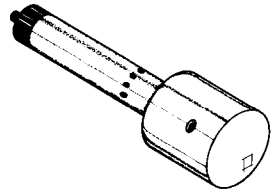
Heater Voltage		6.3 Volts
Heater Current		0.6 ± 10% Ampere
Direct Interelectrode Capacitances	**Min.**	**Max.**
Cathode to All Other Electrodes	3.0	4.5 μμf
Grid No. 1 to All Other Electrodes	5.5	7.2 μμf
Between Deflecting Plates 1-2	1.4	2.0 μμf
Between Deflecting Plates 3-4	0.9	1.5 μμf
Deflecting Plate 1 to All Other Electrodes	3.6	4.6 μμf
Deflecting Plate 2 to All Other Electrodes	3.6	4.6 μμf
Deflecting Plate 3 to All Other Electrodes	2.7	3.6 μμf
Deflecting Plate 4 to All Other Electrodes	2.7	3.6 μμf

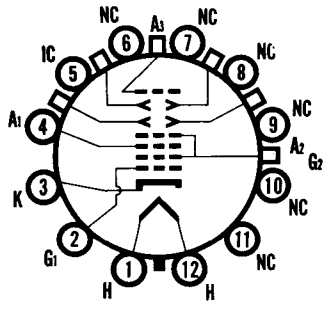
MECHANICAL DATA

Minimum Useful Screen Diameter	2.63 Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Neck Contacts	J1-25
Base (Small Shell Duodecal 12-Pin)	B12-43
Basing	12Z
Base Alignment	
D1-D2 trace aligns with Pin No. 5 and Tube Axis	±10 Degrees
Positive Voltage on D1 deflects beam approx. toward Pin No. 5	
Positive Voltage on D3 deflects beam approx. toward Pin No. 2	
Angle Between traces D1-D2 and D3-D4	90 ± 1 Degree
Bulb Contact Alignment	
J1-22 Contact aligns with D1-D2 Trace	±10 Degrees
J1-22 Contact on same side as Pin No. 5	

QUICK REFERENCE DATA

3" Direct Viewed
Round Glass Type
Flat, Clear Faceplate
Electrostatic Focus
Electrostatic Deflection
Post Deflection Acceleration
Close Tolerances





SYLVANIA
ELECTRONIC TUBES
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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JULY, 1959

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 3 Voltage	6600 Volts	dc
Anode No. 2 Voltage[1]	3300 Volts	dc
Ratio of Anode No. 3 Voltage to Anode No. 2 Voltage	2 : 1	
Anode No. 1 Voltage (Focusing Electrode)	1100 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	220 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	0 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	
Peak Voltage Between Anode No. 2 and Any Deflecting Plate	600 Volts	

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage	4000 Volts		
Anode No. 2 Voltage	2000 Volts		
Anode No. 1 Voltage for Focus	320 to 470 Volts		
Grid No. 1 Voltage Required for Cutoff[2]	−52 to −87 Volts		
Deflection Factor			
Deflecting Plates 1-2	140 to 160 Volts	dc/Inch	
Deflecting Plates 3-4	61 to 70 Volts	dc/Inch	
Modulation @ Ib3 = 25 μa[3]	38 Volts	dc	Max.
Line Width "A" @ Ib3 = 25 μa[3]	.014 Inches		Max.
Light Output @ Ib3 = 25 μa[4]			
3ADP1[5]	20 Ft. L.		Min.
3ADP11[6]	14 Ft. L.		Min.
Deflection Factor Uniformity[3]	2 Percent		Max.
Pattern Distortion[7]	2 Percent		Max.
Undeflected Spot Position[8]	Within a 10 mm Square		
Useful Scan			
D1-D2	±1.315 Inches From Tube Face Center or a Total 2.63 Inches Min.		
D3-D4	±0.75 Inches From Tube Face Center or a Total 1.5 Inches Min.		

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.
Deflection Circuit Resistance[9]	1.0 Megohms	Max.

NOTES:

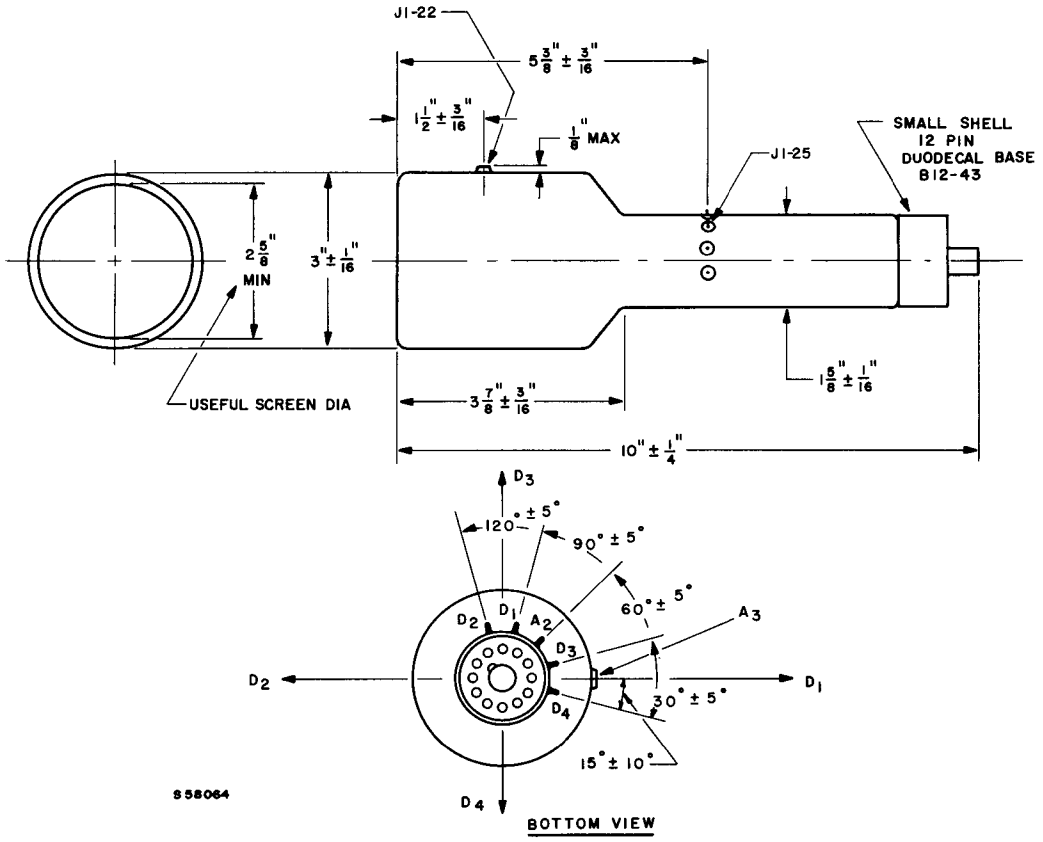
1. *The product of the Anode No. 2 Voltage and the Average Anode No. 2 Current should be limited to 6.0 watts.*
2. *Visual extinction of undeflected focused spot.*

NOTES: (Cont'd)

3. *Measured in accordance with MIL-E-1.*
4. *Using a raster size of 2¼ x 1½ inches.*
5. *Using a No. 594 Photronic cell with Viscor filter (for eye correction).*
6. *Using a No. 594 Photronic cell without Viscor filter (without eye correction).*
7. *All edges of a raster, pattern adjusted so its widest points just touch the sides of 2.295 x 1.530 inch rectangle, will fall within the area bounded by the 2.295 x 1.530 inch rectangle and an inscribed 2.205 x 1.470 inch rectangle.*
8. *With the tube shielded and with all deflection plates connected to Anode No. 2. Limit square centered on tube face, sides parallel to deflection axes.*
9. *It is recommended that the deflecting electrode circuit resistances be approximately equal.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.



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EMPORIUM, PA.



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engineering data service

SYLVANIA
3AP1A
3AP-A*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic
Phosphor	P1
Fluorescence	Green
Persistence	Medium
Faceplate	Clear

**In addition to the type shown, the 3AP-A* can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	2.5 Volts
Heater Current (Approx.)	2.1 Ampere
Direct Interelectrode Capacitances (Approx.)	
Grid No. 1 to All Other Electrodes	9 μμf
Deflecting Plate 1[1] to All Other Electrodes	8.5 μμf
Deflecting Plate 3[1] to All Other Electrodes	6.5 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	2¾ Inches
Nominal Overall Length	11½ Inches
Base	Medium 7-Pin
Basing	7CE

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	1650 Volts	dc
Anode No. 1 Voltage	1100 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	125 Volts	dc
Positive Bias Value	0 Volts	dc
Peak Voltage Between Anode No. 2 and Any Deflecting Plate	550 Volts	

TYPICAL OPERATING CONDITIONS

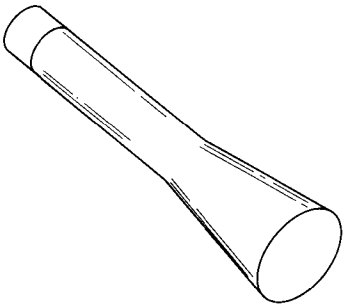
Anode No. 2 Voltage[2]	1500 Volts	dc
Anode No. 1 Voltage	240 to 560 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−25 to −75 Volts	dc
Deflection Factor[4,5]		
Deflecting Plates 1-2[6]	90 to 137 Volts dc/Inch	
Deflecting Plates 3-4[7]	88 to 130 Volts dc/Inch	

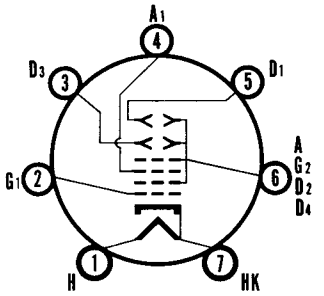
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5.0 Megohms Max.

QUICK REFERENCE DATA

3" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus





7-CE

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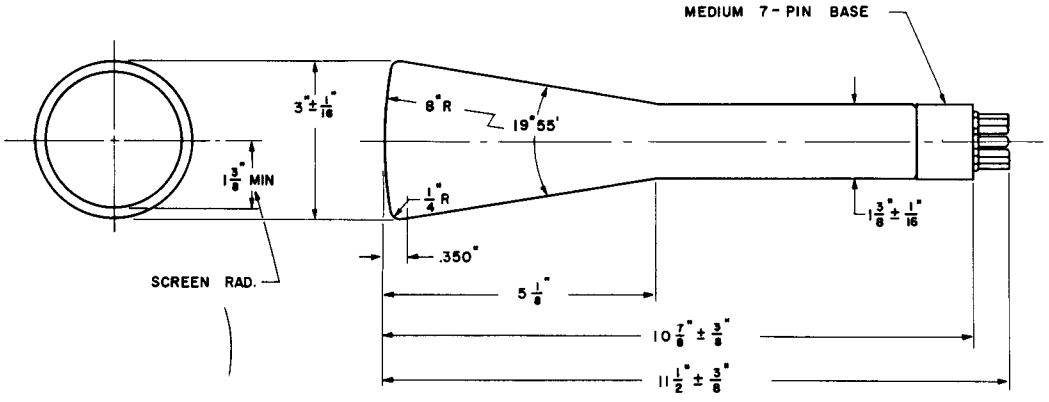
NOVEMBER, 1958

NOTES:

1. *With D2 positive with respect to D1, the spot is deflected toward Pin No. 1. With D4 positive with respect to D3, the spot is deflected toward Pin No. 6.*
2. *Brilliance and definition decrease with decreasing Anode No. 2 Voltage. In general, Anode No. 2 Voltage should not be less than 1,000 Volts.*
3. *Visual extinction of undeflected focused spot.*
4. *The plane through the tube axis and Pin 6 may vary from the trace produced by Deflecting Plates 3-4 by an angular tolerance measured about the tube axis; of 10 degrees.*
5. *Angle between D1-D2 trace and D3-D4 trace is 90° ± 3°.*
6. *Deflecting Plates 1-2 are nearer the screen.*
7. *Deflecting Plates 3-4 are nearer the base.*

3AP1

Sylvania Type 3AP1A replaces Type 3AP1.



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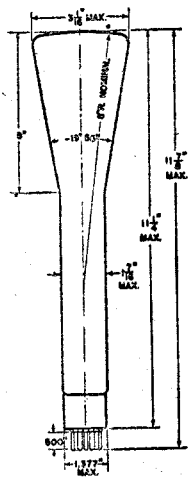
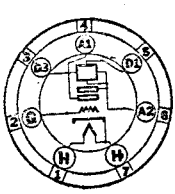


Sylvania

TYPES 3AP1/906-P1 3AP3/906-P3 3AP4/906-P4

TUBES DE TELEVISION A RAYONS CATHODIQUES

Les types Sylvania 3AP1/906-P1, 3AP3/906-P3 et 3AP4/906-P4 sont des tubes de télévision, à vide parfait, à déflexion électrostatique, à rayons cathodiques avec un écran de 3 pouces (7,5 centimètres). La structure des trois tubes est identique; la seule différence consiste dans la pâte fluorescente utilisée pour l'écran. Dans ce type de tube à rayons cathodiques, les champs électriques entre les organes du canon électronique agissent sur le faisceau d'électrons depuis la cathode pour le mettre au point, de manière à produire une petite image sur l'écran. De même, les champs électriques entre les jeux de plaques déflectrices servent à contrôler la position de l'image sur l'écran à volonté. La contre-marque des types 3AP1/906-P1, 3AP3/906-P3 et 3AP4/906-P4 indique que ces tubes remplaceront directement n'importe quel tube type 906-P1, 906-P3 et 906-P4 ou n'importe quel 3AP1, 3AP3 et 3AP4.



7-N

CARACTERISTIQUES

Tension de chauffage	2,5 volts
Courant de chauffage	2,1 ampère
Ampoule	J-24
Culot : moyen 7 broches	7-N
Conditions limites de fonctionnement :	
Tension anode n° 2	1,500 volts max.
Tension anode n° 1	550 volts max.
Tension grille. contrôle	Jamais positive.
Tension grille pour couper courant*	—60 volts appr.
Tension pointe entre anode n° 2 et n'importe quelle plaque déflectrice	600 volts max.
Puissance densité écran par cm2	10 mw. max.

* Avec 400 volts approx. (pour mise au point) sur anode n° 1.

Conditions de fonctionnement :

Tension de chauffage	2,5	2,5	2,5	2,5 volts
Tension anode n° 2	600	800	1,000	1,500 volts
Tension anode n° 1**	170	230	285	475 volts appr.
Tension grille contrôle	Variable pour contrôle intensité image.			

** Pour mettre au point.

Sensibilité de déflexion :

Plaques D1 et D2	0,55	0,41	0,33	0,22 mm. volt c. c.
Plaques D3 et D4	0,58	0,44	0,35	0,23 mm. volt c. c.

Ecran :

Type	Fluorphor	Couleur
3AP1/906-P1	N° 1	verte
3AP3/906-P3	N° 3	jaune
3AP4/906-P4	N° 4	Blanche

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SYLVANIA
3AQP1
3AQP*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic

Types*	Fluorescence	Phosphorescence	Persistence
3AQP1	Green	———	Medium
3AQP2	Blue - Green	Green	Long
3AQP7	Blue - White	Yellow	Long
3AQP11	Blue	———	Short

Faceplate . . . . . Clear, Spherical

* In addition to the types shown, the 3AQP — can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	4.3 μμf
Grid No. 1 to All Other Electrodes	7.5 μμf
Between Deflecting Plates 1-2	5.2 μμf
Between Deflecting Plates 3-4	7.0 μμf
Deflecting Plate 1 to All Other Electrodes	10.1 μμf
Deflecting Plate 2 to All Other Electrodes	7.5 μμf
Deflecting Plate 3 to All Other Electrodes	8.1 μμf
Deflecting Plate 4 to All Other Electrodes	9.2 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	2 ¾ Inches
Base (Small Shell Duodecal 12-Pin)	B12-43
Basing	12E
Bulb	J24P1
Base Alignment	
D1-D2 Trace Aligns with Pin No. 4 and Tube Axis	± 10 Degrees
Positive Voltage on D1 deflects Beam approx. Toward Pin No. 4	
Positive Voltage on D3 deflects Beam approx. Toward Pin No. 1	
Angle Between D3-D4 and D1-D2 Traces	90 ± 1 Degree
Weight (approx.)	½ Pound

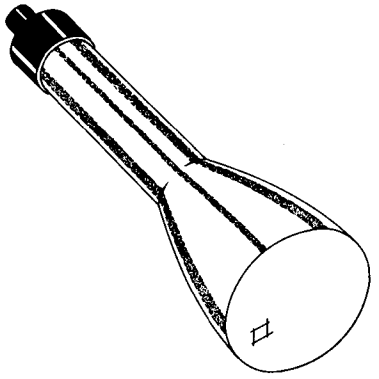
RATINGS

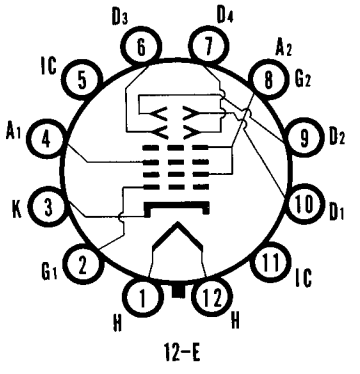
MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	3000 Volts	dc
Anode No. 2 Input	6.0 Watts	
Anode No. 1 Voltage (Focusing Electrode)	1200 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	220 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up	140 Volts	
Heater Positive with Respect to Cathode	140 Volts	
Peak Voltage Between Anode No. 2 and Any Deflection Plate	600 Volts	

QUICK REFERENCE DATA

3" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Clear, Spherical Faceplate
High Deflection Sensitivity





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APRIL, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

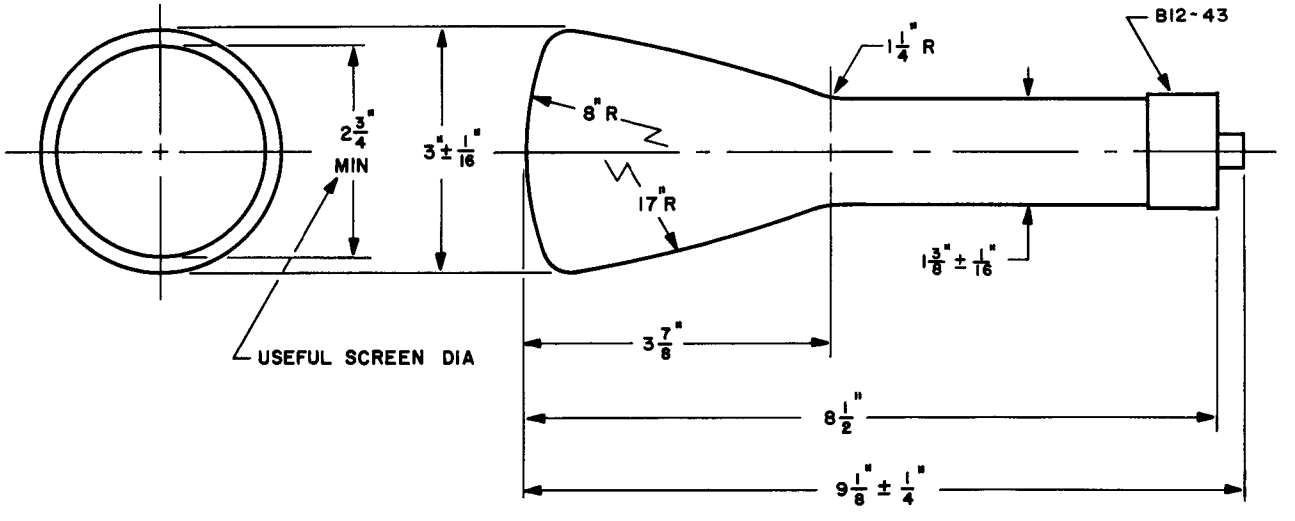
Anode No. 2 Voltage[1]	2000 Volts dc
Anode No. 1 Voltage for Focus	330 to 620 Volts dc
Grid Voltage Required for Cutoff[2]	−58 to −135 Volts dc
Deflection Factors	
Deflecting Plates 1-2[3]	146 to 198 Volts dc/Inch
Deflecting Plates 3-4[4]	52 to 70 Volts dc/Inch
Useful Scan	
D1-D2[5]	2 ¾ Inches Min
D3-D4[5]	2 ¼ Inches Min
Spot Position (Undeflected, Focused)[6]	Within a 12 mm Square

CIRCUIT VALUES

Grid Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance[7]	1.0 Megohms Max.

NOTES:

1. *Operation of Type 3AQP7 at Anode Voltages of less than 1000 volts is not recommended.*
2. *Visual extinction of undeflected focused spot.*
3. *Deflecting Plates 1-2 are nearer the screen.*
4. *Deflecting Plates 3-4 are nearer the base.*
5. *Useful scan to be centered with respect to the tube face.*
6. *With the tube shielded and all deflection plates connected to Anode No. 2. Limit square centered on tube face, with sides parallel to deflection axes.*
7. *The resistances in each deflecting plate circuit should be approximately equal.*



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SYLVANIA

engineering data service

SYLVANIA
3ASP1
3ASP*

CHARACTERISTICS

GENERAL DATA

Focusing Method			Electrostatic
Deflection Method			Electrostatic
Types*	Fluorescence	Phosphorescence	Persistence
3ASP1	Green	.....	Medium
3ASP2	Blue-Green	Green	Long
3ASP11	Blue	.....	Short
Faceplate			Flat, Clear

**In addition to the types shown, the 3ASP- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Ampere
Direct Interelectrode Capacitances (approx.)	
Grid No. 1 to All Other Electrodes	4.5 μμf
Between Deflection Plates 1-2	2.0 μμf
Between Deflection Plates 3-4	2.5 μμf
Deflection Plate 1 to All Other Electrodes	6.5 μμf
Deflection Plate 2 to All Other Electrodes	6.0 μμf
Deflection Plate 3 to All Other Electrodes	5.5 μμf
Deflection Plate 4 to All Other Electrodes	5.5 μμf

MECHANICAL DATA

Minimum Useful Screen Dimensions	
Horizontal	2¾ Inches
Vertical	1⅛ Inches
Bulb	LEA 448 or Equiv.
Base	B8-218
Basing	8KF
Anode No. 2 Contact	J1-22

Base Alignment

Pin #3 aligns with major axis of tube face within 10°, and is on same side as anode contact (J1-22)

Trace Alignment

Positive Voltage on D1 (Pin #2) with respect to D2, (Pin #1) deflects spot approximately toward Pin #3.

Positive Voltage on D3 (Pin #6) with respect to D4, (Pin #7) deflects spot approximately toward Pin #5.

Angle between D1-D2 and D3-D4 traces	90 ± 1 Degree
Angle between D1-D2 and major axis of tube face	0 ± 1½ Degrees

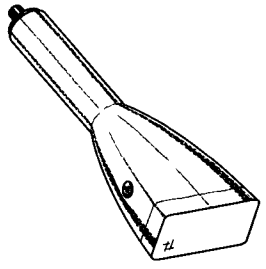
Deflection Plates

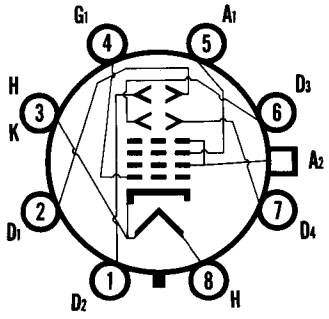
D1 and D2 are nearer to the tube face

D3 and D4 are nearer the base

QUICK REFERENCE DATA

1½" x 3" Direct Viewed
Rectangular Glass Type
Clear, Pressed Faceplate
Electrostatic Deflection
Electrostatic Focus
High Deflection Sensitivity





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EMPORIUM, PENNSYLVANIA

MARCH, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	3000	Volts	dc
Anode No. 2 Input	6.0	Watts	
Anode No. 1 Voltage (Focusing Electrode)	1200	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	140	Volts	dc
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Voltage between Anode No. 2 and Any Deflection Plate	600	Volts	
Altitude	35,000	Feet	

TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage	2000	Volts	dc
Anode No. 1 Voltage for Focus	400 to 700	Volts	dc
Grid No. 1 Voltage Required for Cutoff[1]	−40 to −70	Volts	dc
Deflection Factors			
Deflection Plates 1-2	68 to 92	Volts	dc/Inch
Deflection Plates 3-4	28 to 38	Volts	dc/Inch
Spot Position (Undeflected, Focused)[2]	Within a 15	mm Square	
P1 Light Output[4]	20	Ft. L.	Min.
Modulation[5]	38	Volts	dc Max.
Line Width A[6]	0.65	mm Max.	

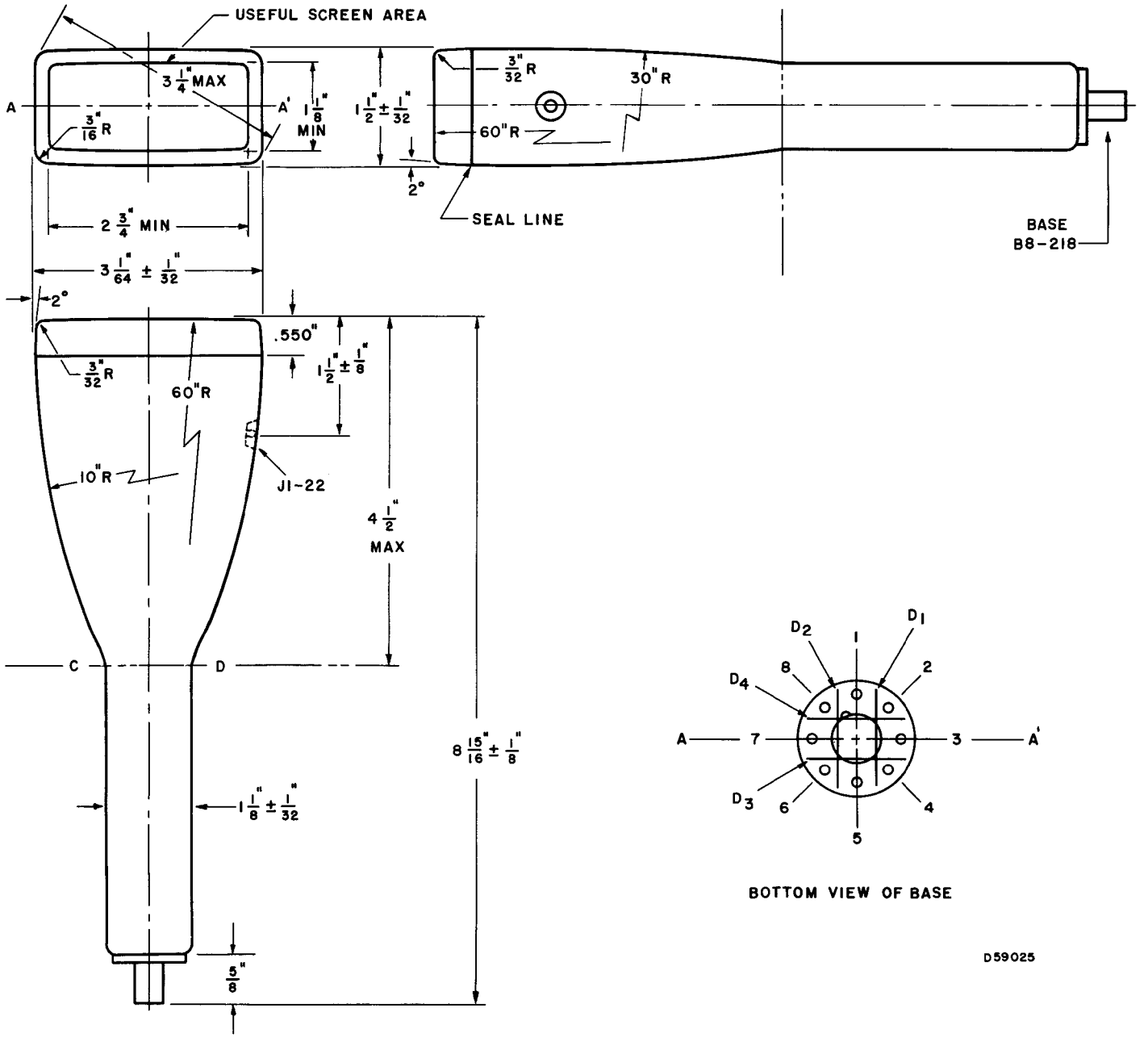
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.
Deflection Circuit Resistance[3]	1.0	Megohms	Max.

NOTES:

1. *Visual extinction of undeflected focused spot.*
2. *With the tube shielded and with the deflection plates connected to Anode No. 2, the square shall be centered on the tube face with its sides parallel to the deflection axis.*
3. *It is recommended that the deflecting electrode circuit resistances be approximately equal.*
4. *Raster size 1 1/8" x 1 9/16".*
5. *Measured at 20 Ft. L. on a raster 1 1/8" x 1 9/16".*
6. *Measured by compressed raster method starting with conditions of Note 5.*

OUTLINE



BOTTOM VIEW OF BASE

D59025

MECHANICAL DATA

Bulb	T-12
Base	B8-71, Short Jumbo Shell Octal, 8-Pin
Top Cap	C1-1, Small
Outline	See Drawing
Basing	8GH
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage, AC	3.15	Volts
Heater Current	220	Ma

DIRECT INTERELECTRODE CAPACITANCES (Approx.)

Plate to (h + k + I.S.)	1.8	$\mu\mu$f

RATINGS (Design Center Values — Except as Noted)

Pulsed Rectifier Service[1]

Inverse Plate Voltage		
Total DC and Peak, Abs. Max.	35000	Volts
DC	25000	Volts Max.
Peak Plate Current	80	Ma Max.
Average Plate Current	1.1	Ma Max.

CHARACTERISTICS

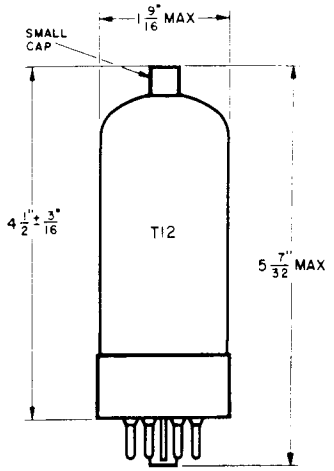
Tube Drop with DC Plate Current of 7 Ma	135	Volts

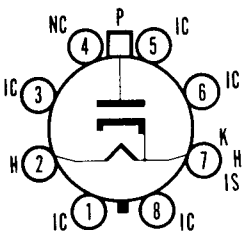
NOTES:

1. *For operation in a 525 line, 30-frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations; Federal Communications Commission".*
2. *Pins 1, 3, 5 and 7 may be connected together. Pins 2, 6 and 8 may be connected together. Pin 4 may be connected to either pin 2 or pin 7, or may be used as a tie point for a heater dropping resistor. Do not use pin 4 as a low potential tie point.*

QUICK REFERENCE DATA

The Sylvania Type 3B2 is a half-wave, high voltage rectifier contained in a T-12 envelope. It is designed for application as a high voltage rectifier in color television receivers.





8GH

(NOTE 2)

SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

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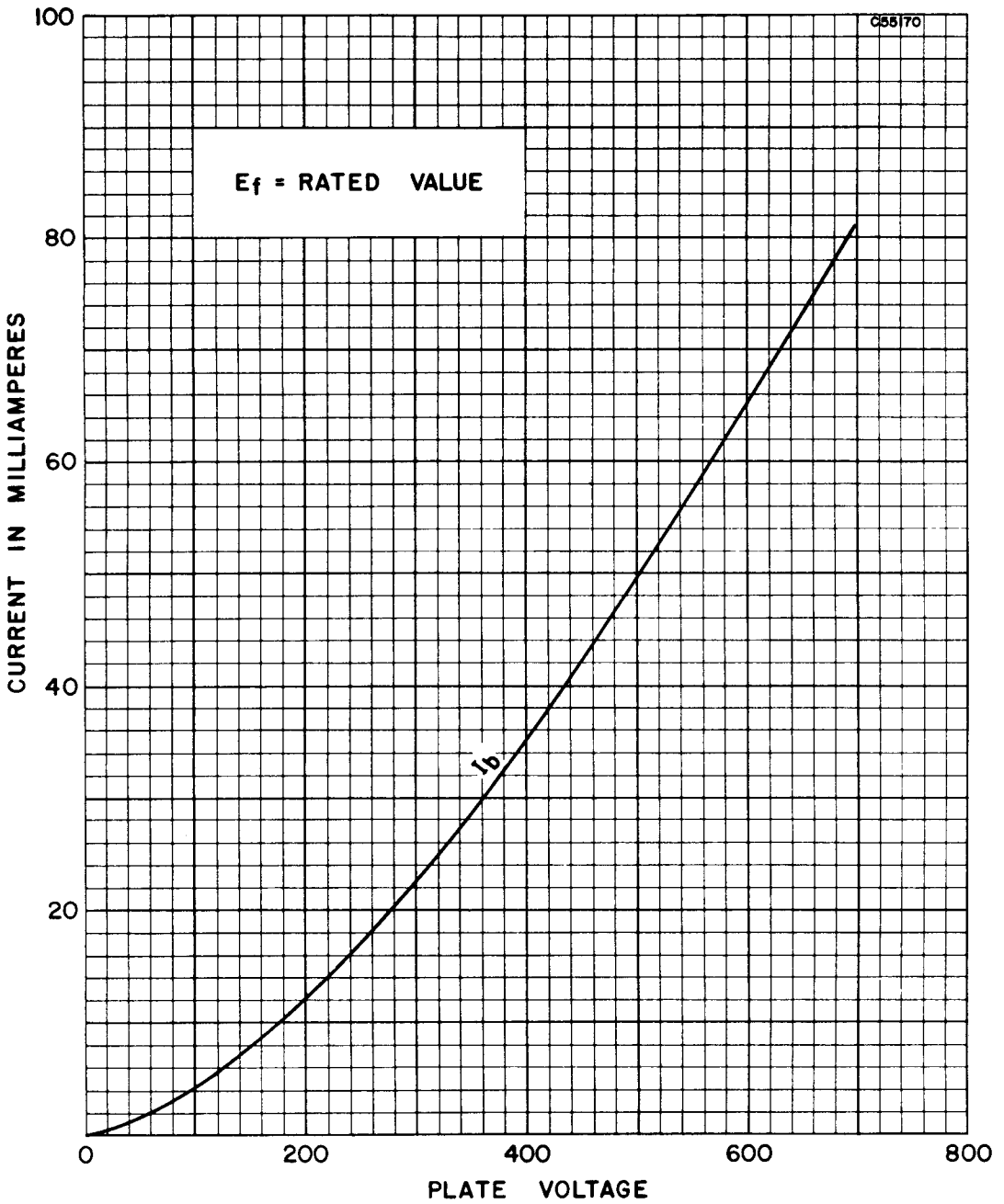
JANUARY 1956

AVERAGE PLATE CHARACTERISTICS



SYLVANIA

engineering data service

SYLVANIA
3BEP1
3BEP-*

DESCRIPTION

Sylvania 3BEP- is a compact, rectangular direct-view oscilloscope tube designed primarily for use in airborne equipment. It features a high quality, nearly flat pressed faceplate, and employs electrostatic focus and deflection. Its encapsulated leads permit operation at high altitude and it will withstand a wide range of temperatures.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic

Types*	Fluorescence	Phosphorescence	Persistence
P1	Green	———	Medium

Faceplate	Clear, Pressed Glass

* In addition to the type shown, the 3BEP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	8 μμf
Between Deflecting Plates 1-2	7 μμf
Between Deflecting Plates 3-4	6 μμf
Deflecting Plate 1 to All	9 μμf
Deflecting Plate 2 to All	8 μμf
Deflecting Plate 3 to All	7 μμf
Deflecting Plate 4 to All	8 μμf

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Horizontal	2 ¾ Inches
Vertical	1 ⅛ Inches
Bulb	LEA 417 or Equivalent
Base	Encapsulated, Color Coded Leads
Trace Alignment with Bulb (See Diagram)	
D1-D2 Trace aligns with long axis of tube face[1]	± 1.5 Degrees
Angle between D1-D2 trace and D3-D4 trace	90 ± 1 Degrees
Weight (Approx.)	¾ Pounds

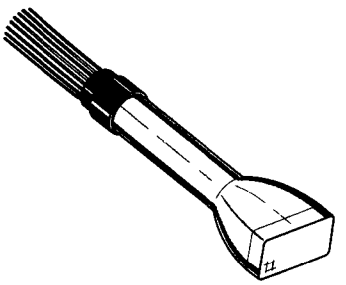
RATINGS

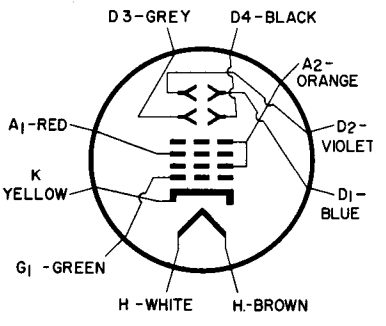
MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	3000 Volts	dc
Anode No. 1 Voltage (Focusing Electrode)	1200 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	140 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode.	140 Volts	
Heater Positive with Respect to Cathode.	140 Volts	
Altitude	70,000 Feet	
Operating Temperature Range	−65 to +85 °C	

QUICK REFERENCE DATA

Oscilloscope Tube
1½" x 3" Direct Viewed
Rectangular Glass Type
Electrostatic Deflection
Electrostatic Focus
High Quality, Clear, Pressed Faceplate
Encapsulated Base with color coded leads.





3BEP1

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SENECA FALLS, NEW YORK

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EMPORIUM, PENNSYLVANIA
APRIL, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage	1500 Volts	dc
Anode No. 1 Voltage for Focus	247 to 465 Volts	dc
Grid No. 1 Voltage Required for Cutoff[2]	−43.5 to −101 Volts	dc
Deflection Factors		
Deflecting Plates 1-2[3]	109 to 149 Volts	dc/Inch
Deflecting Plates 3-4[4]	78 to 105 Volts	dc/Inch
Spot Position (Focused, Undeflected)[5]	Within a 7.5 mm Square	

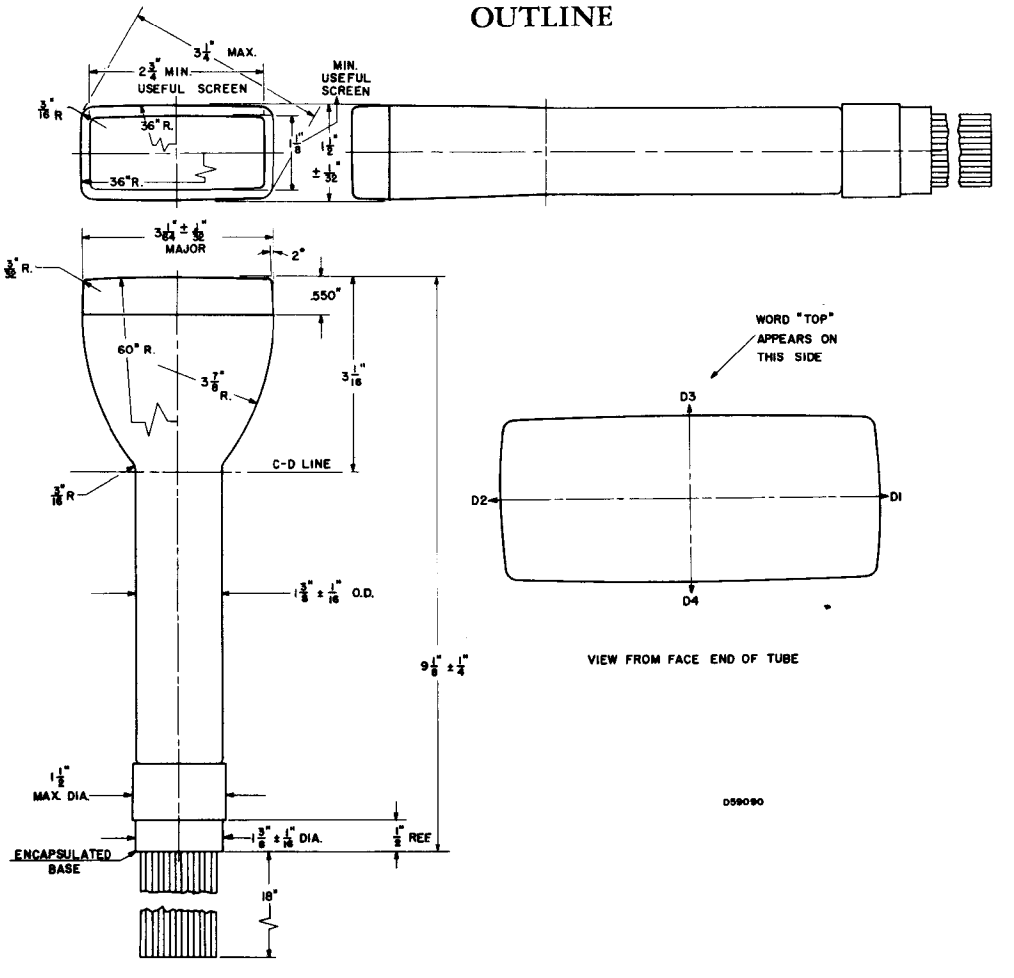
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Resistance in Any Deflecting Electrode Circuit[6]	1.0 Megohms Max.

NOTES:

1. *The D1-D2 trace scanning through the geometric center of the tube face will be parallel to the long axis of the tube faces within the limits specified.*
2. *Visual extinction of undeflected focused spot.*
3. *Deflecting Plates 1 and 2 are nearer the screen and scan the major dimension of the screen.*
4. *Deflecting Plates 3 and 4 are nearer the base and scan the minor dimension of the screen.*
5. *With deflecting plates connected to Anode No. 2 and with tube shielded, the sides of the limit square will be parallel to the deflection axes.*
6. *It is recommended that the deflecting electrode circuit resistances be approximately equal.*

OUTLINE



SYLVANIA

engineering data service

SYLVANIA
3BGP1
3BGP*

DESCRIPTION

Sylvania 3BGP1 is a compact, rectangular direct view oscilloscope tube designed for portable oscilloscope and radar applications. It features a high efficiency 1.5 v, 140 ma heater for battery economy and lightweight design. This low heater power design requires only $\frac{1}{16}$ of the power necessary to operate a conventional 6.3 v, 600 ma heater.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic

Types*	Fluorescence	Phosphorescence	Persistence
3BGP1	Green	——	Medium
3BGP2	Blue-Green	Green	Long
3BGP7	Blue-White	Yellow	Long
3BGP11	Blue	——	Short

Faceplate . . . . . Flat, Clear

*In addition to the types shown, the 3BGP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	1.5 Volts
Heater Current	0.140 ± 10% Ampere
Direct Interelectrode Capacitances (approx.)	
Grid No. 1 to All Other Electrodes	4.5 μμf
Between Deflection Plates 1-2	2.0 μμf
Between Deflection Plates 3-4	2.5 μμf
Deflection Plate 1 to All Other Electrodes	6.5 μμf
Deflection Plate 2 to All Other Electrodes	6.0 μμf
Deflection Plate 3 to All Other Electrodes	5.5 μμf
Deflection Plate 4 to All Other Electrodes	5.5 μμf

MECHANICAL DATA

Minimum Useful Screen Dimensions	
Horizontal	2¾ Inches
Vertical	1⅛ Inches
Bulb	LEA 448 or Equiv.
Base	B8-181
Basing	8KF
Anode No. 2 Contact	J1-22

Base Alignment

Pin #3 aligns with major axis of tube face within 10°, and is on same side as anode contact (J1-22).

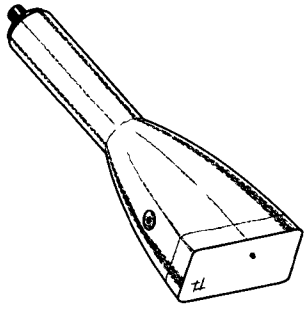
Trace Alignment

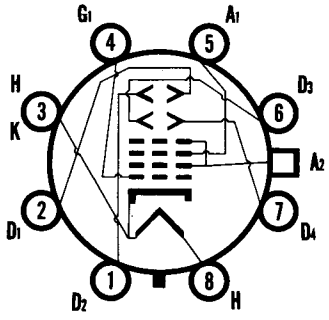
Positive Voltage on D1 (Pin #2) with respect to D2, (Pin #1) deflects spot approximately toward Pin #3.

Positive Voltage on D3 (Pin #6) with respect to D4, (Pin #7) deflects spot approximately toward Pin #5.

QUICK REFERENCE DATA

1½" x 3" Direct Viewed
Rectangular Glass Type
Clear, Pressed Faceplate
Electrostatic Deflection
Electrostatic Focus
High Deflection Sensitivity
Very Low Heater Power





8KF

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JULY, 1960

File Under
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CATHODE RAY TUBES

MECHANICAL DATA (Continued)

Angle between D1-D2 and D3-D4 traces	90 ± 1 Degree
Angle between D1-D2 trace and major axis of tube face	0 ± 1½ Degrees
Deflection Plates	
D1 and D2 are nearer to the tube face	
D3 and D4 are nearer the base	

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	2750 Volts dc
Anode No. 2 Input	6.0 Watts
Anode No. 1 Voltage (Focusing Electrode)	1100 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	200 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Voltage between Anode No. 2 and Any Deflection Plate	550 Volts
Altitude	35,000 Feet

TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage	2000 Volts dc
Anode No. 1 Voltage for Focus	400 to 700 Volts dc
Grid No. 1 Voltage Required for Cutoff[1]	−38 to −67½ Volts dc
Deflection Factors	
Deflection Plates 1-2	68 to 92 Volts dc/Inch
Deflection Plates 3-4	28 to 38 Volts dc/Inch
Spot Position (Undeflected, Focused)[2]	Within a 15 mm Square
P1 Light Output[4]	20 Ft. L. Min.
Modulation[5]	38 Volts dc Max.
Line Width A[6]	0.65 mm Max.

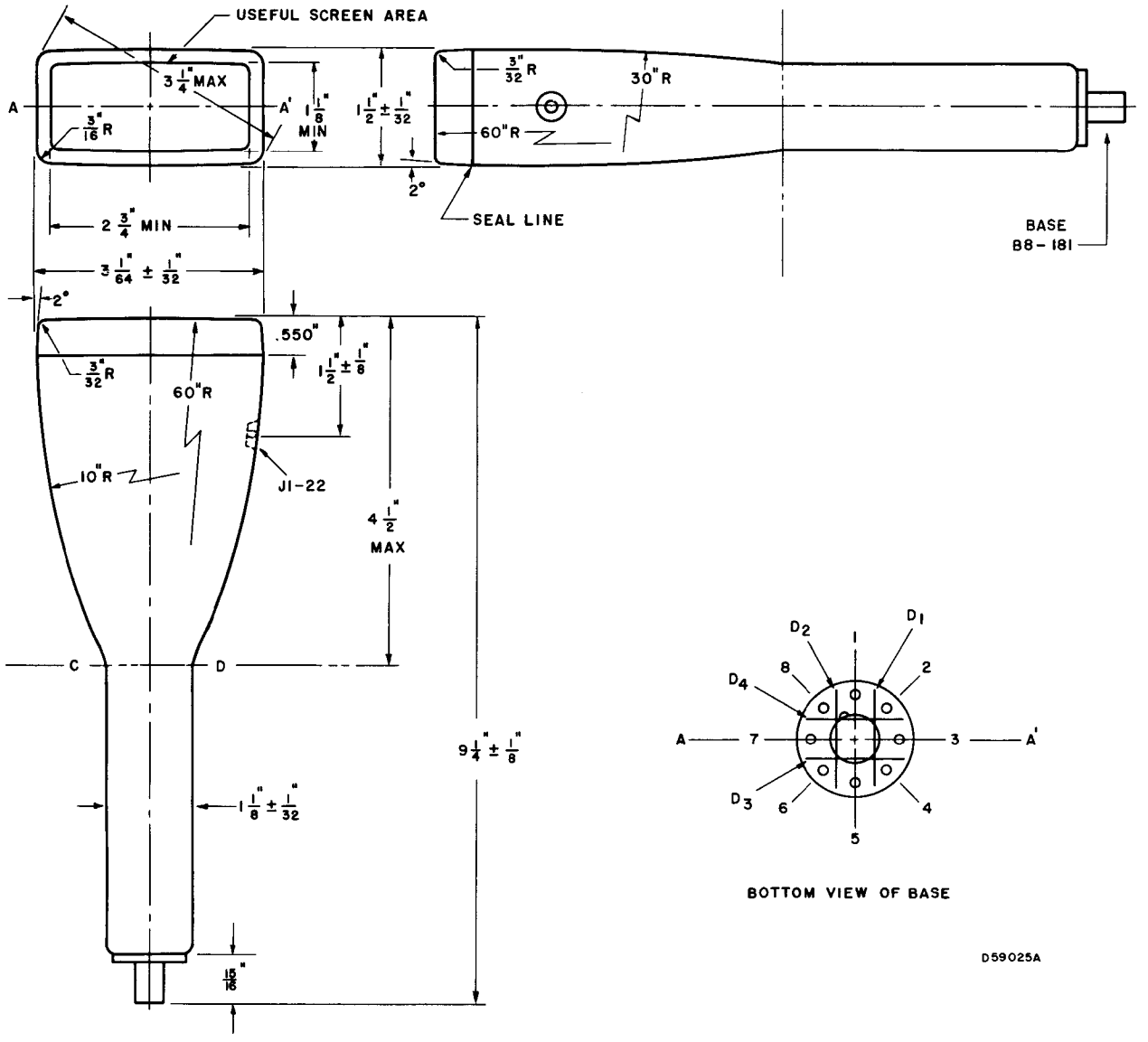
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance[3]	1.0 Megohms Max.

NOTES:

1. *Visual extinction of undeflected focused spot.*
2. *With the tube shielded and with the deflection plates connected to Anode No. 2. The square shall be centered on the tube face with its sides parallel to the deflection axes.*
3. *It is recommended that the deflecting electrode circuit resistances be approximately equal.*
4. *Raster size 1⅛" x 1-9/16".*
5. *Measured at 20 Ft. L. on a raster 1⅛" x 1-9/16".*
6. *Measured by compressed raster method starting with conditions of Note 5.*

OUTLINE



BOTTOM VIEW OF BASE

D59025A

SYLVANIA engineering data service

SYLVANIA
3BMP1
3BMP-

CHARACTERISTICS

GENERAL DATA

Focusing Method			Electrostatic
Deflection Method			Electrostatic
Types*	Fluorescence	Phosphorescence	Persistence
3BMP1	Green	——	Medium
3BMP2	Blue - Green	Green	Long
3BMP7	Blue - White	Yellow	Long
3BMP11	Blue	——	Short
3BMP12	Orange	Orange	Medium Long
Faceplate			Flat, Clear

* In addition to the types shown, the 3BMP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	1.5 Volts
Heater Current	0.14 ±10% Ampere
Direct Interelectrode Capacitances (Maximum)	
Cathode to All Other Electrodes	4.2 μμf
Grid to All Other Electrodes	5.8 μμf
Between Deflecting Plates 1-2	2.1 μμf
Between Deflecting Plates 3-4	1.5 μμf
Deflecting Plate 1 to All Other Electrodes	5.8 μμf
Deflecting Plate 2 to All Other Electrodes	5.8 μμf
Deflecting Plate 3 to All Other Electrodes	4.5 μμf
Deflecting Plate 4 to All Other Electrodes	4.5 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	2.68 Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Bulb	J24V
Base (Medium-Shell Diheptal 12-Pin)	B12-37
Basing	14J
Base Alignment	
D1-D2 trace aligns with Pin No. 5 and Tube Axis	±10 Degrees
Positive Voltage on D1 deflects beam approx. toward Pin No. 5	
Positive Voltage on D3 deflects beam approx. toward Pin No. 2	
Angle between traces D1-D2 and D3-D4	90 ±1 Degrees
Bulb Contact Alignment	
J1-22 contact aligns with D1-D2 trace	±10 Degrees
J1-22 contact on same side as Pin No. 5	

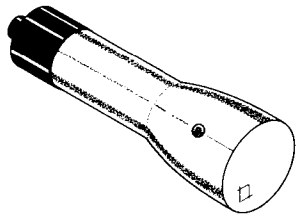
RATINGS

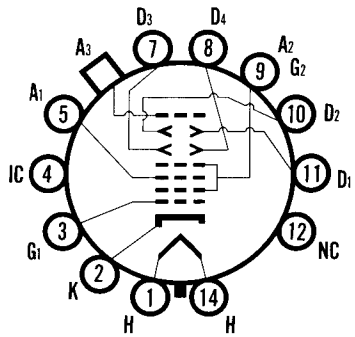
MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 3 Voltage	6600 Volts	dc
Anode No. 2 Voltage	2200 Volts	dc
Ratio Anode No. 3 to Anode No. 2 Voltage[1]	3.0	
Anode No. 2 Input (Av. except for 3BMP12)[2]	6.0 Watts	
Anode No. 1 Voltage (Focusing Electrode)	1500 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	200 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	0 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	50 Volts	
Heater Positive with Respect to Cathode	0 Volts	
Peak Voltage Between Anode No. 2 and Deflection Plate	550 Volts	

QUICK REFERENCE DATA

3" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Close Tolerances
Flat Face Plate
Post Deflection Acceleration
Very Low Heater Power





14-J

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EMPORIUM, PENNSYLVANIA
SEPTEMBER, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS[2]

Anode No. 3 Voltage	4000 Volts	dc
Anode No. 2 Voltage	2000 Volts	dc
Anode No. 1 Voltage for Focus	375 to 575 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−45 to −75 Volts	dc
Deflection Factor		
Deflecting Plates 1-2	180 to 220 Volts	dc/Inch
Deflecting Plates 3-4	133 to 163 Volts	dc/Inch
Deflection Factor Uniformity[4]	2%	Max.
Pattern Distortion[5]	2%	Max.
Modulation at Anode No. 3 Current = 25μAdc[4]	38 Volts	dc Max.
Line Width "A" at Anode No. 3 Current = 25μAdc	.016 Inches	Max.
Light Output at Anode No. 3 Current = 25μAdc[6] (3BMP1)	20 Foot Lamberts	Min.
Spot Position[7]	Within a 10 mm Square	

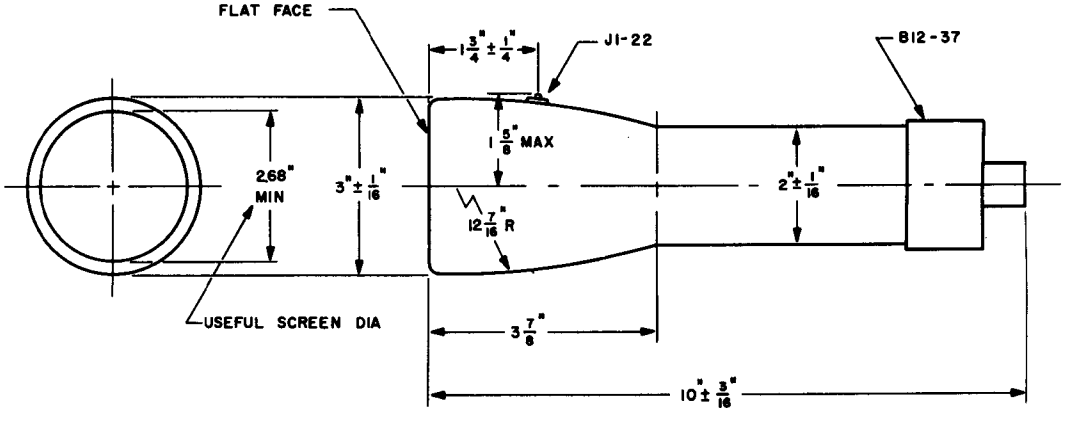
CIRCUIT VALUES

Grid Circuit Resistance	1.5 Megohms	Max.
Deflection Circuit Resistance[8]	1.0 Megohms	Max.

NOTES:

1. *These types are designed for optimum performance when operating at EB3/EB2 ratio of 2.0.*
2. *Type 3BMP12 can be severely and permanently damaged if current density is allowed to rise too high. Test and operate at minimum usable currents.*
3. *Visual extinction of undeflected focused spot.*
4. *Per MIL-E-1 specifications.*
5. *All portions of a raster pattern, adjusted so its widest points just touch the sides of a 1.938 inch square, will fall within the area bounded by the 1.938 inch square and an inscribed 1.862 inch square.*
6. *Measured in accordance with MIL-E-1 specifications using a raster size of 1⅞ x 1⅞ inches.*
7. *With tubes magnetically shielded, deflecting plates connected to Anode No. 2, and spot focused. Limit square centered on tube face, with sides parallel to deflection axes.*
8. *It is recommended that the deflecting electrode circuit resistance be approximately equal. Higher resistance values up to five megohms may be used for low beam current operation.*

OUTLINE



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engineering data service

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3BP1A

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic
Phosphor	P1
Fluorescence	Green
Persistence	Medium
Faceplate	Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	8.0 μμf
Grid to All Other Electrodes	8.5 μμf
Between Deflecting Plates 1-2[1]	2.0 μμf
Between Deflecting Plates 3-4[1]	2.0 μμf
Deflecting Plate 1 to All Other Electrodes Except DP2	6.0 μμf
Deflecting Plate 2 to All Other Electrodes Except DP1	5.0 μμf
Deflecting Plate 3 to All Other Electrodes Except DP4	4.0 μμf
Deflecting Plate 4 to All Other Electrodes Except DP3	6.0 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	2¾ Inches
Base	Medium Shell Diheptal 12-Pin
Basing	14G

RATINGS

MAXIMUM RATINGS (Absolute Values)

Anode No. 2 Voltage	2,200 Volts dc
Anode No. 1 Voltage	1,100 Volts dc
Grid Voltage	
Negative Value	200 Volts
Positive Value	0 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	125 Volts
Heater Positive with Respect to Cathode	10 Volts
Peak Voltage Between Anode No. 2 And Any Deflection Plate	550 Volts

RECOMMENDED OPERATING CONDITIONS

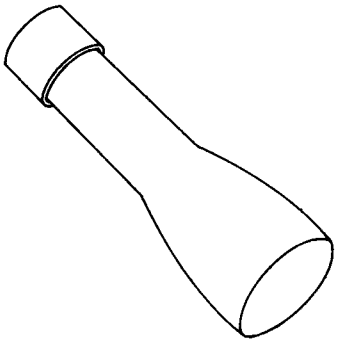
Anode No. 2 Voltage[2]	2,000 Volts dc
Anode No. 1 Voltage for Focus	400 to 690 Volts dc
Grid Voltage Required for Cutoff[3]	-30 to -90 Volts dc
Deflection Factor	
Deflecting Plates 1-2[4]	200 Volts dc/Inch
Deflecting Plates 3-4[5]	148 Volts dc/Inch

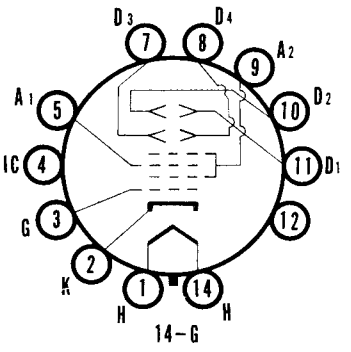
CIRCUIT VALUES

Grid Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5.0 Megohms Max.

QUICK REFERENCE DATA

Special Purpose Tube
3" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus





SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

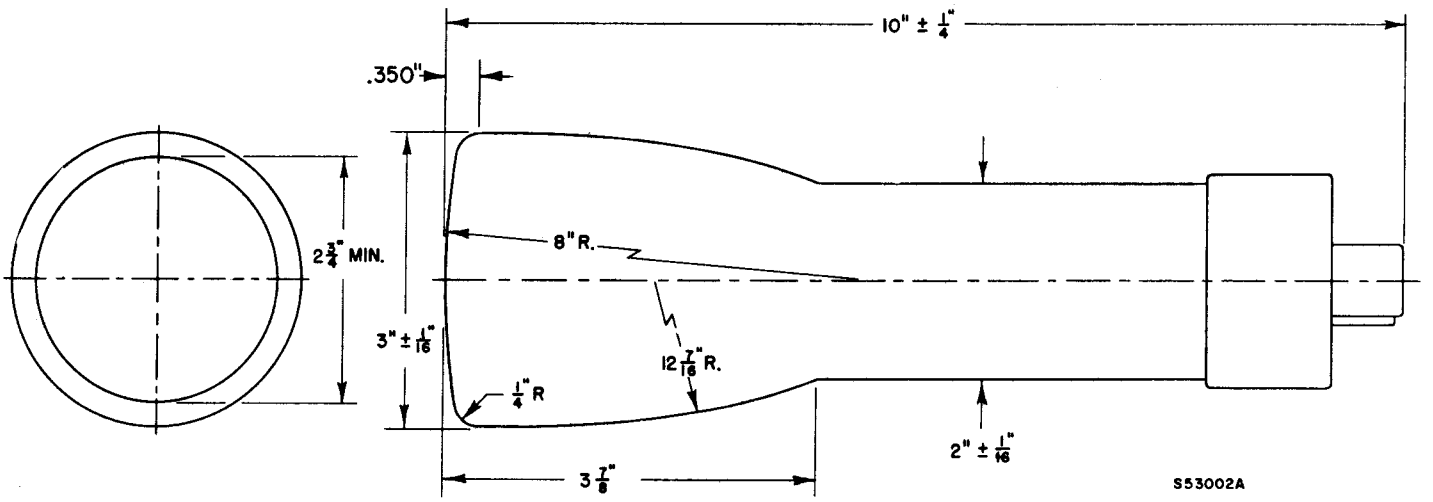
JULY, 1954

SYLVANIA

3BP1A

NOTES:

1. *Deflecting Plate 1 is Pin No. 11*
   Deflecting Plate 2 is Pin No. 10
   Deflecting Plate 3 is Pin No. 7
   Deflecting Plate 4 is Pin No. 8
2. *Brilliance and definition decrease with decreasing Anode No. 2 Voltage. In general, Anode No. 2 Voltage should not be less than 1500 volts.*
3. *Visual extinction of undeflected focused spot.*
4. *Deflecting Plates 1-2 are nearer the screen.*
5. *Deflecting Plates 3-4 are nearer the base.*



MECHANICAL DATA

Bulb	T-12
Base	B8-110 Short Medium Shell Octal. 8-Pin
Cap	C1-1 Small
Outline	See Drawing
Basing[1]	8FV
Cathode	Coated Filament
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Series	Parallel	
Filament Voltage[2]	3.15	1.58	Volts
Filament Current	0.21	0.42	Ampere

DIRECT INTERELECTRODE CAPACITANCES (approx.) Unshielded

Plate to Filament	1.4	$\mu\mu$f

RATINGS (Design Maximum Values) [3 & 4]

Peak Inverse Plate Voltage		
DC component	28000	Volts
Total DC and Peak	33000	Volts
Steady State Peak Plate Current	80	Ma
DC Output Current	1.1	Ma

AVERAGE CHARACTERISTICS

Tube Voltage Drop (approx.) for I_b = 7.0 Ma	62	Volts

NOTES:

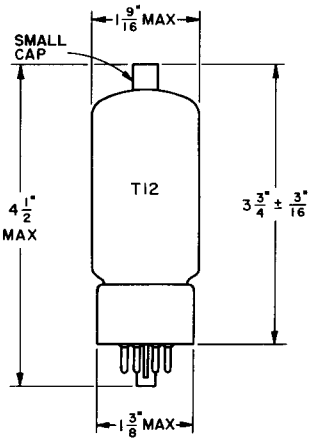
1. *Pins 1 and 3 may be used as tie points for the filament dropping resistance or may be connected to the filament. Do not connect to any other circuit.*
2. *Filament voltage for parallel operation should never be less than 1.4 volts or more than 1.8 volts; for series operation voltage should never be less than 2.7 volts or more than 3.6 volts.*
3. *For operation in 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations; Federal Communications Commission", the duty cycle of the voltage pulse must not exceed 15% of one horizontal scanning cycle.*
4. *Design-Maximum Ratings are the limiting values, expressed with respect to bogie tubes, at which satisfactory tube life can be expected to occur. In order to obtain satisfactory circuit performance, therefore, the equipment designer must establish the circuit design so that no design-maximum value is exceeded with a bogie tube under the worst probable operating conditions with respect to the combined effect of supply-voltage variation, equipment component variation, equipment control adjustment, load variation, and any other variation associated with the equipment or the environment of the equipment.*

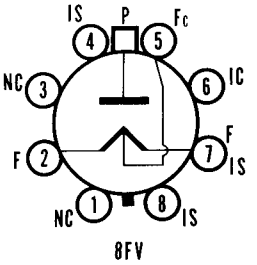
WARNING:

X-Ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's maximum Rated Anode Voltage or 16,000 volts whichever is less.

QUICK REFERENCE DATA

The Sylvania Type 3C2 is a half-wave rectifier in a T-12 envelope. It is designed primarily for service as a high voltage rectifier in color television receivers.





8FV

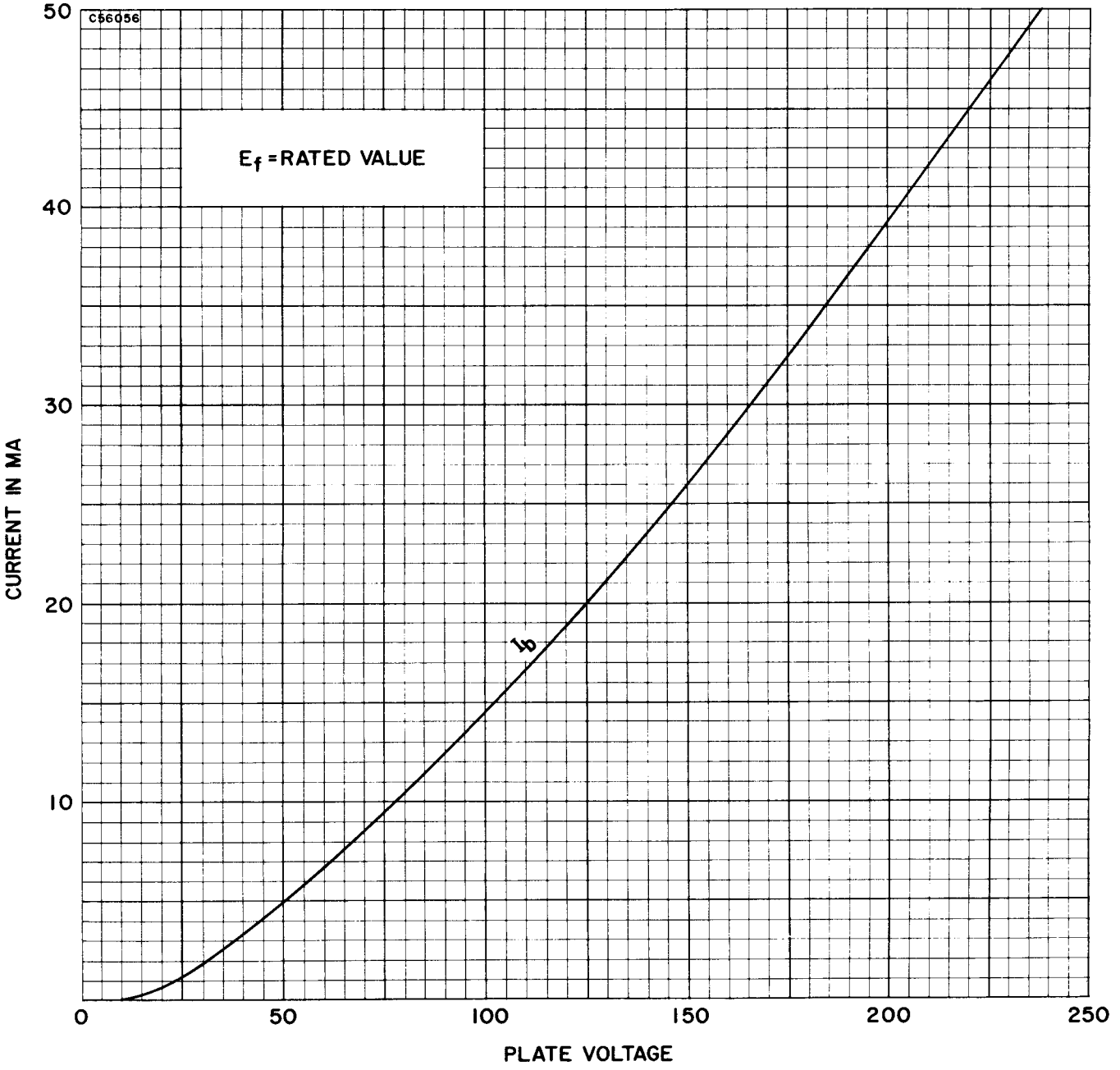
SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JULY 1956

AVERAGE PLATE CHARACTERISTICS



TECHNICAL DATA

3D24

Sylvania

TYPE 3D24

VHF TRANSMITTING TETRODE

TENTATIVE RATINGS AND CHARACTERISTICS

Filament Voltage	6.3	Volts
Filament Current	3.0	Amperes
Maximum Plate Voltage DC	2000	Volts
Maximum Screen Voltage	400	Volts
Max. Control Grid Voltage	350	Volts
Max. Plate Current DC	100	Ma.
Max. Screen Current	25	Ma.
Max. Control Grid Current DC	20	Ma.
Max. Plate Dissipation	45	Watts
Max. Screen Dissipation	10	Watts
Max. Plate Input	180	Watts

Direct Interelectrode Capacitances:*

Grid to Plate	0.20	μμf. Max.
Input	6.5	μμf.
Output	2.4	μμf.

** Unshielded, but with base shell and unconnected pin grounded.*

PHYSICAL SPECIFICATIONS

Style	Lock-In
Base	Lock-In 8-Pin
Dimensions	See Next Page
Mounting Position	Vertical

BASE PIN CONNECTIONS

Pin 1 - Control Grid
Pin 2 - Filament
Pin 3 - No Connection
Pin 4 - Screen Grid & Shield
Pin 5 - Control Grid
Pin 6 - Screen Grid & Shield
Pin 7 - Filament
Pin 8 - Screen Grid & Shield
Cap - Plate

RMA Basing

TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS

RF Power Amplifier and Oscillator - Class C Telegraphy

	CCS	CCS	
Filament Voltage	6.3	6.3	Volts
Filament Current	3.0	3.0	Amperes
Plate Voltage DC	1500	2000	Volts
Screen Grid Voltage	375	375	Volts
Control Grid Voltage	-300	-300	Volts
Plate Current DC	90	90	Ma.
Screen Grid Current DC	22	20	Ma.
Control Grid Current DC	10	10	Ma.
Peak RF Input Signal (approx.)	400	400	Volts
Total Grid Driving Power⊙	4.0	4.0	Watts
Power Output	105	140	Watts
Amplification Factor	50	50	

⊙ With a grid resistor of 30,000 ohms, the grid requires 1 watt driving power and there is a loss of 3.0 watts in the grid resistor.

CIRCUIT APPLICATION

Sylvania Type 3D24 is a high-efficiency, air cooled tetrode designed for use in small compact transmitters where space and weight saving are important. The use of a short T12 bulb on a Lock-In header gives short leads and improved high-frequency performance.

from RMA release #576, April 2, 1947

MARCH 24, 1947 COMMERCIAL ENGINEERING DEPT.
Sylvania Electric Products Inc., Emporium, Pennsylvania
PRINTED IN U.S.A.

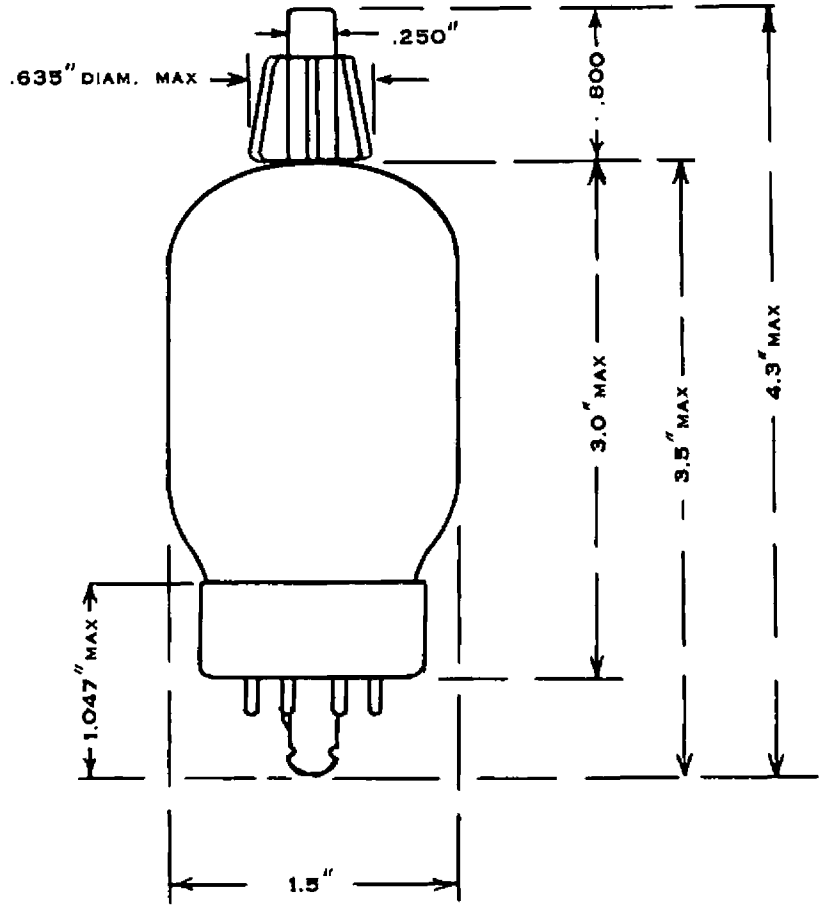
CIRCUIT APPLICATION *(continued)*

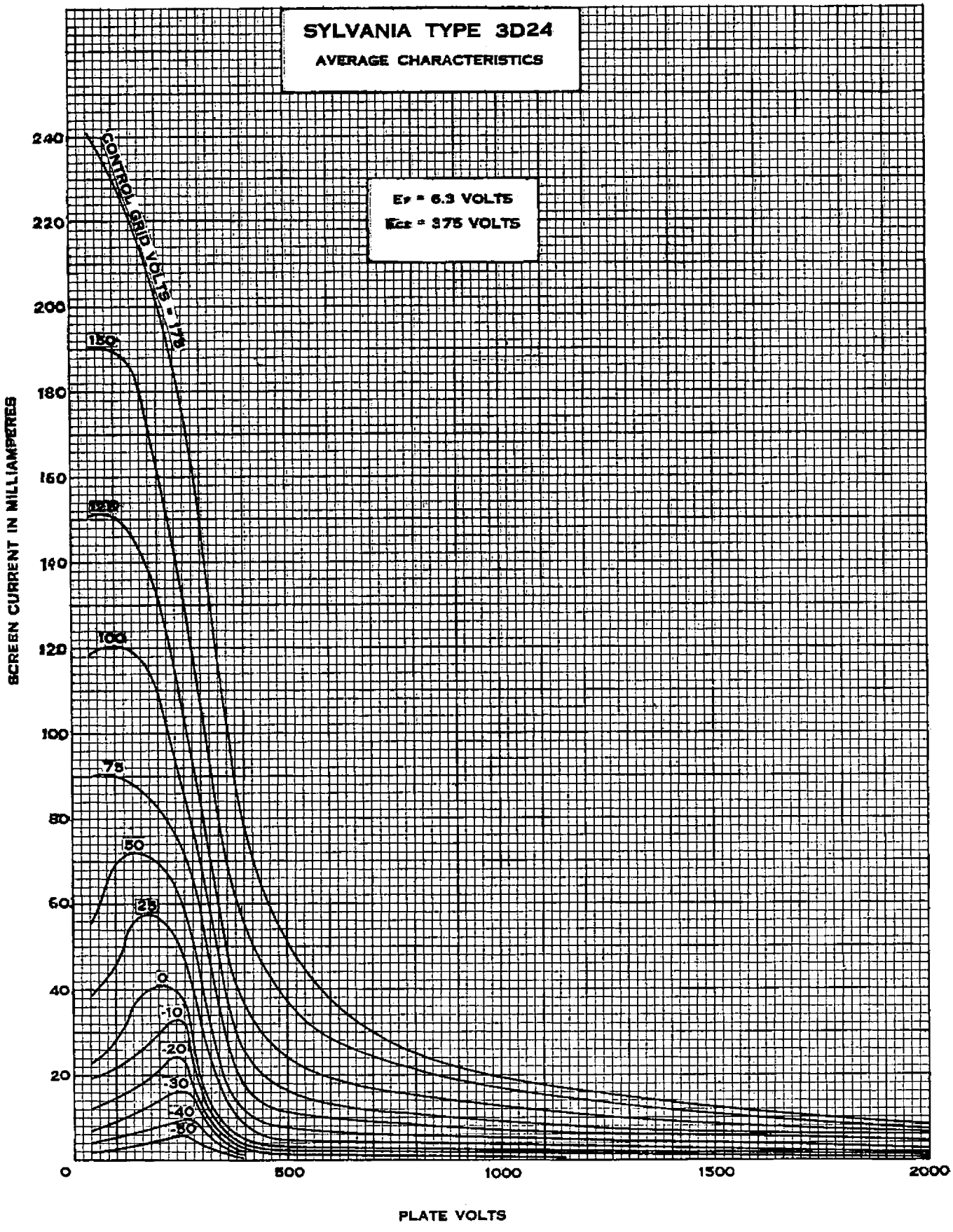
In order to get such a high rating in this small size, great care has been used in the choice of materials. The plate is graphite with a coating of zirconium to make a getter deposit on the bulb unnecessary. A special top cap which includes an external radiator connected directly to the plate is used. The emitter is thoriated tungsten requiring good regulation of the supply voltage. High frequency performance is obtained by the use of vertical bar type grids, the Lock-In construction and high-conductivity Kovar leads. Full ratings may be used up to 125 mc.

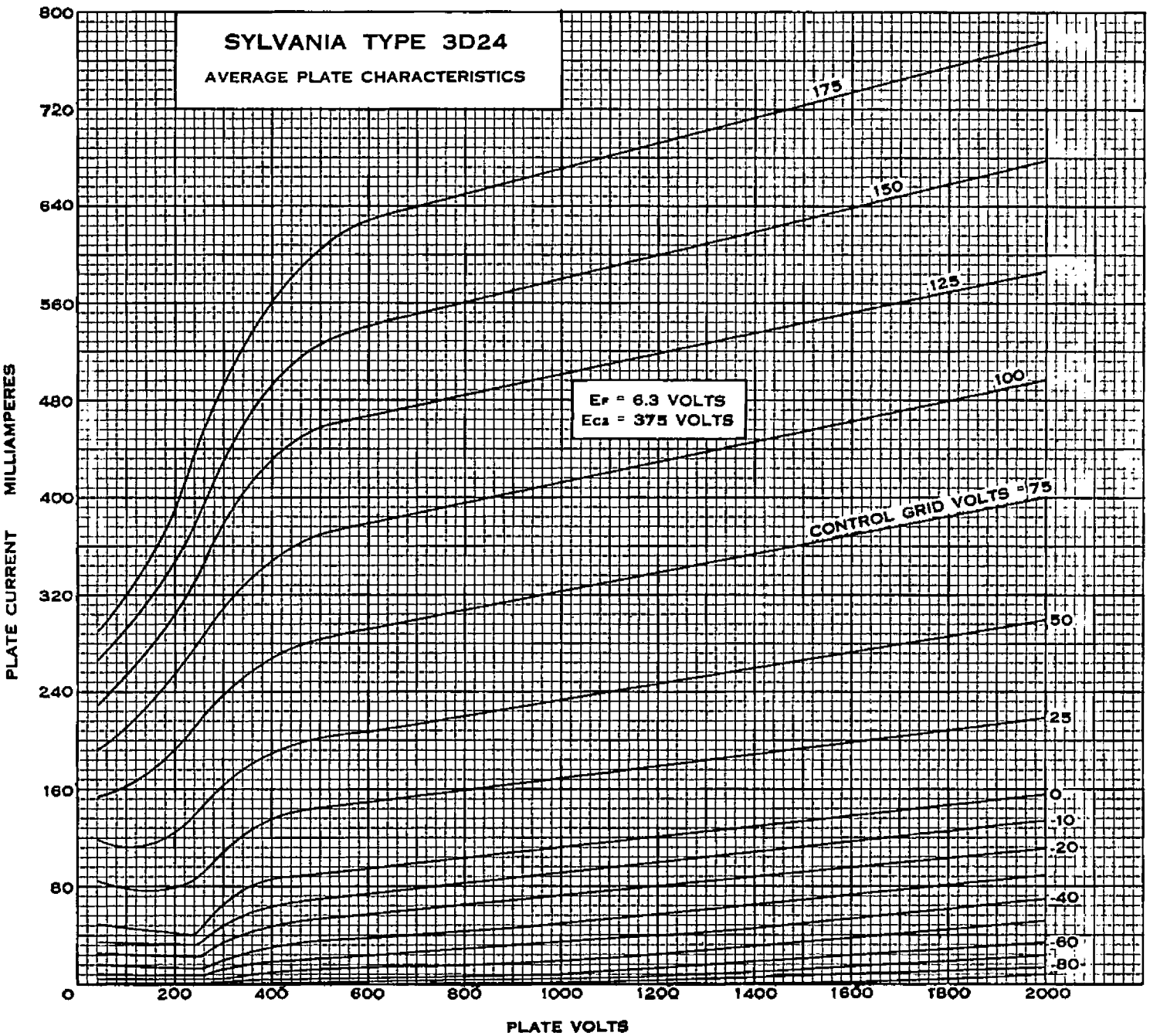
There are a few precautions to be observed in designing equipment to use the Sylvania Type 3D24; a ceramic socket is essential as the high operating temperature will soften the usual socket materials. Do not try to solder to the tube pins or remove the top cap.

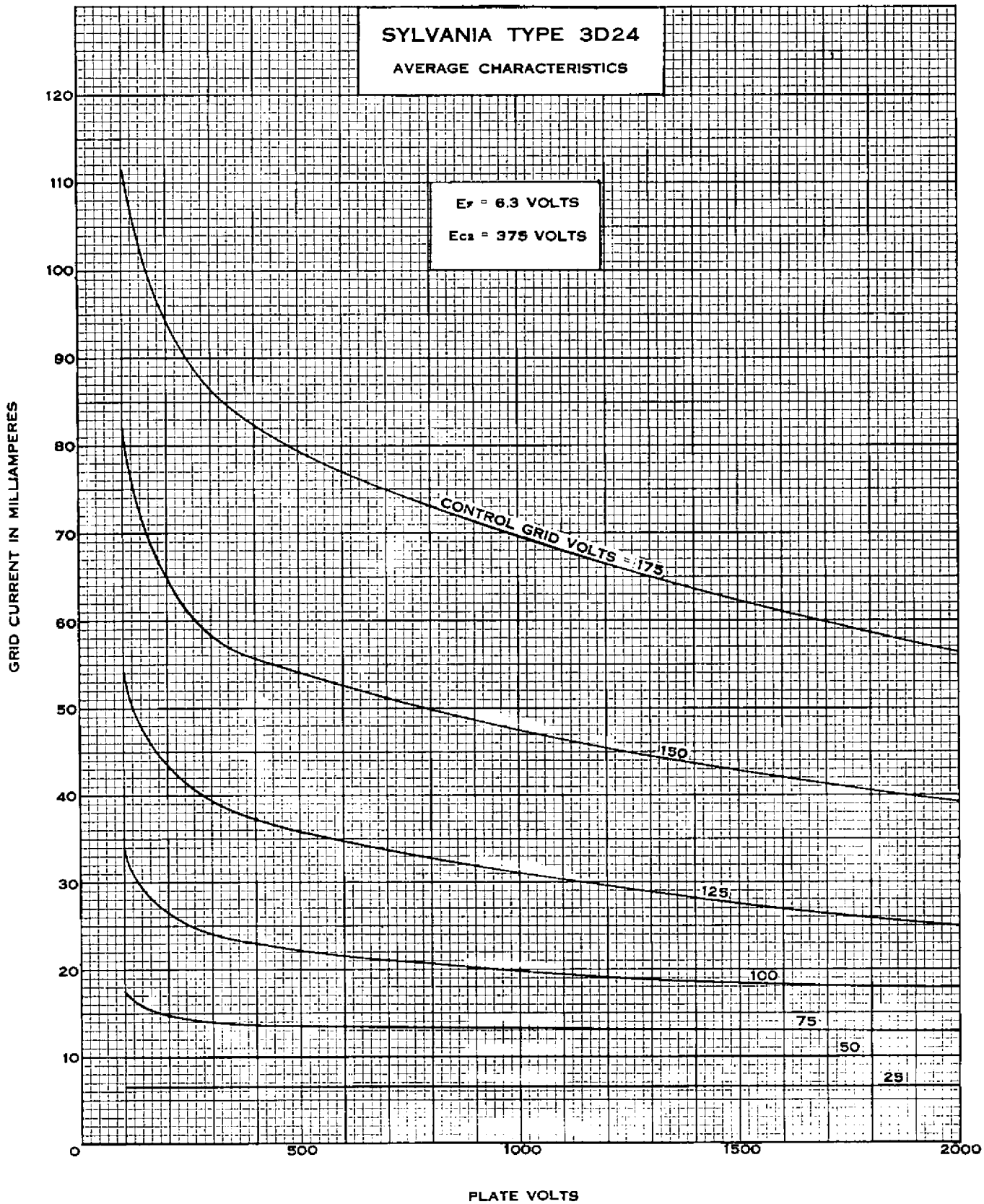
When adjusting equipment, it is suggested that the plate voltage be reduced as the high output is based on use in carefully adjusted circuits. An improperly adjusted circuit would increase the plate dissipation greatly and soon cause damage to the tube.

OUTLINE DRAWING




SYLVANIA TYPE 3D24
AVERAGE CHARACTERISTICS
Ef = 6.3 VOLTS
Ec2 = 375 VOLTS
CONTROL GRID VOLTS = +75
150
125
100
75
50
25
0
-10
-20
-30
-40
-50
SCREEN CURRENT IN MILLIAMPERES
240
220
200
180
160
140
120
100
80
60
40
20
0
500
1000
1500
2000
PLATE VOLTS


SYLVANIA TYPE 3D24
AVERAGE PLATE CHARACTERISTICS
Ef = 6.3 VOLTS
Ec2 = 375 VOLTS
CONTROL GRID VOLTS
175
150
125
100
75
50
25
0
-10
-20
-40
-60
-80
800
720
640
560
480
400
320
240
160
80
0
200
400
600
800
1000
1200
1400
1600
1800
2000
PLATE CURRENT MILLIAMPERES
PLATE VOLTS


SYLVANIA TYPE 3D24
AVERAGE CHARACTERISTICS
Ef = 6.3 VOLTS
Ec2 = 375 VOLTS
CONTROL GRID VOLTS = 175
150
125
100
75
50
25
GRID CURRENT IN MILLIAMPERES
120
110
100
90
80
70
60
50
40
30
20
10
0
500
1000
1500
2000
PLATE VOLTS

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 3E5

BEAM PENTODE

MECHANICAL DATA

Style	miniature
Cathode	coated filament
Bulb	T-5 1/2
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Maximum Diameter	3/4 inch
Maximum Overall Length	2 1/8 inches
Maximum Sealed Height	1 7/8 inches
Basing	6BX-0-0

Pin Connections:

Pin 1 .. negative filament (series connection)
Pin 2 .. plate
Pin 3 .. grid #2
Pin 4 .. no connection
Pin 5 .. negative filament (parallel connection), beam plates
Pin 6 .. grid #1
Pin 7 .. positive filament

Mounting Position ..... any

ELECTRICAL DATA

RATINGS -- *Design Center Values*

	Parallel Filaments	*Series Filaments*	
Filament Voltage(1)	1.4	2.8	volts
Maximum Plate Voltage (dc)	110	110	volts
Maximum Grid #2 Voltage (dc)	110	110	volts
Maximum Cathode Current	8	4(2)	volts

CHARACTERISTICS AND TYPICAL OPERATION

	Parallel Filaments		*Series Filaments*		
Filament Voltage	1.4	1.4	2.8	2.8	volts
Filament Current	50	50	25	25	milliamps
Plate Voltage (dc)	67.5	90	67.5	90	volts
Grid #2 Voltage (dc)	67.5	90	67.5	90	volts
Grid #1 Voltage (dc)	-5.0	-8.0	-5.0	-8.0	volts
Plate Current	5.0	6.0	4.5	5.5	milliamps
Grid #2 Current	1.0	1.5	1.0	1.5	milliamps
Plate Resistance	120,000	140,000	110,000	120,000	ohms
Transconductance	1,300	1,200	1,200	1,100	micromhos
Peak Signal Voltage (af)	5.0	8.0	5.0	8.0	volts
Load Resistance	7,000	8,000	7,000	8,000	ohms
Total Harmonic Distortion	7.5	9.5	10.5	11.0	per cent
Power Output	100	200	90	175	milliwatts

(1) For power-line operation the filament voltage is centered at 1.4 or 2.8 volts respectively with parallel or series filaments for normal line voltage (117 volts).

(2) Each 1.4 volt filament section. (Shunting resistor across negative section of filament is necessary to limit current to value shown.)

TECHNICAL DATA

3J22

Sylvania

T E N T A T I V E

Type 3J22

Pulse Type Magnetron

Non-Integral Magnetization, Removable Cavity

PHYSICAL SPECIFICATIONS

Cathode: Coated Unipotential
Dimensions: As Per Outline
Mounting Position: Any
Cooling: Convection

ELECTRICAL CONNECTIONS

Flat Disc:	Anode
Pin Terminals:	Heater & Cathode
Threaded Disc:	Output Flange

from RMA release # 520, Sept. 16, 1946

Ratings and Characteristics

Heater Voltage (ac or dc)	6.3	V
Heater Current	1.5	A
Minimum Cathode Heating Time	300	sec
Maximum Peak Anode Voltage	2000	v
Maximum Peak Anode Current	1.0	a
Maximum Peak Input Power	125	w
Maximum Duty Cycle	0.10	
Maximum Pulse Duration	5.0	us
Maximum Anode Temperature	100°	C
Maximum Operating Frequency	4950	Mc
Minimum Operating Frequency	4300	Mc
Maximum Magnetic Field Strength	H = 1100	gauss
Minimum Magnetic Field Strength	H = 1050	gauss

Typical Operating Conditions and Characteristics*

Starting Heater Voltage (ac cr dc)	6.3	V
Operating Heater Voltage (ac or dc)	Note 1	V
Peak Anode Voltage	1850	v
Peak Anode Current	0.6	a
Average Anode Current	60	ma
Peak Power Output	80	w
Minimum Average Power Output	6.0	w
Pulse Duration	4.0	us
Pulse Repetition Rate	25,000	pps

*Measured in external cavity with dimensions of 3 inches inside diameter and 0.312 inches inside height.

Note 1: Reduce Heater voltage after 15 seconds to the following value:

$$Ef = 6.3\ (1-Po)$$

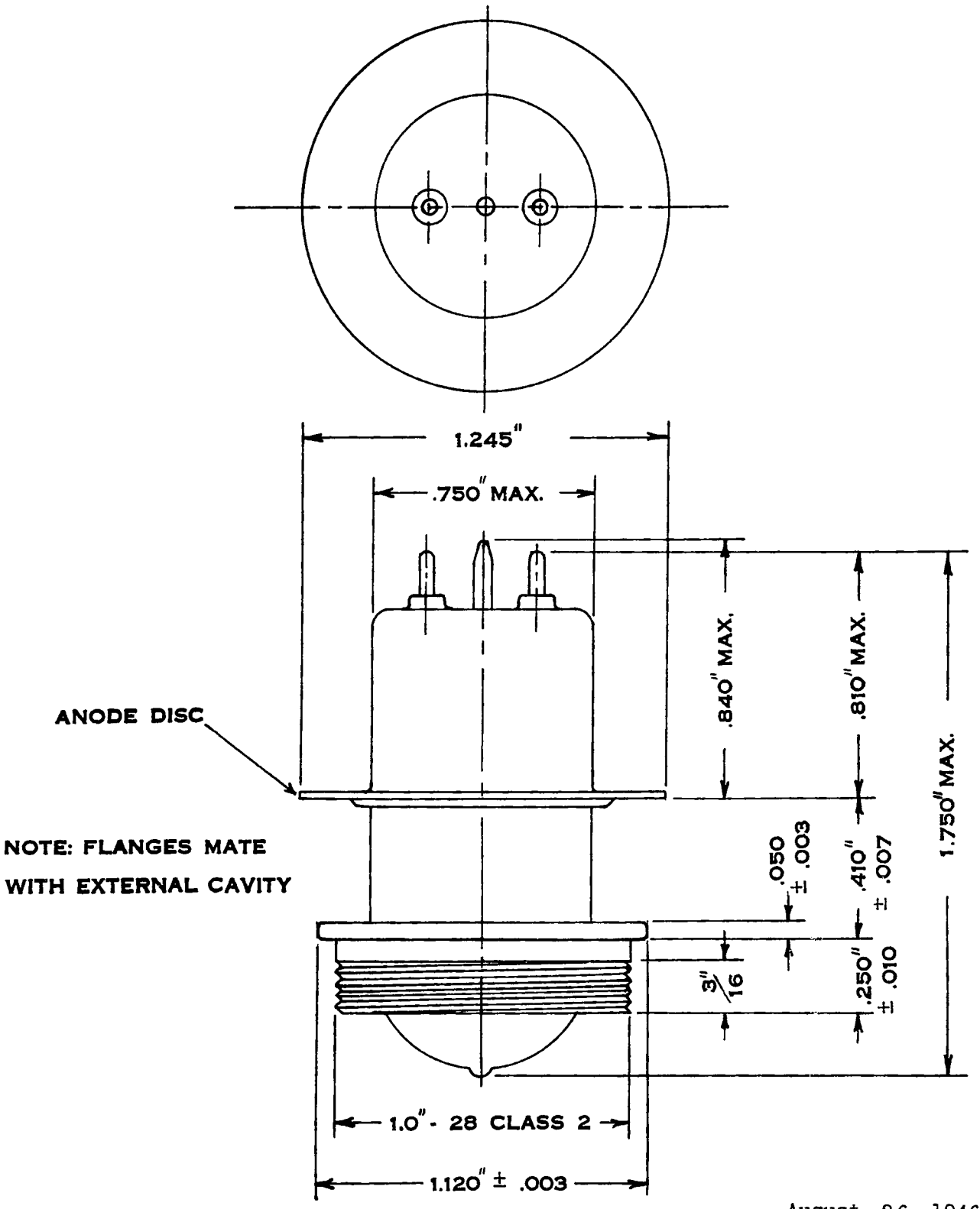
56

Type 3J22 is provided with tuning screws to cover the tuning range and a loop for coupling to the cavity.

SYLVANIA ELECTRIC PRODUCTS INC.

OUTLINE DRAWING

TYPE 3J22



August 26 1946

TECHNICAL DATA

3J31

Sylvania

T E N T A T I V E

TYPE 3J31

Pulse Type Magnetron

External Magnet

PHYSICAL SPECIFICATIONS

Cathode: Coated Unipotential

Dimensions: As Per Outline

Mounting Position: Any

Cooling: Forced Air

Finish: Metal Surface to be Painted Except for Back Surface of Base Plate and Wave Guide Surface of Output Flange.

Ratings and Characteristics

Heater Voltage (ac or dc)	6.0 ± 0.5	V
Heater Current	1.9 ± 0.2	A
Minimum Cathode Heating Time	120	sec
Maximum Peak Anode Voltage	16	kv
Maximum Peak Anode Current	16	a
Maximum Peak Input Power	225	kw
Maximum Average Input Power	105	W
Maximum Duty Cycle*	0.0006	
Maximum Anode Temperature	125°	C
Maximum Operating Frequency	24,176	Mc
Minimum Operating Frequency	23,792	Mc
Maximum Frequency Pulling (VSWR = 1.5)	30	Mc
Maximum Magnetic Field Strength	8,000	H

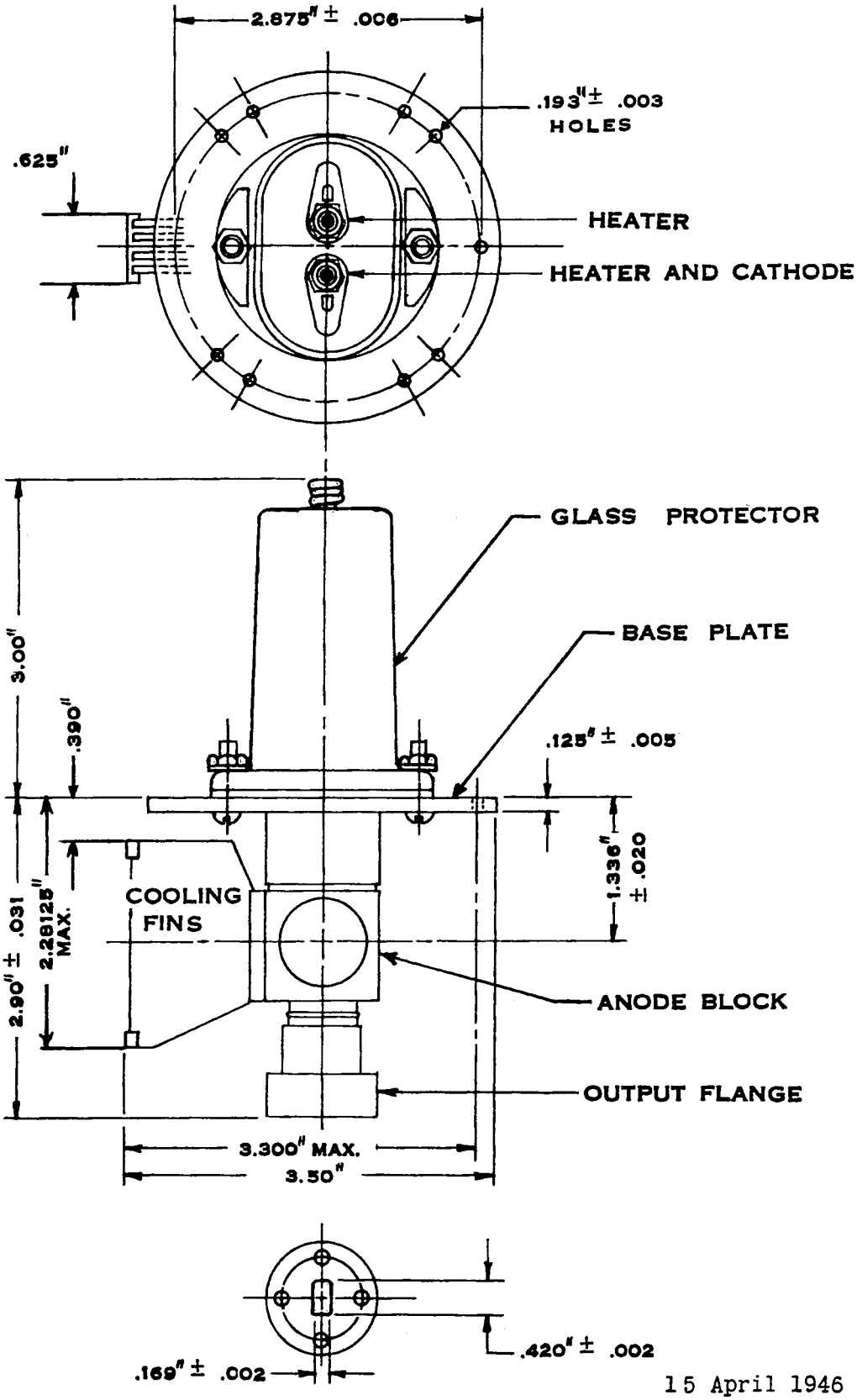
Typical Operating Conditions and Characteristics

Heater Voltage (ac or dc) (to start)	6.0	V
Heater Voltage (ac or dc) (to run)	1.3	V
Peak Anode Voltage	13.75	kv
Peak Anode Current	12.0	a
Average Anode Current	7.0	mAdc
Peak Power Output	40	kw
Minimum Average Power Output	15.0	W
Pulse Duration	0.25	us
Pulse Repetition Rate	2000	pps
Magnetic Field Strength (Internal)	7600	H

* In any 100 microsecond interval, the tube shall not be operated longer than 1.0 microsecond.

from RMA release # 498, May 15, 1946

SYLVANIA ELECTRIC PRODUCTS INC.
OUTLINE DRAWING
TYPE 3J31



15 April 1946

SYLVANIA

engineering data service

SYLVANIA
3JP1
3JP7
3JP12

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic
Phosphor	P1
Fluorescence	Green
Persistence	Medium
Faceplate	Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 ±10% Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	8 μμf
Grid No. 1 to All Other Electrodes	8 μμf
Between Deflecting Plates 1-2[1]	2.5 μμf
Between Deflecting Plates 3-4[1]	2 μμf
Deflecting Plate 1[1] to All Other Electrodes	8 μμf
Deflecting Plate 2[1] to All Other Electrodes	7 μμf
Deflecting Plate 3[1] to All Other Electrodes	7 μμf
Deflecting Plate 4[1] to All Other Electrodes	8 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	2¾ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14J

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 3 Voltage	4,400 Volts dc
Anode No. 2 Voltage	2,200 Volts dc
Anode No. 1 Voltage	1,100 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	220 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	140 Volts
Heater Positive with Respect to Cathode	140 Volts
Peak Voltage Between Anode No. 2 And Any Deflecting Plate	550 Volts

TYPICAL OPERATING CONDITIONS

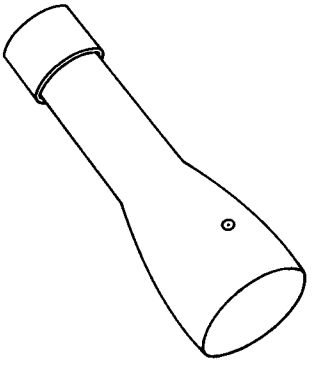
Anode No. 3 Voltage[2]	3,000 Volts dc
Anode No. 2 Voltage[3]	1,500 Volts dc
Anode No. 1 Voltage	300 to 515 Volts dc
Grid No. 1 Voltage Required for Cutoff[4]	−22.5 to 67.5 Volts dc
Deflection Factor[5, 6]	
Deflecting Plates 1-2[7]	127-173 Volts dc/Inch
Deflecting Plates 3-4[8]	94-128 Volts dc/Inch

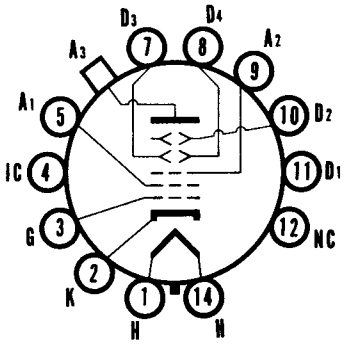
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5.0 Megohms Max.

QUICK REFERENCE DATA

Special Purpose Tube
3" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Post Deflection Accelerator





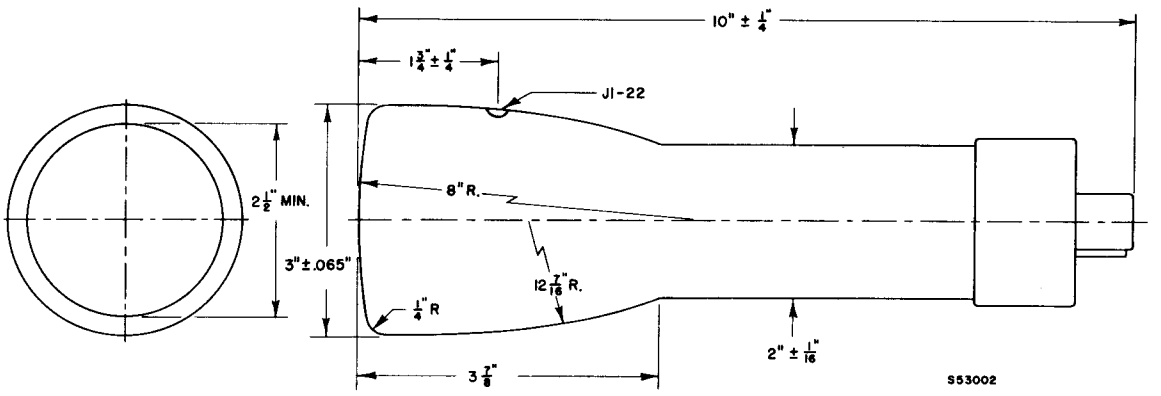
14-J

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JULY, 1957

NOTES:

1. *Positive voltage on Pin No. 1 will deflect spot approximately toward Pin No. 5. Positive voltage on Pin No. 7 will deflect spot approximately toward Pin No. 2.*
2. *Anode No. 3 voltage should not be less than 3,000 volts for high speed scanning.*
3. *Recommended minimum value of Anode No. 2 Voltage.*
4. *Visual extinction of undeflected focused spot.*
5. *The plane through the tube axis and each of the following items may vary from the trace produced by Deflecting Plates 1-2 by the following angular tolerances measured about the tube axis; Pin 5 10 degrees; cap (on same side of tube as Pin 5) 10 degrees.*
6. *Angle between D1-D2 trace and D3-D4 trace is 90° ± 3°.*
7. *Deflecting Plates 1-2 are nearer the screen.*
8. *Deflecting Plates 3-4 are nearer the base.*



3JP7

The Type 3JP7 is identical to the Type 3JP1 except it has a phosphor of blue-white fluorescence, yellow phosphorescence, and long persistence.

3JP12

The Type 3JP12 is identical to the Type 3JP1 except it has an orange phosphor of Medium Long persistence.

SYLVANIA

engineering data service

SYLVANIA
3KP1
3KP*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic

Types*	Fluorescence	Phosphorescence	Persistence
3KP1	Green	——	Medium
3KP4	White	——	Short to Medium
3KP7	Blue-White	Yellow	Long
3KP11	Blue	——	Short
3KP16	Violet & Near Ultraviolet	——	Extremely Short

Faceplate	Clear, Spherical

*In addition to the types shown, the 3KP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

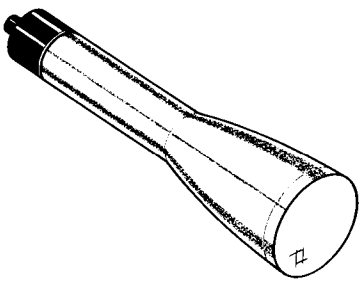
Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Ampere
Direct Interelectrode Capacitances (Approx.)	
Grid No. 1 to All Other Electrodes	8 $\mu\mu$f
Between Deflecting Plates 1-2	2.5 $\mu\mu$f
Between Deflecting Plates 3-4	2.5 $\mu\mu$f
Deflecting Plate 1 to All Other Electrodes	11 $\mu\mu$f
Deflecting Plate 2 to All Other Electrodes	8 $\mu\mu$f
Deflecting Plate 3 to All Other Electrodes	7 $\mu\mu$f
Deflecting Plate 4 to All Other Electrodes	8 $\mu\mu$f

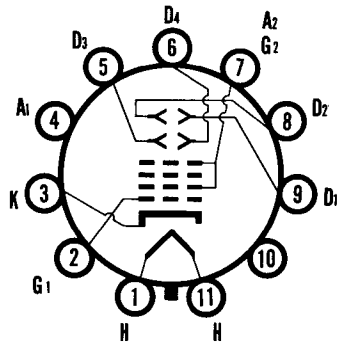
MECHANICAL DATA

Minimum Useful Screen Diameter	2¾ Inches
Bulb	J24N
Base (Medium Shell Magnal 11-Pin)	B11-66
Basing	11M
Base Alignment	
D3-D4 Trace Aligns with Pin No. 1 and Tube Axis	± 10 Degrees
Positive Voltage on D1 Deflects Beam Approx. Toward Pin No. 4	
Positive Voltage on D3 Deflects Beam Approx. Toward Pin No. 1	
Angle Between D1-D2 and D3-D4 Traces	90 ± 3 Degrees
Weight (Approx.)	¾ Pound

QUICK REFERENCE DATA

3" Direct Viewed
Round Glass Type
Clear, Spherical Faceplate
Electrostatic Deflection
Electrostatic Focus





11-M

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

MARCH, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage[1]	2750 Volts dc
Anode No. 1 Voltage (Focusing Electrode)	1100 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	220 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	140 Volts
Heater Positive with Respect to Cathode	140 Volts
Peak Voltage Between Anode No. 2 and Any Deflecting Plate	550 Volts

TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage[2]	2000 Volts dc
Anode No. 1 Voltage for Focus	320 to 600 Volts dc
Grid No. 1 Voltage Required for Cutoff[3]	−38 to −90 Volts dc
Deflection Factor	
Deflecting Plates 1-2[4]	100 to 136 Volts dc/Inch
Deflecting Plates 3-4[5]	76 to 104 Volts dc/Inch
Spot Position (Focused, Undeflected)[6]	Within a Circle of 7.5 mm Radius concentric with the center of the face

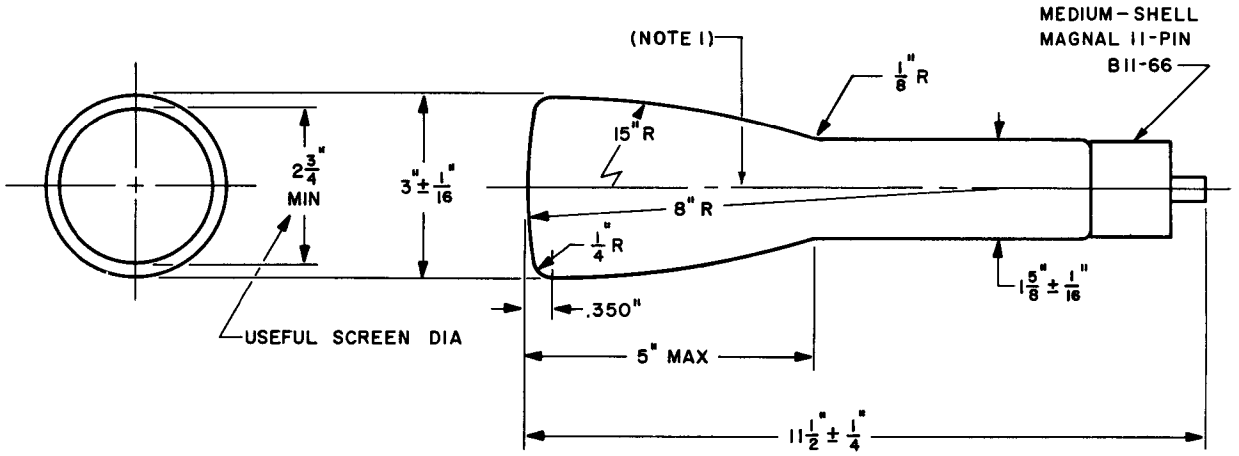
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Resistance in any Deflecting Electrode Circuit[7]	5.0 Megohms Max.

NOTES:

1. *Anode No. 2 power input should be limited to 6 watts.*
2. *Brilliance and definition decrease with decreasing Anode No. 2 Voltage. Recommended minimum for Type 3KP1 is 1000 volts. Recommended minimum for Types 3KP4, 3KP7, 3KP11 and 3KP16 is 1500 volts.*
3. *Visual extinction of undeflected focused spot.*
4. *Deflecting Plates D1-D2 are nearer the screen.*
5. *Deflecting Plates D3-D4 are nearer the base.*
6. *With tube shielded and all deflection plates connected to Anode No. 2.*
7. *It is recommended that deflecting electrode circuit resistances be approximately equal.*

OUTLINE



S 58060

DIAGRAM NOTE:

1. *Centerline of bulb will not deviate more than ± 2 degrees in any direction from perpendicular erected at center of bottom of base.*

RMA RELEASE #250

July 18, 1940

HYGRADE SYLVANIA CORPORATION
TECHNICAL DATA
SYLVANIA TYPE 3LE4
Power Amplifier

Physical Specifications

Coated Filament with Center Tap connected to Pin #7.

Base	Lock-in 8-Pin
Bulb	T-9
Maximum Diameter	1 3/16"
Maximum Overall Length	2 25/32"
Maximum Seated Height	2 1/4"
Pin Connections	RMA Basing No. 6BA-L-0

Pin 1 - Filament (Positive)
Pin 2 - Plate
Pin 3 - Grid #2 (Screen)
Pin 4 - No Connection
Pin 5 - No Connection
Pin 6 - Grid #1 (Control)
Pin 7 - Negative Filament and G_3 (Parallel)
Pin 8 - Negative Filament (Series)

Mounting Position — Any

Ratings

	Series Filament+	Parallel Filament *	
Maximum Filament Voltage			
Battery Operation - Voltage must never Exceed	3.2	1.6	Volts
AC/DC Power Line Operation - Design Center	2.6	1.3	Volts
Maximum Plate Voltage	110	110	Volts
Maximum Screen Voltage	110	110	Volts
Maximum Cathode Current	6.5+	13	ma

Typical Operating Conditions and Characteristics Amplifier Class A_1

	Series Filament +	Parallel Filament *	
Filament Voltage	2.8dc	1.4 dc	Volts
Filament Current	0.050	0.100	Ampere
Plate Voltage	90	90	Volts
Screen Voltage	90	90	Volts
Grid Voltage	-9	-9	Volts
Peak Signal Voltage	9	9	Volts
Plate Current	9.0	10.0	ma
Screen Current	1.8	2	ma
Transconductance	1600	1750	umhos
Plate Resistance	110,000	100,000	Ohms
Load Resistance	6,000	6,000	Ohms
Total Harmonic Distortion	11	11	Per Cent
Power Output	300	325	Milliwatts

* For Parallel Filament Operation connect Pins #1 and #8 to positive voltage supply and pin #7 to negative voltage supply.

\+ A resistor of 250 ohms must be used in parallel with the negative section of the filament (Pins 7 and 8) in order to insure that the value of 6.5 ma total cathode current for each 1.4 volt section of the filament is not exceeded.

For interpretation of ratings, refer to Receiving Tube Rating Sheet

SYLVANIA

engineering data service

SYLVANIA
3MP1
3MP*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic
Type*	3MP1
Fluorescence	Green
Phosphorescence	——
Persistence	Medium
Faceplate	Clear, Spherical

*In addition to the type shown, the 3MP- can be supplied with several other screen phosphors

ELECTRICAL DATA

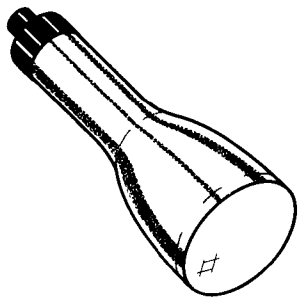
Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	2.2 μμf
Grid to All Other Electrodes	10.3 μμf
Between Deflecting Plates 1-2	1.3 μμf
Between Deflecting Plates 3-4	1.2 μμf
Deflecting Plate 1 to All Other Electrodes Except D2	4.4 μμf
Deflecting Plate 2 to All Other Electrodes Except D1	5.6 μμf
Deflecting Plate 3 to All Other Electrodes Except D4	5.0 μμf
Deflecting Plate 4 to All Other Electrodes Except D3	4.5 μμf

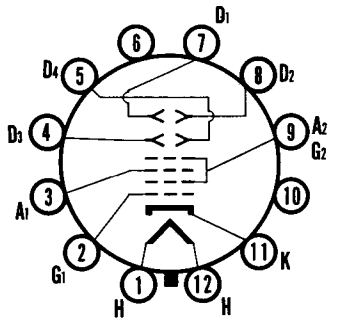
MECHANICAL DATA

Minimum Useful Screen Diameter	2¾ Inches
Bulb	J24P
Base (Small Shell Duodecal 12-Pin)	B12-43
Basing	12F
Base Alignment	
D1-D2 Trace Aligns with Pin No. 4 and Tube Axis	±10 Degrees
Positive Voltage on D1 Deflects Beam Approx. Toward Pin No. 4	
Positive Voltage on D3 Deflects Beam Approx. Toward Pin No. 1	
Angle Between D1-D2 and D3-D4 Traces	90±3 Degrees
Weight (Approx.)	½ Pound

QUICK REFERENCE DATA

Oscilloscope Tube
3" Direct Viewed
Round Glass Type
Clear, Spherical Faceplate
Electrostatic Focus
Electrostatic Deflection





12-F

SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

MARCH, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	2750 Volts dc
Anode No. 1 Voltage (Focusing Electrode)	1100 Volts dc
Grid Voltage	
Negative Bias Value	220 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	140 Volts
Heater Positive with Respect to Cathode	140 Volts
Peak Voltage Between Anode No. 2 and	
Any Deflection Plate	550 Volts

TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage[1]	2000 Volts dc
Anode No. 1 Voltage for Focus	400 to 700 Volts dc
Grid Voltage Required for Cutoff[2]	0 to −126 Volts dc
Deflection Factor	
Deflection Plates 1-2[3]	230 to 290 Volts dc/Inch
Deflecting Plates 3-4[4]	220 to 280 Volts dc/Inch

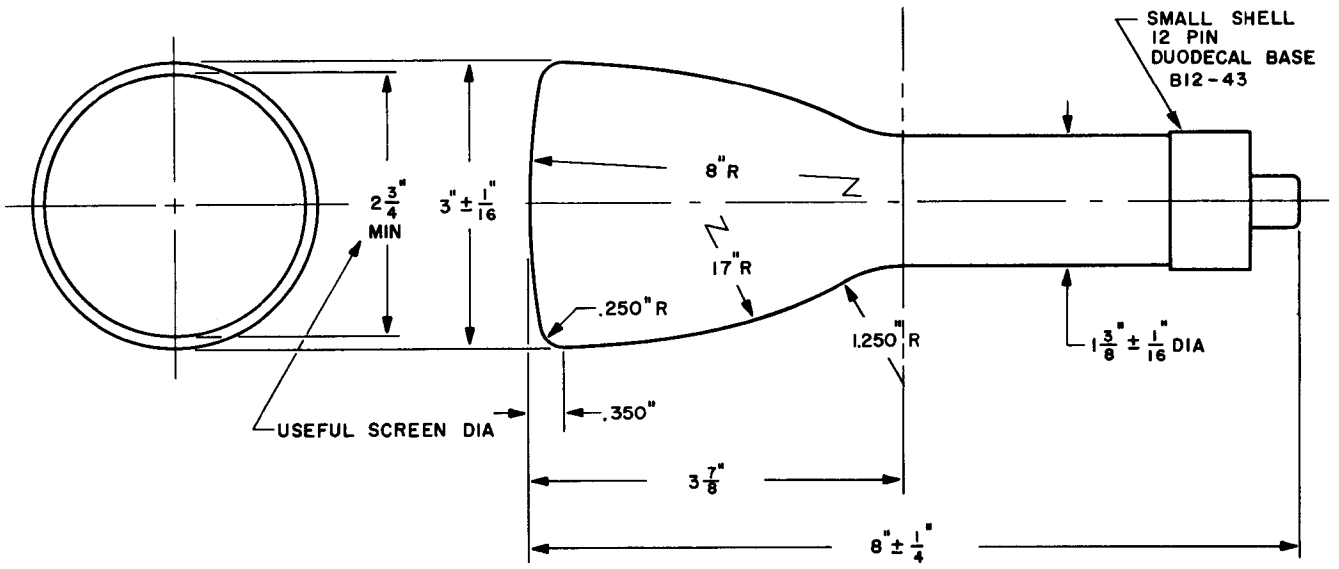
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance[5]	5.0 Megohms Max.

NOTES:

1. *Brilliance and definition decreases with decreasing Anode No. 2 Voltage. In general, Anode No. 2 Voltage should not be less than 1000 Volts.*
2. *Visual extinction of undeflected focused spot.*
3. *Deflecting Plates D1 and D2 are nearer the screen.*
4. *Deflecting Plates D3 and D4 are nearer the base.*
5. *It is recommended that the deflecting electrode circuit resistances be approximately equal.*

OUTLINE



S 58061

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button, 7-Pin
Basing	7BA
Cathode	Coated Filament
Mounting Position	Any

ELECTRICAL DATA

FILAMENT CHARACTERISTICS

	Series	Parallel	
Filament Voltage			
Battery Operation	3.2	1.6 Volts	Abs. Max.
AC/DC Line Operation (Design Center)	2.6	1.3 Volts	Max.
Filament Voltage (DC)	2.8	1.4 Volts	
Filament Current	50	100 Ma	

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Control Grid to Plate	0.20 μμf	Max.
Input	5.5 μμf	
Output	3.8 μμf	

RATINGS (Design Center Values)

	Series Filament	Parallel Filament	
Plate Voltage	90	90 Volts	Max.
Screen Voltage	90	90 Volts	Max.
Cathode Current[1] (Zero Signal)	6	12 Ma	Max.

CHARACTERISTICS AND TYPICAL OPERATION

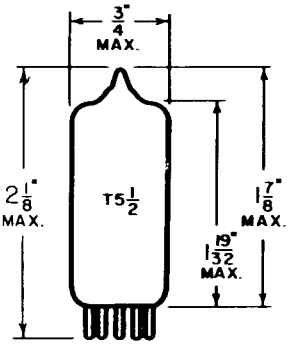
Class A_1 Amplifier	Series Filament	Parallel Filament	
Plate Voltage	90	85	90 Volts
Screen Voltage	90	85	90 Volts
Negative Grid Voltage	−4.5	−5	−4.5 Volts
Peak Signal Voltage	4.5	5	4.5 Volts
Zero Signal Plate Current	7.7	6.9	9.5 Ma
Zero Signal Screen Current	1.7	1.5	2.1 Ma
Transconductance	2000	1975	2150 μmhos
Load Resistance	10,000	10,000	10,000 Ohms
Total Harmonic Distortion	7	10	7 Percent
Maximum Signal Power Output	0.24	0.25	0.27 Watt

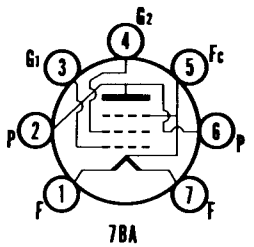
NOTE:

1. *When series filament connections are used a shunting resistor should be used across the negative filament section (pins 1 and 5) to limit cathode current to the value specified. If other tubes in a series filament string contribute to the filament current, another resistor should be connected between pins 1 and 7 to carry any excess current over the ratings.*

QUICK REFERENCE DATA

The Sylvania Type 3Q4 is a miniature power amplifier pentode designed for service in the output stage of portable equipment. The filament is center-tapped to permit operation from a 1.4 volt or 2.8 volt source. Except for basing, the Type 3Q4 is identical to the Type 3V4.





SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION

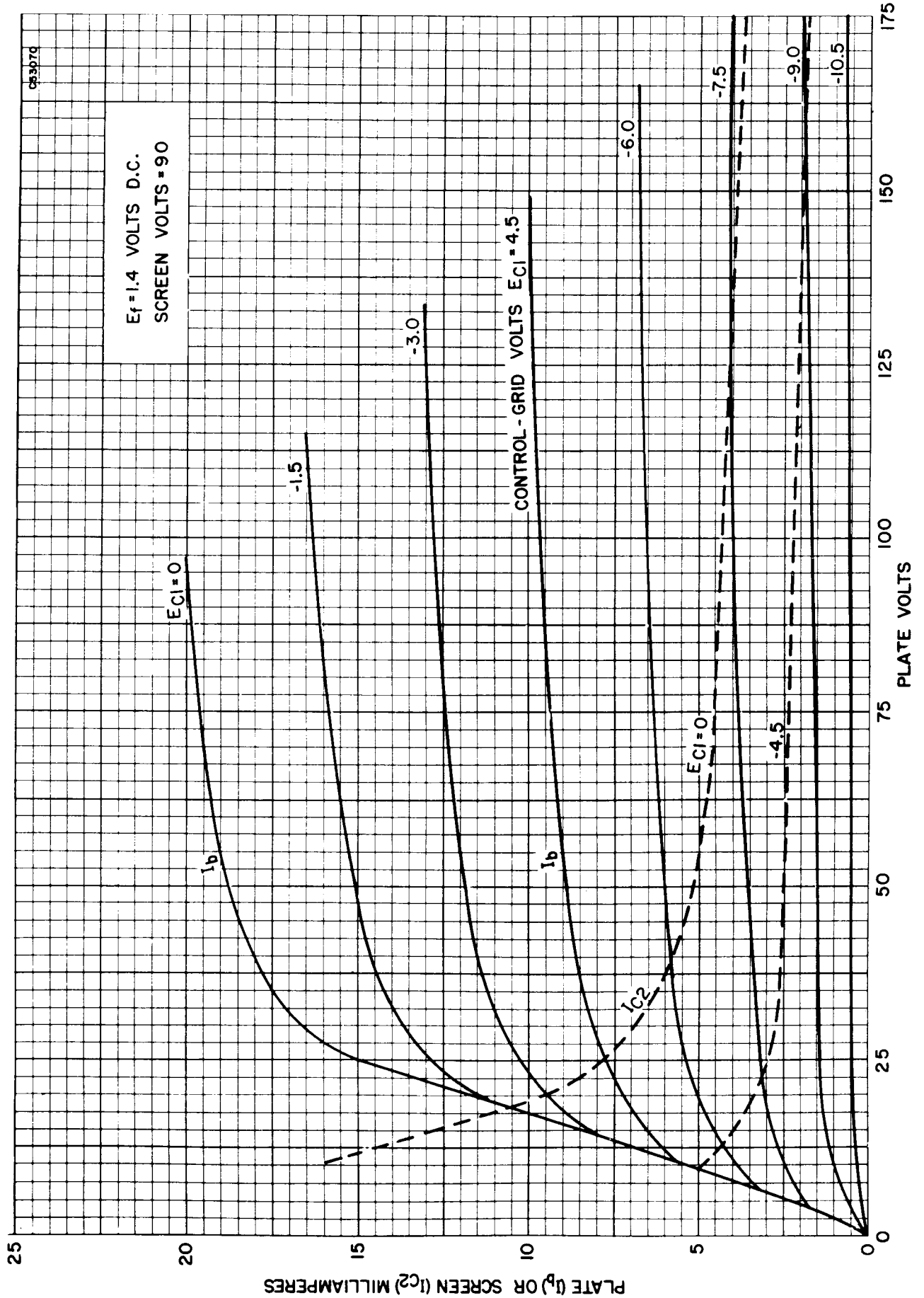
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

MARCH 1954

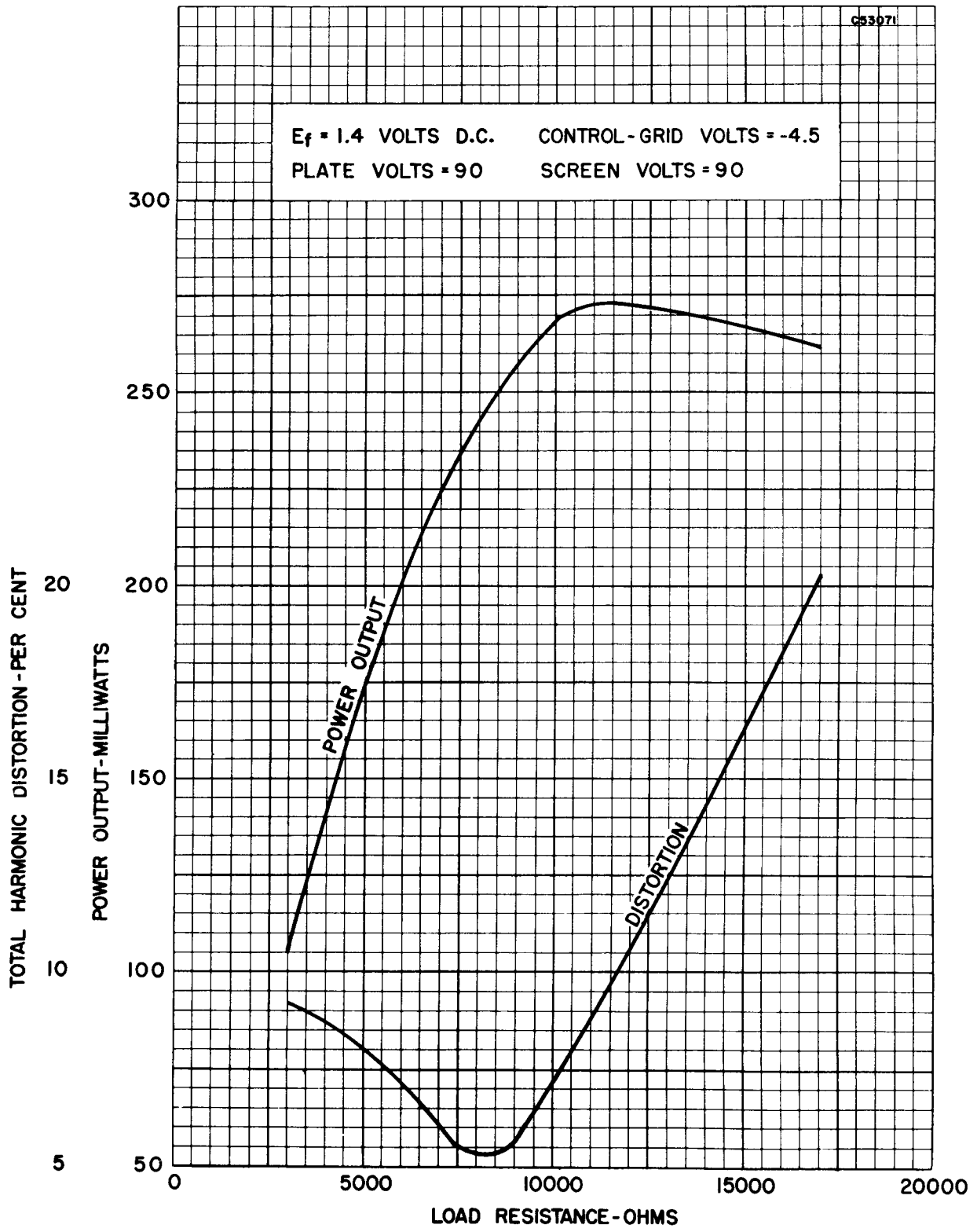
SYLVANIA

3Q4

AVERAGE PLATE CHARACTERISTICS



AVERAGE OPERATION CHARACTERISTICS



#239

HYGRADE SYLVANIA CORPORATION

SYLVANIA TYPE 3Q5G

Beam Power Amplifier

E. I. A. REGISTRATION FILE

Physical Specifications

Coated Filament with Center Tap Connected to Pin #8

Base	Small Shell Octal 7-Pin
Bulb	T-9
Maximum Diameter	1 3/16"
Maximum Overall Length	4"
Maximum Seated Height	3 7/16"
Pin Connections	RMA Basing No. 7AQ-0-0

Pin 1 - No Connection
Pin 2 - Positive Filament
Pin 3 - Plate
Pin 4 - Grid #2 (Screen)
Pin 5 - Grid #1 (Control)
Pin 7 - Negative Filament (Series)
Pin 8 - Negative Filament (Parallel) / Beam Plates

Mounting Position

Any

Ratings

	Series-Filament	Parallel-* Filament	
Maximum Filament Voltage Range			
Battery Operation - Voltage Must Never Exceed	3.2	1.6	Volts
AC/DC Power Line Operation - Design Center**	2.6	1.3	volts
Maximum Plate Voltage	110	110	volts
Maximum Screen Voltage	110	110	volts
Maximum Cathode Current	6#	12	ma

For each 1.4 volt section of the filament.

Typical Operating Conditions and Characteristics Amplifier Class A_1

	Series-Filament	Parallel-Filament	
Filament Voltage	2.8 dc	1.4 dc	volts
Filament Current	0.050	0.100	amp
Plate Voltage	90	90	volts
Screen Voltage	90	90	volts
Grid Voltage	-4.5	-4.5	volts
Peak Signal Voltage	4.5	4.5	volts
Plate Current	7.5	9.5	ma
Screen Current	1.0	1.6	ma
Transconductance	1800	2100	umhos
Plate Resistance (approx.)	0.1	0.1	megohm
Load Resistance	8000	8000	ohms
Total Harmonic Distortion	7.5	7.5	%
Power Output	250	270	milliwatts

* For Parallel Filament Operation connect Pins #2 and #7 to positive voltage supply and Pin #8 to negative voltage supply.

** The voltage across each 1.4 volt filament, or 1.4 volt section of filament must range between 1.25 and 1.40 volts when operating at the normal line voltage of 117 volts. These voltages must be in effect for each supply voltage for which the set is rated.

For interpretation of ratings, refer to Receiving Tube Rating Sheet.

4-1-40

SYLVANIA

engineering data service

SYLVANIA
3RP1
3RP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic
Phosphor	P1
Fluorescence	Green
Persistence	Medium
Faceplate	Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ±10% Ampere
Direct Interelectrode Capacitances (approx.)	
Grid to All Other Electrodes	8.5 μμf
Between Deflecting Plates 1-2	2.0 μμf
Between Deflecting Plates 3-4	2.0 μμf
Deflecting Plate 1[1] to All Other Electrodes	11.0 μμf
Deflecting Plate 2[1] to All Other Electrodes	8.0 μμf
Deflecting Plate 3[1] to All Other Electrodes	7.0 μμf
Deflecting Plate 4[1] to All Other Electrodes	8.0 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	2¾ Inches
Base (Small-Shell Duodecal 10-Pin)	B10-75
or (Small-Shell Duodecal 12-Pin)	B12-43
Basing	12E

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	2750 Volts dc
Anode No. 1 Voltage	1100 Volts dc
Grid Voltage	
Negative Bias Value	220 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	140 Volts
Heater Positive with Respect to Cathode	140 Volts
Peak Voltage Between Anode No. 2 and Any Deflection Plate	550 Volts

TYPICAL OPERATING CONDITIONS

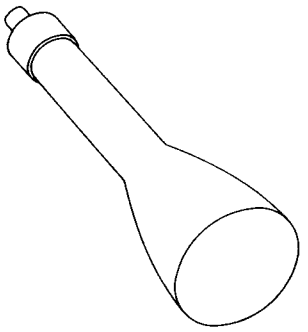
Anode No. 2 Voltage[2]	2000 Volts dc
Anode No. 1 Voltage for Focus	330 to 620 Volts dc
Maximum Grid Voltage Required for Cutoff[3]	−135 Volts dc
Deflection Factor[4, 5]	
Deflecting Plates 1-2[6]	146 to 198 Volts dc/Inch
Deflecting Plates 3-4[7]	104 to 140 Volts dc/Inch

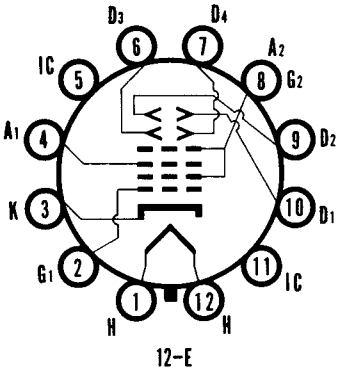
CIRCUIT VALUES

Grid Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5.0 Megohms Max.

QUICK REFERENCE DATA

Special Purpose Tube
3" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus





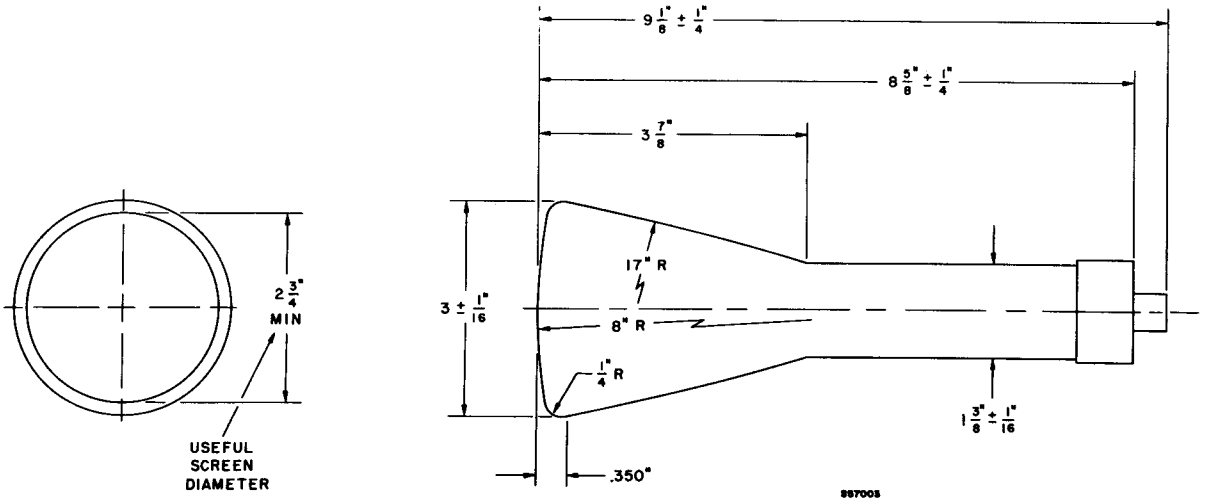
12-E

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JULY, 1957

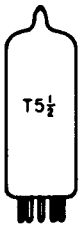
NOTES:

1. *Positive voltage on Pin No. 10 will move spot approximately in direction of Pin No. 4. Positive voltage on Pin No. 6 will move spot approximately in direction of Pin No. 1.*
2. *Brilliance and definition decrease with decreasing Anode No. 2 Voltage. In general, Anode No. 2 Voltage should not be less than 1500 volts.*
3. *Visual extinction of undeflected focused spot.*
4. *Angle between trace produced by plates D1-D2 and the plane through the tube axis and Pin No. 4 does not exceed 10°.*
5. *Angle between D1-D2 trace and D3-D4 trace is 90° ± 30.*
6. *Deflecting Plates 1-2 are nearer the screen.*
7. *Deflecting Plates 3-4 are nearer the base.*



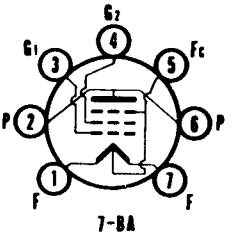
3RP4

The Sylvania Type 3RP4 is identical to the Type 3RP1 except it has a white phosphor of short to medium persistence.



SYLVANIA TYPE 3S4

PENTODE POWER AMPLIFIER



MECHANICAL DATA

Bulb	T-5 ½, Outline 5-2
Base	Miniature Button 7-Pin
Basing	7BA
Mounting Position	Any

ELECTRICAL DATA

FILAMENT CHARACTERISTICS

	Series	Parallel[1]
Filament Voltage D C	2.8	1.4 Volts
Filament Current	50	100 Ma

MAXIMUM RATINGS (Design Center Values)

	Series	Parallel[1]
Plate Voltage	90	90 Volts
Screen Voltage	67.5	67.5 Volts
Cathode Current (Zero Signal)[2]	6	12 Ma

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier	Series		Parallel[1]		
Plate Voltage	67.5	90	67.5	90	Volts
Grid No. 2 Voltage	67.5	67.5	67.5	67.5	Volts
Negative Grid Voltage	−7	−7	−7	−7	Volts
Peak Signal Voltage	7	7	7	7	Volts
Plate Current (Zero Signal)	6.0	6.1	7.2	7.4	Ma
Grid No. 2 Current (Zero Signal)	1.2	1.1	1.5	1.4	Ma
Transconductance	1400	1425	1550	1575	μmhos
Load Resistance	5000	8000	5000	8000	Ohms
Plate Resistance (approx.)	0.1	0.1	0.1	0.1	Megohm
Total Harmonic Distortion	12	13	10	12	Percent
Maximum Signal Power Output	160	235	180	270	Mw

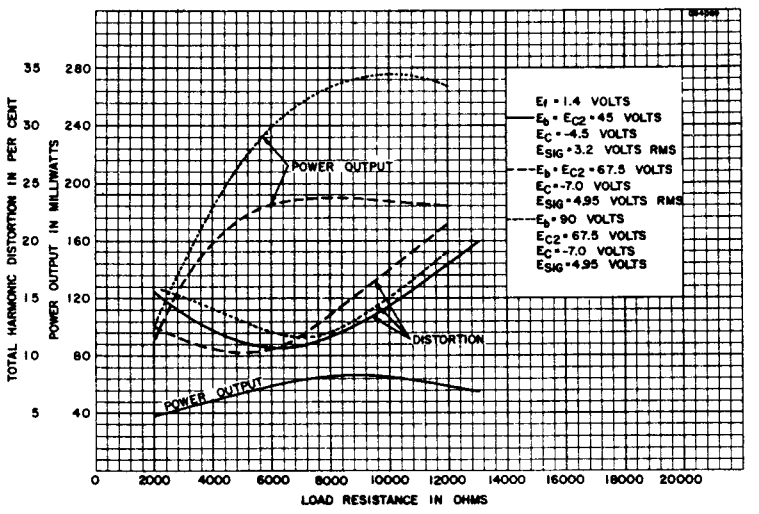
NOTES:

1. For parallel operation, tie pins 1 and 7. Negative end of filament connected to pin No. 5.
2. When series filament connections are used, a shunting resistor should be used across the negative filament section (pins 1 and 5) to limit cathode current to the value specified. If other tubes in a series filament string contribute to the filament current, another resistor should be connected between pins 1 and 7 to carry any excess current over the ratings.

APPLICATION

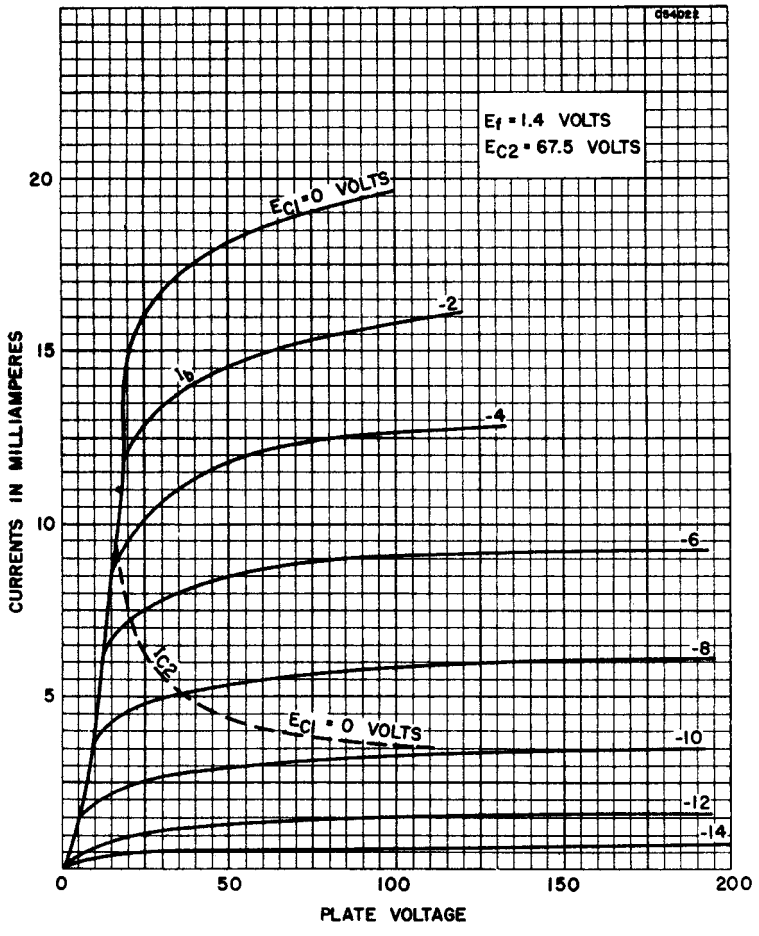
Sylvania Type 3S4 is a miniature power amplifier pentode designed for service in portable, battery operated equipment. The electrical characteristics of the 3S4 are similar to those of the 1S4. The Type 3S4, however, is designed for operation from either a 1.4 volt or 2.8 volt filament supply.

AVERAGE OPERATION CHARACTERISTICS



3S4 (Cont'd)

AVERAGE PLATE CHARACTERISTICS



SYLVANIA

engineering data service

SYLVANIA
3SP1
3SP*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic

Types*	Fluorescence	Phosphorescence	Persistence
3SP1	Green	———	Medium
3SP2	Blue-Green	Green	Long
3SP4	White	———	Short to Medium
3SP5	Blue	———	Very Short
3SP7	Blue-White	Yellow	Long
3SP11	Blue	———	Short

Faceplate . . . . . Clear, Cylindrical

*In addition to the types shown, the 3SP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 pf
Grid No. 1 to All Other Electrodes	6.5 pf
Between Deflecting Plates 1-2	2 pf
Between Deflecting Plates 3-4	2 pf
Deflecting Plate 1 to All Other Electrodes	7.5 pf
Deflecting Plate 2 to All Other Electrodes	6.0 pf
Deflecting Plate 3 to All Other Electrodes	5.5 pf
Deflecting Plate 4 to All Other Electrodes	6.5 pf

MECHANICAL DATA

Minimum Useful Screen Dimensions	
Horizontal	2¾ Inches
Vertical	1⅛ Inches
Diagonal	3 Inches
Base (Small Shell Duodecal 12-Pin)	B12-43
Basing	12E
Base Alignment	
The Plane through the Base Key and the Tube Axis aligns with Long Axis of Tube Face	± 10 Degrees
Trace Alignment[1]	
Angle Between D1-D2 trace and D3-D4 trace	90 ± 1 Degrees
D1-D2 trace Aligns with Long Axis of Tube Face[2]	± 1.5 Degrees
Positive Voltage on D1 deflects Beam approx. Toward Key	
Positive Voltage on D3 deflects Beam approx. Toward Pin. No. 4	
Bulb	C26 Exp 6 or equivalent
Weight (approx.)	¾ Pound

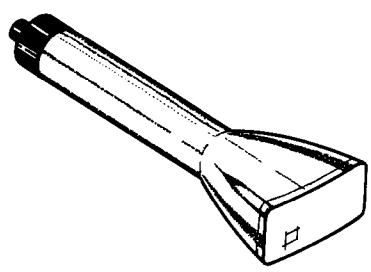
RATINGS

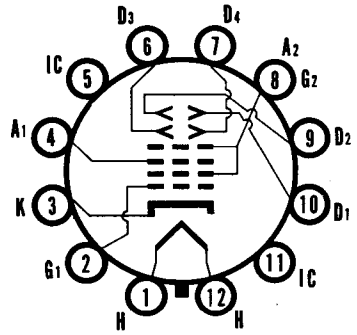
MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	3000 Volts dc
Anode No. 1 Voltage (Focusing Electrode)	1200 Volts dc
Anode No. 2 Input	6 Watts Max.

QUICK REFERENCE DATA

Oscilloscope Tube
1½" x 3" Direct Viewed
Rectangular Glass Type
Electrostatic Deflection
Electrostatic Focus
Clear, Cylindrical
Faceplate





12-E

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

APRIL, 1964

File Under

SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

MAXIMUM RATINGS (Absolute Maximum Values) (con'td)

Grid No. 1 Voltage		
Negative Bias Value	200 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	140 Volts	
Heater Positive with Respect to Cathode	140 Volts	
Peak Voltage between A2 and any Deflecting Plate	550 Volts	

TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage	2000 Volts	dc
Anode No. 1 Voltage for Focus	330 to 620 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−58 to −135 Volts	dc
Deflection Factors		
Deflecting Plates 1-2	146 to 198 Volts	dc/Inch
Deflecting Plates 3-4	104 to 140 Volts	dc/Inch
Spot Position (Focused, Undeflected)[4]	Within a 12 mm Square	

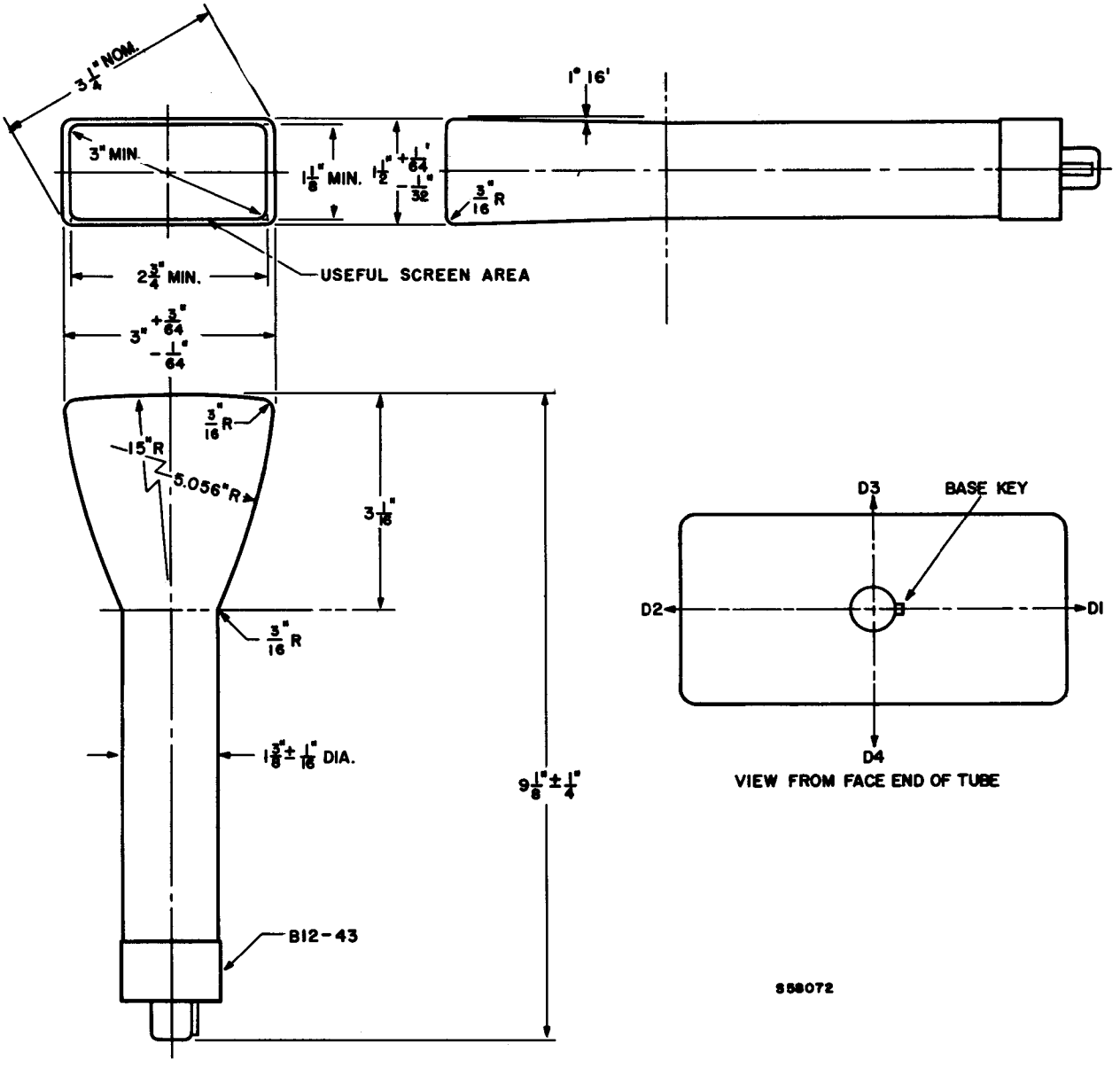
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Resistance in Any Deflecting Plate Circuit[5]	1.0 Megohms Max.

NOTES:

1. *Deflecting plates 1 & 2 are nearer the screen, and scan the major dimension of the screen. Plates 3 & 4 are nearer the base, and scan the minor dimension of the screen.*
2. *The D1-D2 trace scanning through the geometric center of the tube face will be parallel to the long axis of the tube face, within the limits specified.*
3. *Visual extinction of undeflected focused spot.*
4. *With deflecting plates connected to Anode No. 2 and with tube shielded. The sides of the limit square will be parellel to the deflection axes.*
5. *It is recommended that the deflecting plate circuit resistances be approximately equal.*

OUTLINE


3 1/4" NOM.
3" MIN.
1 1/8" MIN.
1 1/2" +1/64 -1/32
3/16" R
1° 16'
2 3/4" MIN.
USEFUL SCREEN AREA
3" +3/64 -1/64
3/16" R
.15" R
5.056" R
3 1/16"
3/16" R
1 3/8" ± 1/16" DIA.
9 1/8" ± 1/4"
B12-43
D3
BASE KEY
D2
D1
D4
VIEW FROM FACE END OF TUBE
S58072

SYLVANIA

engineering data service

SYLVANIA
3WP1
3WP*

CHARACTERISTICS

GENERAL DATA

Focusing Method			Electrostatic
Deflection Method			Electrostatic
Types*	**3WP1**	**3WP2**	**3WP11**
Fluorescence	Green	Blue-Green	Blue
Phosphorescence	.....	Green	.....
Persistence	Medium	Long	Short
Faceplate			Flat, Clear

**In addition to the types shown, the 3WP- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage			6.3 Volts
Heater Current			0.6 ± 10% Ampere
Direct Interelectrode Capacitances			
	Min.	**Max.**	
Cathode to All Other Electrodes	3.0	5.7	μμf
Grid No. 1 to All Other Electrodes	4.6	8.7	μμf
Between Deflecting Plates 1-2	1.7	3.3	μμf
Between Deflecting Plates 3-4	1.0	2.0	μμf
Deflecting Plate 1 to All Other Electrodes except D2	3.8	7.2	μμf
Deflecting Plate 2 to All Other Electrodes except D1	3.8	7.2	μμf
Deflecting Plate 3 to All Other Electrodes except D4	2.5	4.8	μμf
Deflecting Plate 4 to All Other Electrodes except D3	2.5	4.8	μμf

MECHANICAL DATA

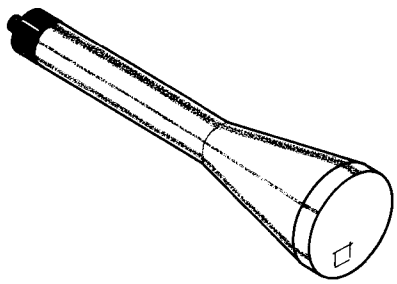
Minimum Useful Screen Diameter	2¾ Inches
Base (Small Shell Duodecal 12-Pin or	B12-43
Small Shell Duodecal 10-Pin)	B10-75
Basing	12T
Base Alignment	
D1-D2 trace aligns with Pin No. 3 and Tube Axis	±10 Degrees
Angle Between D1-D2 and D3-D4 Traces	90 ± 1 Degree

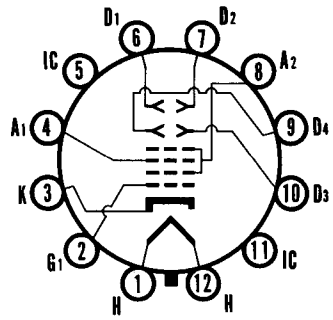
Positive voltage on D1 deflects beam approximately toward Pin No. 3.

Positive voltage on D3 deflects beam approximately toward Pin No. 12.

QUICK REFERENCE DATA

3" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
High Deflection Sensitivity
Flat, Clear Faceplate





12-T

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

NOVEMBER, 1959

File Under
SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage[1]	2750 Volts dc
Anode No. 1 Voltage (Focusing Electrode)	1100 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	220 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	0 Volts
Peak Heater Cathode Voltage	
Heater Negative with Respect to Cathode	200 Volts
Heater Positive with Respect to Cathode	200 Volts
Peak Voltage Between Anode No. 2 and Any Deflecting Plate	550 Volts

TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage	1500 Volts dc
Anode No. 1 Voltage for Focus	247 to 465 Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	−45 to −75 Volts dc
Deflection Factor	
Deflecting Plates 1-2	62 to 76 Volts dc/Inch
Deflecting Plates 3-4	43 to 52 Volts dc/Inch
Modulation[3] (3WP1, at 7 Ft. L. Light Output)	50 Volts Max.
Line Width A[3] (3WP1, at 7 Ft. L. Light Output)	.026 Inches Max.
Deflection Factor Uniformity[4]	2 Percent Max.
Pattern Distortion @ 75% of Useful Scan[5]	2½ Percent Max.
Spot Position (Focused, Undeflected)[6]	Within a 3/16 Inch Radius Circle
Useful Scan	
D1-D2 ± 1.25 Inches from Tube Face Center or a total of 2.50 Inches Min.	
D3-D4 ± 1.125 Inches from Tube Face Center or a total of 2.25 Inches Min.	

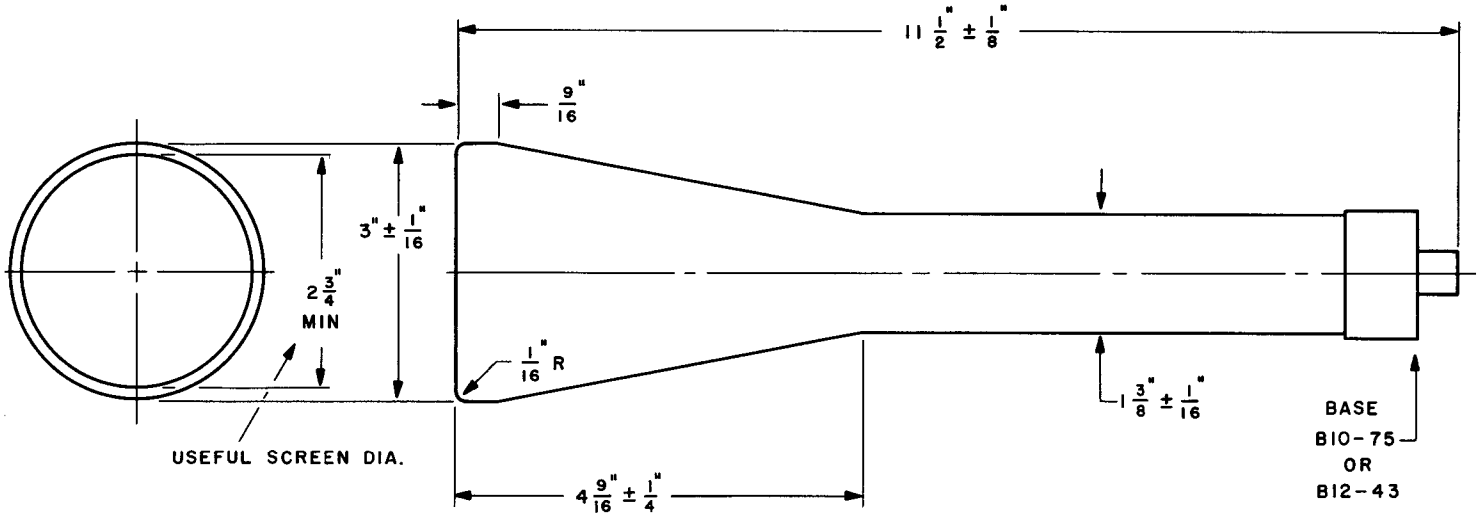
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance[7]	5.0 Megohms Max.

NOTES:

1. *The product of acceleration voltage and average acceleration current should be limited to 6.0 watts.*
2. *Visual extinction of undeflected focused spot.*
3. *Measured in accordance with MIL-E-1.*
4. *The deflection factors of 75% of useful scan and at 25% of useful scan shall not differ by more than the indicated value.*
5. *The edges of a raster pattern, whose mean dimensions are the indicated percentage of useful scan, shall not deviate from the mean dimensional rectangle by more than the specified amount.*
6. *Centered on the tube face with the tube shielded and with all deflection plates connected to anode No. 2.*
7. *It is recommended that the deflecting electrode circuit resistances be approximately equal.*

OUTLINE



S 58068

A Technical Publication of
SYLVANIA ELECTRIC
PRODUCTS INC.
EMPORIUM, PA.



DESCRIPTION

The type 4C35 Hydrogen Thyratron is a hot-cathode grid-controlled gas rectifier tube especially designed for pulsing service at high repetition frequencies, high peak currents, and high voltages.

An outstanding feature of the Hydrogen Thyratron is the short deionization time required to convert the gaseous ions to neutral molecules when the tube is shut off. This permits the 4C35 to be operated at exceptionally high repetition frequencies. This tube also has the advantage that it may be operated over a wide range of ambient temperatures without significant change in electrical characteristics. For a tube of the same type rated at higher voltage see the Engineering Data Service sheet for type 5C22.



MECHANICAL DATA

Envelope	T20
Cap	Medium metal
Base	Super-Jumbo 4-pin with bayonet, A4-18
Mounting Position	Any, See Note 1

NOTE 1:—*Clamping is permissible by the base and/or by the bulb in the area up to 2½ inches above the top of the base only.*

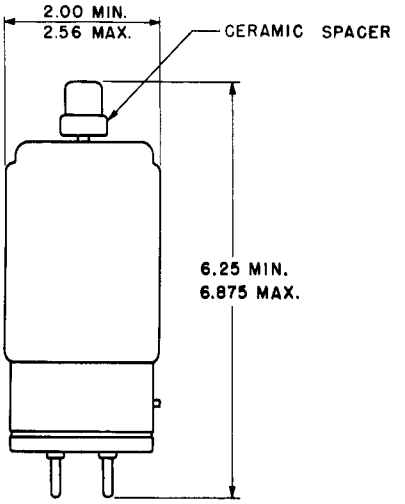
NOTE 2:—*Return for cathode current should be to pin No. 4 only.*

NOTE 3:—*No cooling stream of air should be directly applied to the tube envelope.*

NOTE 4:—*Tube should be kept away from strong fields which could ionize gas in the tube.*

ELECTRICAL DATA AND OPERATING CONDITIONS (4C35)

	+5%
Heater voltage	6.3 — 10% volts
Heater current at 6.3 volts	5.5 to 6.7 amps.
Starting anode voltage	2.5 KV DC Min.
Cathode heating time	180 sec. min.
Peak anode voltage (Note 1)	8.0 KV max.
Peak anode current	90 amps. max.
Peak inverse anode voltage (Note 2)	8.0 KV max. 5% epy min.
Average anode current	100 ma. DC max.
Rate of rise of anode current	1000 amps/μs max.
Dissipation factor (Note 3)	
Grid Drive (Note 4)	
a) peak grid voltage	175 volts min.
b) time of rise	0.5 μsec. max.
c) grid pulse duration at 50 volts min. amplitude	2.0 μsec. min.
d) impedance of grid drive circuit	1500 ohms max.
Peak inverse grid voltage	200 volts max.
Ambient temperature	—50°C. to +90°C.



NOTE 1:—*Where the plate supply voltage is applied instantaneously, the maximum value of the plate voltage shall not reach 7.0 KV in less than 0.04 second.*

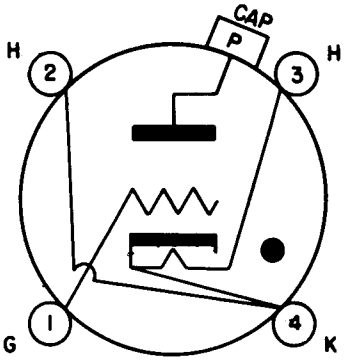
NOTE 2:—*In pulsed operation, the peak inverse anode voltage exclusive of a spike of 0.05 micro-second maximum duration should not exceed 2.5 KV during the first 25 micro-seconds after the pulse.*

NOTE 3:—*The maximum dissipation factor will depend on the peak forward anode voltage (epy in volts), the peak anode current (ib in amps.), and the pulse repetition frequency (prf in pulses per second) according to the formula:*

$$epy \times ib \times prf = 2.0 \times 10^9 \text{ Max.}$$

This formula is applicable for pulse repetition rates in the neighborhood of the test condition of 2800 pps. For rates far in excess of this, special caution should be exercised.

NOTE 4:—*Measurements are at the tube socket with the thyratron grid disconnected.*



APPLICATIONS

The type 4C35 may be used in a wide variety of applications which will take advantage of such features as:

1. Low deionization time, hence rapid switching rates.
2. High peak currents.
3. High plate voltages (but may be used at lower voltages if it is desired).
4. Moderate trigger requirements.
5. Ability to be operated at zero bias.
6. Operation over a wide ambient temperature range without appreciable effect on the electrical characteristics.
7. Low tube voltage drop, with attendant efficiency.
8. Relatively low cost.
9. Reliability and general flexibility of operation.

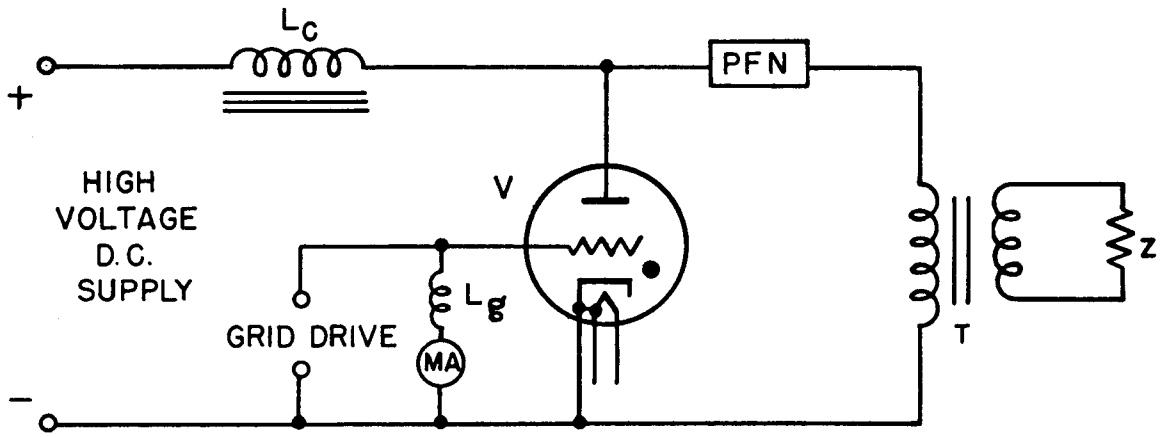
The circuit for which this tube was especially developed is shown below. The output in this case consists of periodic rectangular pulses. These are developed when the thyratron fires and releases electric charge stored in the capacitance of the pulse-forming-network (PFN). This network determines the duration and shape of the pulses. Between pulses, when the thyratron is not conducting, the PFN capacitance charges up through the charging choke Lc in a transient which swings the instantaneous plate voltage of the 4C35 above the power supply voltage.

(The value reached is about double the power supply voltage and must be taken into account when applying the peak anode voltage ratings of the tube.)

The peak voltage of the pulse supplied to the pulse-transformer is about equal to that of the supply. By means of the pulse-transformer, of course, the output to the load may be stepped up to a higher level. This results in a saving in the size and cost of the supply, since components at lower voltage ratings may be used. The SYLVANIA 4C35 Hydrogen Thyratron is very well adapted to such voltage step-up by virtue of the very high peak currents it can furnish. Many varieties of short-duration pulses may be produced by different PFN designs.

Other applications suggested by the characteristics of this thyratron are:

1. Switching in welding circuits, particularly of the capacitor discharge type.
2. Shock excitation of tuned circuit.
3. Excitation of piezoelectric crystals.
4. Use in induction heating circuits to replace spark-gap heaters, resulting in trouble-free and quieter performance.
5. Pulser for pulse-time-modulation circuits in which signals are produced by modulating the pulse repetition rate.
6. Servomechanisms and control circuits where relatively high A.C. supply frequencies are used.



Lg	Grid Choke	T	Matching or Pulse-Transformer
Lc	Charging Choke	Z	Load
PFN	Pulse-Forming-Network	V	4C35

MECHANICAL DATA

Dimensions	Per Outline
Envelope	T-20
Cap	Medium metal, C1-5
Base	Super-Jumbo 4 pin with bayonet, A4-18 with ceramic insert
Mounting Position (1)	Any

ELECTRICAL DATA AND OPERATING CONDITIONS

Ratings (Absolute)

	Max.	Min.
Heater voltage	6.3 + 5%	-10% Vac
Cathode heating time		180 sec
Starting anode voltage		2500 Vdc
Peak anode voltage (2)	8.0 kv	
Peak inverse anode voltage (3)	8.0 kv	5% of peak anode voltage
Peak anode current	90 amps	
Average anode current	100 mAdc	
Rate of rise (cathode current)	1000 amps/μsec	
Dissipation factor (4)		
Grid drive pulse (5)		
Peak grid voltage		175 v
Time of rise	0.5 μsec	
Grid pulse duration		2 μsec
Impedance of grid drive curcuit	1500 ohms	
Peak inverse grid voltage	200 v	
Ambient temperature	-50 to +90°C	

Electrical Characteristics

Heater current at 6.3 Vac	5.5 to 6.7 Aac
Anode delay time (max.) (6)	0.6 μsec
Time jitter (Variation in firing time) (max.)	0.01 μsec

APPLICATION DATA

The Sylvania Type 4C35A is a hot-cathode grid-controlled hydrogen thyratron designed for pulsing service at high repetition rates, high peak currents, and high voltages. It is specifically designed to be used in place of the type 4C35 in circuits requiring low time jitter (variation in firing time from pulse to pulse).

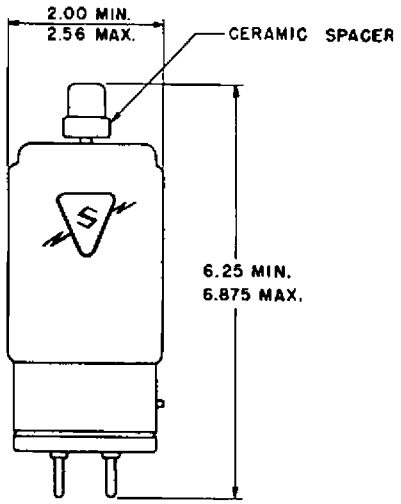
The Type 4C35A may be used in a wide variety of applications which will take advantage of such features as:

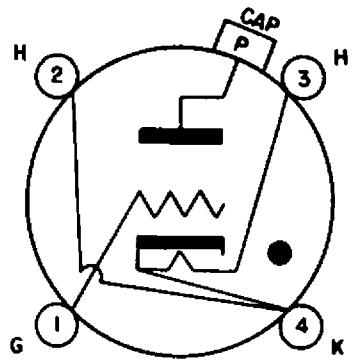
1. Low deionization time
2. Low time jitter
3. High peak currents
4. High plate voltages
5. Moderate trigger requirements
6. Ability to be operated at zero bias.

from JETEC release #1416, Feb. 14, 1955

QUICK REFERENCE DATA

The Sylvania Type 4C35A is a hydrogen thyratron designed for pulsing service at high repetition rates, high peak currents and high voltages. It is similar to the Type 4C35 with improved time jitter characteristics.





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NOTES:

(1) The tube may be clamped by the base and/or by the bulb in the area up to 2½ inches above the top of the base.

No cooling stream of air should be directly applied to the tube envelope.

The tube should be kept away from stray fields which could ionize gas in the tube.

(2) When the plate supply voltage is applied instantaneously, the plate voltage should not read 7.0 kv inless than 0.04 seconds.

(3) In pulsed operation, the peak inverse anode voltage, exclusive of a spike of 0.05 μsec maximum duration, should not exceed 2.5 kv during the first 25 μsec after the pulse.

(4) The maximum dissipation factor depends on the peak forward anode voltage in volts (epy), the peak anode current in amps (ib), and the pulse repetition rate in pulses per second (prr) according to the formula:

$$epy \times ib \times prr = 2.0 \times 10^9 \text{ max.}$$

This formula is applicable for pulse repetition rates in the neighborhood of 2800 pps. For rates in excess of this, special caution should be exercised.

(5) Measured at the tube socket with thyratron grid disconnected.

(6) The time interval between the point on the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

ADVANCE DATA

DESCRIPTION

Features of the design of the 4GK5 include: A partial shield between the grid and plate which lowers the capacitance between these two elements and promotes ease of neutralization; low input capacitance; and higher input impedance by virtue of dual cathode leads.

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7FP
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

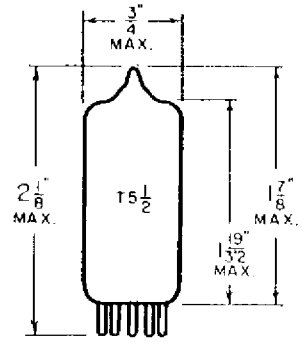
HEATER CHARACTERISTICS AND RATINGS

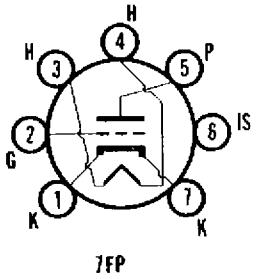
Average Characteristics Heater Operation	4GK5 Series	
Heater Voltage	4.0	Volts
Heater Current	300[1]	Ma
Heater Warm-up Time[2]	11	Sec.
Ratings (Design Maximum Values)		
Heater Current[3]	280-320	Ma
Maximum Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
Total DC and Peak	100	Volts
Heater Positive with Respect to Cathode		
Total DC and Peak	100	Volts

QUICK REFERENCE DATA

The Sylvania Type 4GK5 is a frame grid gain controlled triode designed for use as a VHF RF amplifier at a B+ of 135 volts.

Except for heater ratings and controlled heater warm-up time, the 4GK5 is identical to Type 6GK5 contained in EIA Release 3095.





7FP

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

August 30, 1961

146 (10-58)

from JEDEC release #3430, Sept. 25, 1961

NOTES:

1. For series operation of heater, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current.

2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

3. Heater voltage supply variations shall be restricted to maintain heater current within the specified values.

SYLVANIA

engineering data service

SYLVANIA
4MP1
4MP*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic

Types*	Fluorescence	Phosphorescence	Persistence
4MP1	Green	——	Medium
4MP2	Blue - Green	Green	Long
4MP7	Blue - White	Yellow	Long
4MP11	Blue	——	Short

Faceplate	Spherical, Clear

*In addition to the types shown, the 4MP — can be supplied with several other screen phosphors.

ELECTRICAL DATA

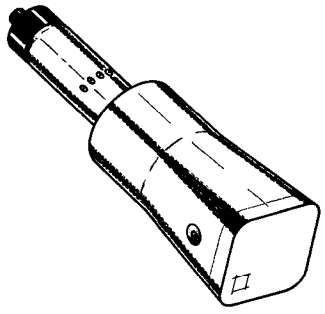
Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Amperes
Direct Interelectrode Capacitances	
Cathode to All Other Electrodes	5.0 μμf
Grid No. 1 to All Other Electrodes	6.2 μμf
Between Deflecting Plates 1-2[11]	2.7 μμf
Between Deflecting Plates 3-4[11]	1.9 μμf
Deflecting Plate 1 to All Other Electrodes	5.8 μμf
Deflecting Plate 2 to All Other Electrodes	5.8 μμf
Deflecting Plate 3 to All Other Electrodes	4.3 μμf
Deflecting Plate 4 to All Other Electrodes	4.0 μμf

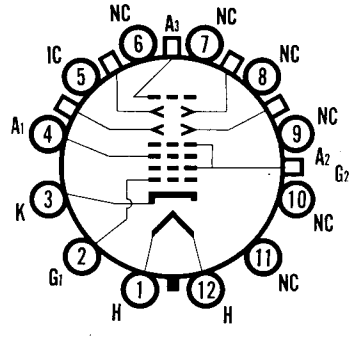
MECHANICAL DATA

Minimum Useful Screen (Rounded Corners)	2⅞ x 2⅞ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Neck Contacts (Anode No. 2 and Deflection Plates)	J1-25
Bulb	LEA 467 or Equivalent
Weight (Approx.)	1½ Pounds
Base (Small Shell Duodecal 12-Pin)	B12-43
Basing	12Z
Base Alignment	
D1-D2 trace aligns with Pin No. 5 and Tube Axis	±10 Degrees
Positive Voltage on D1 deflects beam approx. toward Pin No. 5	
Positive Voltage on D3 deflects beam approx. toward Pin No. 2	
Bulb Contact Alignment	
J1-22 Contact Aligns with D1-D2 Trace	±10 Degrees
J1-22 Contact on Same Side as Pin No. 5	
Trace Alignment	
Angle between D1-D2 and D3-D4 Trace	90 ± 1 Degrees
D1-D2 Trace Aligns with Bulb Wall	± 1.5 Degrees

QUICK REFERENCE DATA

3½" x 3½" Direct Viewed
Square Glass Type
Spherical Clear Faceplate
Electrostatic Focus
Electrostatic Deflection
Post Deflection Acceleration
Deflection Plate
Connectors on Neck Wall





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SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

MARCH, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Input	6.6 Watts
Anode No. 3 Voltage	6600 Volts dc
Anode No. 2 Voltage	3300 Volts dc
Ratio of Anode No. 3 Voltage to Anode No. 2 Voltage[1]	2 :1
Anode No. 1 Voltage (Focusing Electrode)	1100 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	220 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	0 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	200 Volts
Heater Positive with Respect to Cathode	200 Volts
Peak Voltage Between Anode No. 2 and Any Deflecting Plate	600 Volts

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage	4000 Volts
Anode No. 2 Voltage	2000 Volts
Anode No. 1 Voltage for Focus	340 to 510 Volts
Grid No. 1 Voltage Required for Cutoff[2]	−52 to −87 Volts
Deflection Factor	
Deflecting Plates 1-2	68 to 82 Volts dc/Inch
Deflecting Plates 3-4	42 to 52 Volts dc/Inch
Modulation at Ib3 = 25 μa[3]	38 Volts dc Max.
Line Width "A" at Ib3 = 25 μa[3]	.45 mm Max.
Line Width "B" at Ib3 = 25 μa[3]	.65 mm Max.
Light Output at Ib3 = 25 μa[4]	
4MP1[5]	20 Ft. L. Min.
4MP11[6]	14 Ft. L. Min.
Deflection Factor Uniformity[3]	2 Percent Max.
Pattern Distortion[7]	2 Percent Max.
Undeflected Spot Position[8]	Within a 10 mm Square
Trace Distortion[9]	.02 Inch Max.
Useful Scan	2⅞ Inches Min.

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance[10]	1.0 Megohms Max.

NOTES:

1. *This tube is designed for optimum performance when operated at an Eb3/Eb2 ratio of 2.0. Operation of other ratios of Eb3/Eb2 may result in changes of deflection uniformity and pattern distortion.*

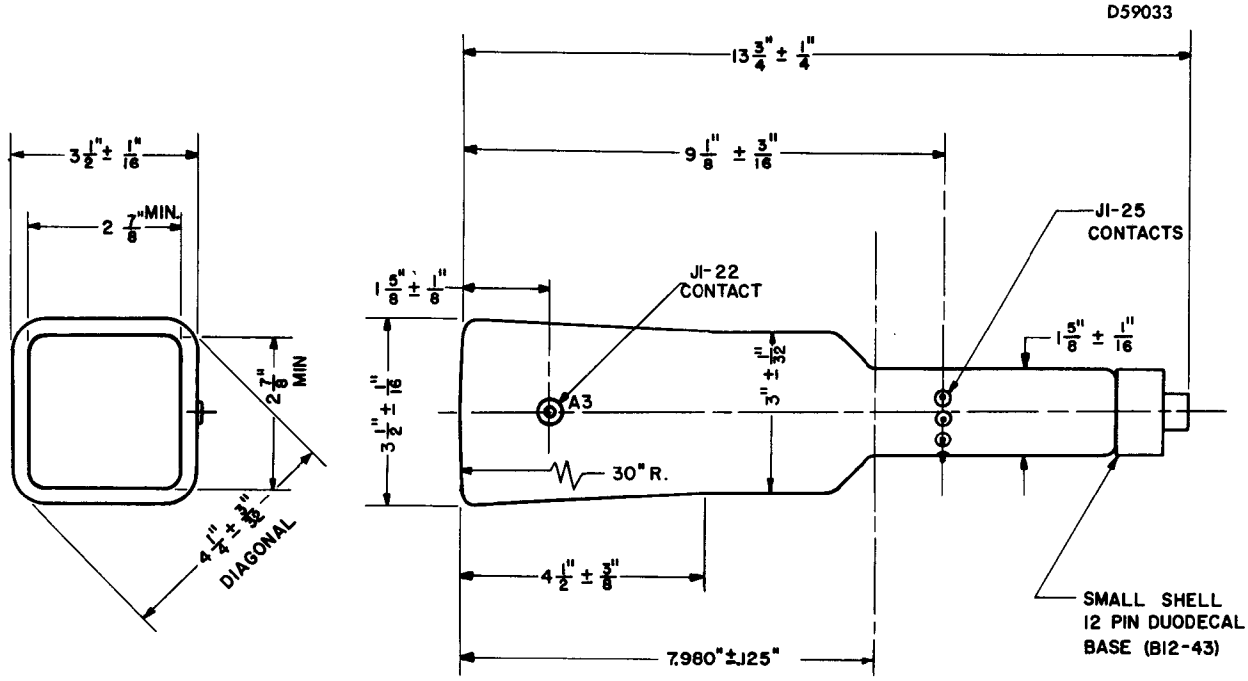
NOTES: (Cont'd)

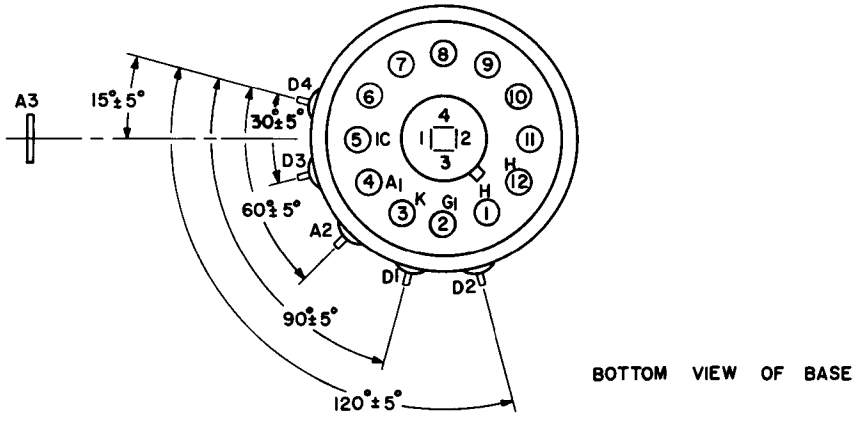
2. *Visual extinction of undeflected focused spot.*
3. *Measured in accordance with MIL-E-1.*
4. *Using a raster size of 2¼ x 2¼ inches.*
5. *Using a No. 594 Photronic cell with Viscor filter (for eye correction).*
6. *Using a No. 594 Photronic cell without Viscor filter (without eye correction).*
7. *All portions of a raster, pattern adjusted so its widest points just touch the sides of 2.295 x 2.295 inch square, will fall within the area bounded by the 2.295 x 2.295 inch square and an inscribed 2.205 x 2.205 inch square.*
8. *Centered with respect to the tube face and with the tube shielded. Connect free deflection electrodes to accelerator.*
9. *A 2¼ inch long trace which is deflected and focused ± 1⅛ inch from center in both the horizontal and vertical directions, shall not deviate from straight lines by more than the indicated value.*
10. *It is recommended that the deflection electrode circuit resistances be approximately equal.*
11. *Deflecting plates D1 and D2 are nearer the screen while deflecting plates D3 and D4 are nearer the base.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE





BOTTOM VIEW OF BASE

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic

Types*	Fluorescence	Phosphorescence	Persistence
4VP1	Green	—	Medium
4VP2	Blue-Green	Green	Long
4VP7	Blue-White	Yellow	Long
4VP11	Blue	—	Short

Faceplate	Spherical, Clear

**In addition to the types shown, the 4VP- can be supplied with several screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10 % Amperes
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6.5 μμf
Between Deflecting Plates 1-2[11]	2 μμf
Between Deflecting Plates 3-4[11]	2 μμf
Deflecting Plate 1 to All Other Electrodes	7.5 μμf
Deflecting Plate 2 to All Other Electrodes	6 μμf
Deflecting Plate 3 to All Other Electrodes	5.5 μμf
Deflecting Plate 4 to All Other Electrodes	6.5 μμf

MECHANICAL DATA

Minimum Useful Screen (Rounded Corners)	2⅞ x 2⅞ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Bulb	LEA 467 or Equivalent
Weight (Approx.)	1½ Pounds
Base (Small Shell Duodecal 12-Pin)	B12-43
Basing	12EP
Base Alignment	
D1-D2 Trace Aligns with Base Key and Tube Axis[6]	±10 Degrees
Positive Voltage on D1 Deflects Beam Approx. Toward Base Key	
Positive Voltage on D3 Deflects Beam Approx. Toward Pin No. 9	
Bulb Contact Alignment	
J1-22 Contact Aligns with D1-D2 Trace	±10 Degrees
J1-22 Contact on Same Side as Base Key	
Trace Alignment	
Angle between D1-D2 and D3-D4 Trace	90 ± 2 Degrees
D1-D2 Trace Aligns with Bulb Wall	±1.5 Degrees

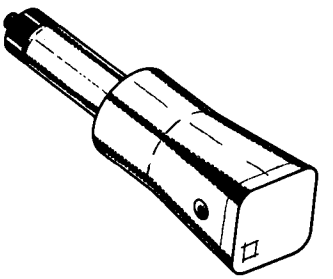
RATINGS

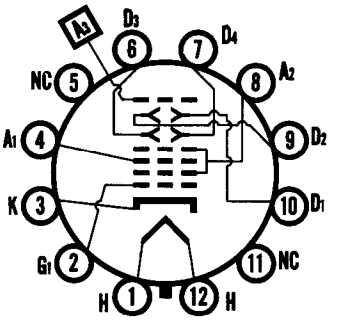
MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Input	6 Watts
Anode No. 3 Voltage	5500 Volts dc
Anode No. 2 Voltage	2750 Volts dc
Ratio of Anode No. 3 Voltage to Anode No. 2 Voltage[1]	2:1
Anode No. 1 Voltage (Focusing Electrode)	1100 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	200 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	0 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	180 Volts
Heater Positive with Respect to Cathode	180 Volts
Peak Voltage Between Anode No. 2 and Any Deflecting Plate	600 Volts

QUICK REFERENCE DATA

3 ½" x 3 ½" Direct Viewed
Square Glass Type
Spherical Clear Faceplate
Electrostatic Focus
Electrostatic Deflection
Post Deflection Acceleration





12EP

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE
OPERATIONS
SENECA FALLS, NEW YORK
Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
MARCH, 1963

File Under
SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage	4000 Volts	
Anode No. 2 Voltage	2000 Volts	
Anode No. 1 Voltage for Focus	200 to 500 Volts	
Grid No. 1 Voltage Required for Cutoff[2]	−58 to −135 Volts	
Deflection Factor		
Deflecting Plates 1-2	98 to 132 Volts dc/Inch	
Deflecting Plates 3-4	72 to 98 Volts dc/Inch	
Modulation at Ib3 = 25 μa[3]	30 Volts dc/	Max.
Line Width "A" at Ib3 = 25 μa[3]	.45 mm	Max.
Line Width "B" at Ib3 = 25 μa[3]	.55 mm	Max.
Light Output at Ib3 = 25 μa[3]		
P1	25 Ft. L	Min.
Deflection Factor Uniformity[3]	3 Percent	Max.
Undeflected Spot Position[4]	Within a 10 mm Square	
Useful Scan	2⅞ Inches	Min.

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.
Deflection Circuit Resistance[5]	1.0 Megohms	Max.

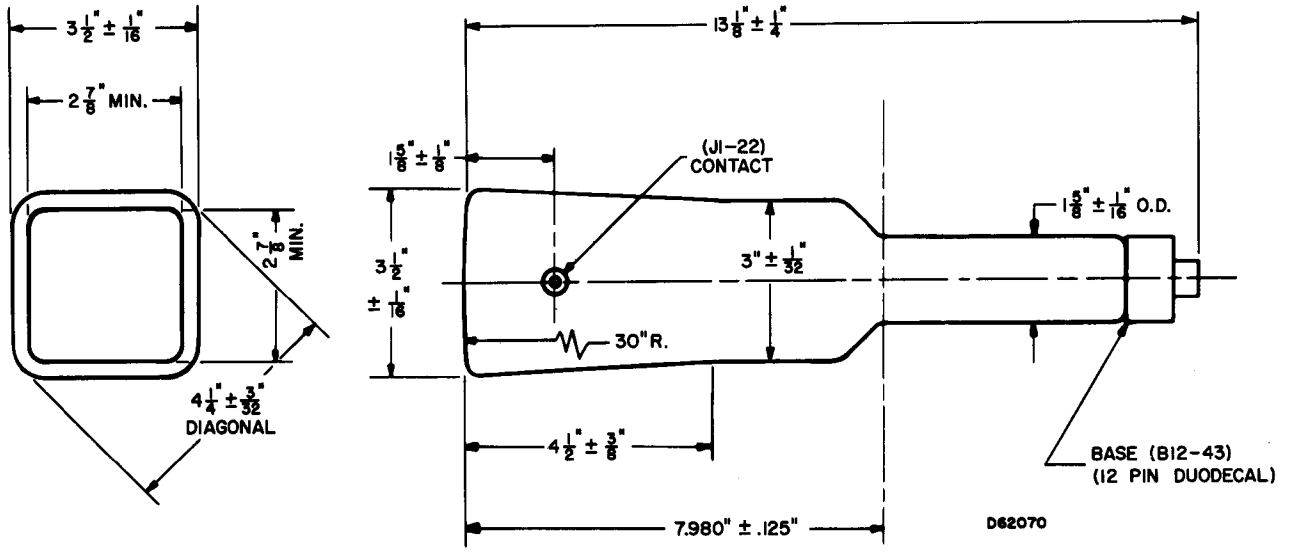
NOTES:

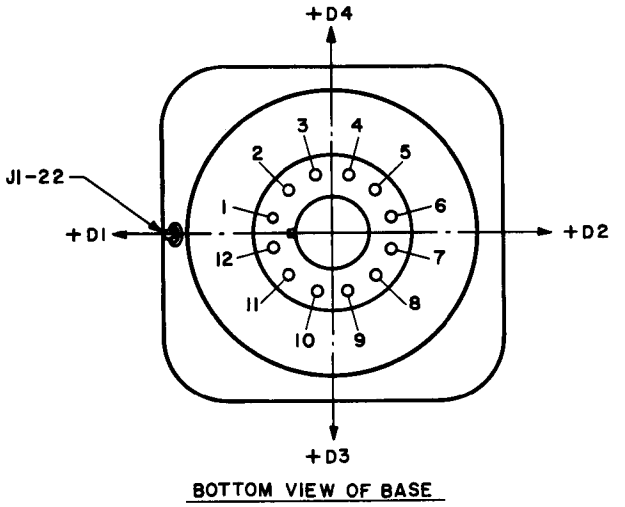
1. *This tube is designed for optimum performance when operated at an Eb3/Eb2 ratio of 2.0. Operation of other ratios of Eb3/Eb2 may result in changes of deflection uniformity and pattern distortion.*
2. *Visual extinction of undeflected focused spot.*
3. *Measured in accordance with MIL-E-1.*
4. *Centered with respect to the tube face and with the tube shielded. Connect free deflection electrodes to accelerator.*
5. *It is recommended that the deflection electrode circuit resistances be approximately equal.*
6. *Deflecting plates D1 and D2 are nearer the screen while deflecting plates D3 and D4 are nearer the base.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE





BOTTOM VIEW OF BASE

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic

Types*	5ABP1	5ABP4	5ABP7	5ABP11
Fluorescence	Green	White	Blue	Blue
Phosphorescence	.....	.....	Yellow	.....
Persistence	Medium	Medium	Long	Short

Faceplate	Clear

**In addition to the types shown, the 5ABP- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 Ampere
Direct Interelectrode Capacitances (Nominal)	
Cathode to All Other Electrodes	5.0 $\mu\mu$f
Grid No. 1 to All Other Electrodes	8.0 $\mu\mu$f
Between Deflecting Plates 1-2	2.5 $\mu\mu$f
Between Deflecting Plates 3-4	1.3 $\mu\mu$f
Deflecting Plate 1^1 to All Other Electrodes	9.0 $\mu\mu$f
Deflecting Plate 2^1 to All Other Electrodes	9.0 $\mu\mu$f
Deflecting Plate 3^1 to All Other Electrodes	5.0 $\mu\mu$f
Deflecting Plate 4^1 to All Other Electrodes	6.0 $\mu\mu$f

MECHANICAL DATA

Minimum Useful Screen Diameter	4-9/16 Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Bulb	J42K
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14J

Base Alignment

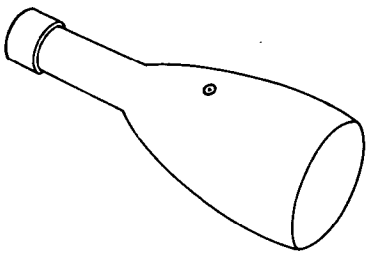
The plane through the tube axis and each of the following items may vary from the trace produced by D1 and D2 by the following angular tolerances (measured about the tube axis): Pin 5, 10 Degrees; side terminal (on same side of tube as Pin No. 5), 10 Degrees.

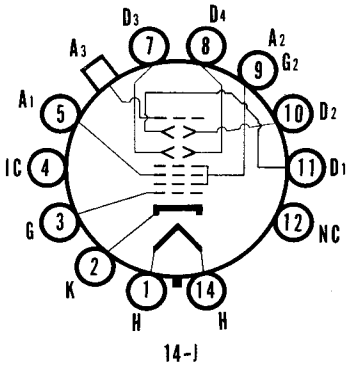
Angle between D1-D2 trace and D3-D4 trace is 90 ± 1.5 Degrees.

Weight (approx.)	2½ Pounds
Mounting Position	Any

QUICK REFERENCE DATA

Oscilloscope Tube
5" Direct Viewed
Round Glass Type
Flate Faceplate
Clear Faceplate
Electrostatic Focus
Electrostatic Deflection
High Sensitivity
Post Deflection Acceleration.





14-J

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

SEPTEMBER, 1958

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 3 Voltage	6600	Volts	dc
Anode No. 2 Voltage[2]	2860	Volts	dc
Ratio of Anode No. 3 Voltage to Anode No. 2 Voltage	2.3:1	Maximum	
Anode No. 1 Voltage	1100	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	220	Volts	dc
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode	140	Volts	dc
Heater Positive with Respect to Cathode	140	Volts	dc
Peak Voltage Between Anode No. 2 and Any Deflection Plate	550	Volts	

TYPICAL OPERATING CONDITIONS

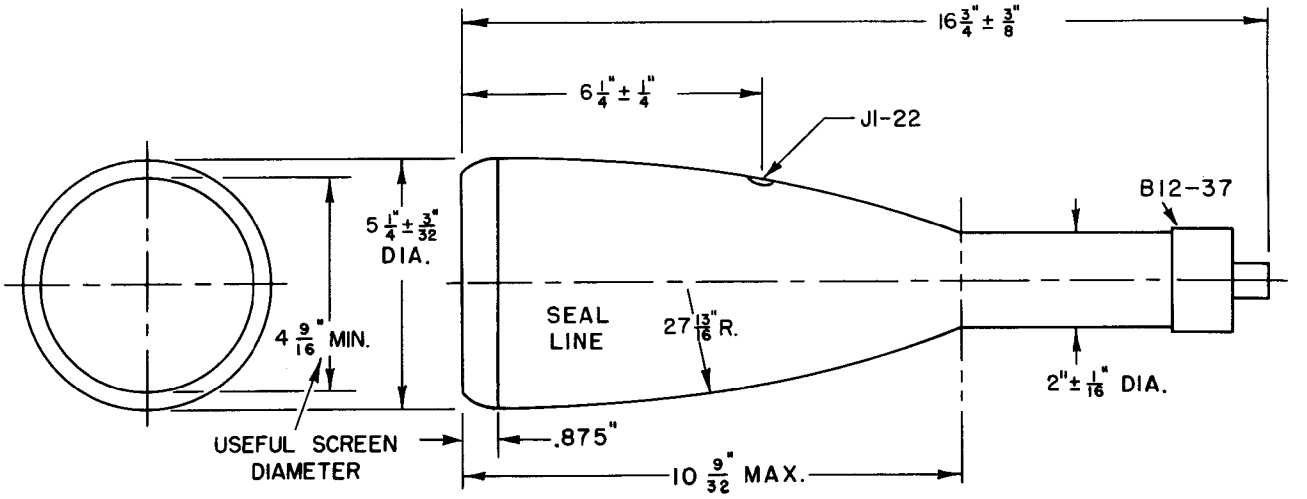
Anode No. 3 Voltage[3]	3000	Volts	dc
Anode No. 2 Voltage[4]	1500	Volts	dc
Anode No. 1 Voltage for Focus	300 to 515	Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−39 to −65	Volts	dc
Deflection Factor[6]			
Deflecting Plates 1-2[7]	40 to 54	Volts	dc/Inch
Deflecting Plates 3-4[8]	27 to 36	Volts	dc/Inch

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms Max.
Deflection Circuit Resistance[9]	5	Megohms Max.

NOTES:

1. *Deflecting Plate 1 is Pin No. 11*
   Deflecting Plate 2 is Pin No. 10
   Deflecting Plate 3 is Pin No. 7
   Deflecting Plate 4 is Pin No. 8
   With D1 positive with respect to D2, the spot is deflected toward Pin No. 5
   With D3 positive with respect to D4, the spot is deflected toward Pin No. 2
2. *The product of the Anode No. 2 Voltage and the Average Anode No. 2 Current should be limited to 6 Watts.*
3. *It is recommended that the Anode No. 3 voltage be not less than 3000 Volts for high-speed scanning.*
4. *In general Anode No. 2 voltage should not be operated at less than 1500 Volts.*
5. *Visual extinction of undeflected focused spot.*
6. *The deflecting electrodes D3 and D4 are designed to have extra-high deflection sensitivity and consequently produce less than full-screen deflection. With post deflection acceleration, the length of deflection may be limited to 4 inches; without post-deflection acceleration, deflection to full screen diameter will ordinarily be obtained. These electrodes are, therefore, more suitable for the signal voltage than for the time base voltage.*
7. *Deflecting Plates 1-2 are nearer the screen.*
8. *Deflecting Plates 3-4 are nearer the base.*
9. *It is recommended that the deflecting electrode resistances be approximately equal.*


16 3/4" ± 3/8"
6 1/4" ± 1/4"
J1-22
B12-37
5 1/4" ± 3/32" DIA.
4 9/16" MIN.
SEAL LINE
27 13/16" R.
2" ± 1/16" DIA.
USEFUL SCREEN DIAMETER
.875"
10 9/32" MAX.

S53005A

A Technical Publication of
SYLVANIA ELECTRIC
PRODUCTS INC.
EMPORIUM, PA.



CHARACTERISTICS

GENERAL DATA

Focusing Method . . . . . Electrostatic
Deflection Method . . . . . Electrostatic

Types*	5ADP1 5ADP1A 5ADP1B	5ADP2 5ADP2A 5ADP2B	5ADP7 5ADP7A 5ADP7B	5ADP11 5ADP11A 5ADP11B	5ADP31A
Fluorescence	Green	Green	Blue	Blue	Green
Phosphorescence	—	Green	Yellow	—	Green
Persistence	Medium	Medium	Long	Short	Medium

Faceplate
5ADP- . . . . . Clear
5ADP-A, 5ADP-B . . . . . Clear, Aluminized

*In addition to the types shown, the 5ADP-, 5ADP-A, and 5ADP-B can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage . . . . . 6.3 Volts
Heater Current . . . . . 0.6 ± 10 % Ampere
Direct Interelectrode Capacitances

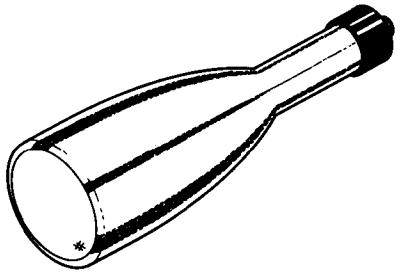
	Min.	Max.
Cathode to All Other Electrodes	3.1	5.8 μμf
Grid No. 1 to All Other Electrodes	4.2	7.9 μμf
Between Deflecting Plate 1-2	1.7	3.1 μμf
Between Deflecting Plates 3-4	0.7	1.3 μμf
Deflecting Plate 1[1] to All Other Electrodes Except D2	2.7	6.1 μμf
Deflecting Plate 2[1] to All Other Electrodes Except D1	2.7	6.1 μμf
Deflecting Plate 3[1] to All Other Electrodes Except D4	2.1	4.0 μμf
Deflecting Plate 4[1] to All Other Electrodes Except D3	2.1	5.0 μμf

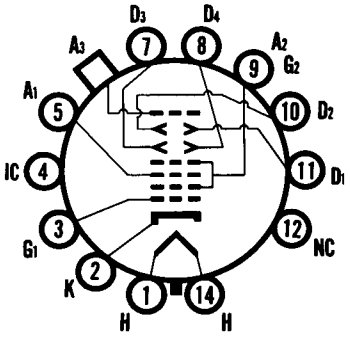
MECHANICAL DATA

Minimum Useful Screen Diameter . . . . . 4 ½ Inches
Bulb Contact (Recessed Small Ball Cap) J1-22
Bulb J42K
Base (Medium Shell Diheptal 12-Pin) B12-37
Basing 14J
Base Alignment
D1-D2 Trace Aligns with Pin No. 5 and Tube Axis . . . ±10 Degrees
Positive Voltage on D1 Deflects Beam Approx. Toward Pin No. 5
Positive Voltage on D3 Deflects Beam Approx. Toward Pin No. 2
Angle Between Traces D1-D2 and D3-D4
5ADP- . . . . . 90 ± 1 Degrees
5ADP-A, 5ADP-B . . . . . 90 ± 0.8 Degrees
Bulb Contact Alignment
J1-22 Contact Aligns with D1-D2 Trace . . . . . ±10 Degrees
J1-22 Contact on Same Side as Pin No. 5
Weight (Approx.) . . . . . 2 ¼ Pounds

QUICK REFERENCE DATA

Oscilloscope Tube
5" Direct Viewed
Round Glass Type
Flat Clear Faceplate
Electrostatic Focus
Electrostatic Deflection
5ADP-A, 5ADP-B—Aluminized and Closer Tolerances
5ADP-B—Lower Minimum A3 Voltage





14-J

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE
OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
MAY, 1962

File Under
SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Maximum Anode No. 3 Voltage	6600 Volts	dc
Minimum Anode No. 3 Voltage (5ADP-, 5ADP-B)	1500 Volts	dc
Minimum Anode No. 3 Voltage (5ADP-A)	2500 Volts	dc
Anode No. 2 Voltage[2]	2860 Volts	dc
Radio of Anode No. 3 Voltage to Anode No. 2 Voltage	2.3:1 Max.	
Anode No. 1 Voltage	1100 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	200 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	180 Volts	dc
Heater Positive with Respect to Cathode	180 Volts	dc
Peak Voltage Between Anode No. 2 and Any Deflection Plate	550 Volts	

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage	3000 Volts	dc
Anode No. 2 Voltage	1500 Volts	dc
Anode No. 1 Voltage for Focus	300 to 515 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−34 to −56 Volts	dc
Deflection Factor		
Deflecting Plates 1-2[4]	40 to 50 Volts	dc/Inch
Deflecting Plates 3-4[5]	30.5 to 37.5 Volts	dc/Inch
Modulation[6,13]	45 Volts	Max.
Line Width[6,13]	.030 Inches	Max.
P1 Light Output[6,13] (5ADP-)	15 Ft. L.	Min.
P1 Light Output[6,13] (5ADP-A, 5ADP-B)	22 Ft. L.	Min.
Deflection Factor Uniformity[8] (5ADP-)	2 Percent	Max.
Deflection Factor Uniformity[7] (5ADP-A, 5ADP-B)	1.5 Percent	Max.
Pattern Distortion with 75 % Useful Scan[9] (5ADP-)	2 ½ Percent	Max.
Pattern Distortion with 100 % Useful Scan[10] (5ADP-A, 5ADP-B)	1.5 Percent	Max.
Undeflected Spot Position[11]	Within a 5/16 Inch Radius Circle	
Useful Scan	± 2 Inches From Tube Face Center or a Total 4 Inches Minimum	

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.
Resistance in Any Deflecting Plate Circuit[12]	5 Megohms	Max.

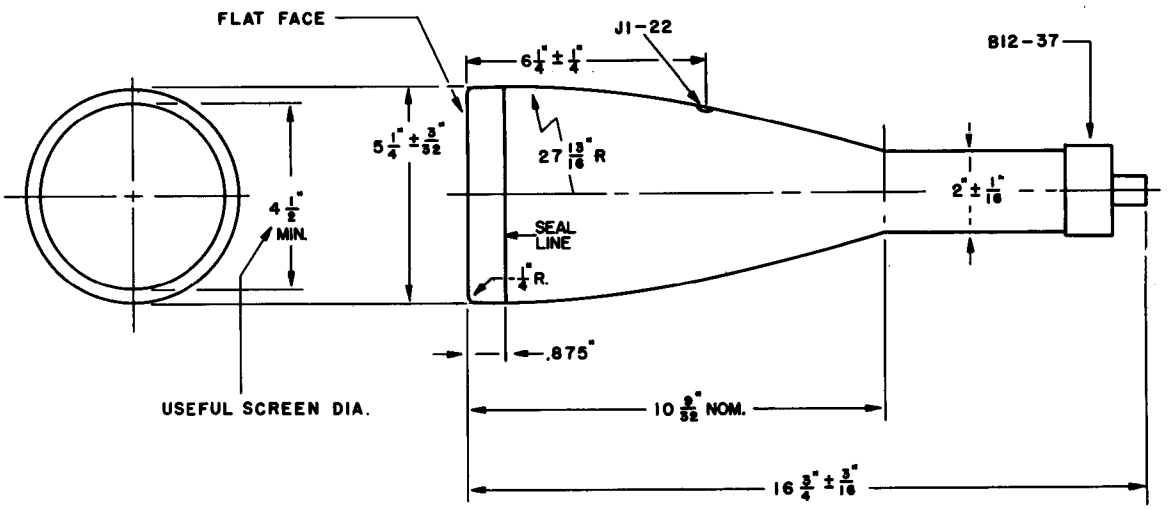
NOTES:

1. *Deflecting Plate 1 is Pin No. 11*
   Deflecting Plate 2 is Pin No. 10
   Deflecting Plate 3 is Pin No. 7
   Deflecting Plate 4 is Pin No. 8
2. *The product of the Anode No. 2 Voltage and the Average Anode No. 2 Current should be limited to 6 watts.*
3. *Visual extinction of undeflected focused spot.*
4. *Deflecting Plates 1-2 are nearer the screen.*
5. *Deflecting plates 3-4 are nearer the base.*
6. *Measured in accordance with MIL-E-1.*
7. *The deflection factor (for both D1-D2 and D3-D4 plate pairs separately) for any deflection of less than 90 % of the useful scan will not differ from the deflection factor for a deflection at 30 % of the useful scan by more than 1 ½ %.*
8. *The deflection factor (for both D1-D2 and D3-D4 plate pairs separately) for a deflection of less than 75 % of the useful scan will not differ from the deflection factor for a deflection at 25 % of the useful scan by more than the indicated value.*
9. *All sides of a raster pattern adjusted so its widest points just touch the sides of a 3.075 inch square will fall within the area bounded by the 3.075 inch square and an inscribed 2.925 inch square.*
10. *All edges of a raster pattern adjusted so its widest points just touch the sides of a 4.000 inch square will fall within the area bounded by the 4.000 inch square and an inscribed 3.880 inch square, except at the corners where the geometry of the tube makes this impossible.*
11. *Centered on tube face with the tube shielded and with all deflection plates connected to Anode No. 2.*
12. *It is recommended that the deflecting electrode circuit resistances be approximately equal.*
13. *Anode No. 3 current = 25 μa when making this measurement on Type 5ADP-.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE



S58013

SYLVANIA

engineering data service

SYLVANIA
5AHP4A
5AHP7*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle (Approx.)	53 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (Approx.)	0.6 Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	4¼ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base (Medium Shell Octal 8-Pin)	B8-11 or B8-65
Basing	8EF
Bulb Contact Aligns with Pin No. 5	±10 Degrees

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	11,000 Volts dc
Grid No. 4 (Focusing Electrode) Voltage	−550 to +1100 Volts dc
Grid No. 2 Voltage	770 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	200 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	0 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	200 Volts
Heater Positive with Respect to Cathode	200 Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage[1]	7,000 Volts dc
Grid No. 4 Voltage for Focus[3]	0 to +250 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage[2]	−33 to −77 Volts dc
Line Width[3,4]	0.40 MM Max.

CIRCUIT VALUES

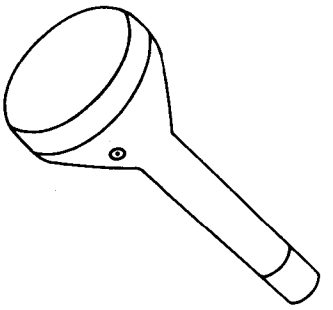
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

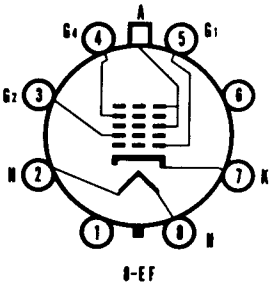
NOTES:

1. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 4,000 volts.*
2. *Visual extinction of undeflected focused spot.*
3. *With Eg1 adjusted for Ib = 100 μa and beam focused for minimum width of individual lines at center of screen.*
4. *Measured by compressed raster method, using 35 to 105 line pattern.*

QUICK REFERENCE DATA

Special Purpose Tube
5" Direct Viewed
Round Glass Type
Magnetic Deflection
Electrostatic Focus
High Resolution





8-EF

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
FEBRUARY, 1957

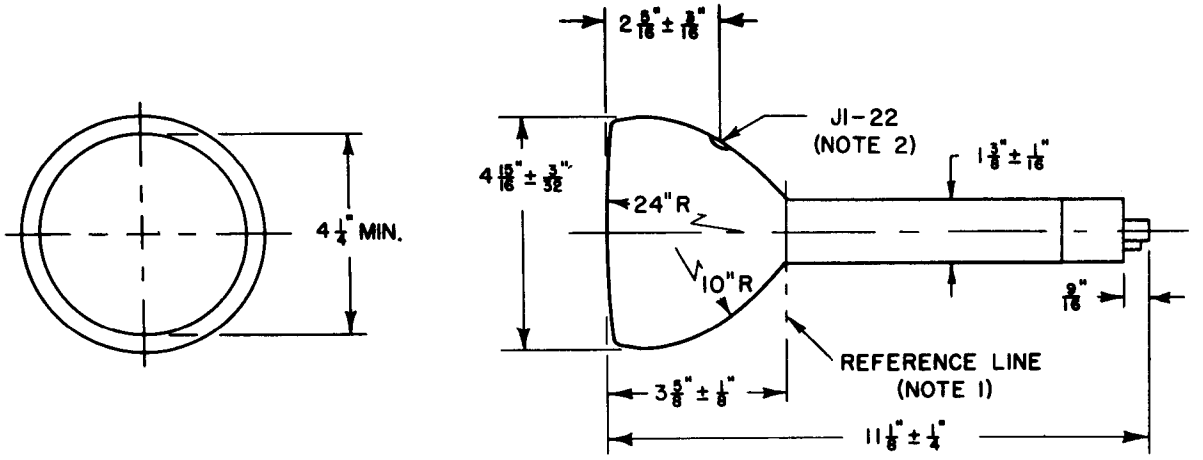


DIAGRAM NOTES:

1. *Reference line is determined by the point where 1.430 ± .003 inch diameter ring gauge 2 inches long will stop.*
2. *Anode contact (J1-22) aligns with base pin No. 5, ±10°.*

*5AHP7

Type 5AHP7 is similar to 5AHP4A except that it has non-aluminized P7 phosphor, which has blue-white fluorescence, yellow phosphorescence and long persistence.

Type 5AHP—can be supplied with several other phosphors, either aluminized or non-aluminized, on special order. Aluminized types are identified by the suffix "A" on the type number.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic

Types*	Fluorescence	Phosphorescence	Persistence
5AMP1	Green	——	Medium
5AMP1A	Green	——	Medium
5AMP2	Blue - Green	Green	Long
5AMP2A	Blue - Green	Green	Long
5AMP7	Blue - White	Yellow	Long
5AMP7A	Blue - White	Yellow	Long
5AMP11	Blue	——	Short
5AMP11A	Blue	——	Short

Faceplate . . . . . Flat, Clear

*In addition to the types shown, the 5AMP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

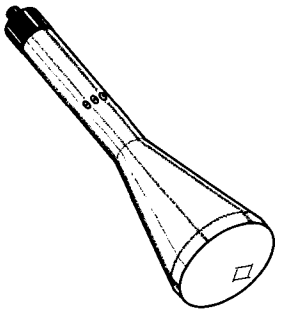
Heater Voltage			6.3 Volts
Heater Current			0.6 ± 10% Ampere
Direct Interelectrode Capacitances	MIN.	MAX.	
Cathode to All Other Electrodes	2.7	4.9	μμf
Grid No. 1 to All Other Electrodes	2.9	5.5	μμf
Between Deflecting Plates 1-2	2.1	3.9	μμf
Between Deflecting Plates 3-4	1.3	2.5	μμf
Deflecting Plate 1 to All Other Electrodes	4.3	7.9	μμf
Deflecting Plate 2 to All Other Electrodes	4.0	7.4	μμf
Deflecting Plate 3 to All Other Electrodes	2.9	5.5	μμf
Deflecting Plate 4 to All Other Electrodes	2.6	4.8	μμf

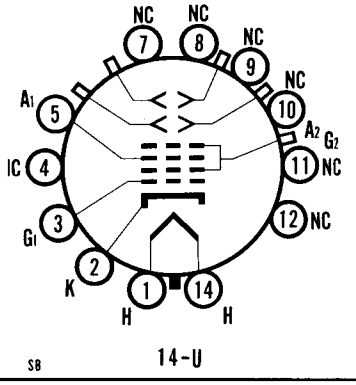
MECHANICAL DATA

Minimum Useful Screen Diameter	4½ Inches
Neck Contacts (Small Ball Caps)	J1-25
Bulb	J42P
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14U
Base Alignment	
D1-D2 Trace Aligns with Pin No. 5 and Tube Axis	± 10 Degrees
Positive Voltage on D1 deflects Beam approx. Toward Pin No. 5	
Positive Voltage on D3 deflects Beam approx. Toward Pin No. 2	
Angle Between D1-D2 trace and D3-D4 trace	90 ± 1 Degrees
Weight (approx.)	2¼ Pounds

QUICK REFERENCE DATA

5" Direct Viewed
Round Glass Type
Flat, Clear Faceplate
Electrostatic Focus
Electrostatic Deflection
Close Tolerances
High Deflection Sensitivity
A2 and deflection plate leads brought out neck.





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK
Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
MARCH, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage[1]	6600 Volts dc
Anode No. 1 Voltage (Focusing Electrode)	1650 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	220 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	0 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	200 Volts
Heater Positive with Respect to Cathode	200 Volts
Peak Voltage Between Anode No. 2 and	
Any Deflection Plate	1320 Volts

TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage	2500 Volts dc
Anode No. 1 Voltage for Focus	0 to 300 Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	−34 to −56 Volts dc
Deflection Factors	
Deflecting Plates 1-2[3]	40 to 50 Volts dc/Inch
Deflecting Plates 3-4[3]	20 to 25 Volts dc/Inch
Deflection Factor Uniformity[4]	1% Max.
Modulation[5]	45 Volts dc/Max.
Line Width "A"[5]	.032 Inches Max.
Anode No. 2 Current[5]	800 μAdc Max.
Pattern Distortion @ 75% Useful Scan[6]	2% Max.
Spot Position (Undeflected, Focused)[7]	Within a $\frac{5}{16}$ Inch Radius Circle
Useful Scan	
D1-D2	± 2 Inches From Tube Face Center or a Total of 4 Inches Minimum
D3-D4	± 1.25 Inches From Tube Face Center or a Total of 2.5 Inches Minimum

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance[8]	1.0 Megohms Max.

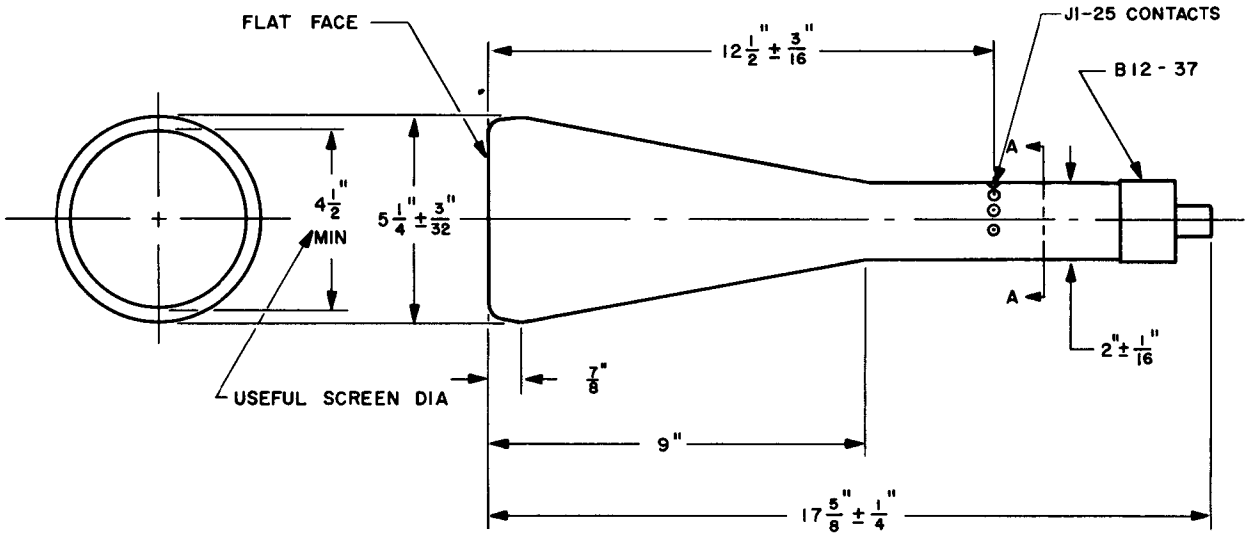
NOTES:

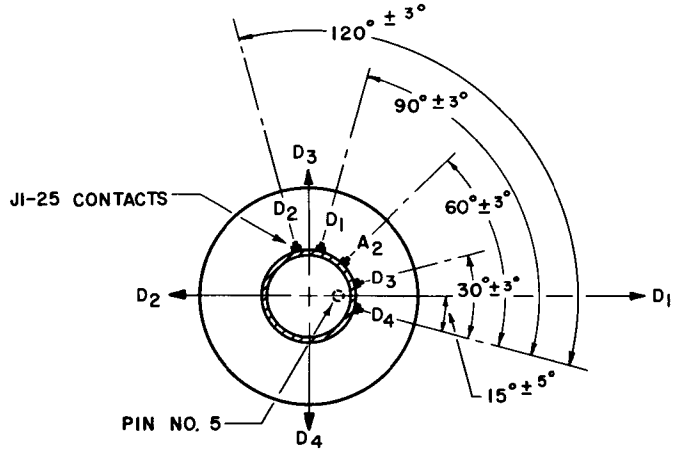
1. *The product of the Anode No. 2 Voltage and Average Anode No. 2 Current should be limited to 6 watts.*
2. *Visual extinction of undeflected focused spot.*
3. *Deflection plates D1 and D2 are nearer the screen; deflecting plates D3 and D4 are nearer the base.*

NOTES: (Cont'd)

4. *The deflection factor (for both D1-D2 and D3-D4 plate pairs, separately) for any deflection of less than 75% of the useful scan will not differ from the deflection factor for a deflection at 25% of the useful scan by more than the indicated value.*
5. *Measured in accordance with MIL-E-1 on a P1 screen at a brightness of 15 foot Lamberts on a 2" x 2" focused raster.*
6. *Raster pattern adjusted so widest points just touch the sides of a 1.912 x 3.060 inch rectangle will fall within the area bounded by the 1.912 x 3.060 inch rectangle and an inscribed 1.837 x 2.940 inch rectangle.*
7. *Limit circle centered on tube face, with the tube shielded and with all deflection plates connected to Anode No. 2. Under stable operating conditions the spot will not shift with changes in intensity by more than .025 inch.*
8. *It is recommended that the deflecting electrode circuit resistances be approximately equal.*
9. *Types 5AMP1A, 5AMP2A, 5AMP7A and 5AMP11A are identical to the 5AMP1, 2, 7, 11 except for the following:*
   (a) Angle between D3-D4 trace and D1-D2 trace — 90° ± 0.8° Degrees
   (b) Pattern distortion at 100% of useful scan: All portions of a raster pattern adjusted so its widest points just touch the sides of a 2.500 by 4.000 inch rectangle will fall within the area bounded by the 2.500 by 4.000 inch rectangle and inscribed 2.420 by 3.912 inch rectangle.

OUTLINE





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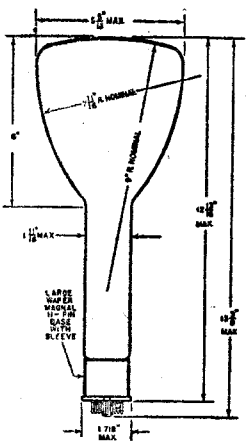
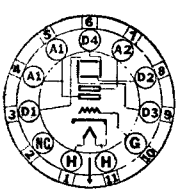
SECTION A-A-VIEW FROM BASE END OF TUBE





10-A

Sylvania

TYPES 5AP1/1805-P1 5AP4/1805-P4

TUBES DE TELEVISION A RAYONS CATHODIQUES

Les types Sylvania 5AP1/1805-P1 et 5AP4/1805-P4 sont des tubes pour images de télévision à rayons cathodiques, ayant un écran visuel de 5 pouces (12,5 cm.). La structure des deux tubes est identique; la seule différence consiste dans la pâte fluorescente utilisée pour l'écran. Ces nouveaux tubes à image sont très semblables aux types Sylvania 5BP1/1802-P1 et 5BP4/1802-P4, quoique plus courts dans la longueur totale.

Le marquage des 5AP1 et 5AP4 est conforme au nouveau système de numérotation R.M.A.

Comme il existe sur le marché des tubes similaires sans cette désignation mais marqués 1805-P1 et 1805-P4, tous ces tubes Sylvania sont marqués avec la double désignation 5AP1/1805-P1 et 5AP4/1805-P4. Ceci indique que ces tubes remplaceront directement n'importe quel 1805-P1 et 1805-P4 ou 5AP1 et 5AP4.

CARACTERISTIQUES

Tension de chauffage	6,3 volts
Courant de chauffage	0,6 ampère
Culot : grand à 11 broches	10-A
Capacités directes interélectrodes :	
Electrode de contrôle à toutes électrodes	6 $\mu\mu f$
Plaques déflectrices D1 à D2	0,8 $\mu\mu f$
Plaques déflectrices D3 à D4	0,5 $\mu\mu f$
D1 à toutes électrodes	7 $\mu\mu f$
D3 à toutes électrodes	5 $\mu\mu f$
D1 à toutes électrodes excepté D2	5 $\mu\mu f$
D2 à toutes électrodes excepté D1	4,5 $\mu\mu f$
D3 à toutes électrodes excepté D4	5 $\mu\mu f$
D4 à toutes électrodes excepté D3	4 $\mu\mu f$
Conditions limites de fonctionnement :	
Tension de chauffage	6,3 volts
Tension anode nº 2	2,000 volts max.
Tension anode nº 1	1,200 volts max.
Tension grille contrôle	Jamais positive.
Tension pointe entre anode nº 2 et n'importe quelle plaque déflectrice	500 volts max.
Puissance densité écran par cm2	10 mw. max.

Conditions de fonctionnement :

Tension de chauffage	6,3	6,3 volts
Tension anode n° 2	1,500	2,000 volts
Tension anode n° 1*	430	575 volts appr.

Tension grille contrôle +× ... Variable pour contrôle intensité image.

Sensibilité de déflexion :

Plaques D1 et D2	0,23	0,17 mm./volt c. c.
Plaques D3 et D4	0,28	0,21 mm./volt c. c.

* Ajustable à ± 20 p. c. des valeurs indiquées.

\+ 15 p. c. approximativement de la tension d'anode n° 1 est nécessaire pour couper courant.

× Résistance maximum dans le circuit de grille limitée à 5 mégohms.

Ecran :

Type	Fluorphor	Couleur
5AP1/1805-P1	N° 1	verte
5AP4/1805-P4	N° 4	blanche

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic			
Deflection Method	Electrostatic			
Types*	5AQP1	5AQP2	5AQP7	5AQP11
	5AQP1A	5AQP2A	5AQP7A	5AQP11A
	5AQP1B	5AQP2B	5AQP7B	5AQP11B
Fluorescence	Green	Green	Blue	Blue
Phosphorescence	—	Green	Yellow	—
Persistence	Medium	Medium	Long	Short
Faceplate				
5AQP-, 5AQP-A	Clear			
5AQP-B	Clear, Aluminized			

*In addition to the types shown, the 5AQP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10 % Ampere

Direct Interelectrode Capacitances

	Min.	Max.
Cathode to All Other Electrodes	2.7	5.0 μμf
Grid No. 1 to All Other Electrodes	3.7	6.9 μμf
Between Deflecting Plates 1-2[1]	2.4	4.5 μμf
Between Deflecting Plates 3-4[1]	0.8	1.6 μμf
Deflecting Plate 1[1] to All Other Electrodes	5.0	9.3 μμf
Deflecting Plate 2[1] to All Other Electrodes	5.0	9.3 μμf
Deflecting Plate 3[1] to All Other Electrodes	3.3	6.3 μμf
Deflecting Plate 4[1] to All Other Electrodes	3.3	6.3 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	4½ Inches
Bulb	J42P
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14G
Base Alignment	
D1-D2 Trace Aligns With Pin No. 5 and Tube Axis[4]	±10 Degrees
Angle Between D1-D2 and D3-D4 Traces (5AQP-)[4]	90 ± 1 Degree
Angle Between D1-D2 and D3-D4 Traces (5AQP-A, 5AQP-B)[4]	90 ± 0.8 Degree
Weight (Approx.)	2 Pounds

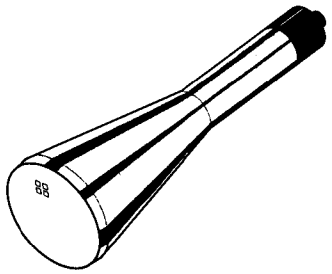
RATINGS

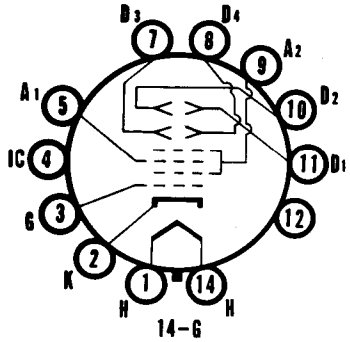
MAXIMUM RATINGS (Absolute Maximum Values)

Maximum Anode No. 2 Voltage[2]	4400 Volts	dc
Minimum Anode No. 2 Voltage (5AQP-B Only)	1500 Volts	dc
Anode No. 1 Voltage	1650 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	220 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	0 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	
Peak Voltage Between Anode No. 2 and Any Deflecting Plate	400 Volts	

QUICK REFERENCE DATA

Oscilloscope Tube
5″ Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Flat Face
Clear Faceplate
5AQP-A Closer Tolerances
5AQP-B Closer Tolerances, Aluminized





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MARCH, 1962

File Under
SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage	2500 Volts	dc
Anode No. 1 Voltage for Focus	0 to 300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−34 to −56 Volts	dc
Deflection Factor[4]		
Deflecting Plates 1-2	40 to 50 Volts	dc/Inch
Deflecting Plates 3-4	31.5 to 38.5 Volts	dc/Inch
P1 Light Output[5]	15 Ft. L.	Min.
Modulation[5]	40 Volts	dc Max.
Line Width A[5]	.030 Inches	Max.
Anode No. 2 Current[5]	400 μa	dc Max.
Deflection Factor Uniformity[6]	1 Percent	Max.
Pattern Distortion at 75 % of Useful Scan[7] (5AQP-)	2 Percent	Max.
Pattern Distortion at 100 % of Useful Scan[8] (5AQP-A, 5AQP-B)	1 Percent	Max.
Spot Position[9]	Within a 5/16 Inch Radius Circle	
Useful Scan (Centered on Tube Face)	4 x 4 Inches	Min.

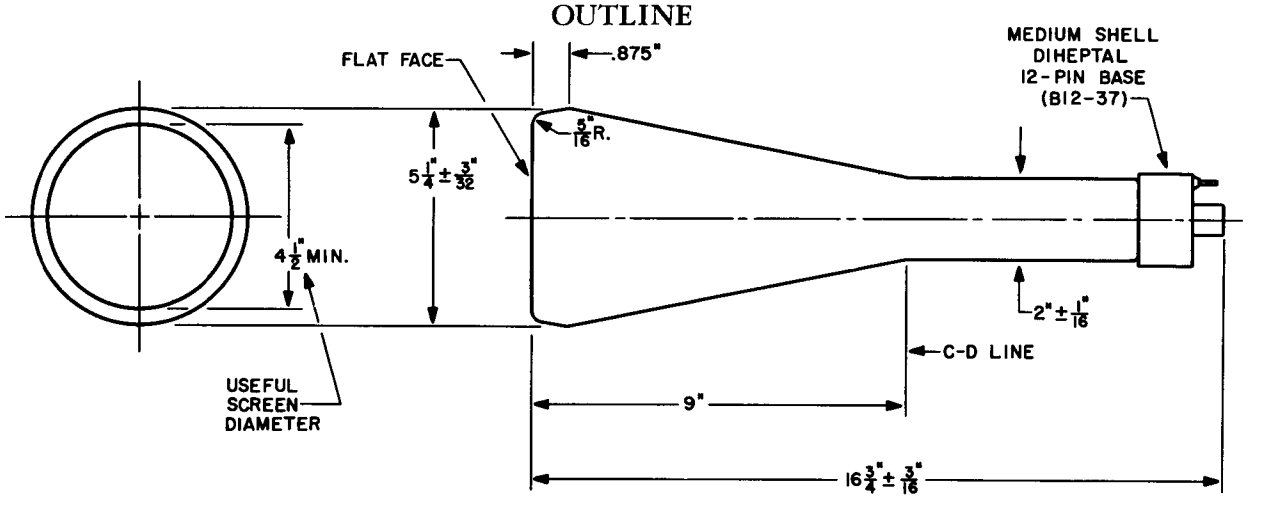
CIRCUIT VALUES

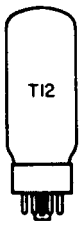
Grid No. 1 Circuit Resistance	1.5 Megohms	Max.
Deflection Circuit Resistance[10]	1.0 Megohms	Max.

NOTES:

1. *Deflecting Plate 1 is Pin No. 11*
   Deflecting Plate 2 is Pin No. 10
   Deflecting Plate 3 is Pin No. 7
   Deflecting Plate 4 is Pin No. 8
2. *The product of Anode No. 2 voltage and average Anode No. 2 current should be limited to 6.0 watts.*
3. *Visual extinction of undeflected focused spot.*
4. *Positive voltage on D1 deflects beam approximately toward Pin No. 5.*
   Positive voltage on D3 deflects beam approximately toward Pin No. 2.
5. *Measured in accordance with MIL-E-1 specification on a P1 screen at a brightness of 15 Ft. L. on a raster size of 2 x 2 inches.*
6. *The deflection factors at 75 % of useful scan and at 25 % of useful scan shall not differ by more than the indicated value.*
7. *All edges of a raster pattern, adjusted so its widest points just touch the sides of a 3.075 inch square, will fall within the area bounded by the 3.075 inch square and an inscribed 2.925 inch square.*
8. *The edges of a raster pattern, adjusted so its widest points just touch the sides of a 4.000 inch square, will fall within the area bounded by the 4.000 inch square and an inscribed 3.916 inch square, except at the corners where the geometry of the tube makes this impossible.*
9. *Centered on the tube face with the tube shielded and with all deflection plates connected to Anode No. 2.*
10. *It is recommended that the deflecting electrode circuit resistances be approximately equal.*

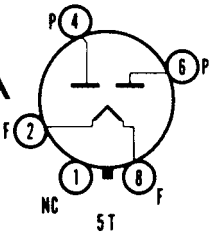
OUTLINE





SYLVANIA TYPE 5AS4A

F-W RECTIFIER



MECHANICAL DATA

Bulb	T-12
Base	B5-121, Short Medium Shell Octal 5-Pin or B8-118 Short Medium Shell Octal 8-Pin
Outline	12-15
Basing	5T
Cathode	Coated Filament
Mounting Position[1]	Vertical

ELECTRICAL DATA

FILAMENT CHARACTERISTICS

Filament Voltage, AC or DC	5.0 Volts
Filament Current	3.0 Amperes

RATINGS (Design Center Values)[2]

Rectifier Service[3]

Peak Inverse Plate Voltage	1550 Volts Max.
AC Plate Supply Voltage Each Plate, RMS (See Rating Chart I)	550 Volts Max.
DC Output Current	See Rating Chart I
Steady State Peak Plate Current Each Plate (See Rating Chart II)	1.0 Amperes Max.
Transient Peak Plate Current Each Plate (See Rating Chart III)	4.6 Amperes Max.

AVERAGE CHARACTERISTICS

Tube Voltage Drop	
Tube Conducting:	
275 Ma Each Plate	50 Volts
300 Ma Each Plate	54 Volts

TYPICAL OPERATION

Full Wave Rectifier—Capacitor Input Filter

AC Plate Supply Voltage Each Plate, RMS[4]	300	450 Volts
Filter Input Capacitor	40	40 μf
Effective Plate-Supply Resistance Each Plate	21	67 Ohms
DC Output Current	300	275 Ma
DC Output Voltage at Filter Input	290	460 Volts

Full Wave Rectifier—Choke Input Filter

AC Plate Supply Voltage Each Plate, RMS[4]	550 Volts
Filter Input Choke	10 Henrys
DC Output Current	275 Ma
DC Output Voltage at Filter Input	420 Volts

NOTES:

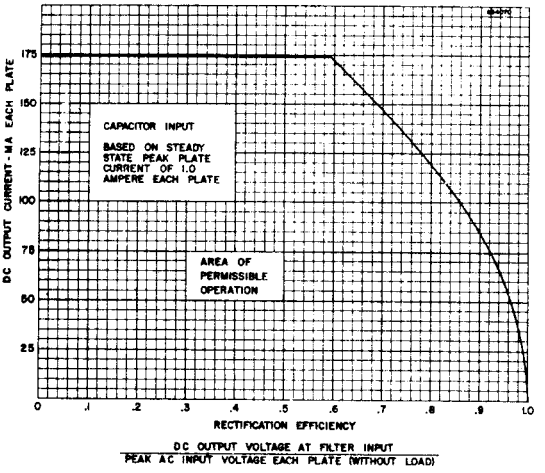
1. Horizontal Operation is permitted if Pins 1 and 4 are in a vertical plane.
2. See "Interpretation of Rating Charts".
3. For use with sinusoidal supply voltages within the frequency range of 25 to 1000 cps.
4. AC plate voltage is measured without load.

APPLICATION

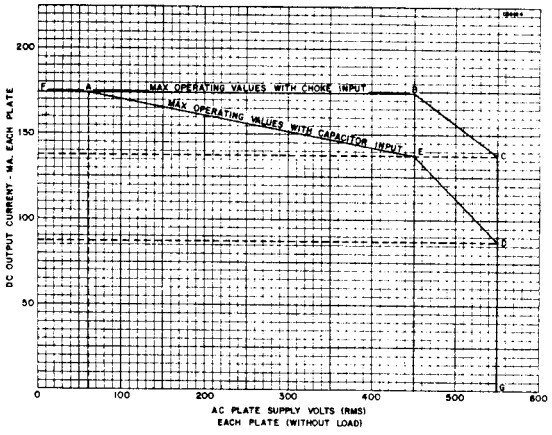
The Sylvania Type 5AS4A is a filamentary, full-wave, high vacuum rectifier designed for service in the power supply of television receivers or other equipment requiring high current.

5AS4A (Cont'd)

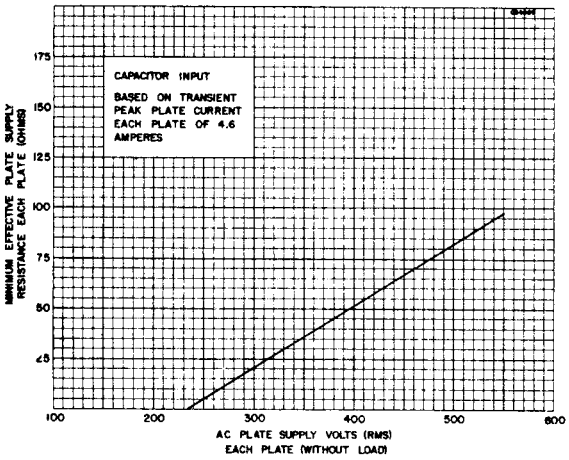
RATING CHART I



RATING CHART II



RATING CHART III



SYLVANIA engineering data service

SYLVANIA
5AUP24
5AUP-*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	40°
Prosphor	Aluminized P-24
Fluorescence	Green
Phosphorescence	Green
Persistence	Short
Faceplate	Clear, Flat

*In addition to the type shown, the 5AUP– can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Amperes
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5	μμfd
Grid No. 1 to All Other Electrodes	8	μμfd
Ion Trap	No Ion Trap Required	

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	4¼	Inches
Overall Length	12½ ± ⅜	Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duo Decal 7 Pin)	B7-51	
Basing	12C	
Bulb	J40L	
External Conductive Neck Coating to Anode[1]	500 μμf	Max.
	100 μμf	Min.
Weight (Approx.)	1.4	Pounds

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Maximum Anode Voltage	30,000	Volts	dc
Minimum Anode Voltage	20,000	Volts	dc
Grid No. 3 Voltage (Focusing Electrode)	6600	Volts	dc
Grid No. 2 Voltage	385	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	155	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	165	Volts	
Heater Positive with Respect to Cathode	165	Volts	

TYPICAL OPERATING CONDITIONS

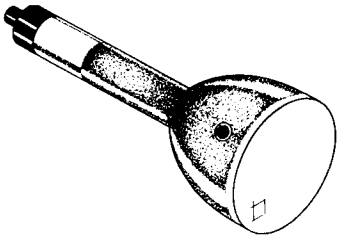
Anode Voltage	27,000 Volts	dc
Grid No. 3 Voltage for Focus (Ib = 200 μa)	4600 to 5800 Volts	dc
Grid No. 2 Voltage	200 Volts	dc
Grid No. 1 Voltage for Spot Cutoff[2]	−40 to −100 Volts	dc

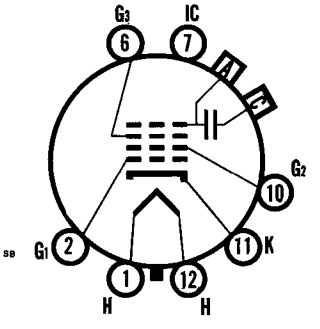
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Color Flying Spot Scanner Tube
5" Round Glass Type
Flat Faceplate
Clear Faceplate
Magnetic Deflection
Electrostatic Focus
No Ion Trap
Aluminized Screen





12-C

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
OCTOBER, 1961

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

NOTE:

1. External conductive neck coating must be grounded.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

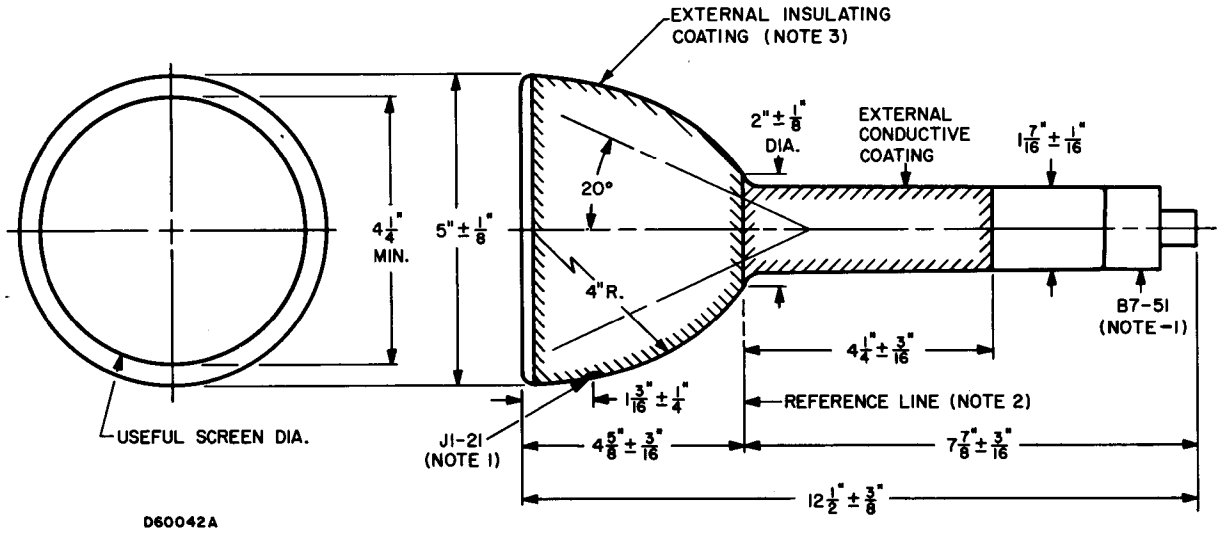


DIAGRAM NOTES:

1. *The plane through the tube axis and vacant pin position No. 3 may vary from the plane through the tube axis and anode terminal by an angular tolerance (measured about the tube axis) of ± 10°. Anode terminal is on the same side as vacant pin position No. 3.*
2. *With tube neck inserted through flared end of reference line gauge (JEDEC No. 110) and with the tube seated in the gauge, the reference line is determined by intersection of plane CC' of the gauge with the glass funnel.*
3. *The 5AUP– should be handled by the neck only. Fingerprints or dust on the insulating coating on the bulb may cause electrical breakdown during humid weather.*

engineering data service

SYLVANIA

5AV8

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9DZ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	4.7 Volts
Heater Current	600 Ma
Heater Warm-up Time[1]	11 Seconds
Heater-Cathode Voltage (Design Center Values)	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
DC	100 Volts Max.
Total DC and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section	
Grid to Plate	1.5 μμf
Input	2.0 μμf
Output	0.27 μμf
Pentode Section	
Grid No. 1 to Plate	0.04 μμf Max.
Input	7.0 μμf
Output	2.3 μμf
Triode Grid to Pentode Plate	0.005 μμf
Pentode Grid No. 1 to Triode Plate	0.006 μμf
Pentode Plate to Triode Plate	0.045 μμf

RATINGS (Design Center Values)

	Triode	Pentode	
Plate Voltage	300	300	Volts Max.
Grid No. 2 Supply Voltage		300	Volts Max.
Grid No. 2 Voltage	See Rating Chart		
Grid No. 1 Voltage			
Positive Bias Value	0	0	Volts Max.
Plate Dissipation	2.5	2.0	Watts Max.
Grid No. 2 Input		0.5	Watt Max.
Grid No. 1 Circuit Resistance[2]			
Cathode Bias	1.0	1.0	Megohm Max.
Fixed Bias	0.5	0.25	Megohm Max.

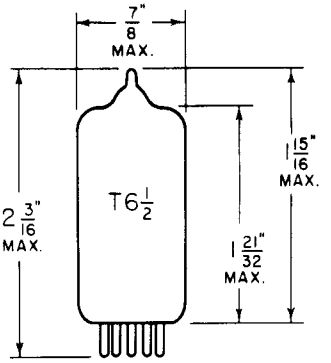
CHARACTERISTICS

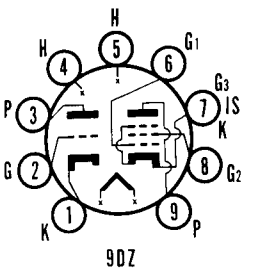
	Triode	Pentode	
Plate Supply Voltage	200	200	Volts
Grid No. 2 Supply Voltage		150	Volts
Grid No. 1 Voltage	-6		Volts
Cathode Bias Resistor		180	Ohms
Plate Current	13	9.5	Ma
Grid No. 2 Current		2.8	Ma
Amplification Factor	19		
Plate Resistance (approx.)	5750	300,000	Ohms
Transconductance	3300	6200	μmhos
Grid No. 1 Voltage for I_b = 10 μa (approx.)	-19	-8	Volts

QUICK REFERENCE DATA

The Sylvania Type 5AV8 is a medium mu triode and sharp cutoff pentode contained in a 9-pin, miniature envelope. It is intended for service in television receivers employing a series heater arrangement.

Except for heater characteristics and basing, the Type 5AV8 is identical to the 6AN8.





9DZ

SYLVANIA ELECTRIC PRODUCTS INC.

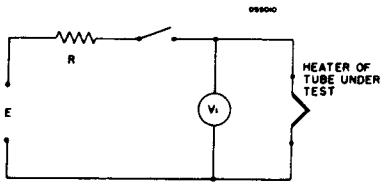
RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JULY 1955

NOTES:

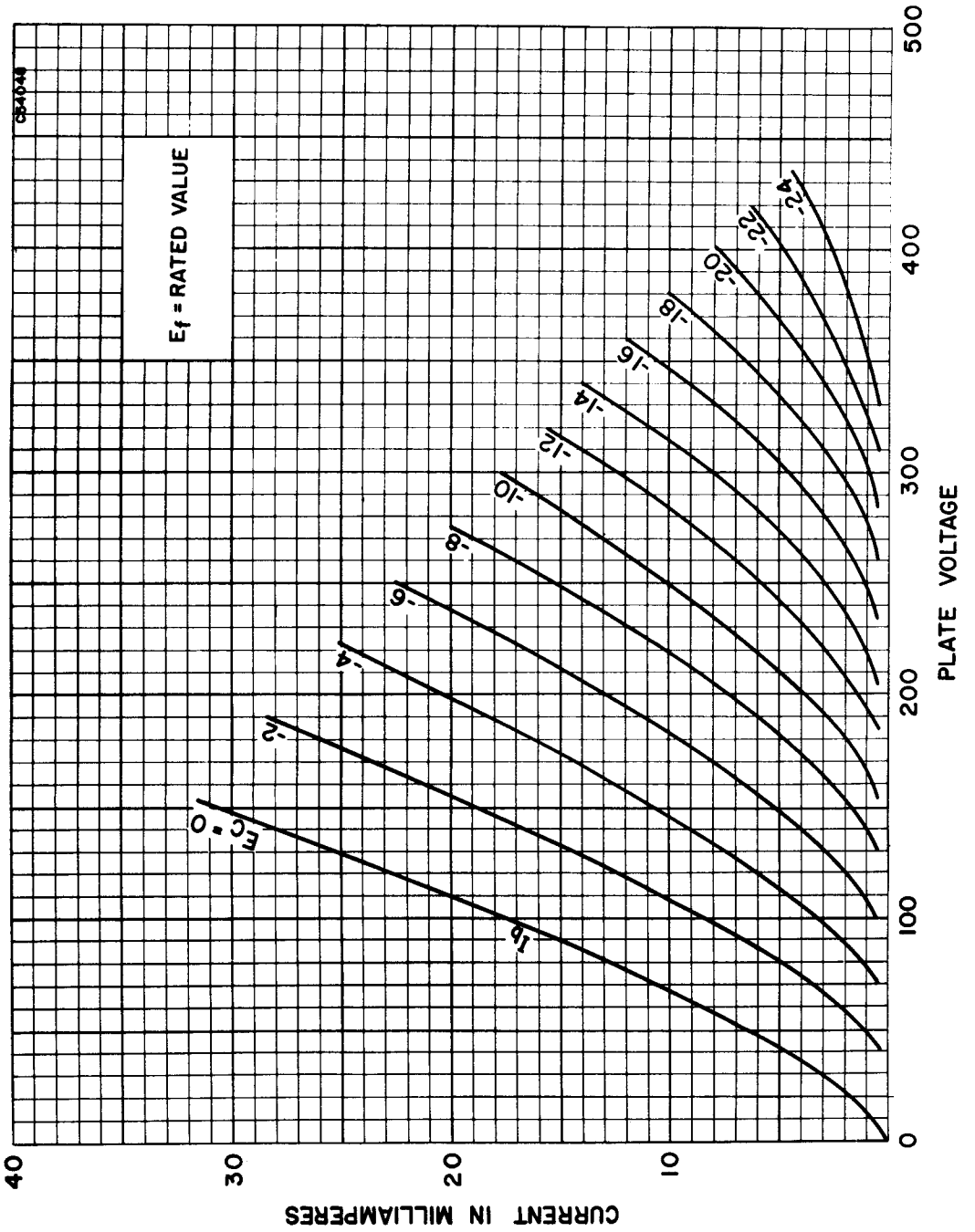
1. *Heater Warm-up Time is defined as the time required in the circuit shown below for the voltage across the heater terminals to increase from zero to the heater test voltage (V1). The conditions used in conjunction with the test circuit depend upon the rated heater voltage and current of the tube under test. For this type: E = 18.8 Volts, R = 23.6 Ohms, V1 = 3.75 Volts.*



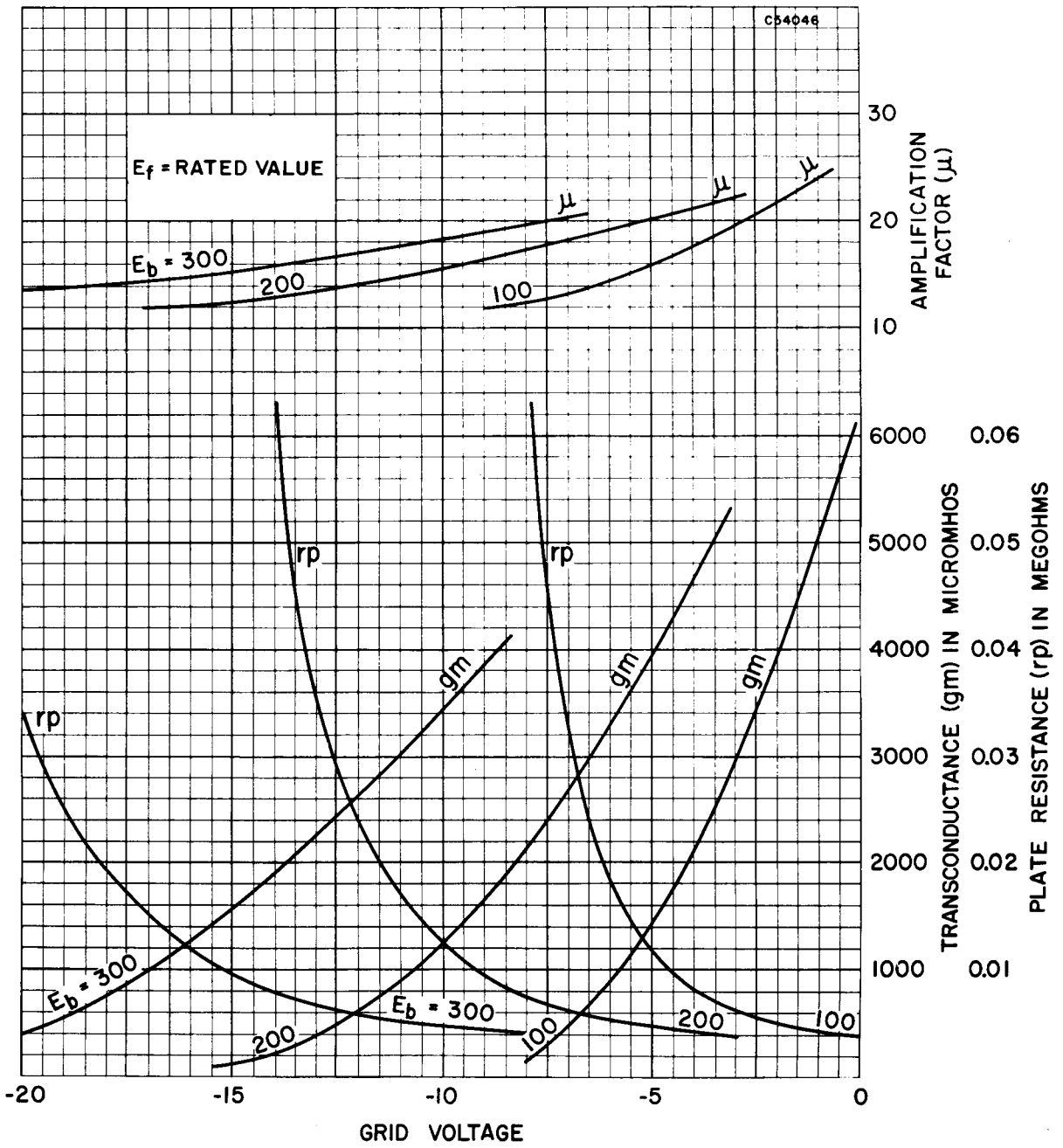
E — Applied Voltage, RMS or DC
R — Total Series Resistance
V1 — Heater Test Voltage, RMS or DC (80% Rated Heater Voltage)

2. *If either unit is operating at maximum rated conditions, Grid No. 1 Circuit resistances for both units should not exceed the stated values.*

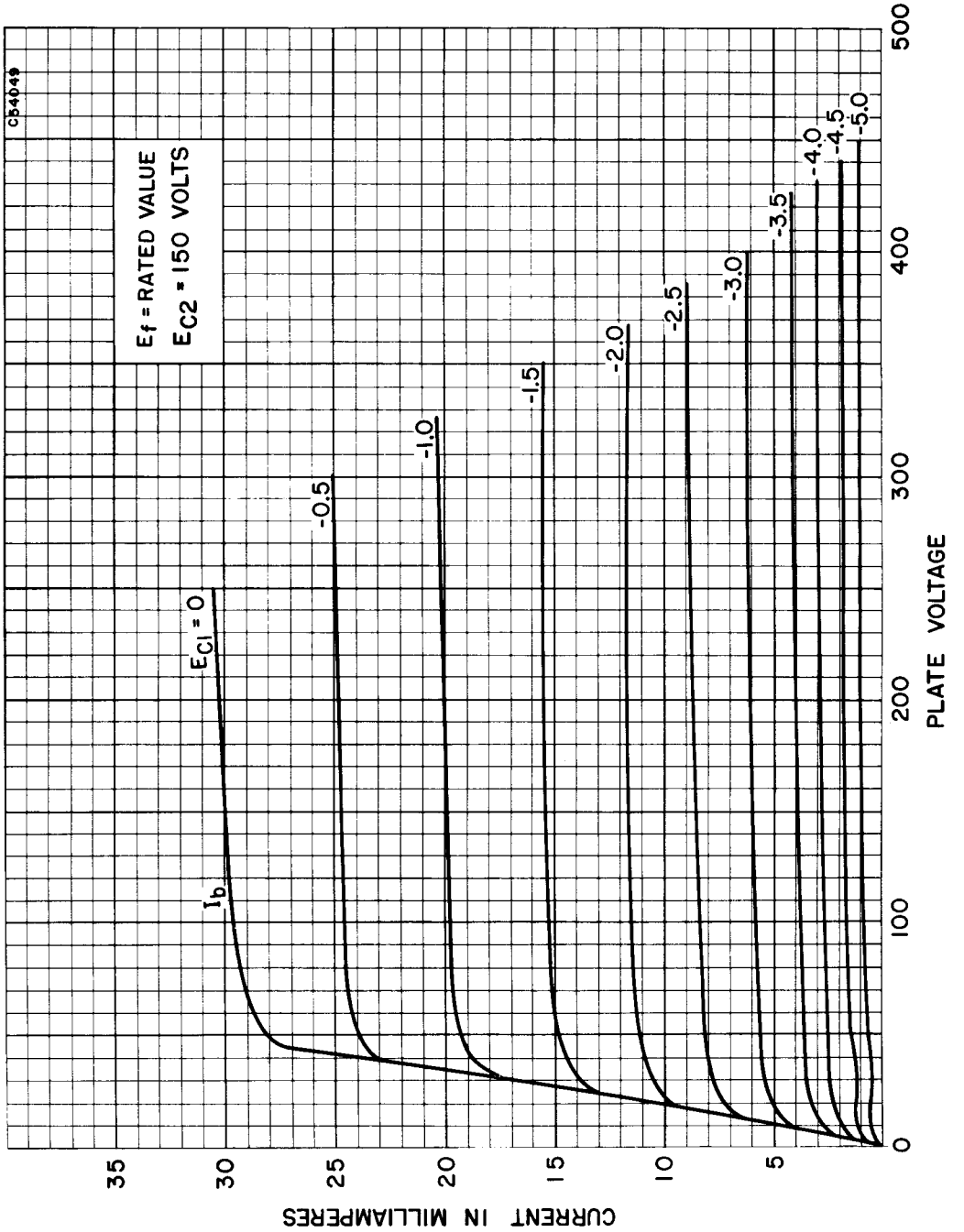
AVERAGE PLATE CHARACTERISTICS
TRIODE SECTION



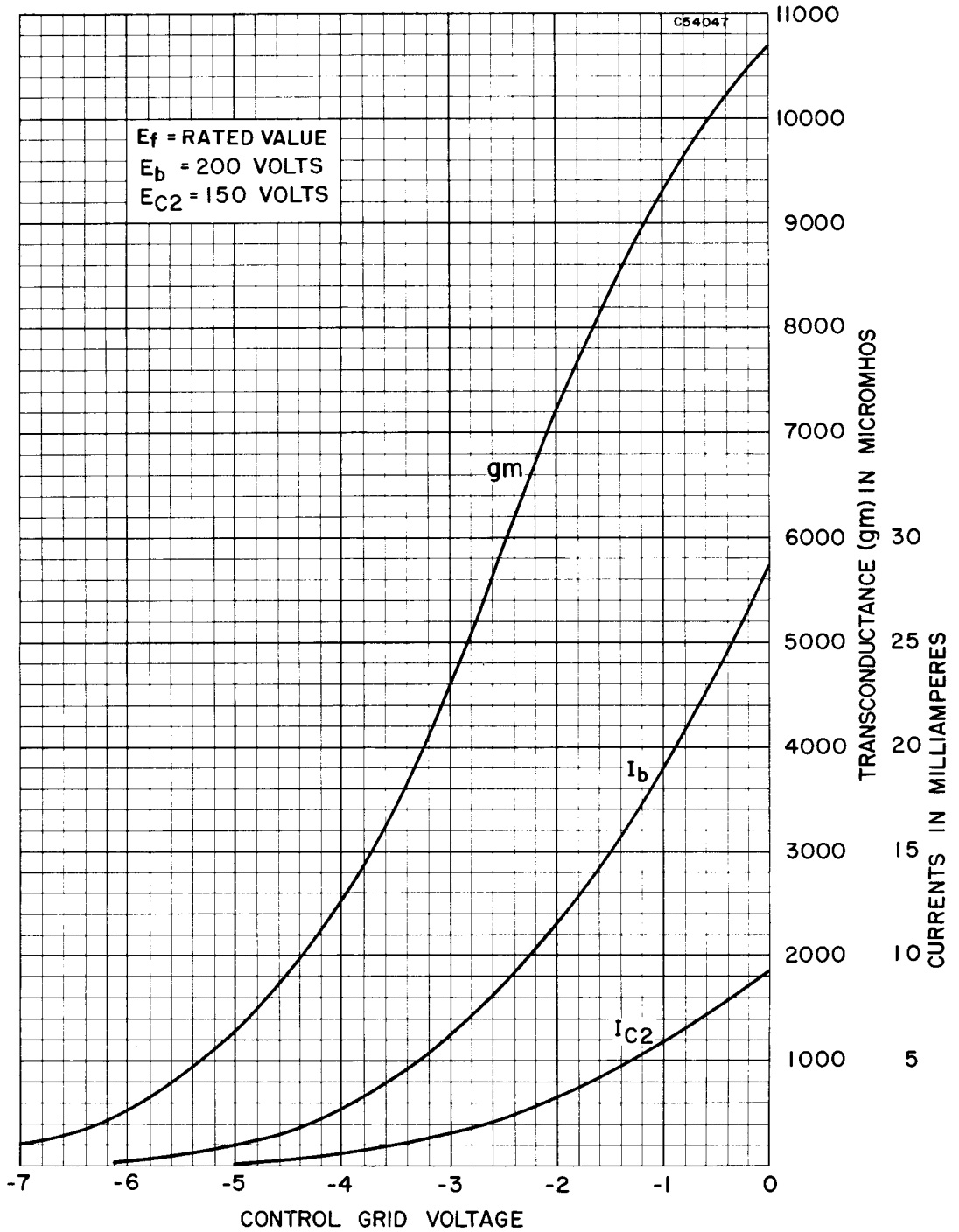
AVERAGE TRANSFER CHARACTERISTICS
TRIODE SECTION



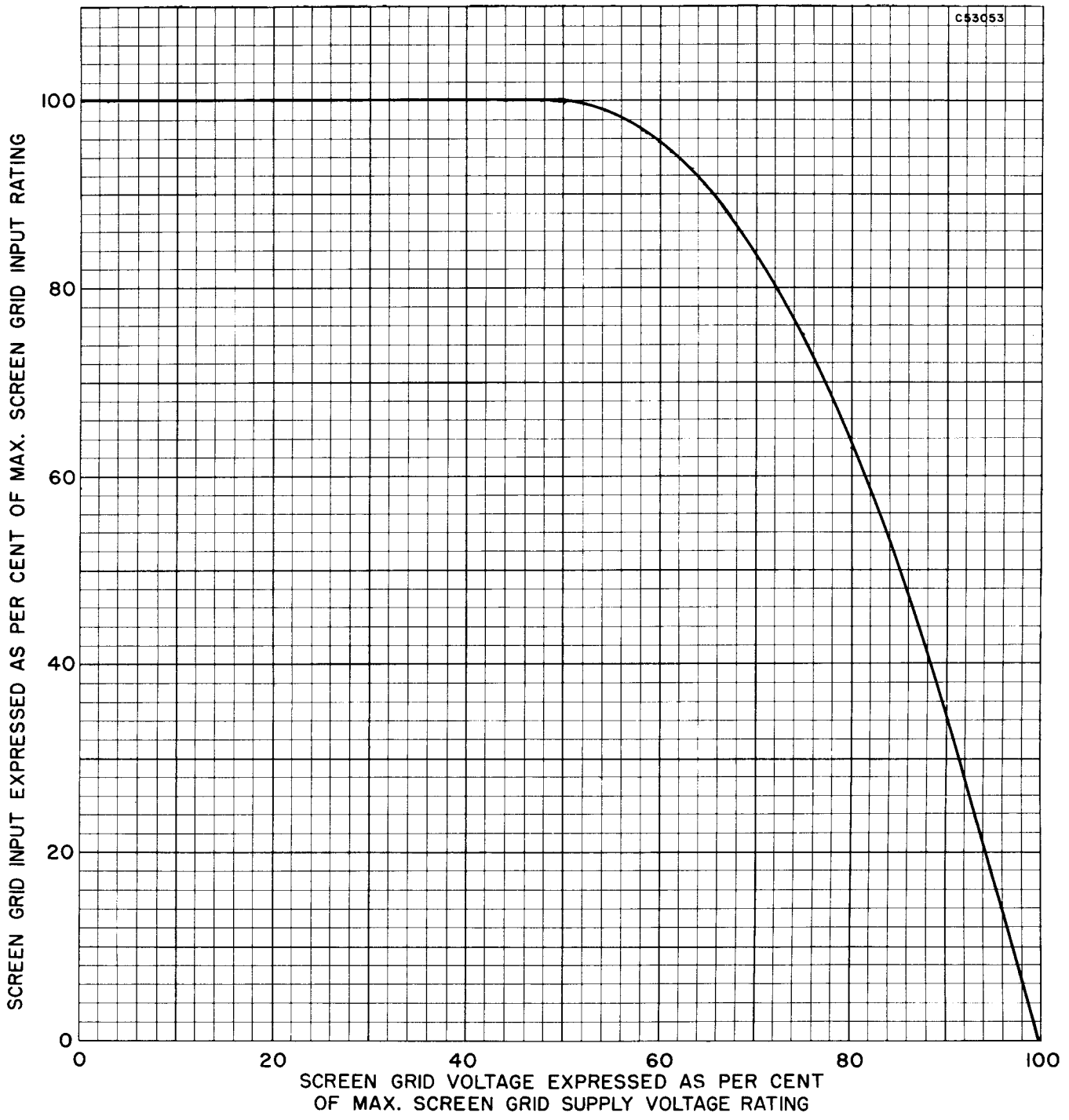
AVERAGE PLATE CHARACTERISTICS
PENTODE SECTION



AVERAGE TRANSFER CHARACTERISTICS
PENTODE SECTION



RATING CURVE



SYLVANIA ELECTRIC

RMA Registration Data

TYPE 5AX4GT

DOUBLE DIODE

MECHANICAL DATA

Style	GT
Cathode	coated filament
Bulb	T-9
Base	B5-10, Intermediate Shell Octal 5-Pin
Outline	9-13
Maximum Diameter	1 5/16 inches
Maximum Overall Length	3 3/8 inches
Maximum Seated Height	2 13/16 inches
Mounting Position:	
Vertical	base up or down
Horizontal	pins 6 and 8 in vertical plane
Basing	5T

Pin Connections:

Pin 1 .. no connection
Pin 2 .. filament
Pin 4 .. plate #2
Pin 6 .. plate #1
Pin 8 .. filament

ELECTRICAL DATA

GENERAL

Filament Voltage (ac or dc)	5.0	volts
Filament Current	2.5	amps

RATINGS -- *Design Center System*

Maximum Plate Supply Voltage (ac) (each plate):		
Capacitor Input	350	volts
Choke Input	500	volts
Maximum Peak Inverse Plate Voltage	1,400	volts
Maximum Peak Plate Current (each plate):		
Steady State	525	milliamps
Transient	3.5	amps
Maximum Output Current (dc)	175	milliamps

CHARACTERISTICS

Tube Voltage Drop, with 175 milliamps Plate Current (dc) (each plate)	65	volts

TYPICAL OPERATION -- *Full Wave Rectifier*

Input to Filter	*Capacitor*	*Choke*	
Filament Voltage	5.0	5.0	volts
Plate Supply Voltage (ac) (each plate)	350	500	volts
Filter Input Capacitance	10	---	microfarads
Filter Input Inductance	---	10	henrys
Effective Plate Supply Impedance (each plate)	50	---	ohms
Output Current (dc)	175	175	milliamps
Output Voltage (dc)	330	375	volts

from RMA release #909, Sept. 21, 1950

SYLVANIA

engineering data service

SYLVANIA

5AXP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Self Focusing (Electrostatic)
Deflecting Method	Magnetic
Deflecting Angle (approx.)	53 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Clear Glass

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 Ampere
Direct Interelectrode Capacitances	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6 μμf

MECHANICAL DATA

Overall Length	$10\frac{5}{8} \pm \frac{3}{8}$"
Maximum Diameter	$4\frac{15}{16} \pm \frac{3}{32}$"
Minimum Useful Screen Diameter	4¼"
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12S

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	18,000 Volts dc
Grid No. 2 (and Grid No. 4) Voltage	500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-Up Not to Exceed 15 Seconds	410 Volts
After Equipment Warm-Up	180 Volts
Heater Positive with Respect to Cathode	180 Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000 Volts dc
Grid No. 2 (and Grid No. 4) Voltage	300 Volts dc
Grid No. 1 Voltage for Cutoff[1]	−28 to −72 Volts dc

CIRCUIT VALUES

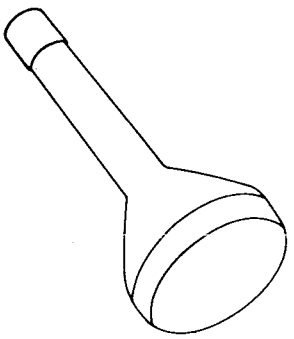
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

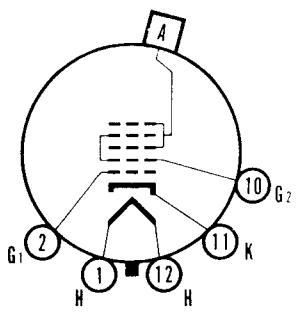
NOTE:

1. Visual Extinction of Raster.

QUICK REFERENCE DATA

Receiver Check Tube
5" Round, All Glass
Self Focusing (Electrostatic)
No Ion Trap
Magnetic Deflection





12-S

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

Rev. 1
MAY 1955

SYLVANIA

5AXP4

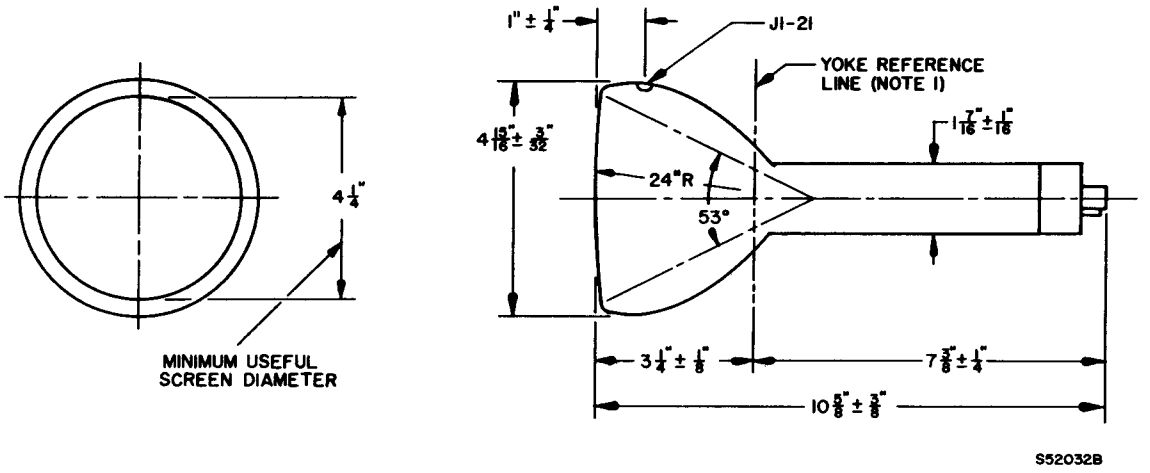


DIAGRAM NOTES:

1. *The yoke reference line is determined by plane C-C' of JETEC gauge 116, with the gauge resting against the bulb cone.*
2. *Anode contact (J1-21) aligns with vacant base pin position No. 6 ±30 degrees.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button, 9-Pin
Outline	6-2
Basing	9EC
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	4.7	Volts
Heater Current	600	Ma
Heater Warm-up Time[1]	11	Seconds
Heater-Cathode Voltage (Design Center Values)		
Heater Negative with Respect to Cathode		
Total DC and Peak	200	Volts Max.
Heater Positive with Respect to Cathode		
DC	100	Volts Max.
Total DC and Peak	200	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded Approx.)

Triode Grid to Triode Plate	1.7	μμf
Pentode Grid No. 1 to Pentode Plate	.05	μμf Max.
Triode Grid to (Triode Cathode, Pentode Grid No. 3, I.S., Heater)	1.9	μμf
Triode Plate to (Triode Cathode, Pentode Grid No. 3, I.S., Heater)	1.4	μμf
Pentode Grid No. 1 to (Pentode Cathode, Grid No. 2, Heater)	6.0	μμf
Pentode Plate to (Pentode Cathode, Grid No. 2, Grid No. 3, Triode Cathode, I.S., Heater)	2.6	μμf
Pentode Plate to (Pentode Cathode, Grid No. 2, Heater)	.15	μμf
Triode Grid to Pentode Plate	.0078	μμf
Pentode Grid No. 1 to Triode Plate	.0033	μμf
Triode Plate to Pentode Plate	.060	μμf

RATINGS (Design Center Values)

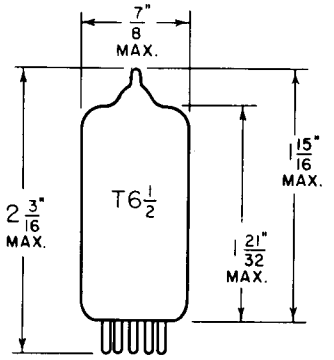
	Triode	Pentode	
Plate Voltage	300	300	Volts Max.
Grid No. 2 Supply Voltage		300	Volts Max.
Grid No. 2 Voltage	See Rating Chart		
Positive Grid No. 1 Voltage	0	0	Volts Max.
Plate Dissipation	2.5	2.0	Watts Max.
Grid No. 2 Dissipation		0.5	Watt Max.
Grid No. 1 Circuit Resistance[2]			
Fixed Bias	0.5	0.25	Megohm
Self Bias	1.0	1.0	Megohm

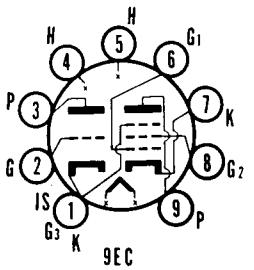
CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier	Triode	Pentode[3]	
Plate Voltage	200	200	Volts
Grid No. 2 Voltage		150	Volts
Grid No. 1 Voltage	-6	0	Volts
Cathode Bias Resistor		180	Ohms
Plate Current	13	9.5	Ma
Grid No. 2 Current		2.8	Ma
Amplification Factor	19		
Transconductance	3300	6200	μmhos
Plate Resistance (approx.)	5750	300,000	Ohms
Grid No. 1 Voltage for I_b = 10 μa (approx.)	-19	-8	Volts

QUICK REFERENCE DATA

The Sylvania Type 5B8 is a miniature sharp cutoff pentode and medium mu triode. The triode section may be used as a low frequency oscillator, sync separator or sync clipper. The pentode section may be used as an if amplifier, video amplifier or agc amplifier. The 5B8 features a 600 Ma heater and controlled heater warm-up time for service in series heater string television receivers. The tube is electrically similar to the 5AV8.





SYLVANIA ELECTRIC PRODUCTS INC.

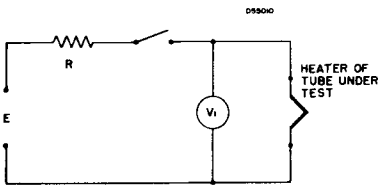
RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JULY 1955

NOTES:

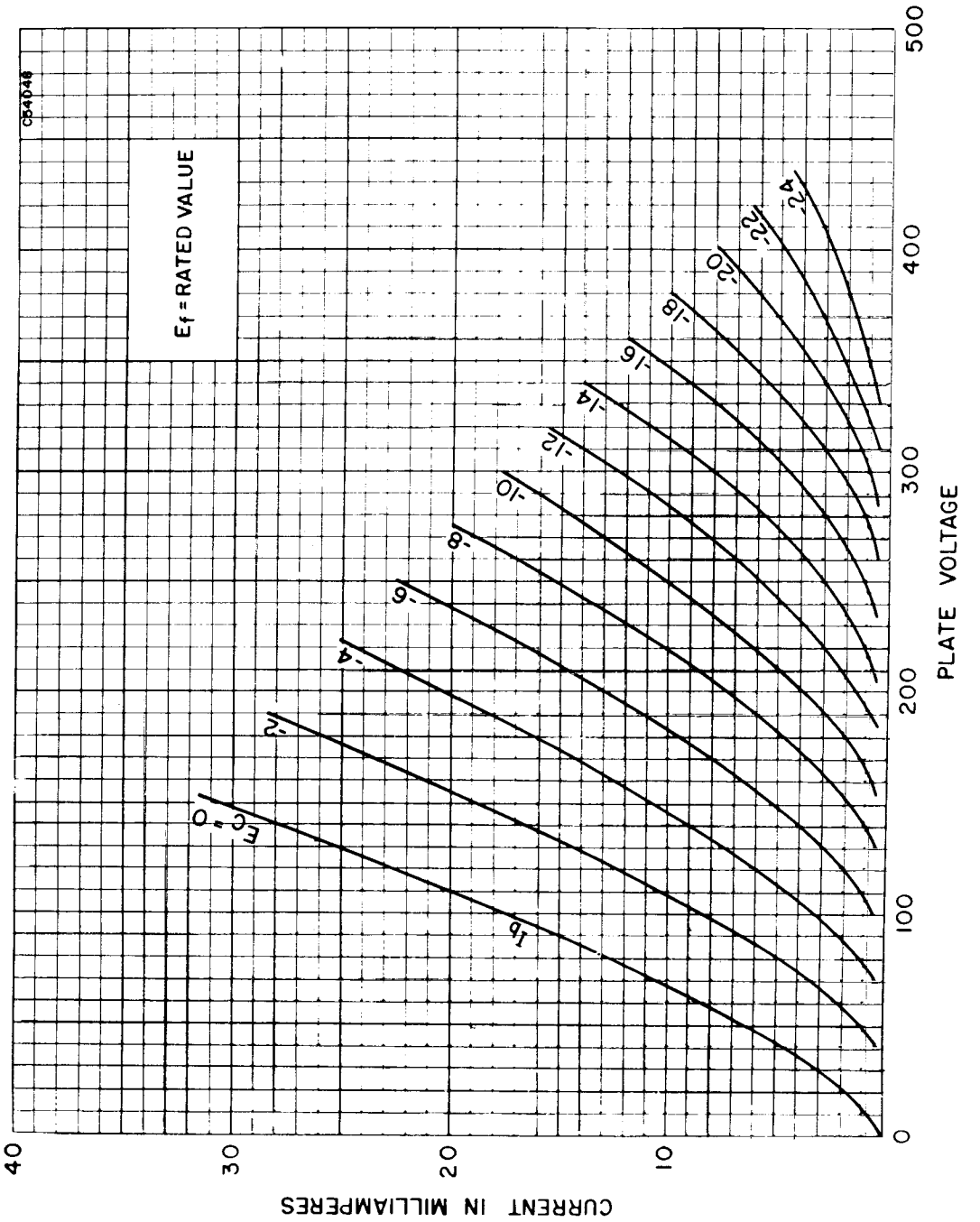
1. *Heater Warm-up Time is defined as the time required in the circuit shown below for the voltage across the heater terminals to increase from zero to the heater test voltage (V1). The conditions used in conjunction with the test circuit depend upon the rated heater voltage and current of the tube under test. For this type: E = 18.8 Volts, R = 23.6 Ohms, V1 = 3.75 Volts.*



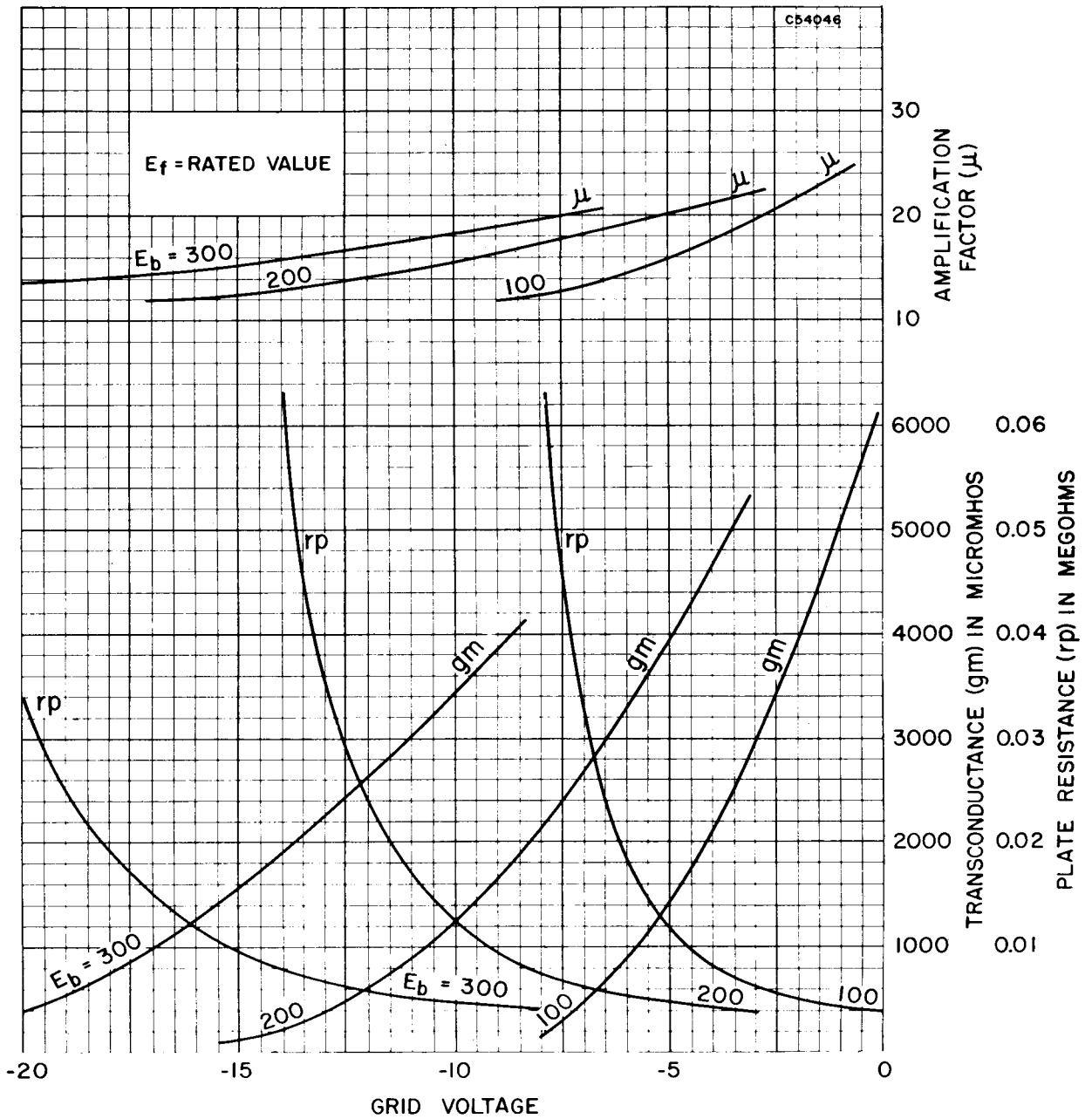
E — Applied Voltage, RMS or DC
R — Total Series Resistance
V1 — Heater Test Voltage, RMS or DC (80% Rated Heater Voltage)

2. *If either unit is operating at maximum rated conditions, Grid No. 1 circuit resistances for both units shall not exceed the stated values.*
3. *When reading characteristics of the pentode section, all triode elements shall be at ground potential. Thus, because of internal connections to Pin No. 1, the pentode suppressor will also be at ground.*

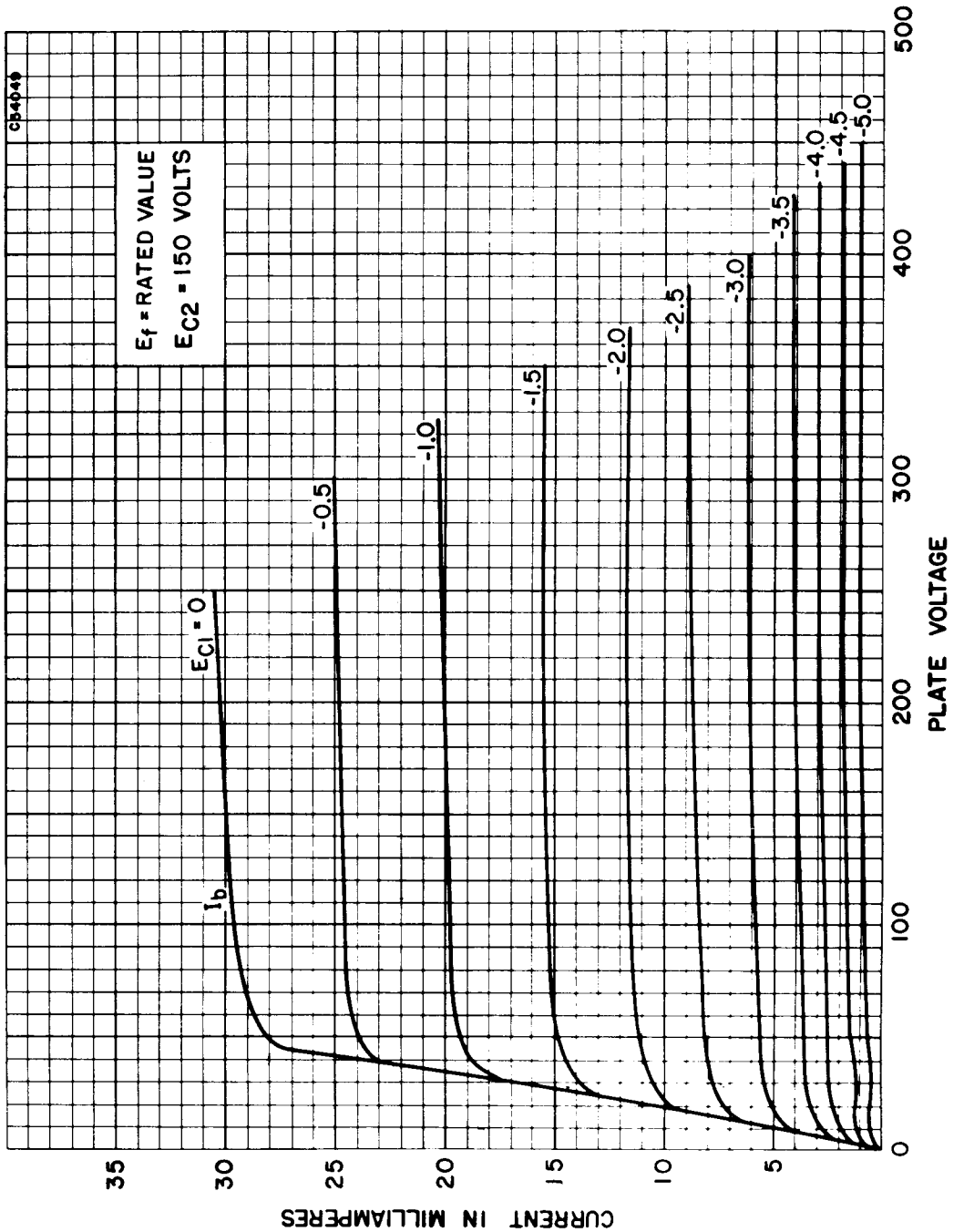
AVERAGE PLATE CHARACTERISTICS
TRIODE SECTION



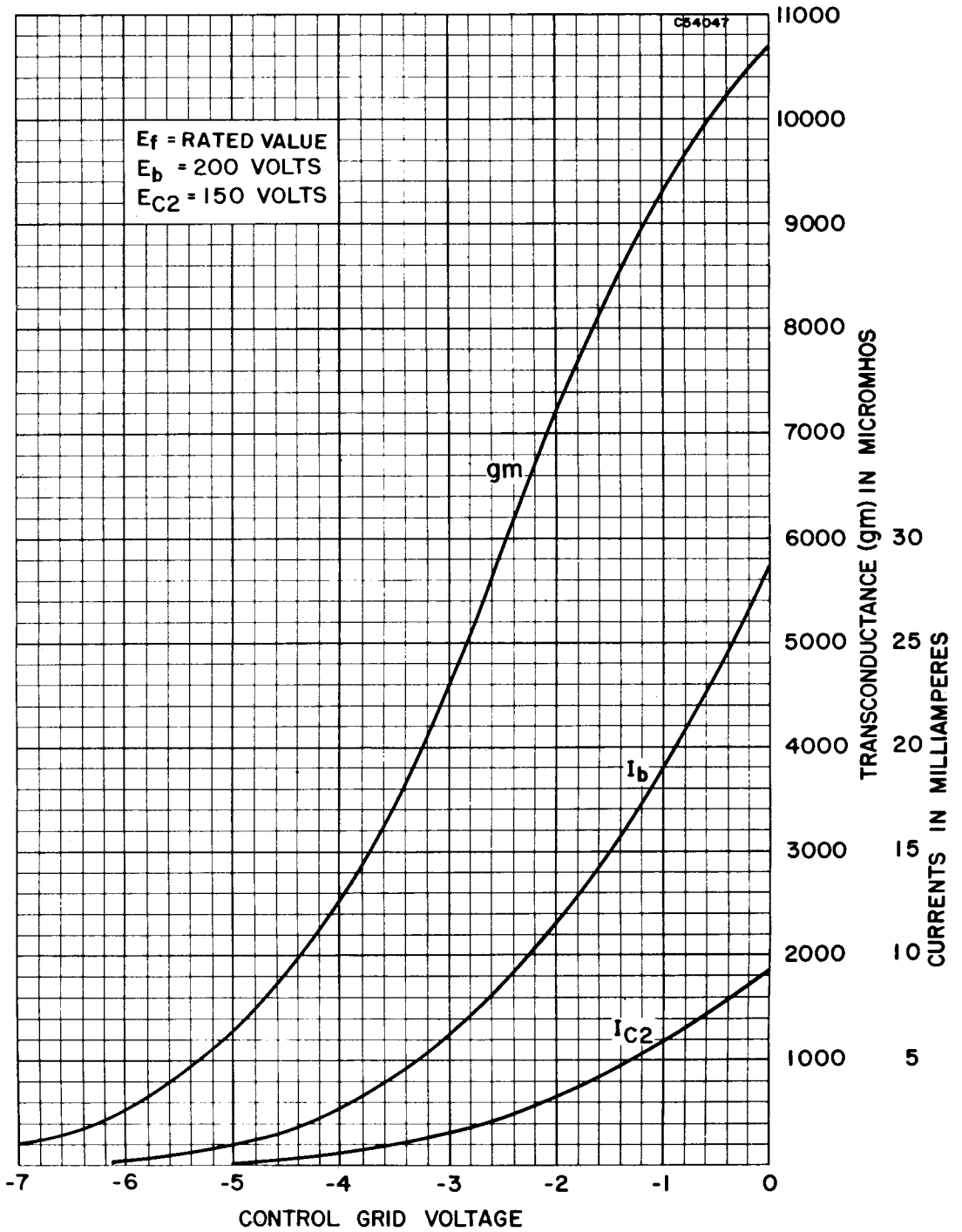
AVERAGE TRANSFER CHARACTERISTICS
TRIODE SECTION



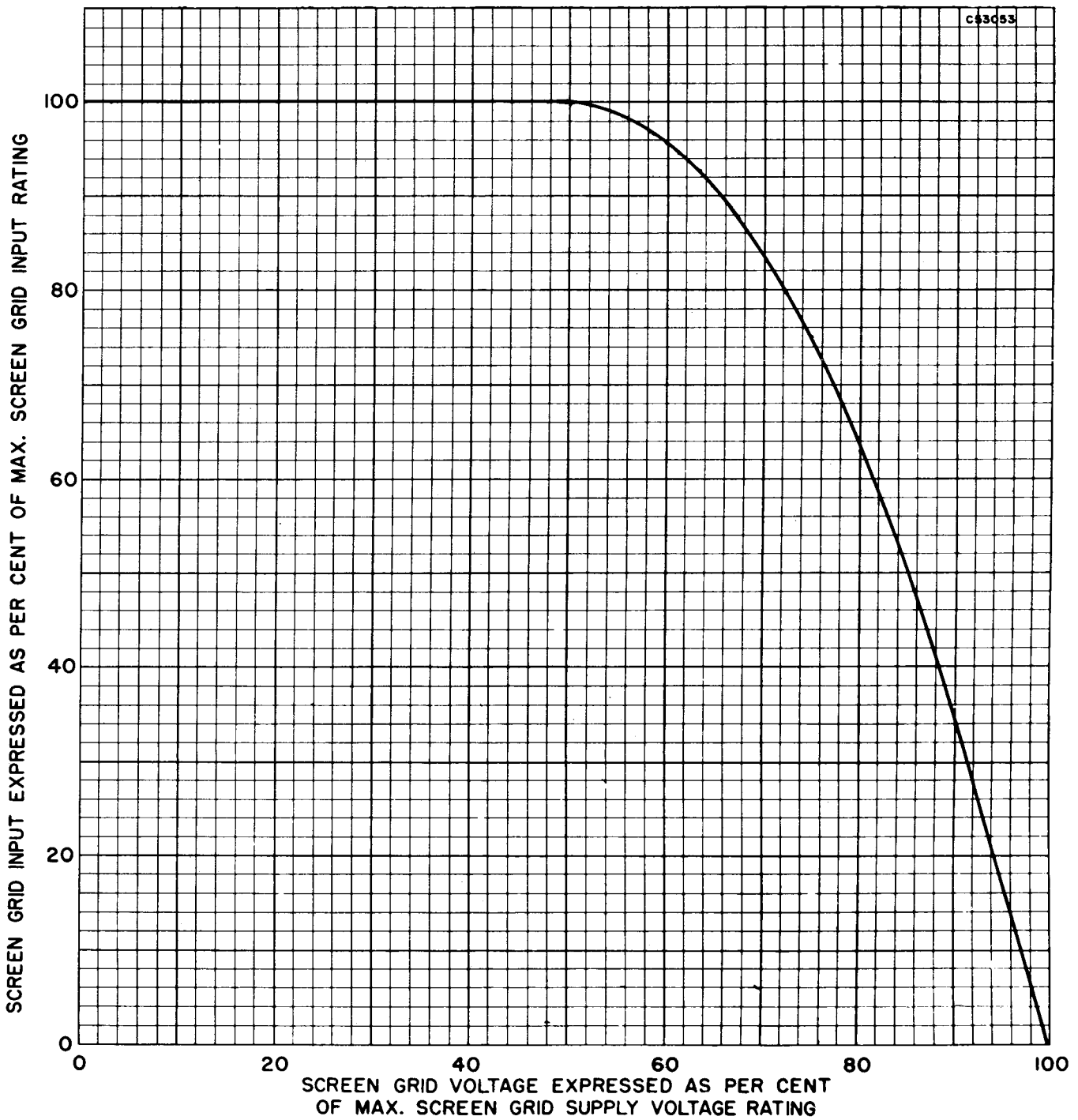
AVERAGE PLATE CHARACTERISTICS
PENTODE SECTION



AVERAGE TRANSFER CHARACTERISTICS
PENTODE SECTION



RATING CURVE



SYLVANIA

engineering data service

SYLVANIA

5BCP1
5BCP*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflection Angle (approx.)	70 Degrees

Types*	5BCP1	5BCP4	5BCP7	5BCP11
Fluorescence	Green	White	Blue	Blue
Phosphorescence	—	—	Yellow	—
Persistence	Medium	Medium	Long	Short

Faceplate . . . . . Clear

**In addition to the types shown, the 5BCP- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.3 ± 10% Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	3.7 $\mu\mu$f
Grid No. 1 to All Other Electrodes	3.5 $\mu\mu$f

MECHANICAL DATA

Minimum Useful Screen Diameter	4¼ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base	E9-37
Basing[1]	9HD
Bulb Contact Alignment	Plane of J1-22 Contact Passes Halfway Between Pins No. 1 and No. 9. ± 10 Degrees

J1-22 Contact on Same Side as Pins No. 1 and No. 9

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	11,000 Volts dc
Anode Input	6 Watts
Grid No. 1 Voltage	
Negative Bias Value	220 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts dc
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	200 Volts
Heater Positive with Respect to Cathode	200 Volts

TYPICAL OPERATING CONDITIONS

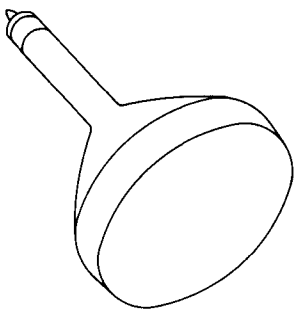
Anode Voltage	8,000 Volts dc
Grid No. 1 Voltage[2]	−25 to −75 Volts dc
Focusing Coil Current (approx.)[3]	56 to 84 Ma dc
Line Width "A" at I_b = 200 μa[4]	.011 Inches Max.
Spot Position[5]	¼ Inch

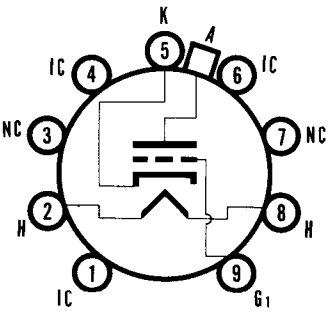
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Special Purpose Tube
5" Direct Viewed
Round Glass Type
Magnetic Deflection
Magnetic Focus
⅞" Diameter Neck





9HD

SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

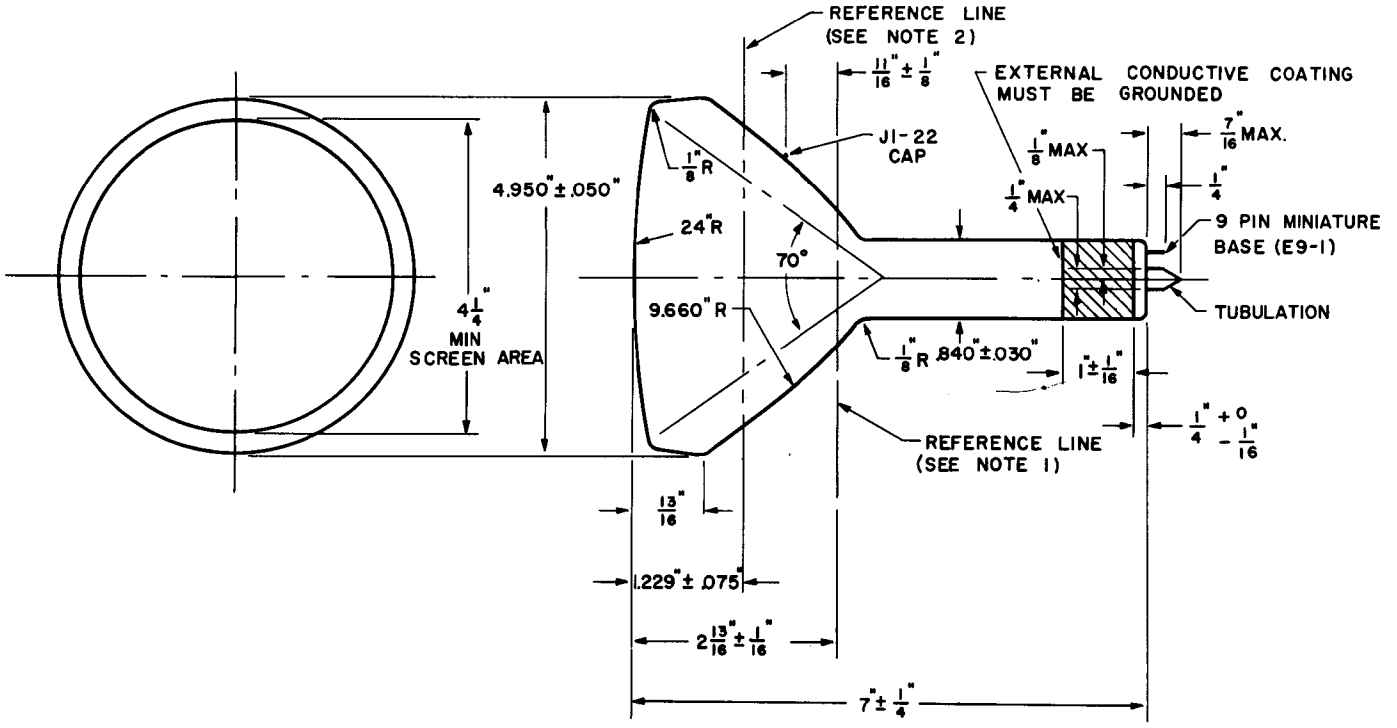
NOVEMBER, 1958

NOTES:

1. *A socket with a center opening to clear the tubulation should be used. Care should be taken in handling the tube to avoid damaging the exposed tubulation and bending the base pins.*
2. *Visual extinction of undeflected, focused spot.*
3. *For JETEC No. 127 focus coil, or equivalent, with the Grid No. 1 bias voltage adjusted to produce a beam current of 200 μa. Distance from reference line to center of gap on focus coil shall be 2 inches.*
4. *Measured in accordance with MIL-E-1C.*
5. *The center of the undeflected, unfocused spot will fall within a circle of 1/4 inch radius concentric with the center of the tube face, with the tube shielded.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.



S 57024

DIAGRAM NOTES:

1. *Reference line is determined by the Point where leading edge of 1.640" reference line gauge No. 123 will stop.*
2. *Reference line is determined by the point where leading edge of a 4.625" ± .002 ring gauge will stop.*

SYLVANIA

engineering data service

SYLVANIA
5BGP1
5BGP*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic
Phosphors	Aluminized

Types*	Fluorescence	Phosphorescence	Persistence
5BGP1	Green	.....	Medium
5BGP2	Blue-Green	Green	Long
5BGP5	Blue	.....	Very Short
5BGP7	Blue-White	Yellow	Long
5BGP11	Blue	.....	Short
5BGP15	Blue-Green	.....	Extremely Short

Faceplate	Clear

**In addition to the types shown, the 5BGP- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

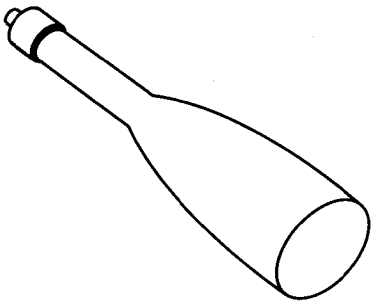
Heater Voltage	6.3 Volts
Heater Current	$0.6 \pm 10\%$ Amperes
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	4.8 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6.7 $\mu\mu$f
D1 to D2	1.8 $\mu\mu$f
D3 to D4	1.3 $\mu\mu$f
D1 to All Other Electrodes Except D2	3.3 $\mu\mu$f
D2 to All Other Electrodes Except D1	3.3 $\mu\mu$f
D3 to All Other Electrodes Except D4	2.7 $\mu\mu$f
D4 to All Other Electrodes Except D3	2.7 $\mu\mu$f
Post Accelerator Helix Resistance	200 to 600 Megohms

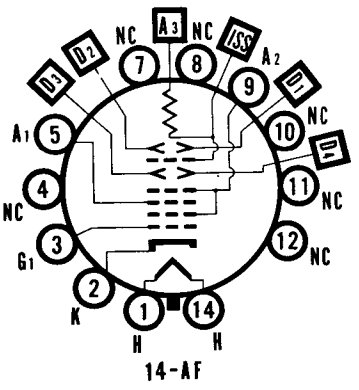
MECHANICAL DATA

Minimum Useful Screen Diameter	$4\frac{1}{2}$ Inches
Anode No. 3 Contact (Recessed Small Cavity Cap)	J1-21
Bulb (Modified)	J42K
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14AF
Base Alignment	
D3-D4 trace aligns with Pin No. 1	± 10 Degrees
Positive Voltage on D1 deflects beam approx. toward Pin No. 4	
Positive Voltage on D3 deflects beam approx. toward Pin No. 1	
Angle Between traces D1-D2 and D3-D4	90 ± 1 Degrees
Bulb Contact Alignment	
J1-21 contact aligns with D1-D2 trace	± 10 Degrees
J1-21 contact on same side as Pin No. 4	

QUICK REFERENCE DATA

5" Direct Viewed
Flat Faceplate
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Helical Resistor Post Deflection Acceleration
High Deflection Sensitivity
High Deflection Accuracy
Aluminized Screen





14-AF

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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

APRIL, 1959

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Input	6	Watts	Max.
Anode No. 3 Voltage	13,200	Volts dc	
Isolation Shield Voltage	2300	Volts dc	
Anode No. 2 Voltage	2200	Volts dc	
Ratio of Anode No. 3 Voltage to Anode No. 2 Voltage	6 : 1	Maximum	
Anode No. 1 (Focus Electrode) Voltage	880	Volts dc	
Grid No. 1 Voltage			
Negative Bias Value	220	Volts dc	
Positive Bias Value	0	Volts dc	
Positive Peak Plate	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period Not to Exceed 15 Seconds	200	Volts	
After Equipment Warm-up Period	140	Volts	
Heater Positive with Respect to Cathode	140	Volts	
Peak Voltage Between Anode No. 2 and Any			
Deflection Plate	550	Volts	

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage[1]	10,000	Volts dc	
Isolation Shield Voltage[2]	1575 to 1700	Volts dc	
Anode No. 2 Voltage[3]	1670	Volts dc	
Anode No. 1 Voltage for Focus	180 to 590	Volts dc	
Grid No. 1 Voltage Required for Cutoff[4]	−50 to −80	Volts dc	
Deflection Factor[5]			
Deflection Plates 1-2	70 to 86	Volts dc/Inch	
Deflection Plates 3-4	28.4 to 34.8	Volts dc/Inch	
Pattern Distortion at 100% Useful Scan[6]	1%	Maximum	
Undeflected Spot Position[7] (Deviation from Center)	5	MM.	Max.
Useful Scan			
D1-D2	10	cm.	
D3-D4	6	cm.	

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. *It is recommended that the Anode No. 3 voltage be no less than 6000 volts for suitable light output.*
2. *The isolation shield and the lower end of the Post Accelerator helix are connected together within the tube. With the proper potential on this electrode combination, barrel and pin-cushion distortions are minimized.*
3. *Under the typical operating conditions listed the Anode No. 2 voltage is made variable from 1575 volts to 1850 volts to provide for astigmatism control. In order to maintain proper astigmatism adjustment as total cathode current is varied, it is recommended that the resistance in the Anode No. 2 circuit be limited to 12,500 ohms.*

NOTES: (Cont'd)

4. *Visual extinction of undeflected focused spot.*

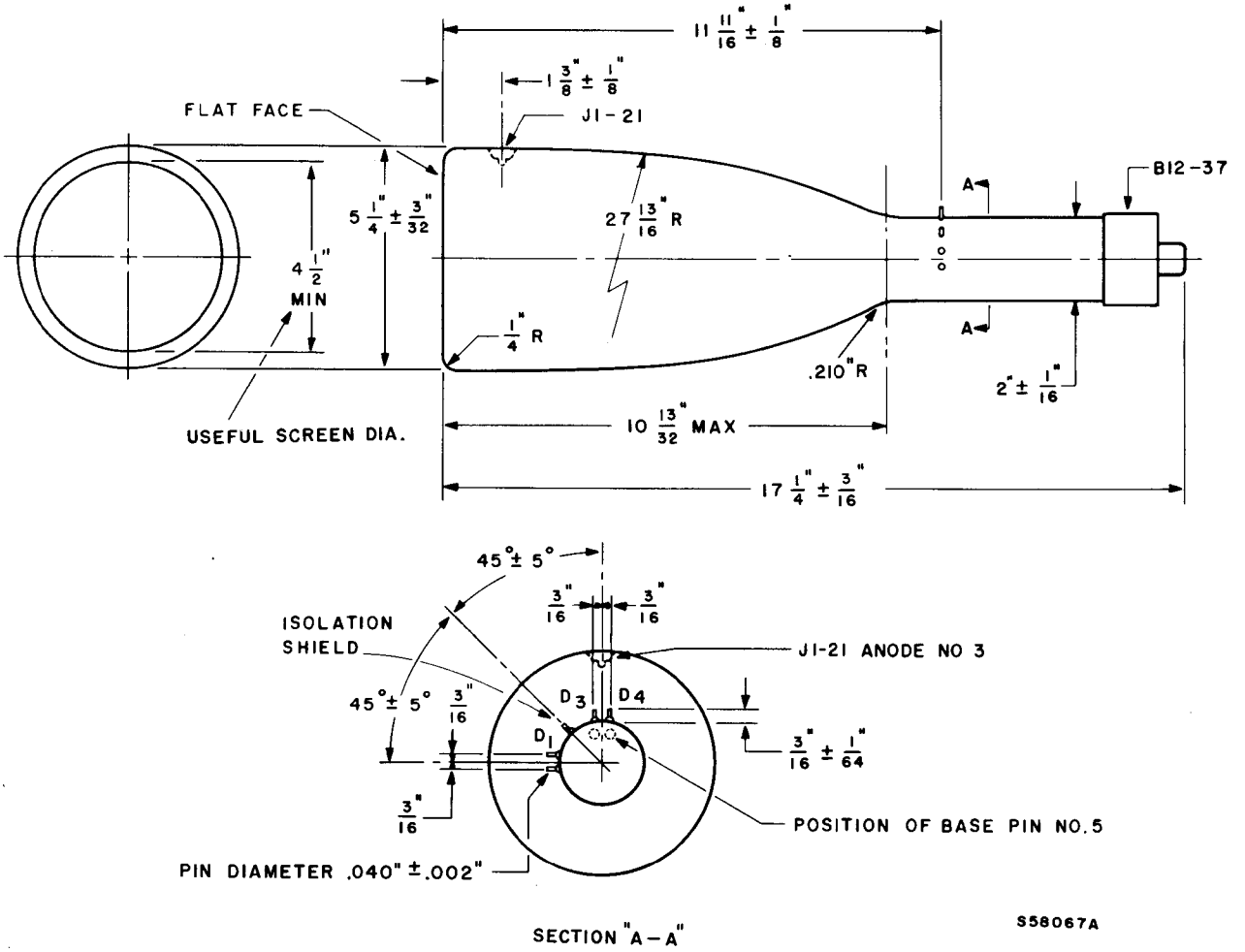
5. *If use is made of the full deflection capabilities of the tube, the deflection plates will intercept part of the electron beam near the edge of the scan; hence a low impedance deflection plate drive is desirable.*

6. *With a 6 x 10 cm rectangular raster centered on the face of the tube, the raster edges will not deviate from straight parallel lines by more than 1 mm total on the left and right edges, nor by more than 0.5 mm total at the top and bottom.*

7. *Connect deflection plates to Anode No. 2.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.



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CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic
Phosphors	Aluminized

Types*	Fluorescence	Phosphorescence	Persistence
5BHP1	Green	.....	Medium
5BHP2	Blue-Green	Green	Long
5BHP5	Blue	.....	Very Short
5BHP7	Blue-White	Yellow	Long
5BHP11	Blue	.....	Short
5BHP15	Blue-Green	.....	Extremely Short

Faceplate	Clear

**In addition to the types shown, the 5BHP- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

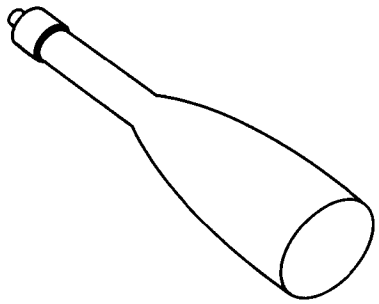
Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Amperes
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	4.6 μμf
Grid No. 1 to All Other Electrodes	6.4 μμf
D1 to D2	1.9 μμf
D3 to D4	1.5 μμf
D1 to All Other Electrodes Except D2	3.5 μμf
D2 to All Other Electrodes Except D1	3.5 μμf
D3 to All Other Electrodes Except D4	2.8 μμf
D4 to All Other Electrodes Except D3	2.8 μμf
Post Accelerator Helix Resistance	200 to 600 Megohms

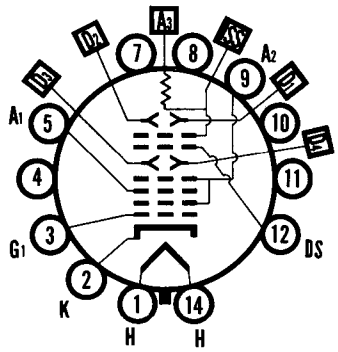
MECHANICAL DATA

Minimum Useful Screen Diameter	4½ Inches
Anode No. 3 Contact (Recessed Small Cavity Cap)	J1-21
Bulb (Modified)	J42K
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14AG
Base Alignment	
D3-D4 trace aligns with Pin No. 1	±10 Degrees
Positive Voltage on D1 deflects beam approx. toward Pin No. 4	
Positive Voltage on D3 deflects beam approx. toward Pin No. 1	
Angle Between traces D1-D2 and D3-D4	90 ± 1 Degrees

QUICK REFERENCE DATA

5" Direct Viewed
Flat Faceplate
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Helical Resistor Post
Deflection Acceleration
High Deflection Sensitivity
High Deflection Accuracy
Aluminized Screen





14-AG

SYLVANIA
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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

APRIL, 1959

NOTES: (cont'd)

2. *The isolation shield and the lower end of the post accelerator helix are connected together within the tube. With the proper potential on this electrode combination, barrel and pin-cushion distortions are minimized.*

3. *Adjustment of deflection plate shield voltage provides improved linearity of D3-D4 deflection by controlling the edge effect of D3-D4 plate field. In many applications Pin No. 12 may be connected externally to the isolation shield.*

4. *Under the typical operating conditions listed the Anode No. 2 voltage is made variable from 1575 volts to 1850 volts to provide for astigmatism control. In order to maintain proper astigmatism adjustment as total cathode current is varied, it is recommended that the resistance in the Anode No. 2 circuit be limited to 12,500 ohms.*

5. *Visual extinction of undeflected focused spot.*

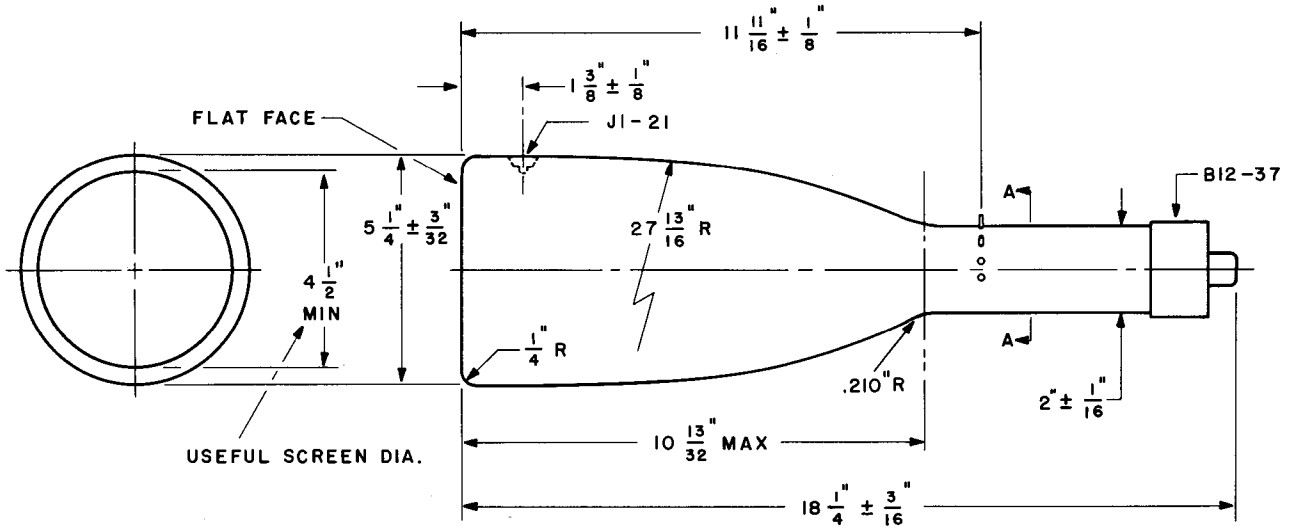
6. *If use is made of the full deflection capabilities of the tube, the deflection plates will intercept part of the electron beam near the edge of the scan; hence a low impedance deflection plate drive is desirable.*

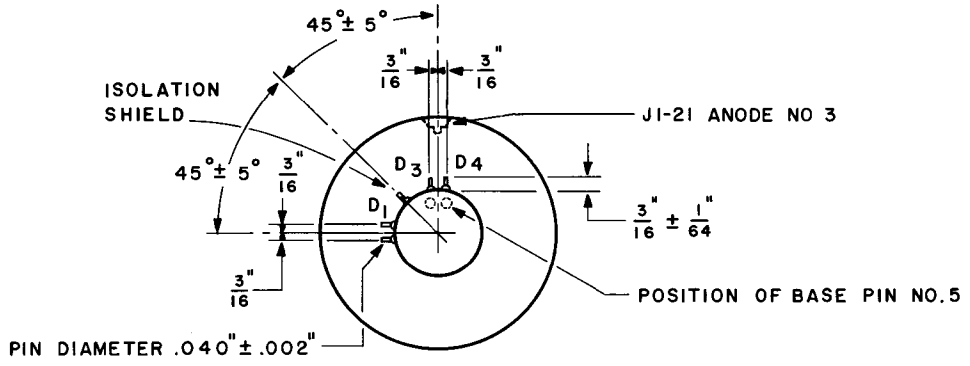
7. *With a 4 x 10 cm rectangular raster centered on the face of the tube, the raster edges will not deviate from straight parallel lines by more than 1 mm total on the left and right edges, nor by more than 0.5 mm total at the top and bottom.*

8. *Connect deflection plates to Anode No. 2.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.





SECTION "A–A"

S 58067

SYLVANIA 5BHP1A 5BHP*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic
Phosphors	Aluminized

Types*	Fluorescence	Phosphorescence	Persistence
5BHP1	Green	—	Medium
5BHP2	Blue-Green	Green	Long
5BHP5	Blue	—	Very Short
5BHP7	Blue-White	Yellow	Long
5BHP11	Blue	—	Short
5BHP15	Blue-Green	—	Extremely Short

Faceplate	Clear

**In addition to the types shown, the 5BHPA- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

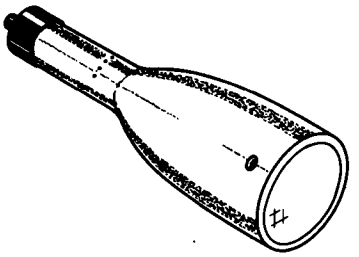
Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10 % Amperes
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	4.6 pf
Grid No. 1 to All Other Electrodes	6.4 pf
D1 to D2	1.9 pf
D3 to D4	1.5 pf
D1 to All Other Electrodes Except D2	3.5 pf
D2 to All Other Electrodes Except D1	3.5 pf
D3 to All Other Electrodes Except D4	2.8 pf
D4 to All Other Electrodes Except D3	2.8 pf
Post Accelerator Helix Resistance	200 to 600 Megohms

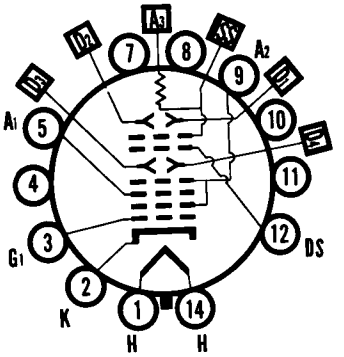
MECHANICAL DATA

Minimum Useful Screen Diameter	4 ½ Inches
Anode No. 3 Contact (Recessed Small Cavity Cap)	J1-21
Bulb (Modified)	J42K
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14AG
Base Alignment	
D3-D4 Trace Aligns with Pin No. 1	±10 Degrees
Positive Voltage on D1 Deflects Beam Approx. Toward Pin No. 4	
Positive Voltage on D3 Deflects Beam Approx. Toward Pin No. 1	
Angle Between Traces D1-D2 and D3-D4	90 ± 0.8 Degrees
Bulb Contact Alignment	
J1-21 Contact Aligns with D1-D2 Trace	±5 Degrees
J1-21 Contact on Same Side as Pin No. 4	

QUICK REFERENCE DATA

5" Direct Viewed
Flat Faceplate
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Helical Resistor Post
Deflection Acceleration
High Deflection Sensitivity
High Deflection Accuracy
Aluminized Screen





14-AG

SYLVANIA
ELECTRONIC TUBES

A Division of
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PICTURE TUBE
OPERATIONS

SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

SEPTEMBER, 1963

File Under
SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Input	6 Watts	
Anode No. 3 Voltage	13,200 Volts	dc
Isolation Shield Voltage	2300 Volts	dc
Deflection Plate Shield Voltage	2300 Volts	dc
Anode No. 2 Voltage	2200 Volts	dc
Ratio of Anode No. 3 Voltage to Anode No. 2 Voltage	6 : 1 Maximum	
Anode No. 1 (Focus Electrode) Voltage	880 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	200 Volts	dc
Positive Bias Value	0 Volt	dc
Positive Peak Plate	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	200 Volts	
After Equipment Warm-up Period	180 Volts	
Heater Positive with Respect to Cathode	180 Volts	
Peak Voltage Between Anode No. 2 and Any Deflection Plate	550 Volts	

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage[1]	10,000 Volts	dc
Isolation Shield Voltage[2]	1575 to 1700 Volts	dc
Deflection Plate Shield Voltage[3]	1575 to 1700 Volts	dc
Anode No. 2 Voltage[4]	1670 Volts	dc
Anode No. 1 Voltage for Focus	180 to 590 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−50 to −80 Volts	dc
Deflection Factors[6]		
Deflection Plates 1-2	70 to 85 Volts	dc/Inch
Deflection Plates 3-4	15 to 18.3 Volts	dc/Inch
Pattern Distortion at 100 % Useful Scan[7]	1.5 %	Max.
Undeflected Spot Position[8] (Deviation from Center)	5 mm.	Max.
Useful Scan		
D1-D2	10 cm.	
D3-D4	4 cm.	

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

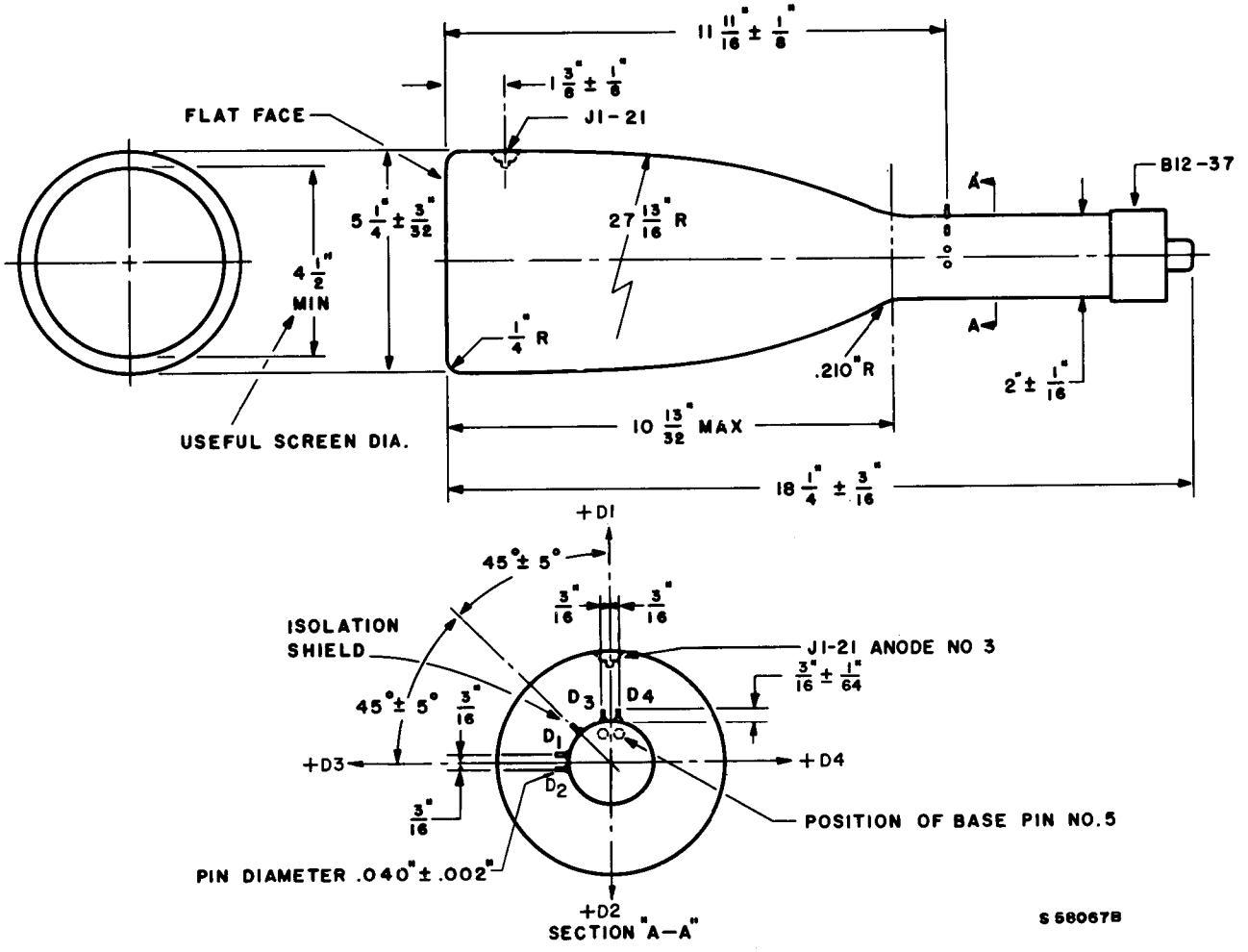
NOTES:

1. *It is recommended that the Anode No. 3 voltage be no less than 6,000 volts for suitable light output.*
2. *The isolation shield and the lower end of the post accelerator helix are connected together within the tube. With the proper potential on this electrode combination, barrel and pin-cushion distortions are minimized.*
3. *Adjustment of deflection plate shield voltage provides improved linearity of D3-D4 deflection by controlling the edge effect of D3-D4 plate field. In many applications Pin No. 12 may be connected externally to the isolation shield.*
4. *Under the typical operating conditions listed the Anode No. 2 voltage is made variable from 1575 volts to 1850 volts to provide for astigmatism control. In order to maintain proper astigmatism adjustment as total cathode current is varied, it is recommended that the resistance in the Anode No. 2 circuit be limited to 12,500 ohms.*
5. *Visual extinction of undeflected focused spot.*
6. *If use is made of the full deflection capabilities of the tube, the deflection plates will intercept part of the electron beam near the edge of the scan; hence a low impedance deflection plate drive is desirable.*
7. *With a 4 x 10 cm rectangular raster centered on the face of the tube, the raster edges will not deviate from straight parallel lines by more than 1 mm total on the left and right edges, nor by more than 0.5 mm total at the top and bottom.*
8. *Connect deflection plates to Anode No. 2.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE



SYLVANIA

engineering data service 5BNP16

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle (approx.)	53°
Phosphor	Aluminized P 16
Fluorescence	Violet and near Ultra-Violet
Persistence	Extremely Short
Faceplate	Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 Amperes
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 μμfd
Grid No. 1 to All Other Electrodes	6 μμfd
Ion Trap	No Ion Trap Required

MECHANICAL DATA

Minimum Useful Screen Diameter (Maximum Assured)	4¼ Inches
Overall Length	10⅝ ± ⅜ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base (Small Shell Duo Decal 6 Pin)	B6-63
Basing	12M
Bulb	J39 ½L

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	19,800 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000 Volts	dc
Grid No. 4 Voltage for Focus	−50 to + 350 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage for Cutoff[1]	−28 to −72 Volts	dc

CIRCUIT VALUES

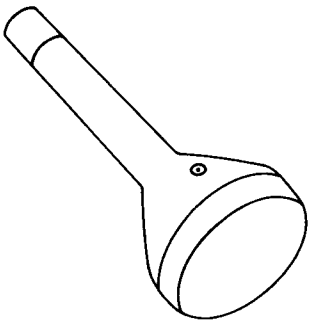
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

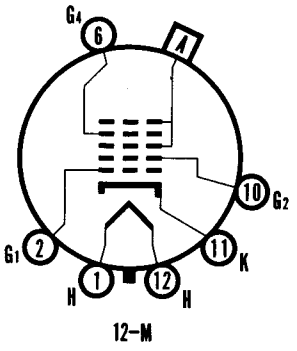
NOTE:

1. *Visual Extinction of Raster.*

QUICK REFERENCE DATA

Flying Spot Scanner Tube
5" Round Glass Type
Spherical Faceplace
Clear Faceplate
Magnetic Deflection
Electrostatic Focus
No Ion Trap
Aluminized Screen





SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JUNE, 1957

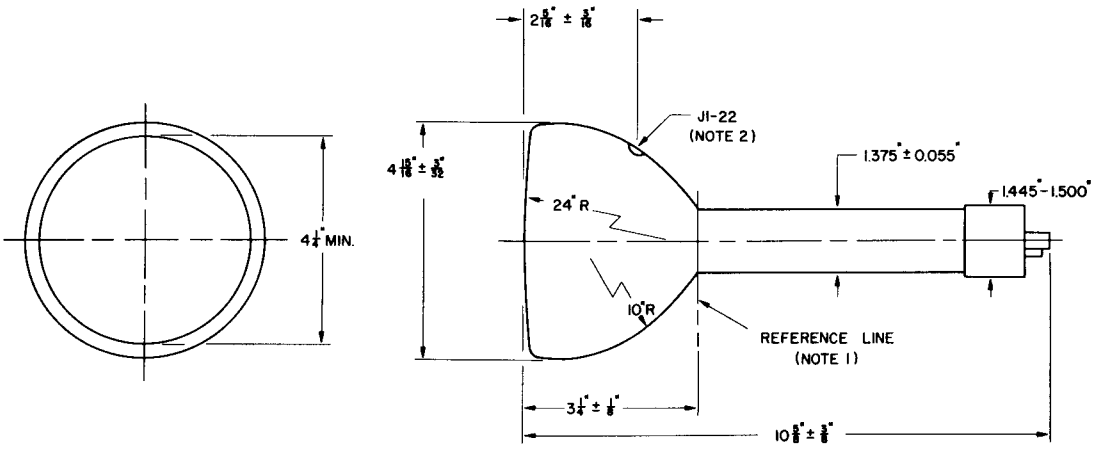
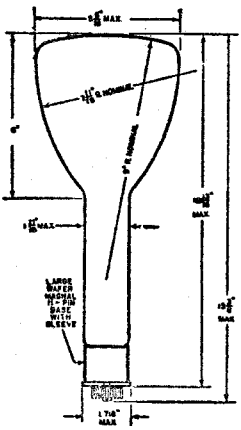


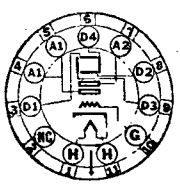
DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of JETEC gauge 116 with gauge resting against bulb cone.*
2. *Anode contact (J1-22) aligns with Base Pin No. 6 ± 30°.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.





10-A

Sylvania

TYPES 5BP1/1802-P1 5BP3/1802-P3 5BP4/1802-P4

TUBES DE TELEVISION A RAYONS CATHODIQUES

Les types Sylvania 5BP1/1802-P1, 5BP3/1802-P3 et 5BP4/1802-P4 sont des tubes pour images de télévision, à rayons cathodiques, du type à déflexion électrostatique ayant un écran visuel de 5 pouces (12,5 cm.). La structure de ces tubes est identique; la seule différence consiste dans la pâte fluorescente utilisée pour l'écran. Le marquage 5BP1, 5BP3 et 5BP4 est conforme au nouveau système de numérotation R.M.A. Comme il existe sur le marché des tubes similaires sans ce marquage, mais désignés comme 1802-P1, 1802-P3 et 1802-P4, tous ces tubes Sylvania portent la double marque. De telle sorte qu'ils peuvent remplacer directement n'importe quel 1802-P1, P3 et P4, ou 5BP1, P3 et P4. Ce tube est d'intérêt particulier, puisqu'une plus grande image, de précision plus aiguë est possible sans tension supérieure à celle requise pour un tube de 3 pouces.

CARACTERISTIQUES

Tension de chauffage	6,3 volts
Courant de chauffage	0,6 ampère
Ampoule	J-42
Culot : grand à 11 broches	10-A

Capacités directes interélectrodes :

Electrode de contrôle à toutes électrodes	9 $\mu\mu$F
Plaques déflectrices D1 à D2	1,2 $\mu\mu$F
Plaques déflectrices D3 à D4	0,8 $\mu\mu$F
D1 à toutes électrodes	14 $\mu\mu$F
D3 à toutes électrodes	8,5 $\mu\mu$F
D1 à toutes électrodes excepté D2	13 $\mu\mu$F
D2 à toutes électrodes excepté D1	12 $\mu\mu$F
D3 à toutes électrodes excepté D4	8 $\mu\mu$F
D4 à toutes électrodes excepté D3	7 $\mu\mu$F

Conditions limites de fonctionnement.

Tension anode n° 2	2,000 volts
Tension anode n° 1	1,000 volts
Tension grille contrôle	Jamais positive.
Tension pointe entre anode n° 2 et n'importe quelle plaque déflectrice	500 volts max.
Puissance densité écran par cm2	10 mw. max.

Conditions de fonctionnement :

Tension anode n° 2	1,200*	1,500	2,000 volts
Tension anode n° 1**	250	310	425 volts appr.

Tension grille contrôle+ × ... Variable pour contrôle intensité image.

Sensibilité de déflexion :

Plaques D1 et D2	0,50	0,40	0,30 mm./volt c. c.
Plaques D3 et D4	0,55	0,44	0,33 mm./volt c. c.

* Recommandé pour types 1802-P1 et 1802-P3 seulement.

** Ajustable à ± 20 p. c. des valeurs indiquées.

+ 20 p. c. approximativement de la tension d'anode n° 1 est nécessaire pour couper courant.

× Résistance maximum dans le circuit de grille limitée à 5 mégohms.

Ecran :

Type	Fluorphor	Couleur
5BP1/1802-P1	N° 1	Verte
5BP3/1802-P3	N° 3	Jaune
5BP4/1802-P4	N° 4	Blanche

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic
Phosphor	P1
Fluorescence	Green
Persistence	Medium
Faceplate	Clear

**In addition to the type shown, the 5BP-A can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Grid No. 1 to All Other Electrodes	8.0 μμf
Between Deflecting Plates 1-2[1]	1.3 μμf
Between Deflecting Plates 3-4[1]	1.2 μμf
Deflecting Plate 1 to All Other Electrodes	9.5 μμf
Deflecting Plate 3 to All Other Electrodes	12 μμf
Deflecting Plate 1[2] to All Other Electrodes Except D2	8.0 μμf
Deflecting Plate 2[2] to all Other Electrodes Except D1	7.5 μμf
Deflecting Plate 3[2] to All Other Electrodes Except D4	10 μμf
Deflecting Plate 4[2] to All Other Electrodes Except D3	7.5 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	4½ Inches
Bulb	J42C or Equivalent
Base	Medium Shell Magnal 11 Pin
Basing	11N
Weight (approx.)	2 Pounds
Mounting Position	Any

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	2,200 Volts	dc
Anode No. 1 Voltage	1,100 Volts	dc
Grid Voltage		
Negative Bias Value	125 Volts	dc
Positive Bias Value	0 Volts	dc
Peak Voltage Between Anode No. 2 and Any Deflection Plate	550 Volts	

TYPICAL OPERATING CONDITIONS

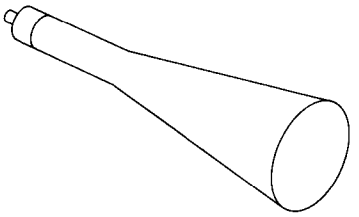
Anode No. 2 Voltage[3]	2,000 Volts	dc
Anode No. 1 Voltage for Focus	315 to 562 Volts	dc
Grid Voltage Required for Cutoff[4]	−20 to −60 Volts	dc
Deflection Factors		
Deflecting Plates 1-2[5]	70 to 98 Volts	dc/Inch
Deflecting Plates 3-4[6]	63 to 89 Volts	dc/Inch

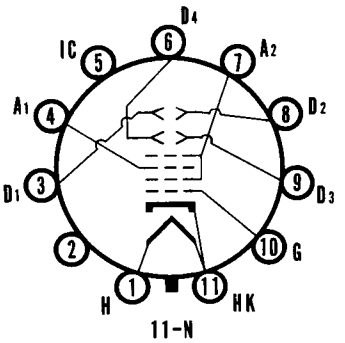
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5.0 Megohms Max.

QUICK REFERENCE DATA

Oscilloscope Tube
5" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus





11-N

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

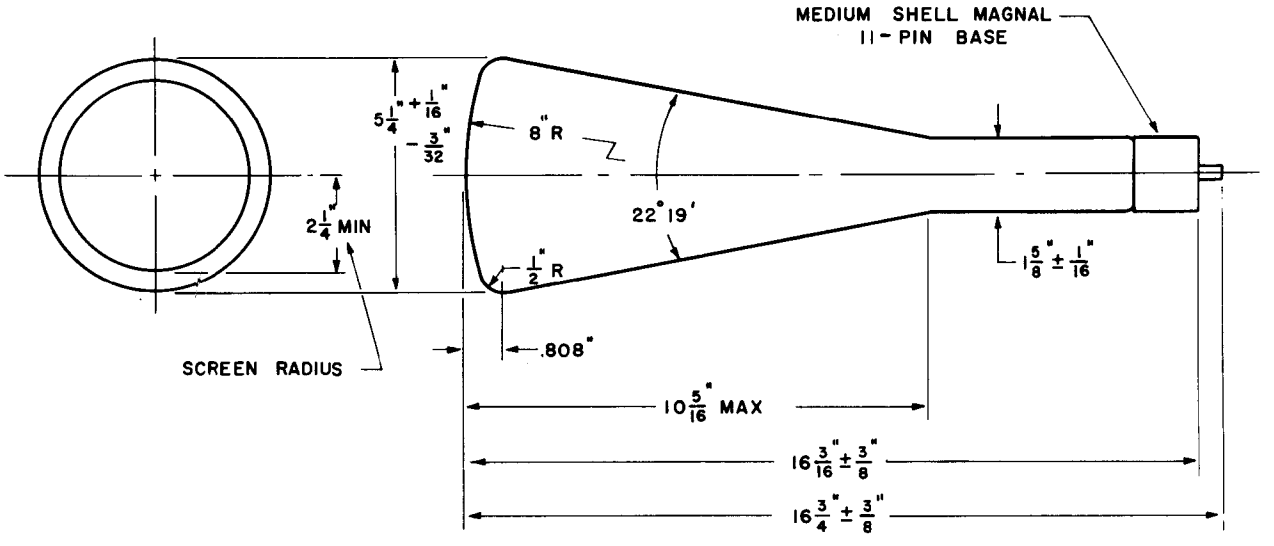
SEPTEMBER, 1958

NOTES:

1. *Deflecting Plate 1 is Pin No. 3*
   Deflecting Plate 2 is Pin No. 8
   Deflecting Plate 3 is Pin No. 9
   Deflecting Plate 4 is Pin No. 6
2. *Trace produced by plates D3-D4 aligns with plane through tube axis and Pin No. 1, within 10°. Angle between D1-D2 trace and D3-D4 trace is 90° ± 3°. With D3 positive with respect to D4, the spot is deflected toward Pin No. 1. With D1 Positive with respect to D2, the spot is deflected toward Pin No. 4.*
3. *Brilliance and definition decrease with decreasing Anode No. 2 Voltage. In general, Anode No. 2 Voltage should not be less than 1500 volts.*
4. *Visual extinction of undeflected focused spot.*
5. *Deflecting Plates 1-2 are nearer the screen.*
6. *Deflecting Plates 3-4 are nearer the base.*

5BP1

Sylvania Type 5BP1A supersedes Type 5BP1.



S58006

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle (Approx.)	70 Degrees

Types*	Fluorescence	Phosphorescence	Persistence
5BRP4	White	White	Medium
5BRP7	Blue-White	Yellow	Long
5BRP16	Purple	- - -	Very Short
5BRP19	Orange	Orange	Long
5BRP25	Orange	Orange	Long
Screen			Aluminized
Faceplate			Clear, Spherical

* In addition to the types shown, the 5BRP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.3 ± 10% Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	3 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6.5 $\mu\mu$f

MECHANICAL DATA

Minimum Useful Screen Diameter	4¼ Inches
Bulb	J39½R
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base[1]	E9-37
Basing	9HT
Weight	1 Pound

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	10,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	770 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	180 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	0 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	180 Volts	
Heater Positive with Respect to Cathode	180 Volts	

TYPICAL OPERATING CONDITIONS[5]

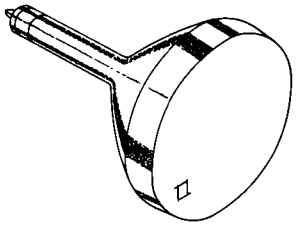
Anode Voltage	8000 Volts	dc
Grid No. 4 Voltage for Focus[2]	−50 to +350 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Spot Cutoff	−15 to −45 Volts	dc
Line Width "A"[3]	.014 Inch	Max.
Spot Position (Undeflected)[4]	¼ Inch	

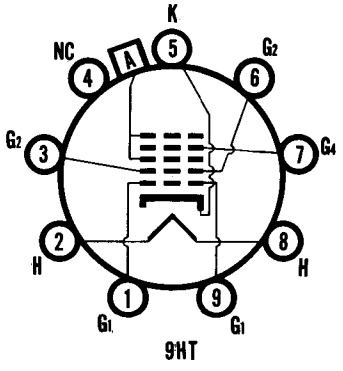
CIRCUIT VALUES:

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.

QUICK REFERENCE DATA

Radar Indicator (5BRP7)
Monitor Tube (5BRP4)
5" Direct Viewed
Round Glass Type
Spherical Faceplate
Aluminized Screen
Magnetic Deflection
Electrostatic Focus
⅞ Inch Neck Diameter
6.3 Volt — 300 Ma Heater
Short Length
Light Weight





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

MAY, 1961

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

NOTES:

1. *A socket with a center opening to clear the tubulation must be used. Care should be exercised to avoid damage to the tubulation.*
2. *With Grid No. 1 Voltage adjusted to give an anode current of 100 μa.*
3. *Measured per Mil-E-1 specifications at an anode current of 100 μa.*
4. *With the tube shielded, the center of the undeflected, focused spot will fall within a circle of ¼ inch radius concentric with the center of the tube face.*
5. *The P16, P19 and P25 screens can be permanently damaged if current density is permitted to rise too high. To prevent burning, minimum beam current densities should be employed.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

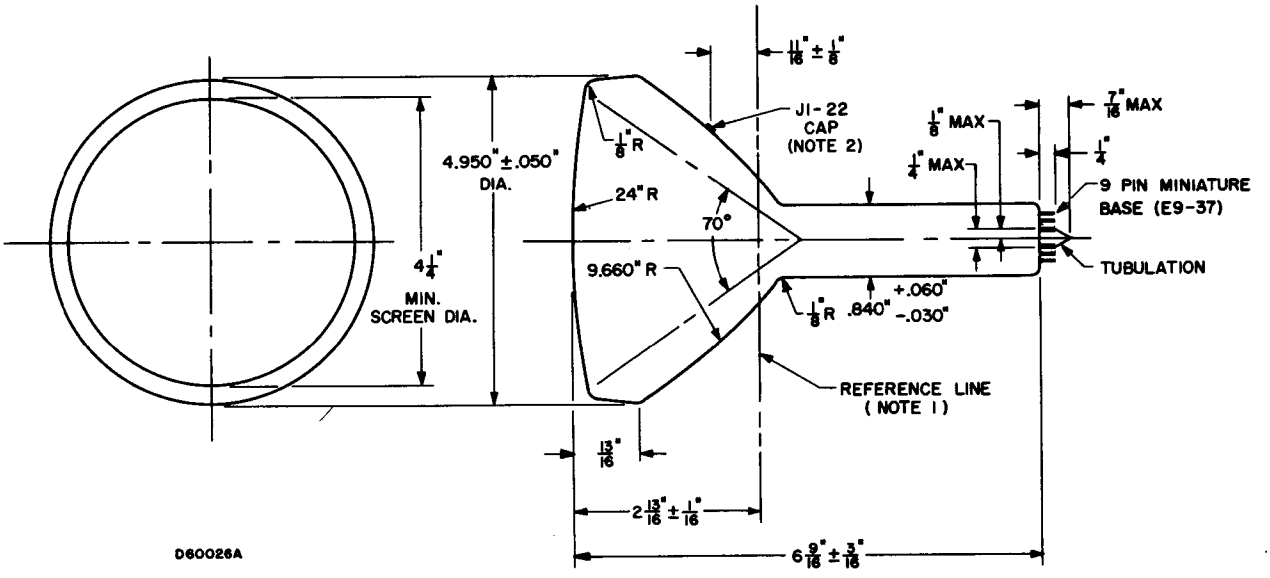


DIAGRAM NOTES:

1. *Reference line is determined by the point where leading edge of JEDEC G-123 reference line gauge will stop.*
2. *Bulb Contact (J1-22 Cap) has radial alignment about tube axis, with mid-plane between base Pins No. 1 and No. 9, ± 10 degrees.*

SYLVANIA

engineering data service

SYLVANIA
5BTP1
5BTP*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic

Types*	Fluorescence	Phosphorescence	Persistence
5BTP1	Green	———	Medium
5BTP2	Blue-Green	Green	Long
5BTP7	Blue-White	Yellow	Long
5BTP11	Blue	———	Short

Faceplate . . . . . Clear, Flat

*In addition to the types shown, the 5BTP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Amperes
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5.0 μμf
Grid No. 1 to All Other Electrodes	8.0 μμf
D1 to D2	2.0 μμf
D3 to D4	3.0 μμf
D1 to All Other Electrodes	10.5 μμf
D2 to All Other Electrodes	8.5 μμf
D3 to All Other Electrodes	8.5 μμf
D4 to All Other Electrodes	9.5 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	4½ Inches
Bulb	LEA-407 or Equivalent
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base (Small Shell Duodecal 12-Pin)	B12-43
Basing	See Diagram
Bulb Contact Alignment	
J1-22 Contact Aligns with D1-D2 Trace	± 10 Degrees
J1-22 Contact on Same Side as Pin No. 4	
Base Alignment	
D1-D2 Trace Aligns with Pin No. 4 and Tube Axis	0 ± 10 Degrees
Positive Voltage on D1 Deflects Beam approximately Toward Pin No. 4	
Positive Voltage on D3 Deflects Beam approximately Toward Pin No. 1	
Angle Between D3-D4 and D1-D2 Traces	90 ± 1 Degrees
Deflection Plates	
D1-D2 are Closer to Screen	
D3-D4 are Closer to Base	
Weight (approx.)	2 Pounds

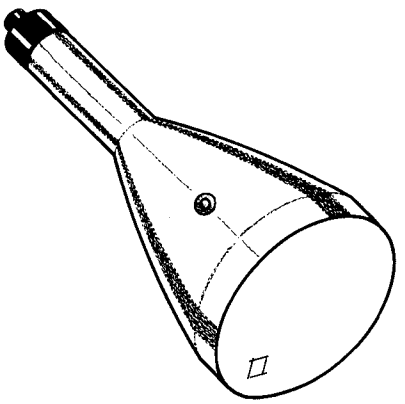
RATINGS

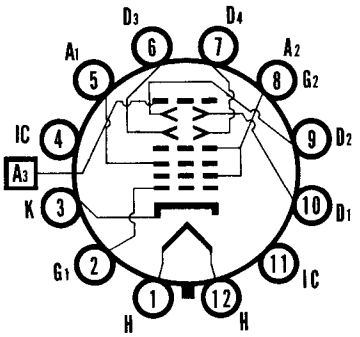
MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Input	6 Wats
Anode No. 3 Voltage	4400 Volts dc
Anode No. 2 Voltage	2700 Volts dc
Ratio Anode No. 3 to Anode No. 2 Voltage	2.1 Max.
Anode No. 1 (Focusing Electrode)	1100 Volts dc

QUICK REFERENCE DATA

Oscilloscope Tube
5" Direct Viewed
Round Glass Type
Flat, Clear Faceplate
Short Length
Electrostatic Deflection
Electrostatic Focus
Post Deflection Accelerator
High Deflection Sensitivity





5BTP1

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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

APRIL, 1960

File Under
SPECIAL PURPOSE
CATHODE RAY TUBES

MAXIMUM RATINGS (Absolute Maximum Values) (cont'd)

Grid No. 1 Voltage	
Negative Bias Value	140 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period Not to Exceed 15 seconds	450 Volts
After Equipment Warm-up Period	140 Volts
Heater Positive with Respect to Cathode	140 Volts
Peak Voltage Between Anode No. 2 and Any Deflection Plate	600 Volts

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage	3000 Volts dc
Anode No. 2 Voltage	1500 Volts dc
Anode No. 1 Voltage for Focus	570 to 772 Volts dc
Grid No. 1 Voltage Required for Cutoff[1]	−40 to −94 Volts dc
Deflection Factors	
Deflection Plates D1-D2	81 to 109 Volts dc/Inch
Deflecting Plates D3-D4	43 to 58 Volts dc/Inch
Spot Position[2]	Within a 15 mm Square
Useful Scan	
D1-D2	Full Screen Coverage
D3-D4	4 Inches — Centered with Respect to the tube face

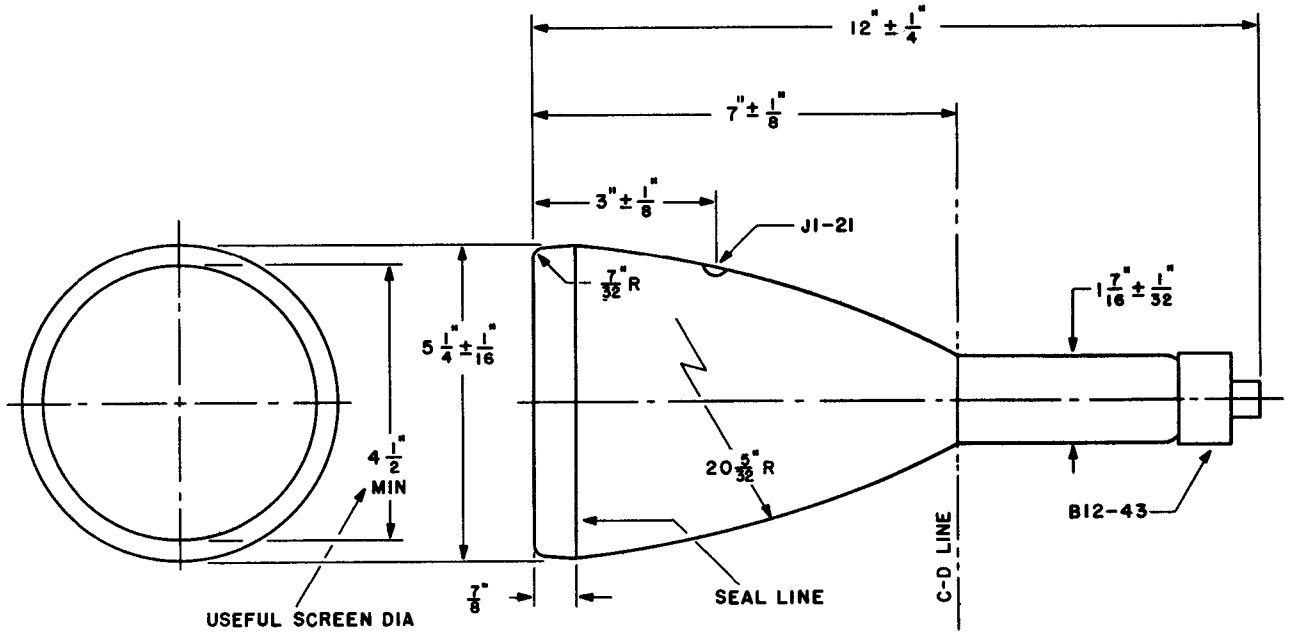
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms
Deflection Circuit Resistance[3]	1.5 Megohms

NOTES:

1. *Visual extinction of the undeflected focused spot.*
2. *With the tube shielded and with all deflection plates connected to Anode No. 2. Limit square centered on tube face with the sides parallel to deflection axes.*
3. *It is recommended that the deflecting electrode circuit resistances be approximately equal.*

OUTLINE



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SYLVANIA

engineering data service

electronic products

SYLVANIA

5C22

DESCRIPTION: Hydrogen Thyratron

The type 5C22 Hydrogen Thyratron is a hot-cathode grid-controlled gas rectifier tube especially designed for pulsing service at high repetition frequencies, high peak currents, and high voltages.

An outstanding feature of the Hydrogen Thyratron is the short deionization time required to convert the gaseous ions to neutral molecules when the tube is shut off. This permits the 5C22 to be operated at exceptionally high repetition frequencies. This tube also has the advantage that it may be operated over a wide range of ambient temperatures without significant change in electrical characteristics. For a tube of the same type rated at lower voltage see the Engineering Data Service sheet for type 4C35.

APPLICATIONS:

The type 5C22 may be used in a wide variety of applications which will take advantage of such features as:

1. *Low deionization time, hence rapid switching rates.*
2. *High peak currents.*
3. *High plate voltages (but may be used at lower voltages if it is desired).*
4. *Moderate trigger requirements.*
5. *Ability to be operated at zero bias.*
6. *Operation over a wide ambient temperature range without appreciable effect on the electrical characteristics.*
7. *Low tube voltage drop, with attendant efficiency.*
8. *Relatively low cost.*
9. *Reliability and general flexibility of operation.*

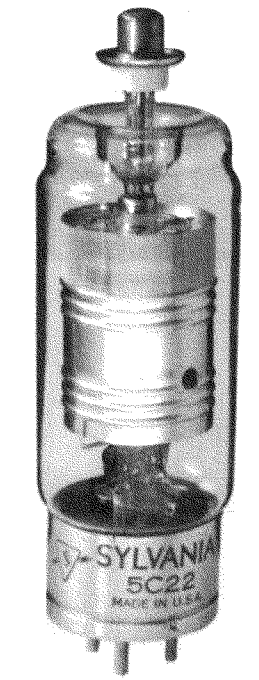
The circuit for which this tube was especially developed is shown below. The output in this case consists of periodic rectangular pulses. These are developed when the thyratron fires and releases electric charge stored in the capacitance of the pulse-forming-network (PFN). This network determines the duration and shape of the pulses. Between pulses, when the thyratron is not conducting, the PFN capacitance charges up through the charging choke Lc in a transient which swings the instantaneous plate voltage the 5C22 above the power supply voltage.

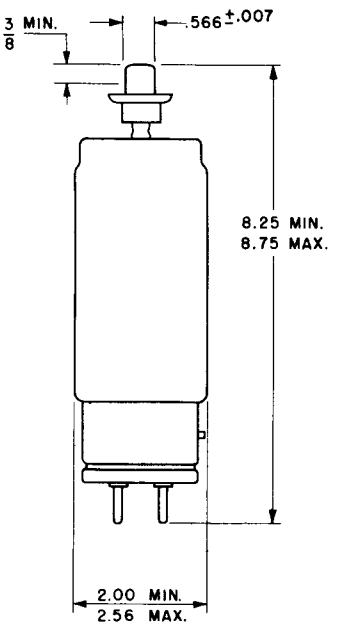
(The value reached is about double the power supply voltage and must be taken into account when applying the peak anode voltage ratings of the tube.)

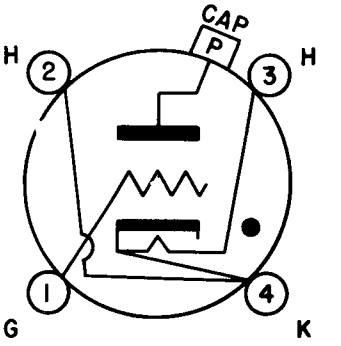
The peak voltage of the pulse supplied to the pulse transformer is about equal to that of the supply. By means of the pulse transformer, of course, the output to the load may be stepped up to a higher level. This results in a saving in the size and cost of the supply, since components at lower voltage ratings may be used. The SYLVANIA 5C22 Hydrogen Thyratron is very well adapted to such voltage step-up by virtue of the very high peak currents it can furnish. Many varieties of short-duration pulses may be produced by different PFN designs.

Other applications suggested by the characteristics of this thyratron are:

1. *Switching in welding circuits, particularly of the capacitor discharge type.*
2. *Shock excitation of tuned circuit.*
3. *Excitation of piezoelectric crystals.*
4. *Use in induction heating circuits to replace spark-gap heaters, resulting in trouble-free and quieter performance.*
5. *Pulser for pulse-time-modulation circuits in which signals are produced by modulating the pulse repetition rate.*
6. *Servomechanisms and control circuits where relatively high A.C. supply frequencies are used.*







SYLVANIA ELECTRIC PRODUCTS, INC. ELECTRONICS DIVISION
1740 Broadway, New York 19, New York

5C22

ELECTRICAL RATINGS AND OPERATING CONDITIONS

Heater voltage	6.3 ± 7.5% volts
Heater current at 6.3 volts	9.6 to 11.6 amps.
Cathode heating time	300 sec. min.
Starting anode voltage	4.5 KV DC min.
Peak anode voltage (Note 1)	16.0 KV max.
Peak inverse anode voltage (Note 2)	16.0 KV max. 5% of epy min.
Rate of rise of anode current	1500 amps./us max.
Peak anode current	325 amps. max.
Average anode current	200 ma. max
Dissipation factor	Note 3
Grid drive (Note 4)	
a) peak grid voltage	200 volts min.
b) time of rise	0.5 μ sec. max.
c) grid pulse duration	2.0 μ sec. min.
d) impedance of grid drive circuit	500 ohms max.
Peak inverse grid voltage	200 volts max.
Ambient temperature	−50°C. to +90°C.

Note 1—Where the plate supply voltage is applied instantaneously, the maximum value of the plate voltage shall not reach 13.5 KV in less than 0.04 second.

Note 2—In pulse operation, the peak inverse voltage, exclusive of a spike of 0.05 microsecond maximum duration, should not exceed 5 KV during the 25 microseconds immediately following the pulse.

Note 3—The maximum dissipation factor will depend on the peak forward anode voltage (epy in volts), the peak anode current (ib in amps.), and the pulse repetition frequency (prf in pulses per second) according to the formula:

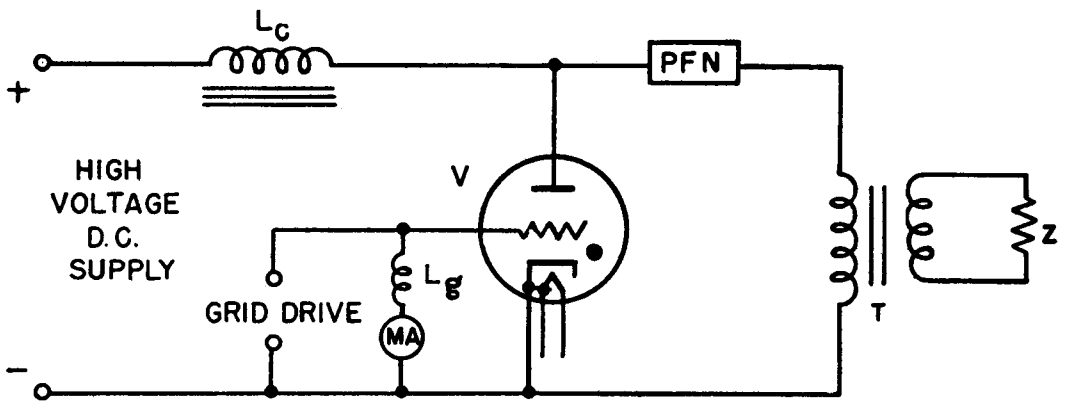
$$epy \times ib \times prf = 3.2 \times 10^9 \text{ max.}$$

This formula is applicable for pulse repetition rates in the neighborhood of the test condition of 1000 pps. For rates far in excess of this, special caution should be exercised.

Note 4—Measurements are at the tube socket with the thyratron grid disconnected.

MECHANICAL SPECIFICATIONS

Envelope	T20
Cap	Special, see outline drawings
Base	Super Jumbo 4-pin with Bayonet, AY-18
Mounting Position	Any, See Note 1



Lg	Grid Choke	T	Matching or Pulse-Transformer
Lc	Charging Choke	Z	Load
PFN	Pulse-Forming-Network	V	5C22

Note 1—Clamping is permissible by the base and/or by the bulb in the area up to 4¼.

Note 2—Return for cathode current should be to Pin No. 4 only.

Note 3—No cooling stream of air should be directly applied to the tube envelope.

Note 4—Tube should be kept away from strong fields which could ionize gas in the tube.

QUICK REFERENCE DATA

The Sylvania Type 5C22A is a hydrogen thyratron designed for pulsing service at high repetition rates, high peak currents, and high voltages. It is similar to the type 5C22 with improved time jitter characteristics.

MECHANICAL DATA

Dimensions	Per Outline
Envelope	T-20
Base	Super-Jumbo 4 pin with bayonet, A4-18 with ceramic insert
Mounting Position (1)	Any

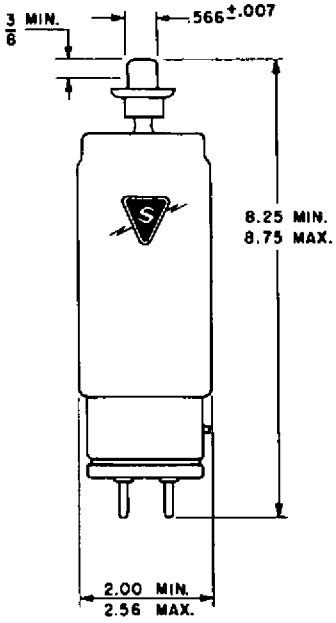
ELECTRICAL DATA AND OPERATING CONDITIONS

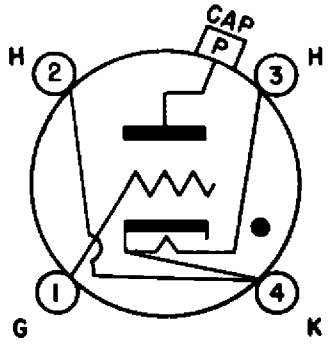
RATINGS (Absolute)

	Max.	Min.
Heater voltage	6.3 + 7.5%	-7.5% Vac
Cathode heating time		300 sec
Starting anode voltage		4500 Vdc
Peak anode voltage (2)	16.0 kv	
Peak inverse anode voltage (3)	16.0 kv	5% of peak anode voltage
Peak anode current	325 amps	
Average anode current	200 mAdc	
Rate of rise (cathode current)	1500 amps / μsec	
Dissipation factor (4)		
Grid drive pulse (5)		
Peak grid voltage		200 v
Time of rise	0.5 μsec	
Grid pulse duration		2 μsec
Impedance of grid drive circuit	500 ohms	
Peak inverse grid voltage	200 volts	
Ambient temperature	-50 to + 90°C	

ELECTRICAL CHARACTERISTICS

Heater current at 6.3 Vac	9.6 to 11.6 amps
Anode delay time (max.) (6)	1.0 μsec
Time jitter (Variation in firing time) (max.)	0.005 μsec





APPLICATION DATA

The Sylvania Type 5C22A is a hot-cathode grid-controlled hydrogen thyratron designed for pulsing service at high repetition rates, high peak currents, and high voltages. It is specifically designed to be used in place of the type 5C22 in circuits requiring low time jitter (variation in firing time from pulse to pulse).

The Type 5C22A may be used in a wide variety of applications which will take advantage of such features as:

1. Low deionization time
2. Low time jitter
3. High peak currents
4. High plate voltages
5. Moderate trigger requirements
6. Ability to be operated at zero bias.

from JETEC release #1416, Feb. 14, 1955

5C22A

NOTES:

(1) The tube may be clamped by the base and/or by the bulb in the area up to 4¼ inches above the top of the base.

No cooling stream of air should be directly applied to the tube envelope.

The tube should be kept away from stray fields which could ionize gas in the tube.

(2) When the plate supply voltage is applied instantaneously, the plate voltage should not read 13.5 kv in less than 0.04 seconds.

(3) In pulsed operation, the peak inverse anode voltage, exclusive of a spike of 0.05 μsec maximum duration, shall not exceed 5.0 kv during the first 25 μsec after the pulse.

(4) The maximum dissipation factor depends on the peak forward anode voltage in volts (epy), the peak anode current in amps (ib), and the pulse repetition rate in pulses per second (prr) according to the formula:

$$epy \times ib \times prr = 3.2 \times 10^9 \text{ max.}$$

This formula is applicable for pulse repetition rates in the neighborhood of 1000 pps. For rates in excess of this, special caution should be exercised.

(5) Measured at tube socket with thyratron grid disconnected.

(6) The time interval between the point on the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

SYLVANIA 5CEP11 5CEP16

DESCRIPTION

The Sylvania Types 5CEP11 and 5CEP16 are 5-inch diameter Cathode Ray Tubes designed for high resolution photographic recording and high resolution flying spot scanning applications respectively. They have electrostatic focus, magnetic deflection, and are capable of producing a line width of 0.0015 inch. The tubes have flat, neutral gray, non-browning optical glass faceplates for optimum photographic quality. Both types have aluminized phosphors to increase display brightness. An integral encapsulated high voltage connector is utilized to minimize corona at high altitude.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angle (Approx.)	42 Degrees	
	5CEP16	**5CEP11**
Phosphor*	P16	Fine Grain P11, Aluminized
Fluorescence	Violet and Near Ultra-Violet	Blue
Persistence	Extremely Short	Short
Faceplate	Gray, Non-Browning Optical Glass	

*In addition to the types shown, the 5CEP can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10 % Ampere
Direct Interelectrode Capacitances (Approx.)	
Grid No. 1 to All Other Electrodes	9 pf
Grid No. 2 to All Other Electrodes	7 pf
Cathode to All Other Electrodes	7 pf

MECHANICAL DATA

Minimum Useful Screen Diameter	4¼ Inches
Overall Length	13 ± ½ Inches
Bulb Diameter	5¼ ± 1/16 Inches
Anode Terminal	16″ HV Cable, Corona Protected
Base	B6-63
Basing	12Q

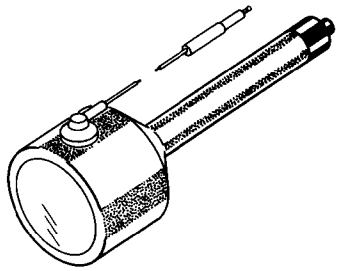
RATINGS

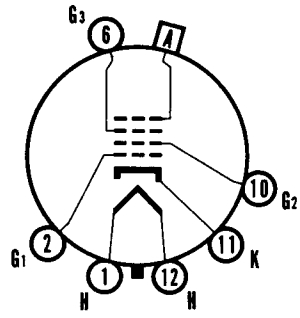
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	22,000 Volts dc
Grid No. 3 (Focus) Voltage	5000 Volts dc
Grid No. 2 Voltage	600 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	180 Volts dc
Positive Bias Value	0 Volt
Positive Peak Value	0 Volt
Peak Heater Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period Not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	180 Volts
Heater Positive with Respect to Cathode	180 Volts

QUICK REFERENCE DATA

High Resolution Tube
.0015″ Line Width
5-Inch, Flat, Optical Glass Faceplate
Clear Non-Browning Faceplate
Extremely Fine Grain Screen
Aluminized Screen
Magnetic Deflection
Electrostatic Focus
No Ion Trap





12-Q

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

JUNE, 1964

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode Voltage	10,000	20,000 Volts
Grid No. 3 (Focus) Voltage[1]	2070-2370	4140-4740 Volts
Grid No. 2 Voltage	300	300 Volts
Grid No. 1 Cutoff Voltage[2]	−40 to −65	−40 to −65 Volts
Line Width[3]	0.0015	0.0015 Inch

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *The Grid No. 3 focus supply should be capable of 250 μa average current. Due to the extreme fineness of the line, it is recommended that focus modulation (dynamic focus) be used.*
2. *Visual extinction of undeflected focused spot.*
3. *Line width measured at 5 μa by the shrinking raster method.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage of 16,000 volts, whichever is less.

OUTLINE

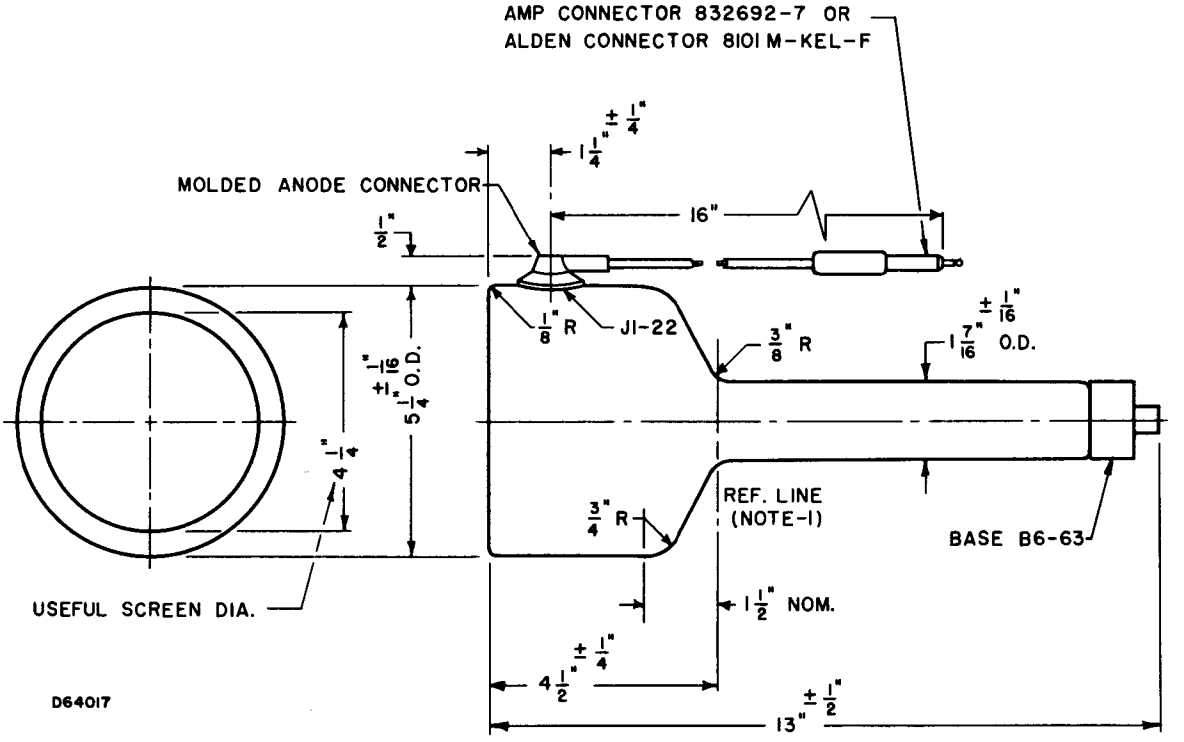


DIAGRAM NOTES:

1. *Yoke Reference Line is the plane where a 1.500" + 0.003", −0.000" I.D. Ring Gage will stop.*
2. *Molded Anode Connector alignment with vacant pin Position No. 3 has angular tolerance of ±10° measured about the tube axis.*

SYLVANIA

engineering data service

SYLVANIA
5CP1A
5CP7A, 5CP11A
5CP12

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic
Phosphor	P1
Fluorescence	Green
Persistence	Medium
Faceplate	Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	9 μμf
Grid No. 1 to All Other Electrodes	8 μμf
Between Deflecting Plates 1-2[1]	2 μμf
Between Deflecting Plates 3-4[1]	2 μμf
Deflecting Plate 1[1] to All Other Electrodes	9 μμf
Deflecting Plate 2[1] to All Other Electrodes	9 μμf
Deflecting Plate 3[1] to All Other Electrodes	7 μμf
Deflecting Plate 4[1] to All Other Electrodes	8 μμf

MECHANICAL DATA

Minimum Useful Screen Dimension (Diameter)	4½ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14J

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode No. 3 Voltage	4,000 Volts dc
Anode No. 2 Voltage	2,000 Volts dc
Anode No. 1 Voltage	1,000 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	200 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater Cathode Voltage	
Heater Negative with Respect to Cathode	125 Volts
Heater Positive with Respect to Cathode	125 Volts
Peak Voltage Between Anode No. 2 And Any Deflecting Plate	500 Volts

RECOMMENDED OPERATING CONDITIONS

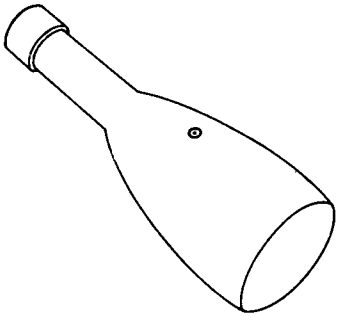
Anode No. 3 Voltage	4,000 Volts dc
Anode No. 2 Voltage	2,000 Volts dc
Anode No. 1 Voltage	375 to 690 Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	−30 to −90 Volts dc
Deflection Factor	
Deflecting Plates 1-2[3]	92 Volts dc/Inch
Deflecting Plates 3-4[4]	78 Volts dc/Inch

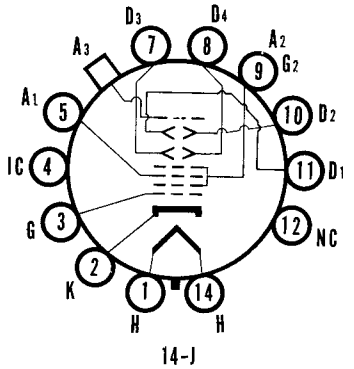
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5.0 Megohms Max.

QUICK REFERENCE DATA

Special Purpose Tube
5" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Post Deflection Accelerator





14-J

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JULY, 1954

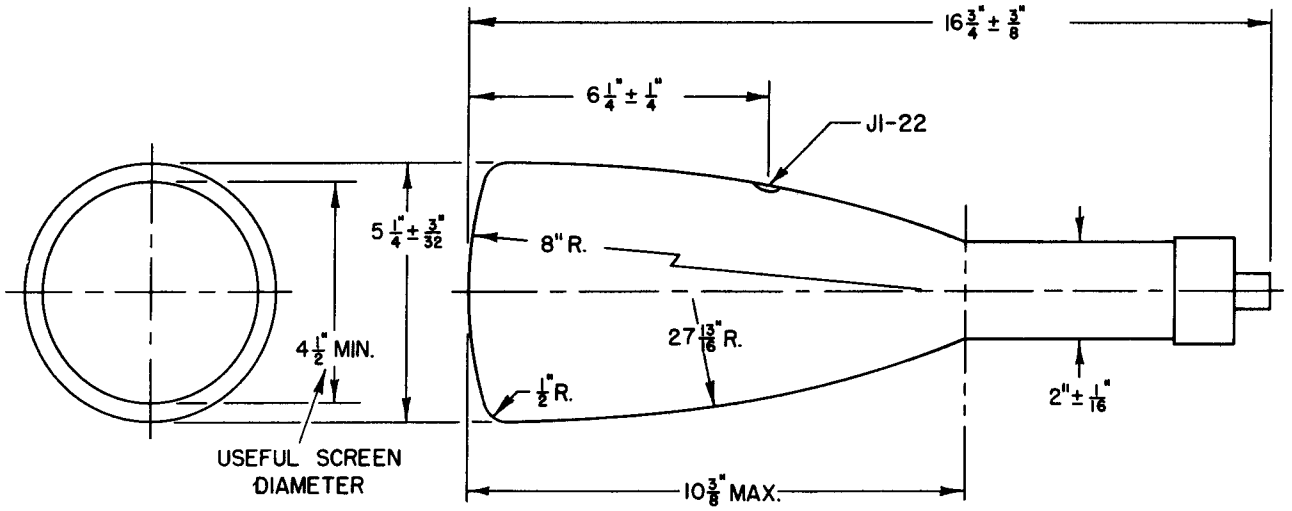
SYLVANIA

5CP1A

5CP7A, 5CP11A
5CP12

NOTES:

1. *Deflecting Plate 1 is Pin No. 11*
   Deflecting Plate 2 is Pin No. 10
   Deflecting Plate 3 is Pin No. 7
   Deflecting Plate 4 is Pin No. 8
2. *Visual extinction of undeflected focused spot.*
3. *Deflecting Plates 1-2 are nearer the screen.*
4. *Deflecting Plates 3-4 are nearer the base.*
5. *The plane through the tube axis and each of the following items may vary from the trace produced by deflecting plates 1-2 by the following angular tolerances measured about the tube axis: Pin 5 10 degrees; cap (on same side of tube as Pin 5) 10 degrees.*



S53005

5CP7A

The Sylvania Type 5CP7A is identical to the Type 5CP1A except it has a blue-white fluorescence, yellow phosphorescence, long persistence phosphor.

5CP11A

The Sylvania Type 5CP11A is identical to the Type 5CP1A except it has blue phosphor and a short persistence.

5CP12

The Sylvania Type 5CP12 is identical to the Type 5CP1A except it has an orange phosphor and a medium long persistence.

DESCRIPTION

Sylvania 5CVP- is a compact, rectangular, direct view cathode-ray tube designed primarily for use in airborne equipment. It features a high quality, nearly flat pressed faceplate, a high resolution electrostatic focus gun, 54 degree magnetic deflection, and neck diameter of .840 inches. Its encapsulated leads permit operation at high altitude, and it will withstand a wide range of temperatures.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	52 Degrees
Vertical	27 Degrees
Diagonal	54 Degrees

Phosphor

Types*	Fluorescence	Phosphorescence	Persistence
P1	Green	———	Medium
P7	Blue - White	Yellow	Long
P19	Orange	Orange	Very Long

Faceplate . . . . . Spherical, Clear, Pressed Glass

* In addition to the types shown, the 5CVP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.3 ± 10% Amperes
Direct Interelectrode Capacitances (approx.)	
Grid No. 1 to All	12.0 μμf
Cathode to All	9.5 μμf

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Horizontal	4 Inches
Vertical	2 Inches
Diagonal	4 1/8 Inches
Area	7.4 Sq. Inches
Bulb	C39 Exp. 3 or equivalent
Bulb Contact	Special Molded Lead
Base	Special Encapsulated Base with Color Coded Leads
Weight (Approx.)	1 ¼ Pounds

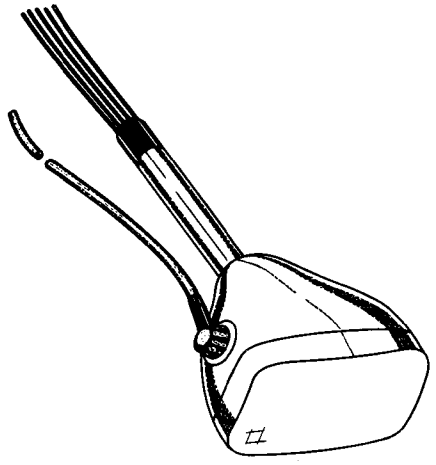
RATINGS

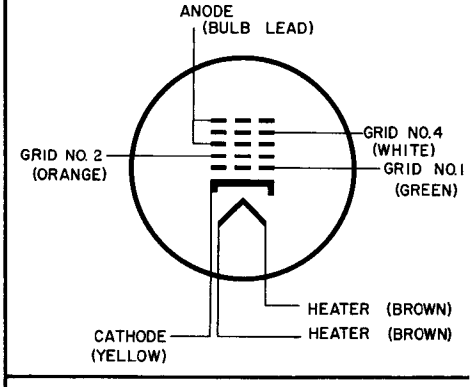
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	4500 Volts dc
Anode Input	6 Watts
Grid No. 4 Voltage (Focusing Electrode)	-500 to +1100 Volts dc
Grid No. 2 Voltage	550 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	165 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	180 Volts
Heater Positive with Respect to Cathode	180 Volts
Altitude	70,000 Feet
Operating Temperature Range	-65 to +85 °C

QUICK REFERENCE DATA

Indicator Tube
2¾ x 4¾ Direct Viewed
Rectangular Glass Type
Magnetic Deflection
Electrostatic Focus
Encapsulated Leads
.840 O.D. Neck Diameter





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

APRIL, 1960

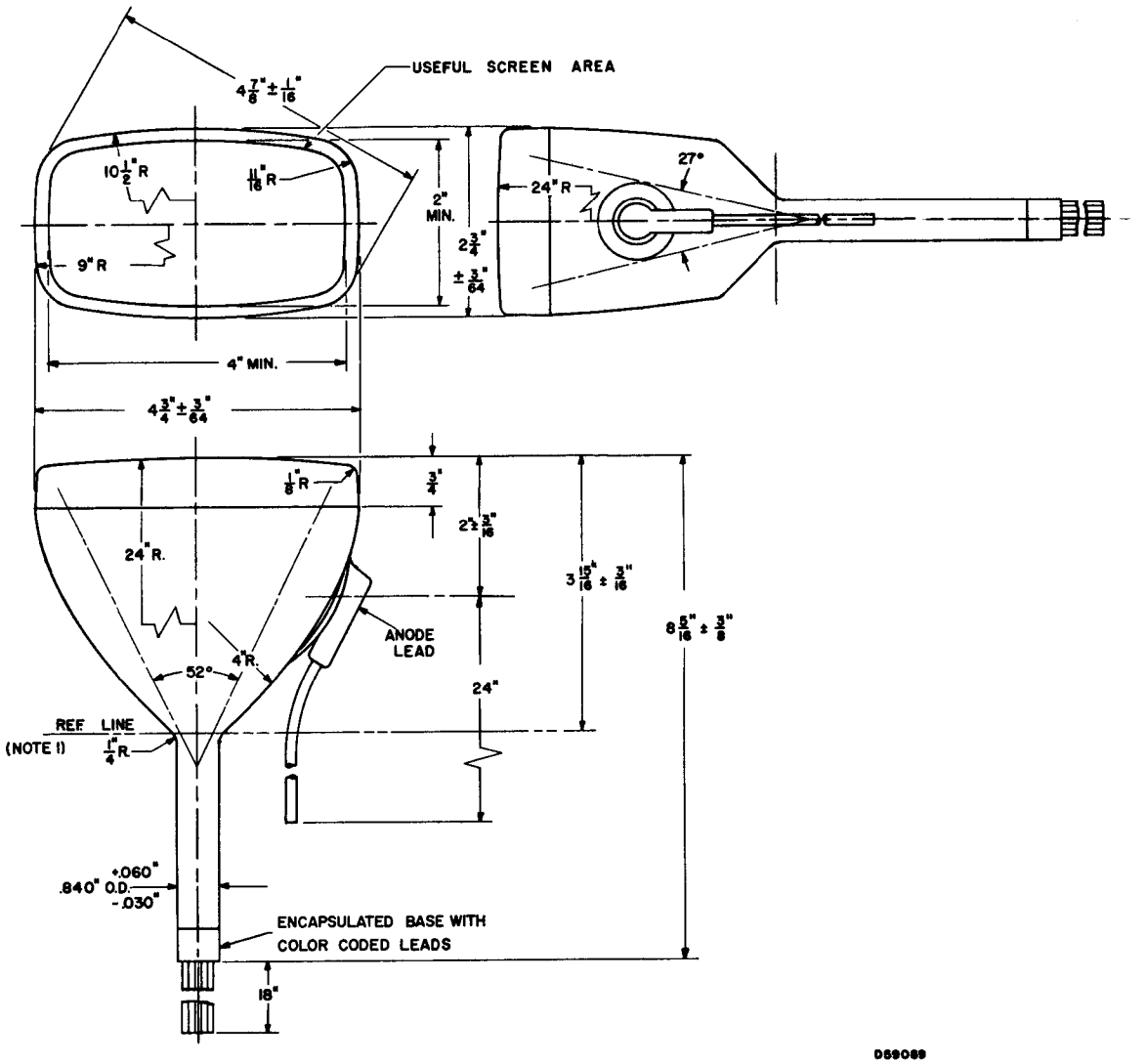
File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode Voltage	4000 Volts dc
Grid No. 4 Voltage (Focusing Electrode)[1]	0 to +120 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage[2]	−15 to −45 Volts dc
Modulation[3]	15 Volts dc Max.
Line Width[3]	.006 Inches Max.

NOTES:

1. *The horizontal deflection current is a triangular wave form of ¼ cps at an amplitude sufficient to scan 3¾ inches. The vertical deflection current is a saw tooth of 1/120 cps at an amplitude sufficient to scan 1⅝ inches. The control grid voltage is adjusted to produce a spot barely visible to dim lighting conditions. The beam is periodically unblanked to zero bias for a period of 500 μsecs at a repetition rate of 200 - 1000 pps. The focus electrode voltage for best focus under these pulsed conditions shall be as specified.*
2. *Visual extinction of undeflected focused spot.*
3. *Measured at a beam current of 10 μa, and in accordance with MIL-E-1 specifications.*



OUTLINE NOTE:

1. *Reference line is determined by the plane where a gauge 1.000 $^{+.003}_{-.000}$ I.D. and 2" long will seat against the bulb body.*

SYLVANIA

engineering data service

SYLVANIA
5DEP1
5DEP-*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic

Phosphor*	P1	P2	P7	P11
Fluorescence	Green	Green	Blue-White	Blue
Phosphorescence	—	Green	Yellow	—
Persistence	Medium	Long	Long	Short

Faceplate	Clear

*In addition, the 5DEP — can be supplied with several other screen phospors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Ampere
Direct Interelectrode Capacitances (Approx.)	
Grid to All Other Electrodes	6.0 μμf
Between Deflecting Plates 1-2	3.5 μμf
Between Deflecting Plates 3-4	3.0 μμf
Deflecting Plate 1[1] to All Other Electrodes	10.0 μμf
Deflecting Plate 2[1] to All Other Electrodes	6.5 μμf
Deflecting Plate 3[1] to All Other Electrodes	7.5 μμf
Deflecting Plate 4[1] to All Other Electrodes	5.0 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	4½ Inches
Bulb	J42J
Base (Small Shell Duodecal 12-Pin)	B12-43
Basing	12E
Weight (Approx.)	1½ Pounds

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	2750 Volts	dc
Anode No. 1 Voltage	1100 Volts	dc
Grid Voltage		
Negative Bias Value	220 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	140 Volts	
Heater Positive with Respect to Cathode	140 Volts	
Peak Voltage Between Anode No. 2 and Any Deflection Plate	550 Volts	

TYPICAL OPERATING CONDITIONS

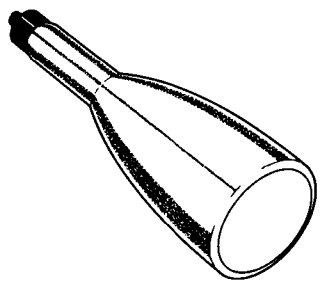
Anode No. 2 Voltage [2]	2000 Volts	dc
Anode No. 1 Voltage for Focus	.340 to 640 Volts	dc
Maximum Grid Voltage Required for Cutoff[3]	–90 Volts	dc
Deflection Factor[4,5]		
Deflecting Plates 1-2[6]	48 to 64 Volts	dc/Inch
Deflecting Plates 3-4[7]	27 to 37 Volts	dc/Inch
Spot Position (Undeflected) [8]	10 mm	Max.

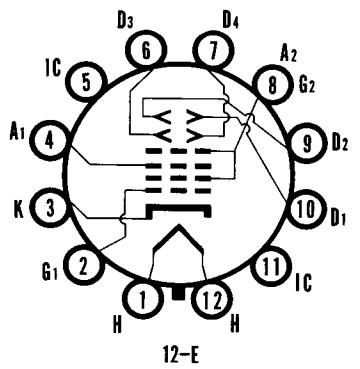
CIRCUIT VALUES

Grid Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5.0 Megohms Max.

QUICK REFERENCE DATA

Oscilloscope Tube
5" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
High Deflection Sensitivity





12-E

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

OCTOBER, 1961

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

NOTES:

1. *Positive voltage on D1 (Pin No. 10) will move spot approximately in direction of Pin No. 4. Positive voltage on D3 (Pin No. 6) will move spot approximately in direction of Pin No. 1.*
2. *Brilliance and definition decrease with decreasing Anode No. 2 Voltages. In general, Anode No. 2 Voltage should not be less than 1000 volts for the Type 5DEP1 and not less than 1500 volts for the Types 5DEP2, 5DEP7, and 5DEP11.*
3. *Visual extinction of undeflected focused spot.*
4. *Angle between trace produced by Plates D1-D2 and the plane through the tube axis and Pin No. 4 does not exceed 10°.*
5. *Angle between D1-D2 trace and D3-D4 trace is 90° ± 1°.*
6. *Deflecting Plates 1-2 are nearer the screen.*
7. *Deflecting Plates 3-4 are nearer the base.*
8. *With the tube shielded and with all deflection plates connected to A2, the spot shall fall within a square, 10 mm on a side, centered with respect to the face and with the sides parallel to the deflection axes.*

OUTLINE

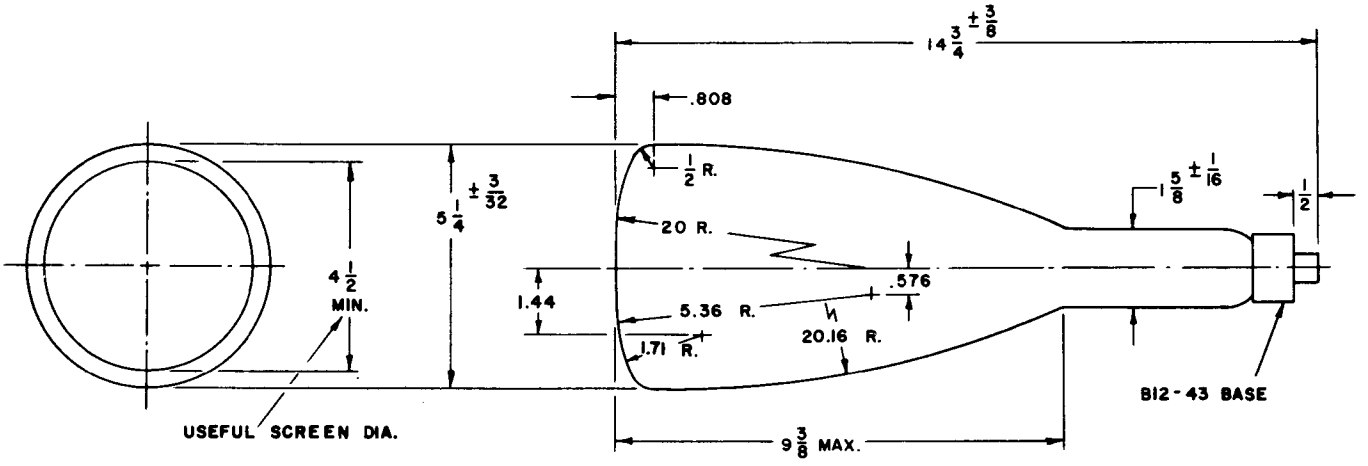


DIAGRAM NOTE:

1. *Dimensions are in inches.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflection Angles (Approx.)	53 Degrees

Types*	Fluorescence	Persistence
5DKP4	White	Medium Short
5DKP11	Blue	Medium Short
5DKP15	Green	Visible: Short U.V.: Very Short
5DKP16	Bluish Purple (U.V.)	Very Short
5DKP24	Green	Short

*In addition to the types shown, the 5DKP- can be supplied with several other screen phosphors. All screens are aluminized.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10 % Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	8 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	4¼ Inches
Nominal Overall Length	11⅛ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base (Medium Shell Octal 5-pin or 8-pin)	B8-11, B8-65 or B5-80
Basing	5AN
Bulb	J39½L

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage[1]	8800 Volts	dc
Grid No. 2 Voltage	770 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	180 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	180 Volts	
Heater Positive with Respect to Cathode	180 Volts	

TYPICAL OPERATING CONDITIONS

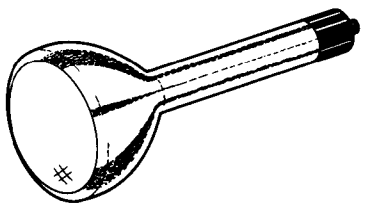
Anode Voltage[2]	8000 Volts	dc
Grid No. 2 Voltage	250 Volts	dc
Grid No. 1 Voltage[3]	−30 to −75 Volts	dc
Focusing Coil Current[4]	136 ± 15 % Ma	dc
Spot Position (Undeflected)[5]	9 mm	
Line Width A[6]	.16 mm	Max.

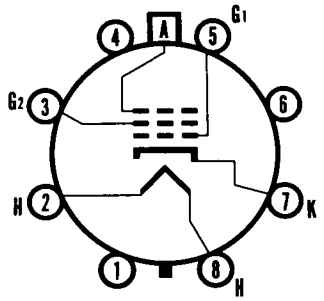
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

5DKP4 —Monitor Tube
5DKP11 —Photo Recorder
5DKP15, 5DKP16, 5DKP24 —Flying Spot Scanners
5″ Round Glass Type
Aluminized Screen
Magnetic Deflection
Magnetic Focus
High Resolution





5-AN

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
MARCH, 1962

File Under
SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

NOTES:

1. *The product of the anode voltage and the average anode current should be limited to 6 watts.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 6000 volts.*
3. *Visual extinction of undeflected focused spot.*
4. *For JEDEC focus coil No. 106 or equivalent, with the Grid No. 1 voltage adjusted to produce an accelerator current of 200 μamps and with distance from reference line to center of air gap equal to 2¾ inches.*
5. *The center of the undeflected unfocused spot will fall within a circle of 9 mm radius centered on the tube face.*
6. *Measured in accordance with MIL-E-1 specification, at anode current of 200 μa.*

OUTLINE

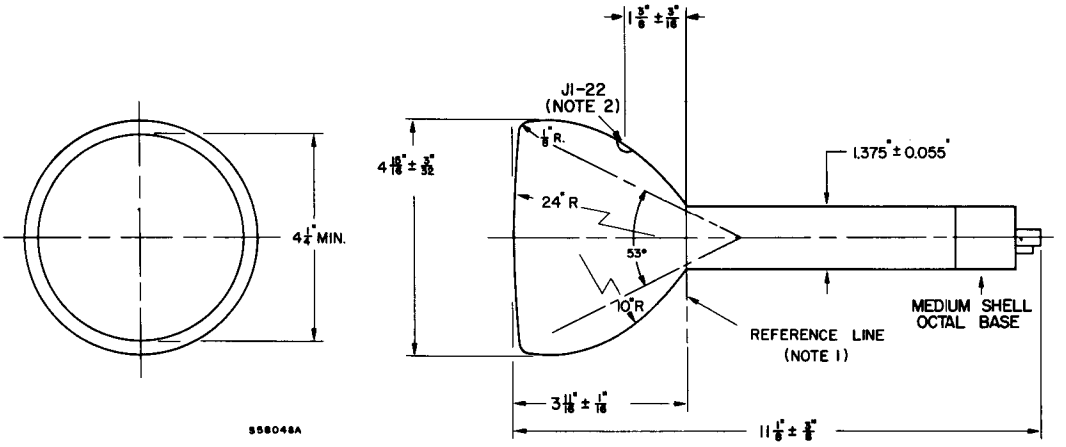


DIAGRAM NOTES:

1. *Reference line is determined by position where JEDEC Gauge No. 124 (a cylinder 1.430" + .003" − .000" ID and 2" long) will seat against cone of bulb.*
2. *The plane through the tube axis and Pin No. 5 may vary from the plane through the tube axis and anode terminal by an angular tolerance (measured about the tube axis) of 10°. Anode terminal is on same side of tube as Pin No. 5.*

SYLVANIA

engineering data service

SYLVANIA

5DLP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angle (Approx.)	53 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Spherical, Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	400 μμf	Max.
	200 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Diameter (Maximum Assured)	4 ¼ Inches
Area	16 Sq. Inches
Neck Length	5⅝ Nom. Inches
Overall Length	$8\frac{7}{8} + \frac{1}{8} - \frac{7}{16}$ Inches
Bulb	J39 ½P
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-183 or B7-208
Basing	8LV
Weight (Approx.)	1 ¼ Pounds

RATINGS

MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Maximum Anode Voltage	12,000 Volts	dc
Minimum Anode Voltage	8000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS, Grid Drive Service

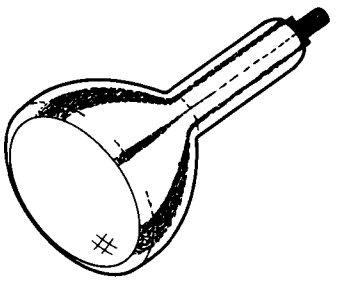
Anode Voltage	10,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts	dc

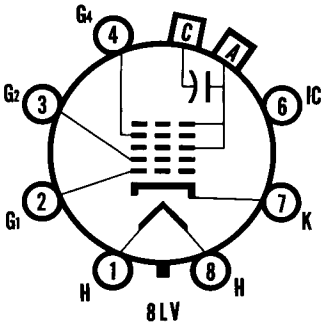
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.

QUICK REFERENCE DATA

Monitor Tube
5" Direct Viewed
Round Glass Type
Clear Glass Face
Aluminized Screen
Electrostatic Focus
53° Magnetic Deflection
No Ion Trap
External Conductive Coating





SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

PICTURE TUBE
OPERATIONS

SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JUNE, 1962

File Under
SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

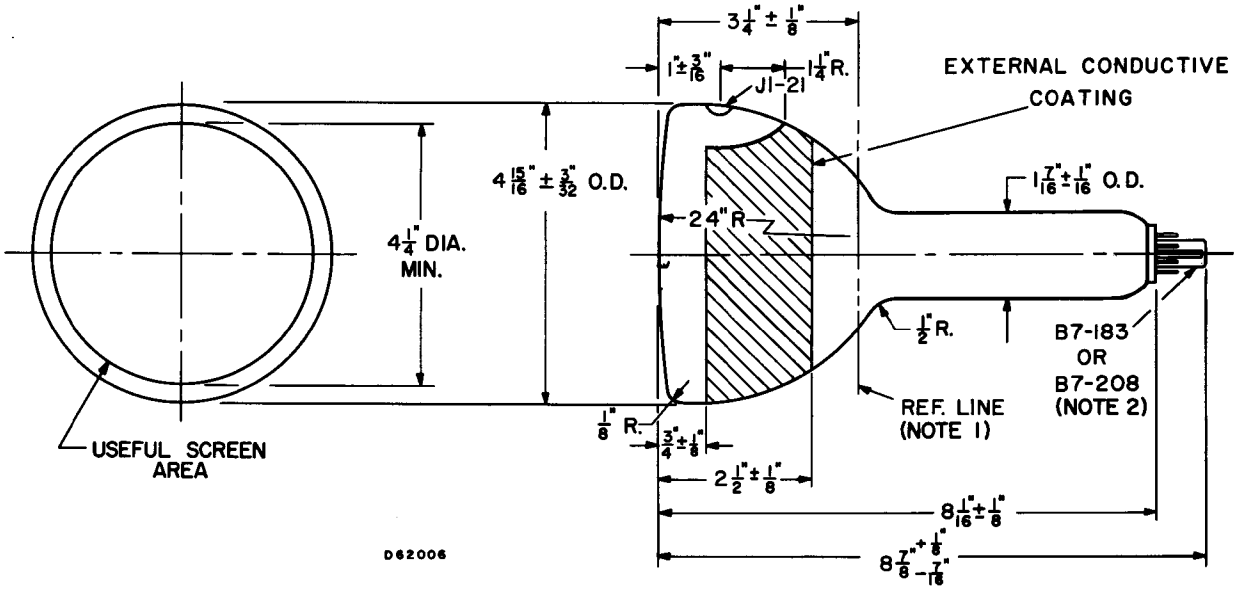


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C¹ JEDEC Gauge No. 116 when gauge is seated against cone of bulb.*
2. *Pin No. 4 aligns with anode contact (J1-21) within 30°.*

SYLVANIA engineering data service

SYLVANIA
5FP4A
5FP-A*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflection Angles (Approx.)	53 Degrees

Types*	5FP4A	5FP7A	5FP11A	5FP14A
Fluorescence	White	Blue-White	Blue	Blue
Phosphorescence	White	Yellow	—	Orange
Persistence	Medium	Long	Short	Medium-Long

Faceplate . . . . . Clear

*In addition to the types shown, the 5FP-A can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (Approx.)	0.6 ± 10% Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	8 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	4¼ Inches
Nominal Overall Length	11⅛ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base (Medium Shell Octal 5-Pin or 8-Pin)	B8-11,B8-65 or B5-80
Basing	5AN
Bulb	J39½ L

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

	5FP4A	5FP7A 5FP11A 5FP14A	
Anode Voltage[1]	8800	8800 Volts	dc
Grid No 2 Voltage	450	770 Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	140	200 Volts	dc
Positive Bias Value	0	0 Volts	dc
Positive Peak Value	2	2 Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode	165	200 Volts	
Heater Positive with Respect to Cathode	165	200 Volts	

TYPICAL OPERATING CONDITIONS

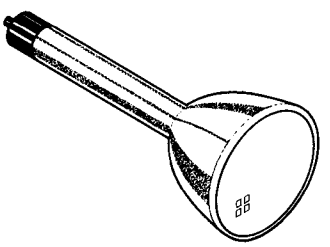
Anode Voltage[2]	6,000	4,000 Volts	dc
Grid No. 2 Voltage	250	250 Volts	dc
Grid No. 1 Voltage[3]	−25 to −70	−25 to −70 Volts	dc
Focusing Coil Current (Approx.)[4,5]	120 ± 15%	96 ± 15% Ma	dc
Spot Position (Undeflected)[6]		9 mm	
Line Width A[7]		.010 in.	Max

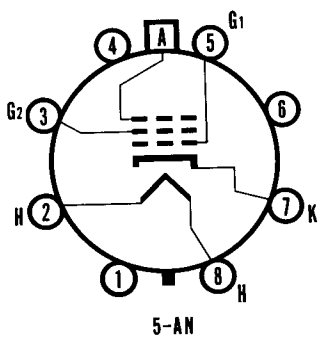
CIRCUIT VALUES

Grid No. 1 Circuit Resistance . . . . . 1.5 Megohms Max.

QUICK REFERENCE DATA

5FP4A: Monitor Tube
5FP7A, 5FP14A; Radar Indicator Tubes
5FP11A: Photo Recorder Tube
5" Direct Viewed
Round Glass Type
Magnetic Deflection
Magnetic Focus





5-AN

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
OCTOBER, 1961

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

NOTES:

1. *The product of the anode voltage and the average anode current should be limited to 6 watts.*
2. *Brillance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 4,000 volts.*
3. *Visual extinction of undeflected focused spot.*
4. *This note applies to Type 5FP4A only. For specimen focusing coil similar to JEDEC focusing coil No. 106 positioned with air gap toward cathode ray tube screen and center line of air gap 3¼ inches from reference line. The indicated current is for condition with combined Grid No. 1 bias voltage and video—signal voltage adjusted to produce a highlight of 10 foot lamberts on a 3⅞ x 2⅞ inch picture area sharply focused at center of the screen.*
5. *This note applies to Types 5FP7A, 5FP11A, 5FP14A. For JEDEC focus coil No. 106 or equivalent, with the Grid No. 1 voltage adjusted to produce an accelerator current of 200 μamps and with distance from reference line to center of air gap equal to 2¾ inches.*
6. *The center of the undeflected unfocused spot will fall within a circle of 9 mm radius concentric with the center of the tube face.*
7. *Measured in accordance with MIL-E-1 specification, at anode current of 200 μa. This value applies to 5FP11A and 5FY14A. Value for 5FP7A is .020" Maximum.*

OUTLINE

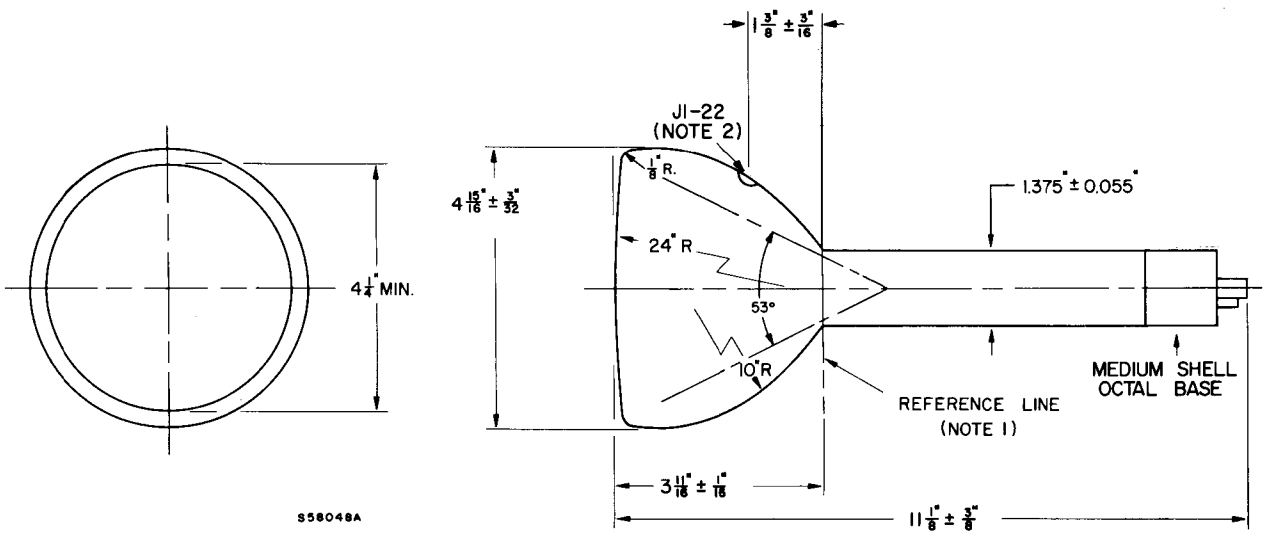


DIAGRAM NOTES:

1. *Reference line is determined by position where JEDEC Gauge #124 (a cylinder 1.430" + .003" – .000" ID and 2" long) will seat against cone of bulb.*
2. *The plane through the tube axis and Pin No. 5 may vary from the plane through the tube axis and anode terminal by an angular tolerance (measured about the tube axis) of 10°. Anode terminal is on same side of tube as Pin No. 5.*

ADVANCE DATA

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9AE
Cathode	Coated Unipotential
Mounting Position	Any

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

	Series Operation
Heater Voltage	5.6 Volts
Heater Current[1]	450 Ma
Heater Warm-up Time[2]	11 Seconds

Ratings (Design Maximum Values)

	Min. - Max.
Heater Current[3]	420-480 Ma
Maximum Heater-Cathode Voltage[4]	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

NOTES:

1. For series operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current.

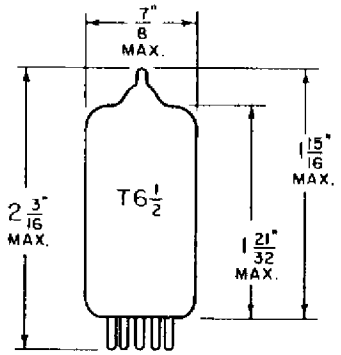
2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

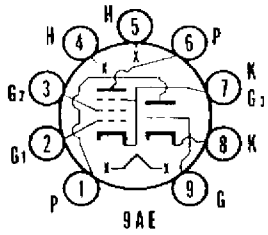
3. Heater voltage supply variations shall be restricted to maintain heater current within the specified values.

4. Heater-cathode voltage ratings apply to triode and pentode sections.

QUICK REFERENCE DATA

The Sylvania Type 5KD8 has a medium mu triode and sharp cutoff pentode contained in one envelope. It is intended for use as a combined VHF oscillator and mixer.
Except for heater characteristics, type 5KD8 is identical to type 6KD8 as defined in EIA Release No. 3687.





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

August 31, 1962

146 (10-58)

from JEDEC release #3687A, Sept. 24, 1962

SYLVANIA ELECTRIC PRODUCTS INC.

CATHODE RAY TUBE CHARACTERISTIC SHEET

TYPES 5NP1 AND 5UP4

Release No. 354
November 8, 1943

Physical Characteristics

Heater Voltage a.c. or d.c.	6.3 volts	
Heater Current	0.6 amperes	
Focusing Method	Electrostatic	
Deflection Method	Electrostatic	
Phosphor	P1	P4
Fluorescence	Green	White
Persistence	Medium	Medium
Overall Length	16 3/4" ±3/8"	
Diameter of Bulb	5 5/16" max.	
Mechanical Dimensions	Refer to Outline Drawing attached	
Bulb Designation	J 42 C 2	
Base	Large Wafer Magnal 11 Pin, Sleeve	
Basing Designation	11 A	

Pin No.	1	2	3	4	5	6	7	8	9	10	11
Element:	h	no	D1	d1	IC	D4	d2	D2	D3	g2	hk

Beam Alignment

- g1 + G. beam aligns with pin #1 and axis ±10°
- Angle between traces, 90° ± 5°
- Positive voltage on D1 (Pin #3) deflects beam toward pin #4
- Positive voltage on D3 (Pin #9) deflects beam towards pin #1

Position of Spot (Note 1) — Within 15 mm square

Direct Interelectrode Capacitances (Maximum)

Control grid to all other electrodes	12.0 uuf
Deflecting Plate D1 to Deflecting Plate D2	3.0 uuf
Deflecting Plate D3 to Deflecting Plate D4	3.0 uuf
K1 to all other electrodes	15.0 uuf
D3 to all other electrodes	15.0 uuf
D1 to all other electrodes except D2	13.0 uuf
D2 to all other electrodes except D1	13.0 uuf
D4 to all other electrodes except D3	13.0 uuf
D3 to all other electrodes except D4	13.0 uuf

ELECTRICAL CHARACTERISTICS

Ratings

Heater Voltage	6.3 volts
Heater Current	0.6 ± 10% amps.
Anode #2 (High Voltage Electrode)	2200 volts max.
Anode #1 (Focusing Electrode)	1100 volts max.
Grid Voltage (Control Electrode)	Never positive
Peak Voltage between Anode #2 and any deflection plate	550 volts max.
Resistance of circuit to grid	1.5 megohms max.
Impedance of any deflecting electrode circuit at heater supply frequency	1.0 megohm max.

Typical Operation

Heater Voltage	6.3	6.3 volts
Anode #2 Voltage	1500	2000 volts
Anode #1 Voltage for Focus	337*	450* volts
Grid Voltage for Cut-off (Note 2)	-30	-40 volts

*Required for focus when Eb is 75% of cut-off value.

Deflection	Factor	Sensitivity
Electrodes D1 and D2	42v/(in.kv)	0.60 mm.kv/v(av)
Electrodes D3 and D4	38v/(in.kv)	0.66 mm.kv/v(av)

NOTES:

1. When the tube is operated with (1) Ef=6.3 volts; Eb2=2000 volts; Eb1 adjusted for focus; Ec set at such a value as will avoid damage to the screen (2) with each of the deflecting electrodes connected to Anode #2 and (3) with the tube shielded against external influences the spot will fall within a square of the specified size, the centre of which coincides with the geometric centre of the tube face and the sides of which are parallel to the traces produced by deflection electrodes D1 and D2 and by deflection electrodes D3 and D4 respectively.

2. Grid Voltage for cut-off is voltage necessary for visual extinction of the undeflected, focused spot.

3. Minimum distance between electrodes D1 and D2 is .140".
Minimum distance from bottom of base to top of electrodes D1 and D2 is .4.250".

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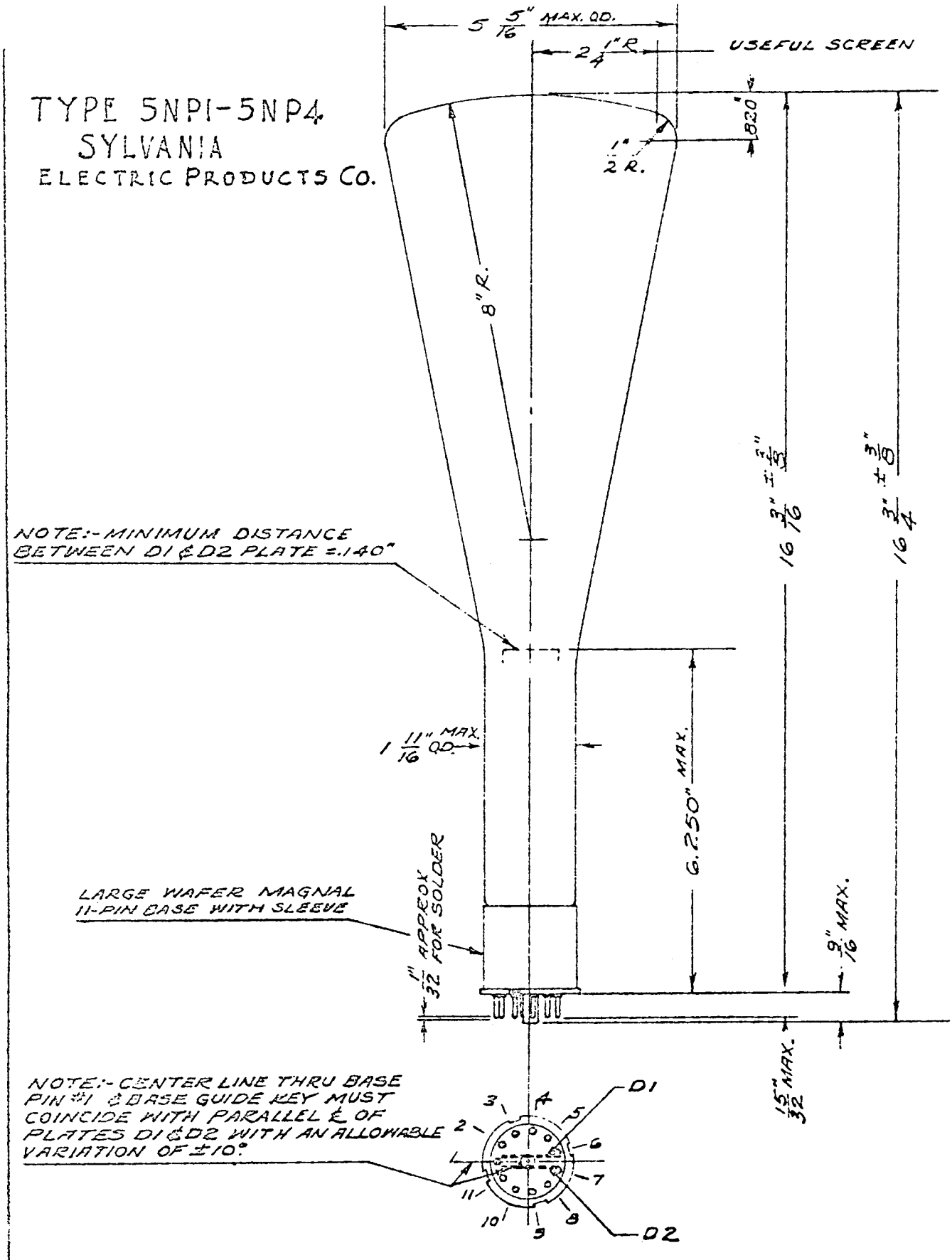
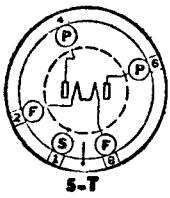
TYPE 5NP1-5NP4
SYLVANIA
ELECTRIC PRODUCTS CO.



BASE PIN CONNECTIONS

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
h	nc	D1	G1	Int. Conn.	D4	G2	D2	D3	g1	h & k



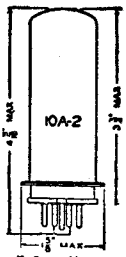
5-T

Sylvania

TYPE 5T4

REDRESSEUR BIPLAQUE A VIDE POUSSE

CARACTERISTIQUES



Tension filament CA.	5,0 volts
Courant filament	2,0 ampères
Ampoule	10A-2
Culot — Petit octal 5 broches	5-T
Position de montage	Verticale

Conditions de fonctionnement et caractéristiques :

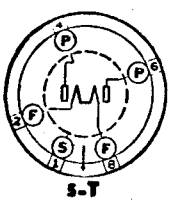
	Entrée Condensat. à filtre	Entrée choke à filtre
Tension filament CA.	5,0	5,0 volts
Tension CA. par plaque	450	550* volts max.
Tension inverse de pointe	1,250	1,550* volts max.
Courant redressé	250	250* ma. max.
Chute tension dans le tube		48 volts

* Possible seulement avec choke d'entrée d'au moins 10 henrys.

APPLICATION

Sylvania type 5T4 est un tube métal redresseur à vide poussé, redressant les 2 alternances pour applications demandant des courants redressés modérés. Les caractéristiques sont quelque peu similaires à celles du type 5U4G.

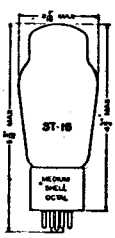
Les circuits seront soigneusement analysés, eu égard au filtrage. Les circuits conventionnels de filtrage, qu'ils soient à condensateur d'entrée ou du type à choke, sont applicables.



Sylvania

TYPE 5U4G

REDRESSEUR BIPLAQUE



CARACTERISTIQUES

Tension filament CC.	5,0 volts
Courant filament	3,0 ampères
Ampoule	ST-16
Culot — Moyen octal 5 broches	5-T
Position de montage	Verticale

Pour toutes les autres caractéristiques, conditions de fonctionnement et applications se référer au type 5Z3,
Pour courbe de redressement, voir fin de volume.

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engineering data service

SYLVANIA
5UP1
5UP7
5UP11

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic
Phosphor	P1
Fluorescence	Green
Persistence	Medium
Faceplate	Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ±10% Ampere
Direct Interelectrode Capacitances (approx.)	
Grid to All Other Electrodes	8.0 μμf
Between Deflecting Plates 1-2	2.5 μμf
Between Deflecting Plates 3-4	2.5 μμf
Deflecting Plate 1[1] to All Other Electrodes	11.0 μμf
Deflecting Plate 2[1] to All Other Electrodes	8.0 μμf
Deflecting Plate 3[1] to All Other Electrodes	7.0 μμf
Deflecting Plate 4[1] to All Other Electrodes	8.0 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	4½ Inches
Base (Small-Shell Duodecal 10-Pin)	B10-75
or (Small Shell Duodecal 12-Pin)	B12-43
Basing	12E

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	2750 Volts dc
Anode No. 1 Voltage	1100 Volts dc
Grid Voltage	
Negative Bias Value	220 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	140 Volts
Heater Positive with Respect to Cathode	140 Volts
Peak Voltage Between Anode No. 2 and Any Deflection Plate	550 Volts

TYPICAL OPERATING CONDITIONS

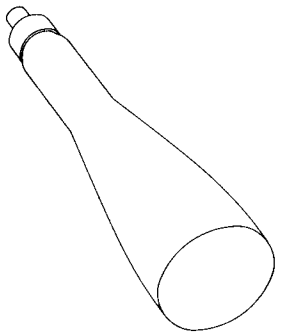
Anode No. 2 Voltage[2]	2000 Volts dc
Anode No. 1 Voltage for Focus	340 to 640 Volts dc
Maximum Grid Voltage Required for Cutoff[3]	−90 Volts dc
Deflection Factor[4, 5]	
Deflecting Plates 1-2[6]	56 to 77 Volts dc/Inch
Deflecting Plates 3-4[7]	46 to 62 Volts dc/Inch

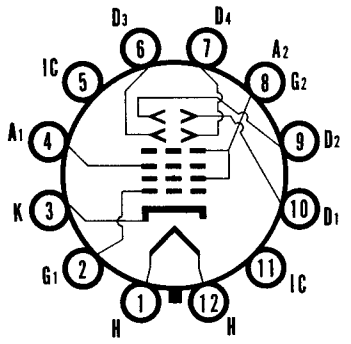
CIRCUIT VALUES

Grid Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5.0 Megohms Max.

QUICK REFERENCE DATA

Special Purpose Tube
5" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus



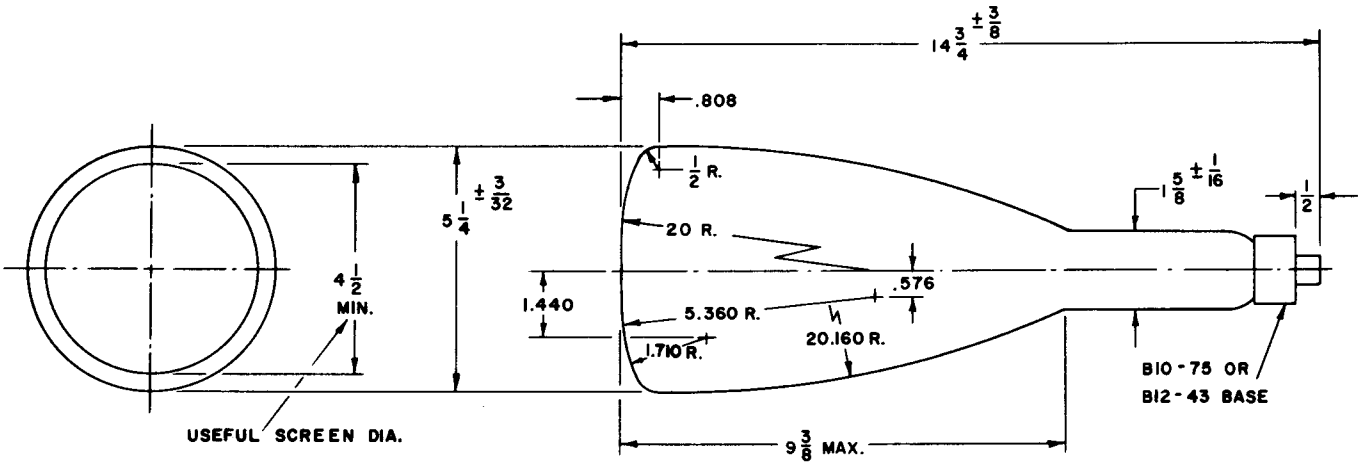


SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JULY, 1957

NOTES:

1. *Positive voltage on Pin No. 10 will move spot approximately in direction of Pin No. 4. Positive voltage on Pin No. 6 will move spot approximately in direction of Pin No. 1.*
2. *Brilliance and definition decrease with decreasing Anode No. 2 Voltage. In general, Anode No. 2 Voltage should not be less than 1000 volts for the Type 5UP1 and not less than 1500 volts for the Types 5UP7 and 5UP11.*
3. *Visual extinction of undeflected focused spot.*
4. *Angle between trace produced by plates D1-D2 and the plane through the tube axis and Pin No. 4 does not exceed 10°.*
5. *Angle between D1-D2 trace and D3-D4 trace is 90° ± 30.*
6. *Deflecting Plates 1-2 are nearer the screen.*
7. *Deflecting Plates 3-4 are nearer the base.*

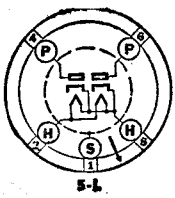


5UP7

The Sylvania Type 5UP7 is identical to the Type 5UP1 except it has a blue-white fluorescence, yellow phosphorescence, long persistence phosphor.

5UP11

The Sylvania Type 5UP11 is identical to the Type 5UP1 except it has blue phosphor and a short persistence.

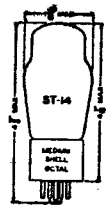


5-L

Sylvania

TYPE 5V4G

REDRESSEUR BIFLAQUE

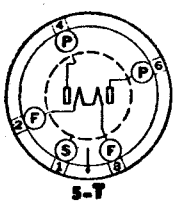


CARACTERISTIQUES

Tension de chauffage CA.	5,0 volts
Courant de chauffage	2,0 ampères
Ampoule	ST-14
Culot — Moyen octal 5 broches	5-L
Position de montage	Toutes

Pour toutes les autres caractéristiques, conditions de fonctionnement et applications se référer au type 83V.

Pour courbe de redressement, voir fin de volume.

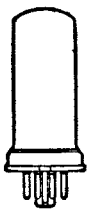


5-T

Sylvania

TYPE 5W4

REDRESSEUR
DEUX ALTERNANCES



CARACTERISTIQUES

Tension filament	5,0 volts
Courant filament	1,5 ampère
Ampoule	8B-1
Culot — Octal 5 broches	5-T
Position de montage	Verticale

Conditions de fonctionnement et caractéristiques :

Tension filament	5,0 volts
Tension efficace par plaque	350 volts
Courant redressé	110 ma. max.
Tension inverse de pointe	1,100 volts max.
Chute tension dans le tube (110 ma. par plaque)	50 volts

APPLICATION

Sylvania 5W4 est un tube métal, redresseur des deux alternances, à chauffage direct. Ce nouveau type, tout métal, a des caractéristiques quelque peu semblables à celles du type 80, mais n'est pas directement interchangeable avec ce redresseur « verre ». Le type 5W4 est muni du culot octal à cinq broches.

Le maximum de courant redressé est 110 milliampères contre 125 milliampères pour le type 80 pour les mêmes tensions de fonctionnement. Le courant filament est 1,5 ampère, tandis que, pour le type 80, il est de 2 ampères.

Le type 5W4 trouvera des applications dans les petits et moyens récepteurs n'exigeant pas un courant redressé supérieur à 110 milliampères.

SYLVANIA

engineering data service

SYLVANIA
5WP11
5WP-*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angle (approx.)	50°

Types*	5WP11	5WP15
Fluorescence	Blue	Blue-Green
Persistence	Short	Extremely Short

Screen	Aluminized
Faceplate	Flat, Clear

**In addition to the types shown, the 5WP- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Ampere
Direct Interelectrode Capacitances		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	7.5	μμf Max.
External Conductive Neck Coating to Anode No. 2[1]	500	μμf Max.
	100	μμf Min.

MECHANICAL DATA

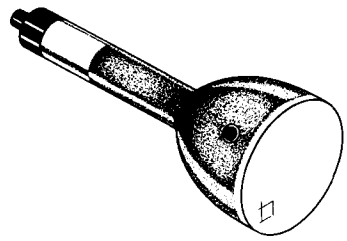
Minimum Useful Screen Diameter	4¼ Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 7-Pin)	B7-51
Basing	12C
Bulb	C40 Exp. 14 or Equivalent

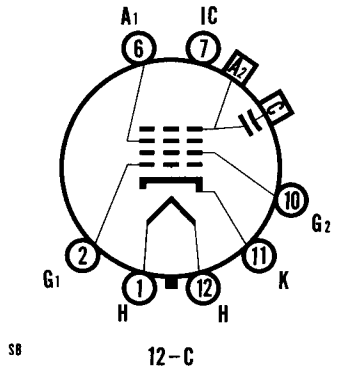
MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	30,000	Volts dc
Anode No. 1 Voltage (Focusing Electrode)	6,600	Volts dc
Grid No. 2 Voltage	385	Volts dc
Grid No. 1 Voltage		
Negative Bias Value	165	Volts dc
Positive Bias Value	0	Volts dc
Positive Peak Value	2	Volts
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period		
Not to Exceed 15 Seconds	450	Volts
After Equipment Warm-up Period	140	Volts
Heater Positive with Respect to Cathode	140	Volts

QUICK REFERENCE DATA

5WP11—Video Recorder
5WP15—Flying Spot Scanner
5" Round Glass Type
Flat, Clear Faceplate
Magnetic Deflection
Acceleration Type Electrostatic Focus
No Ion Trap
External Conductive Coating on Neck
External Insulating Coating on Bulb
Aluminized Screen





SYLVANIA ELECTRONIC TUBES

A Division of
Sylvania Electric Products, Inc.

PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

SEPTEMBER, 1959

TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage[2]	27,000	Volts	dc
Anode No. 1 Voltage for Focus	4200 to 5400	Volts	dc
Grid No. 2 Voltage[3]	200	Volts	dc
Grid No. 1 Voltage Required for Cutoff[4]	−42 to −98	Volts	dc
Anode No. 2 Current			
5WP11	20	μa	dc
5WP15	100	μa	dc
Max. Anode No 1. Current			
5WP11	25	μa	dc
5WP15	150	μa	dc
Grid No. 2 Current	−15 to +15	μa	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms Max.

NOTES:

1. *External conductive neck coating must be grounded.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 15,000 volts.*
3. *Subject to variation of ±40% when Grid No. 1 Voltage cutoff is desired at the average cutoff value of −70 volts.*
4. *Visual extinction of undeflected focused spot.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

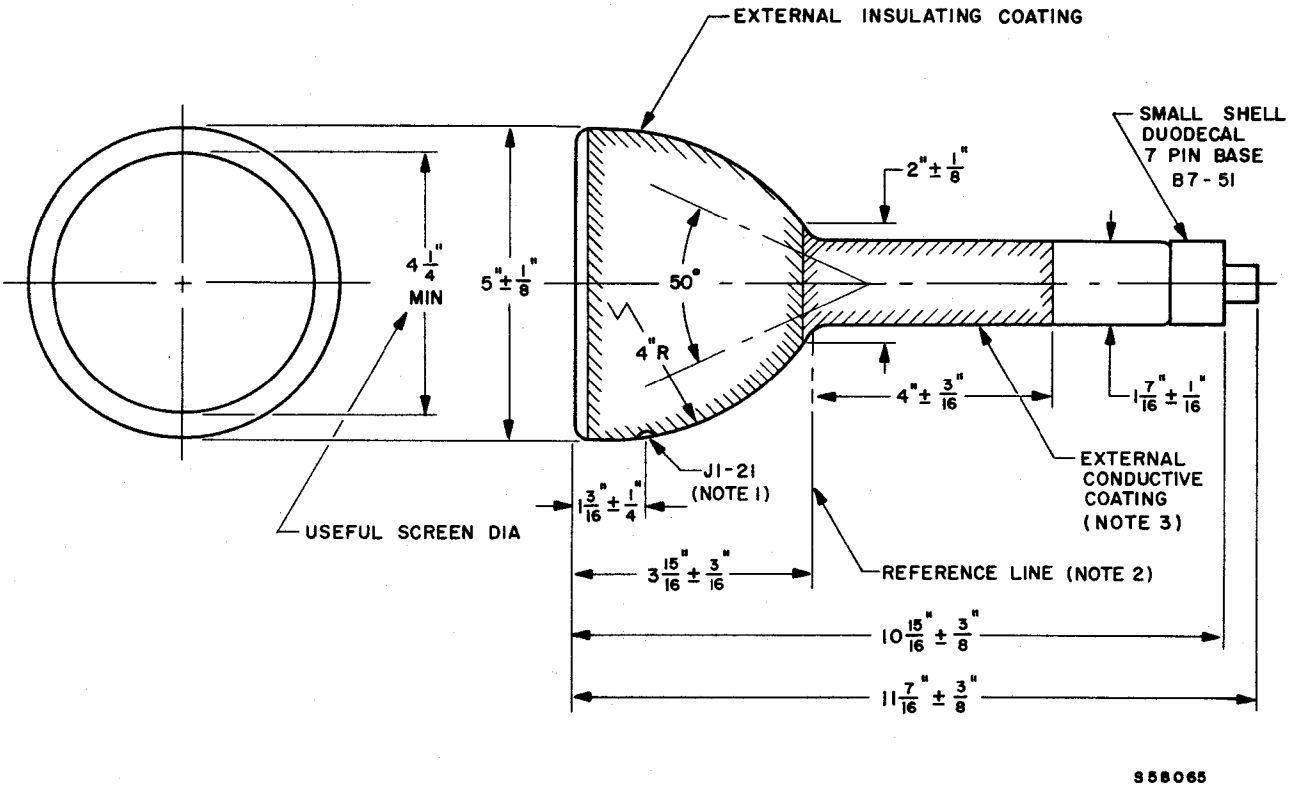


DIAGRAM NOTES:

1. *The plane through the tube axis and vacant pin position No. 3 may vary from the plane through the axis and Anode No. 2 terminal by an angular tolerance (measured about the tube axis) of ±10°.*

   Anode No. 2 terminal is on same side as vacant pin position No. 3.

2. *Reference line is determined by the plane C-C' of the reference line gauge (JEDEC No. G112) when the gauge is seated on the glass cone.*

3. *External conductive coating must be grounded.*

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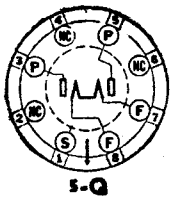
SYLVANIA ELECTRIC
PRODUCTS INC.
EMPORIUM, PA.



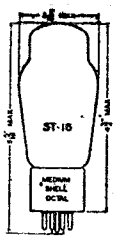


5-Q

Sylvania

TYPE 5X4G

REDRESSEUR BIPLAQUE A VIDE POUSSE



CARACTERISTIQUES

Tension filament CA.	5,0 volts
Courant filament	3,0 ampères
Ampoule	ST-16
Culot — Moyen octal 8 broches	5-Q
Position de montage	Verticale

Pour toutes les autres caractéristiques, conditions de fonctionnement et applications se référer au type 5Z3.

Pour courbe de redressement, voir fin de volume.

SYLVANIA

engineering data service

SYLVANIA

5X4GA

(ADVANCE DATA)

MECHANICAL DATA

Bulb	T-12, Glass
Base	B8-118, Short Medium Shell Octal 8-Pin
Basing	5Q
Cathode	Coated Filament
Mounting Position [1]	Vertical

ELECTRICAL DATA

FILAMENT CHARACTERISTICS

Filament Voltage, A C or D C	5.0 Volts
Filament Current	3.0 Amperes

RATINGS (Design Center Values) [2]

Rectifier Service [3]

Peak Inverse Plate Voltage	1550 Volts	Max.
A C Plate Supply Voltage Per Plate, RMS (See Rating Chart I)	550 Volts	Max.
D C Output Current	See Rating Chart I	
Steady State Peak Plate Current Per Plate (See Rating Chart II)	900 Ma	Max.
Transient Peak Plate Current Per Plate (See Rating Chart III)	4.3 Amperes	Max.

AVERAGE CHARACTERISTICS

Tube Voltage Drop		
Tube Conducting:	225 Ma	44 Volts
	250 Ma	47 Volts
	275 Ma	50 Volts

TYPICAL OPERATION

Full Wave Rectifier - Capacitor Input Filter

A C Plate Supply Voltage Per Plate, RMS	300	450 Volts
Filter Input Capacitor	40	40 uf
Total Plate-Supply Resistance Per Plate	25	75 Ohms
D C Output Current	275	250 Ma
D C Output Voltage at Filter Input	290	460 Volts

Full Wave Rectifier - Choke Input Filter

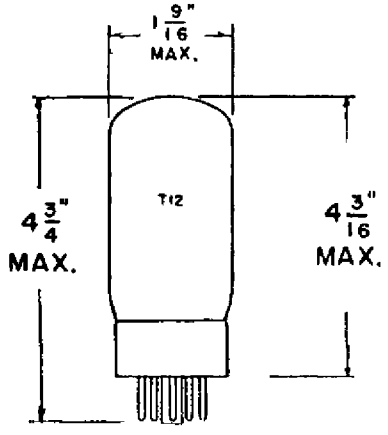
A C Plate Supply Voltage Per Plate, RMS	550 Volts
Filter Input Choke	10 Henrys
D C Output Current	250 Ma
D C Output Voltage at Filter Input	440 Volts

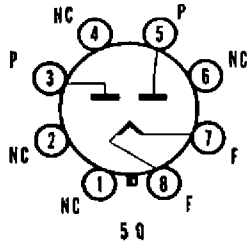
NOTES:

1. Horizontal Operation is permitted if Pins 1 and 4 are in a vertical plane.
2. See "Interpretation of Rating Charts".
3. For use with sinusoidal supply voltages within the frequency range of 25 to 1000 cps.

QUICK REFERENCE DATA

The Sylvania Type 5X4GA is a filamentary, full-wave, high vacuum rectifier designed for service in the power supply of television receivers or other equipment requiring high current. The 5X4GA employs a T-12 envelope and features a higher output current than the 5X4G. Except for basing it is identical to the Type 5U4GB.





SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
May 15, 1954

from JETEC release #1323, June 11, 1954

INTERPRETATION OF RATING CHARTS

Rating Charts I, II and III represent boundary conditions beyond which operation of the Sylvania Type 5X4GA is not permitted. With the aid of simple laboratory measurements and the use of the three Charts, any application may be analyzed for proper rectifier type operation.

The boundaries of Rating Chart I are based on constant plate dissipation. These boundaries differ, depending upon the type of filter used. With capacitor input, operation is confined to the area bounded by FAEDG while for choke input, the entire area bounded by FABCDG may be used.

The boundary of Rating Chart II represents a line of constant steady-state peak current. Operation within the boundary is permitted.

Rating Chart III defines the minimum value of effective plate supply resistance, per plate, for any given plate voltage supply which will assure that the surge currents are within a safe value.

For any application, each Chart should be consulted. On all Charts the points of operation should fall within the proper boundaries.

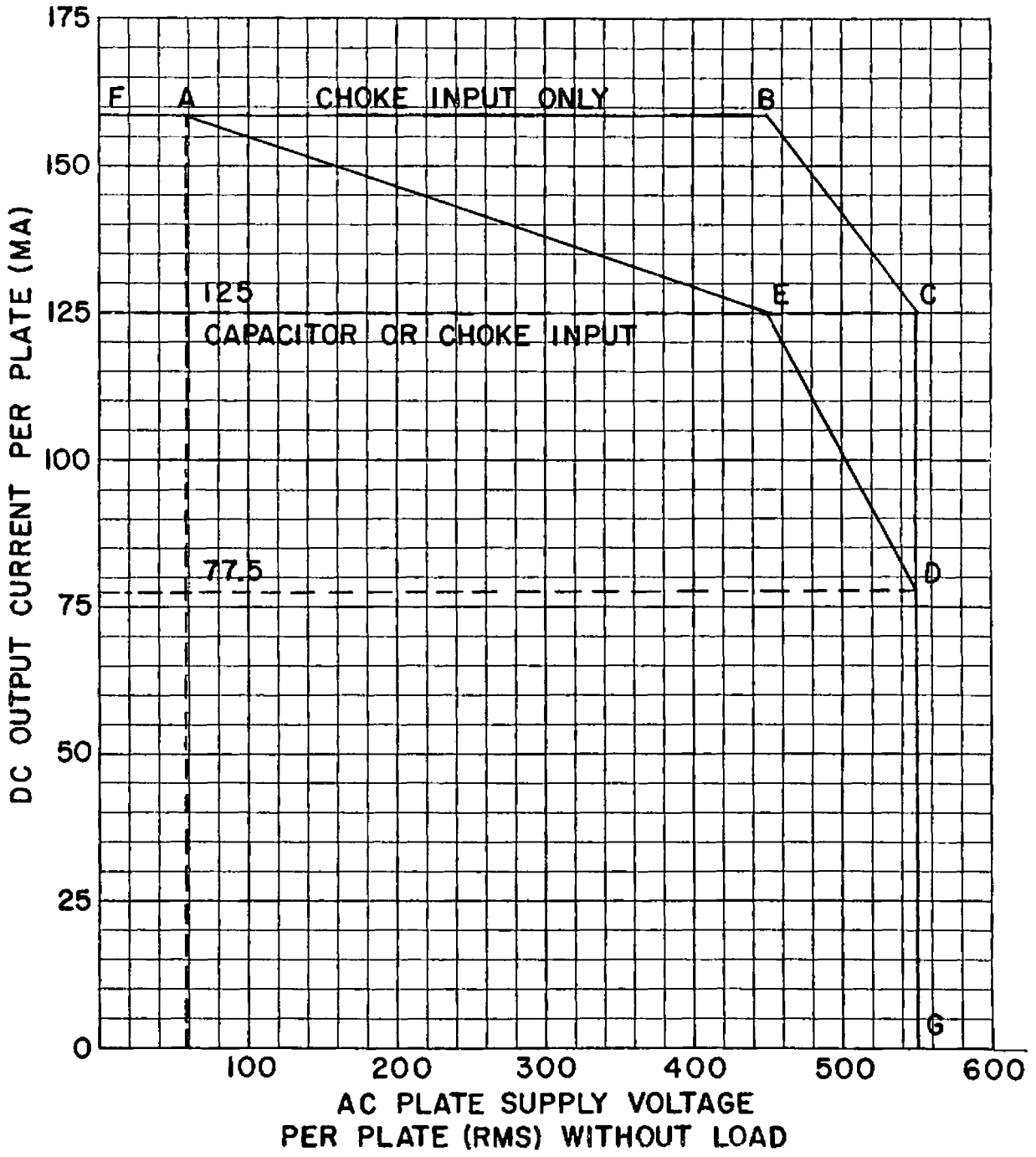
Plate supply voltages are measured with the rectifier tube non-conducting, i.e., with the transformer unloaded. This unloaded voltage is used when calculating rectification efficiency.

The rectification efficiency is defined as

$$\frac{\text{D C Output Voltage}}{\sqrt{2}\ (\text{RMS Supply Voltage Per Plate})}$$

The D C output voltage is measured at the input to the filter.

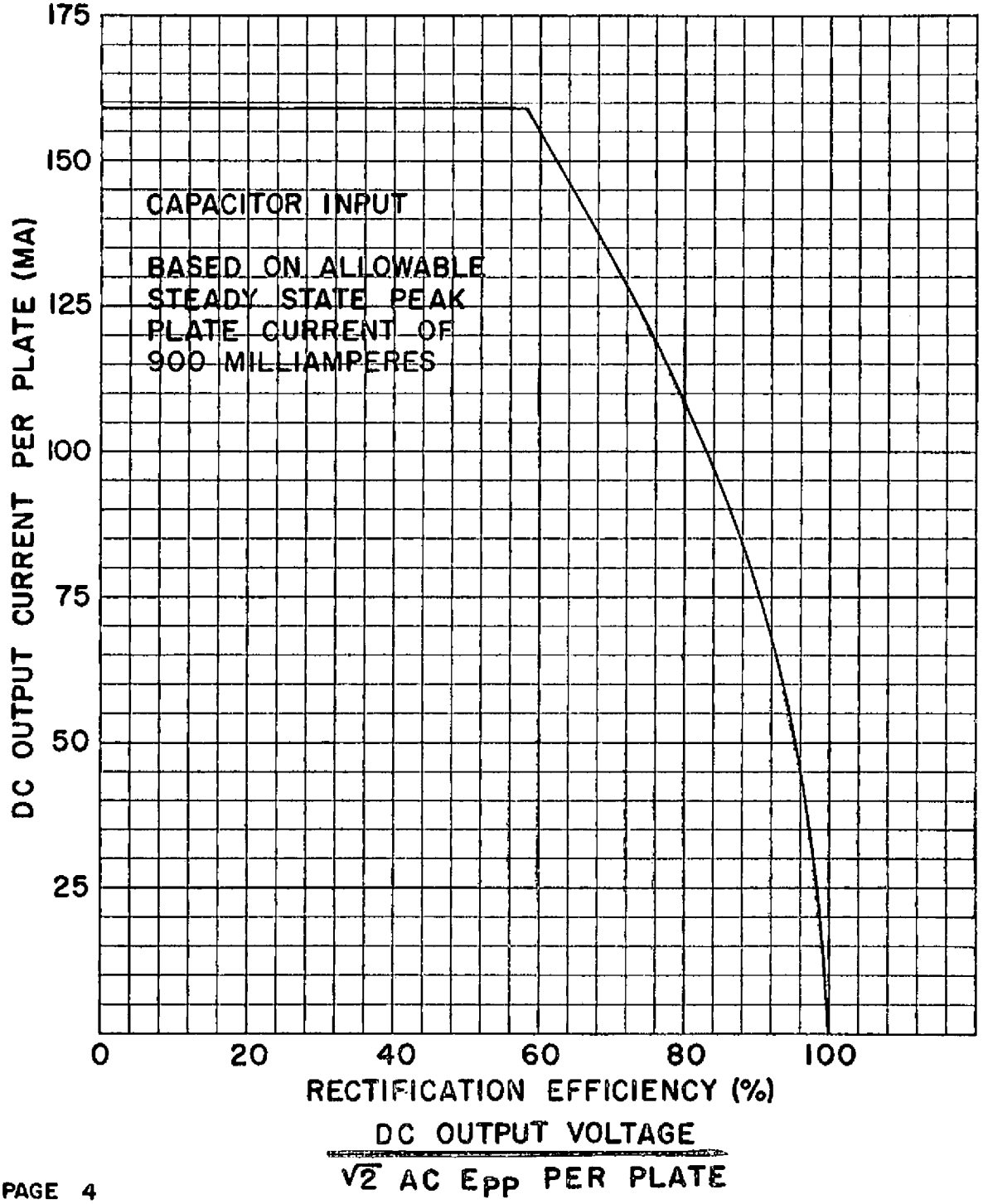
RATING CHART I



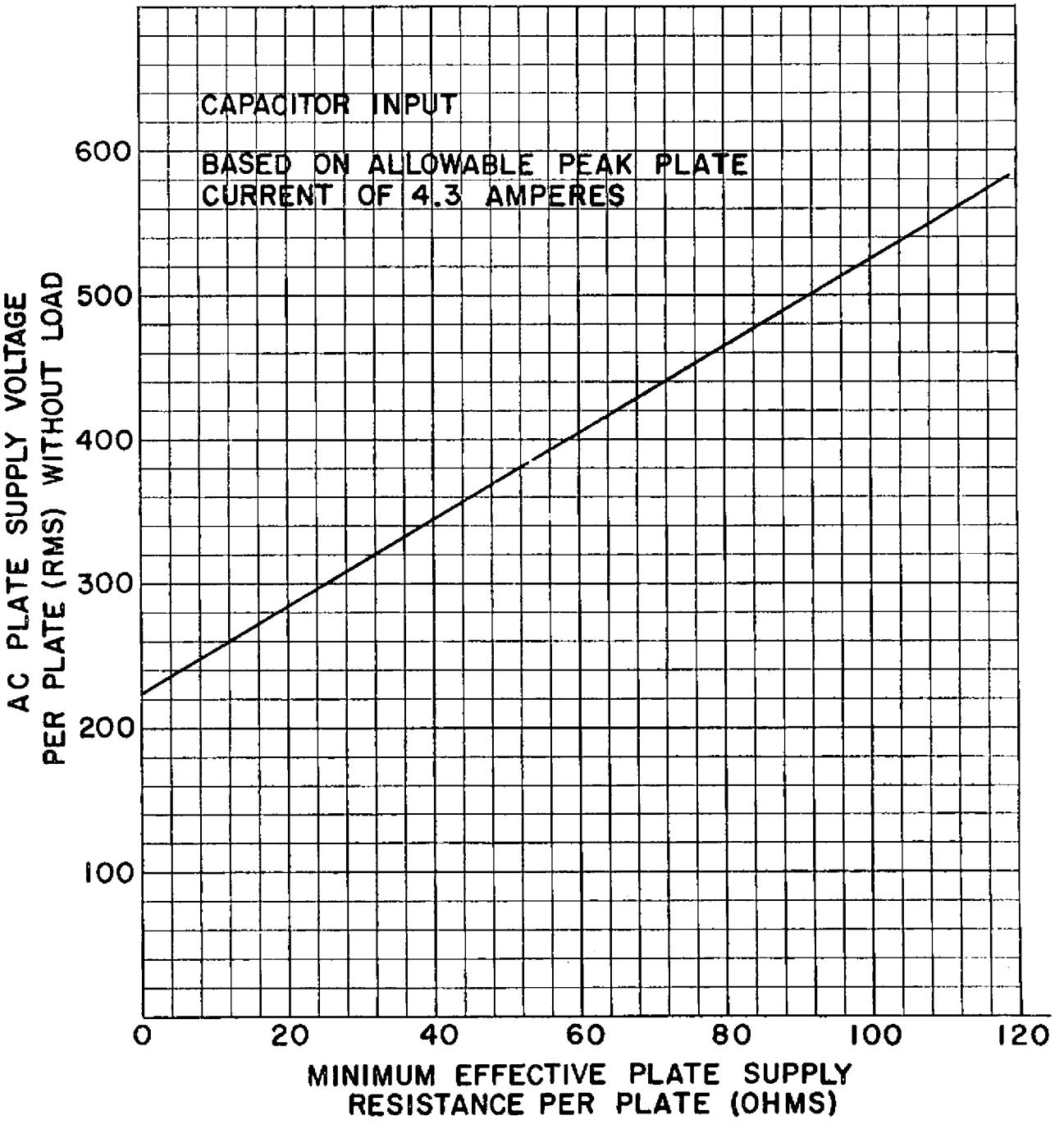
SYLVANIA

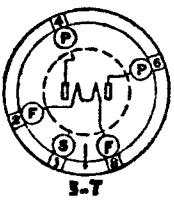
5X4GA

RATING CHART II



RATING CHART III





5-T

Sylvania

TYPE 5Y3G
TYPE 5Y4G

REDRESSEURS BIPLAQUE A VIDE POUSSE

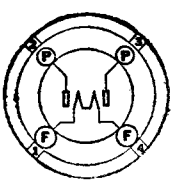


5-Q

CARACTERISTIQUES

Tension filament CA.	5,0 volts
Courant filament	2,0 ampères
Ampoule	ST 14
Culot — Moyen octal 5 broches (5Y3G)	5-T
Culot — Moyen octal 8 broches (5Y4G)	5-Q
Positien de montage	Verticale

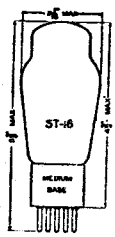
Pour autres caractéristiques et applications, voir type 80 ainsi que pour courbes de redressement.



Sylvania

TYPE 5Z3

REDRESSEUR DEUX ALTERNANCES A VIDE PARFAIT



CARACTERISTIQUES

Tension de chauffage CA.	5,0 volts
Courant de chauffage	3,0 ampères
Ampoule	ST-16
Culot — Moyen 4 broches	4-C
Position de montage	Verticale

Conditions limites de fonctionnement. (Voir page 9) :

Tension de chauffage CA.	5,0 volts
Courant filament	3,0 ampères
Tension inverse de pointe	1,550 volts max.
Chute tension dans tube (225 ma. par plaque) ...	58 volts

Conditions de fonctionnement et caractéristiques :

	Condensat. entrée	Self entrée
Tension CA. par plaque (RMS)	450	550 volts max.
Courant redressé	225	225 ma. max.
Impédance par plaque	75	— ohms min.
Valeur self d'entrée	—	3 henrys min.

Note : Pour les courbes caractéristiques, voir fin de volume.

APPLICATION

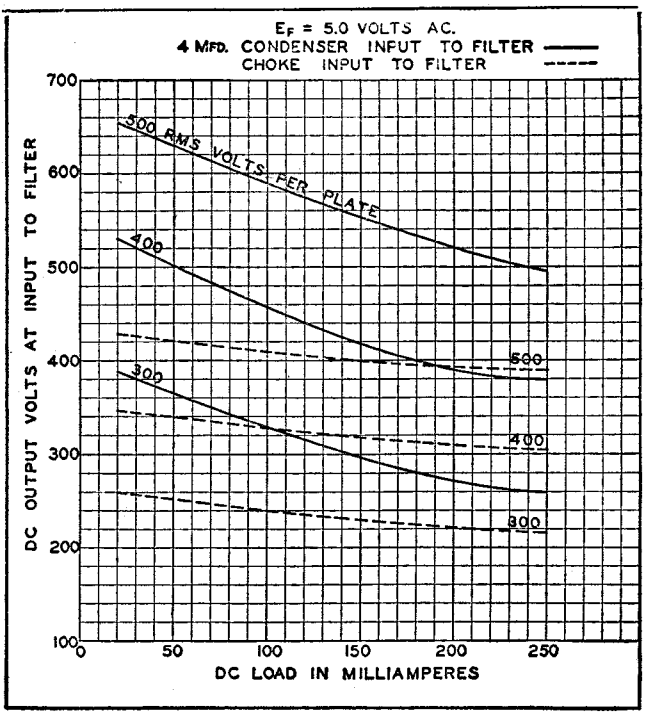
Le tube Sylvania 5Z3 est un redresseur à vide à filament, comme le tube 80. Il redresse les deux alternances et peut fournir un courant continu double de celui fourni par le 80. Le type 5Z3 est comparable au type 83 à vapeur de mercure, à part une légère différence dans la régulation de la tension redressée.

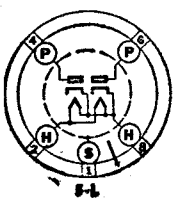
Le type 5Z3 n'est pas directement interchangeable avec le tube 80, quoique ces deux tubes utilisent la même tension de chauffage. Le premier offre une caractéristique de régulation considérablement meilleure. L'étude des circuits, et particulièrement du filtre, associés au tube doit être faite avec soin.

Le fonctionnement du tube 5Z3 est semblable à celui de tout autre tube redresseur à vide. Un filtre à condensateur d'entrée ou à self d'entrée est applicable, mais il faut éviter de dépasser la tension et le courant maximum recommandés. Un filtre à self d'entrée réduit le courant de pointe de plaque, améliore la régulation de tension, mais abaisse la tension redressée.

Les équivalents dans la série « G » sont les types 5U4G et 5X4G (culots différents seulement).

TYPE 5Z3, 5X4G, 5U4G

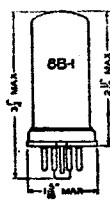




Sylvania

TYPE 5Z4

REDRESSEUR DEUX ALTERNANCES A VIDE PARFAIT



CARACTERISTIQUES

Tension de chauffage CA	5,0 volts
Courant de chauffage	2,0 ampères
Ampoule	8B-1
Culot — Petit octal 5 broches	5-L
Position de montage	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension de chauffage	5,0 volts
Courant de chauffage	2,0 ampères
Tension inverse de pointe	1,400 volts max.
Tension entre filament et cathode	450 volts max.
Chute de tension dans le tube (125 ma. p. plaque)	20 volts

Conditions de fonctionnement et caractéristiques :

	Condensat. entrée	Self entrée
Tension CA. par plaque (RMS)	350	500 volts max.
Courant redressé	125	125 millis max.
Impédance par plaque	30	— ohms min.
Valeur self entrée	—	5 henrys min.

Note : Pour les courbes caractéristiques, voir fin de volume.

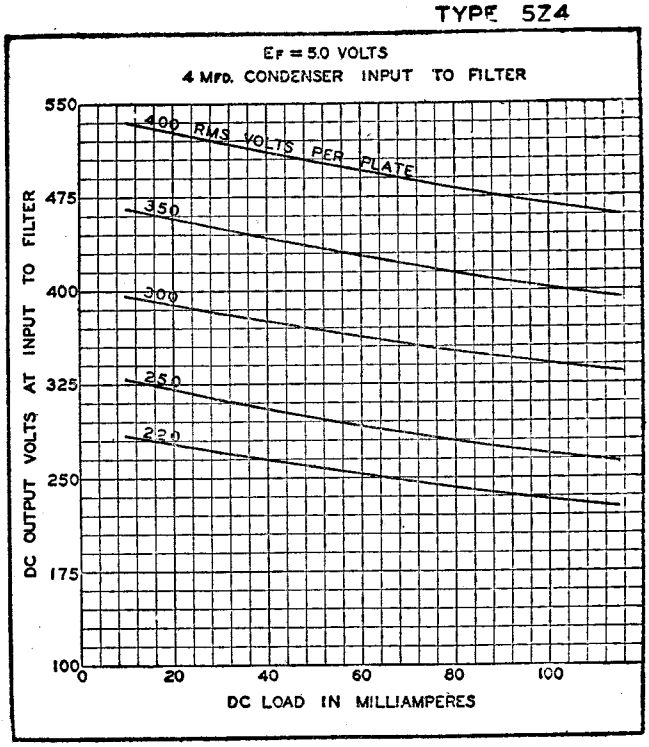
APPLICATION

Le tube Sylvania 5Z4 est un tube métal redresseur à chauffage indirect utilisant les deux alternances. La cathode est connectée intérieurement à une extrémité du filament. Le fonctionnement du tube est semblable à celui de tout autre redresseur à vide. Des circuits filtres à condensateur d'entrée ou à choke d'entrée sont utilisables, mais il est essentiel de ne pas dépasser les valeurs recommandées pour la tension plaque et le courant de sortie.

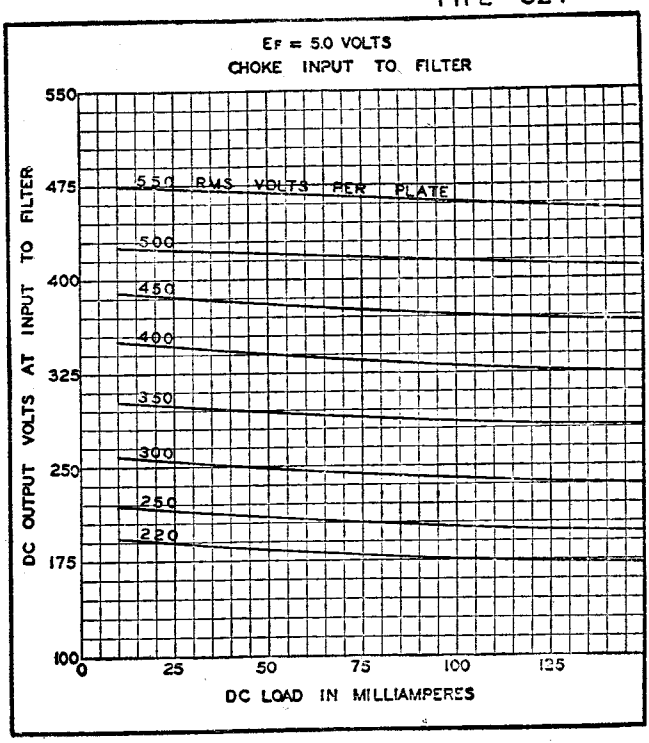
Un filtre à choke d'entrée réduit la pointe de courant plaque et améliore la régulation de tension avec, cependant, une réduction de la tension redressée.

Il est recommandé de placer un fusible dans le primaire du transformateur d'alimentation d'un poste utilisant un tube redresseur 5Z4 ou 83-V.

TYPE 5Z4



TYPE 5Z4



CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angle (approx.)	40 Degrees

Types*

	5ZP15	5ZP16	5ZP24
Fluorescence	Blue-Green	Violet & Near Ultraviolet	Blue-Green
Persistence	Extremely Short	Extremely Short	Extremely Short

Screen	Aluminized
Faceplate	Clear, Non-Browning

**In addition to the types shown, the 5ZP- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 10% Ampere	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	8 μμf	
Grid No. 1 to All Other Electrodes	5 μμf	
External Conductive Neck Coating to Anode[1]	500 μμf	Max.
	100 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Diameter	4¼ Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 7-Pin)	B7-51
Basing	12C
Bulb Contact Aligns with Vacant Pin Position No. 3	±10 Degrees

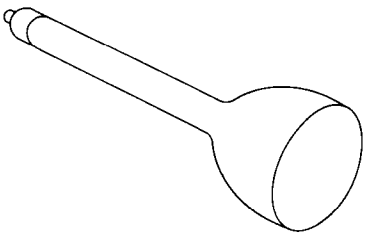
RATINGS

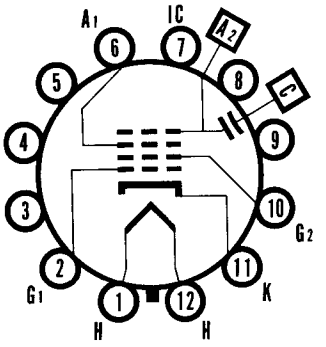
MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	30,000 Volts	dc
Anode No. 1 Voltage (Focusing Electrode)	7,700 Volts	dc
Grid No. 2 Voltage	385 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	165 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period		
Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	165 Volts	
Heater Positive with Respect to Cathode	165 Volts	

QUICK REFERENCE DATA

Flying Spot Scanner Tube
5" Round Glass Type
Flat Faceplate
Clear Non-Browning Faceplate
Magnetic Deflection
Acceleration Type Electrostatic Focus
No Ion Trap
External Conductive Coating on Neck
External Insulating Coating on Bulb
Aluminized Screen





12-C

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

SEPTEMBER, 1958

TYPICAL OPERATING CONDITIONS

Anode Voltage[2]	27,000 Volts	dc
Anode No. 1 Voltage for Focus at Ib = 15 μa	5550 to 7050 Volts	dc
Grid No. 2 Voltage	200 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−42 to −98 Volts	dc
Anode Current	15 μa	dc
Maximum Anode No. 1 Current at Ib = 15 μa	25 μa	dc
Grid No. 2 Current	−15 to +15 μa	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

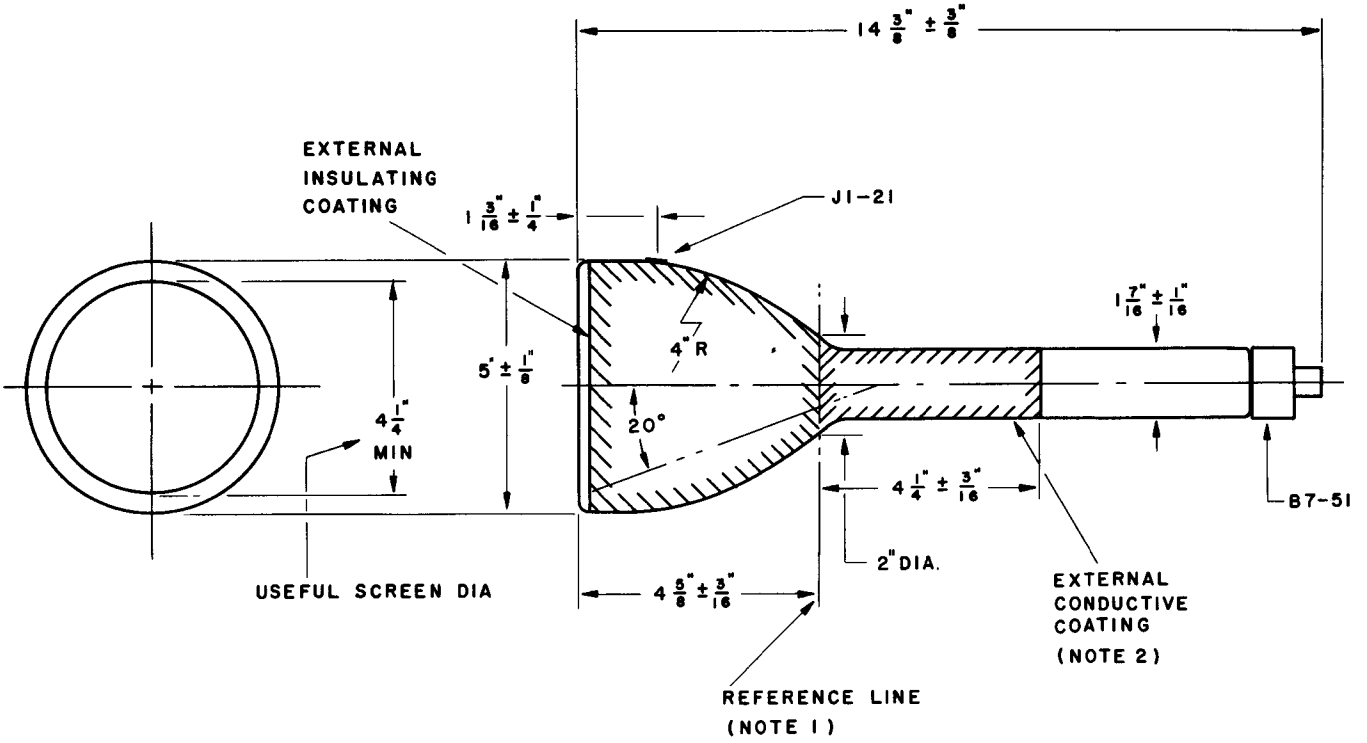
1. *External conductive neck coating must be grounded.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 20,000 volts.*
3. *Visual extinction of undeflected focused spot.*

DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 110) when the gauge is resting on the glass cone.*
2. *External conductive coating must be grounded.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.



S58009

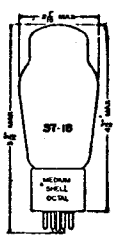


5-S

Sylvania

TYPE 6B4G

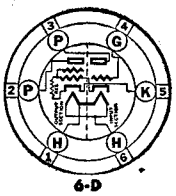
TRIODE AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension filament CA. ou CC.	6,3 volts
Courant filament	1,0 ampère
Ampoule	ST 16
Culot — Moyen octal 8 broches	5-S
Position de montage	Verticale

Pour les autres caractéristiques et applications, voir type 6A3.

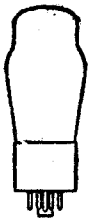


6-D

Sylvania

TYPE 6B5

AMPLIFICATEUR DE PUISSANCE A COUPLAGE DIRECT



CARACTERISTIQUES

Tension de chauffage (CA. ou CC.)	6,3 volts
Courant de chauffage	0,8 ampère
Ampoule	ST 14
Culot — Moyen 6 broches	6-D
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A

Tension de chauffage	6,3 volts
Tension de plaque (sortie)	300 volts max.
Tension plaque (entrée)	300 volts max.
Tension grille (entrée)	0 volt
Courant plaque (sortie)	42 ma.
Courant plaque (entrée)	9 ma.
Résistance interne	24,000 ohms
Conductance mutuelle*	2,400 μmhos
Œfficient d'amplification	58
Résistance de charge	7,000 omhs
Puissance de sortie**	4 watts
Puissance de sortie***	6,5 watts

* Conductance mutuelle grille d'entrée-plaque de sortie.
** 15 volts efficaces appliqués à la grille; distorsion totale 5 p. c.
*** Tension d'entrée à commencement de courant grille; distorsion totale 10 p. c.

APPLICATION

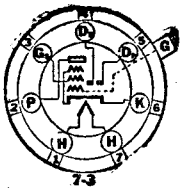
Le tube Sylvania 6B5 est un tube à chauffage indirect, comprenant deux triodes montées dans une ampoule ST14. La plus petite section ou section d'entrée sert de pilote à la section de sortie et est directement couplée avec elle. La cathode de la triode d'entrée est reliée à la grille de la triode de sortie, à l'intérieur de l'ampoule.

Le tube 6B5 peut être employé dans l'étage de sortie de récepteurs pour courant alternatif; il fournit une grande puissance modulée avec peu de distorsion. Deux tubes peuvent être montés en push-pull si l'on désire une plus grande puissance.

En général, le schéma du circuit utilisé avec le tube 6B5 est quelque peu simplifié, car le nombre d'accessoires nécessaires est plus petit que pour les autres tubes de puissance. Le tube fonctionne sans polarisation de grille, ce qui permet de ne pas employer de résistance de cathode. La cathode de sortie est connectée directement au pôle négatif de la source haute tension.

Néanmoins, il n'y a pas de courant de grille d'entrée, car une polarisation est produite automatiquement dans le tube même. La grille d'entrée peut donc être couplée par résistance capacité. La charge optimum pour un seul tube est 7.000 ohms. pour deux tubes en push-pull, la résistance de plaque à plaque sera de 10.000 ohms.

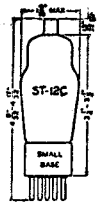
Les caractéristiques sont données pour une tension d'alimentation de 300 volts. Cependant, on peut élever la tension jusqu'à 325 volts avec polarisation de —4,5 volts. Le type équivalent dans la série « G » est le tube 6N6G.



Sylvania

TYPE 6B7

DOUBLE DIODE
PENTODE A GAIN ELEVE



CARACTERISTIQUES

Tension de chauffage (CA. ou CC.)	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12C
Culot — Petit modèle 7 broches	7-D
Position de montage	Toutes

Capacités directes interélectrodes :

Grille à plaque (avec blindage)	0,007 $\mu\mu f$
Entrée	3,5 $\mu\mu f$
Sortie	9,5 $\mu\mu f$

Conditions de fonctionnement et caractéristiques :

SECTIONS DIODES

Pour une tension continue de 10 volts appliquée à la plaque le courant par plaque (sans charge extérieure) doit dépasser 0,5 milliampère.

SECTION PENTODE

AMPLIFICATEUR CLASSE A

Tension de chauffage	6,3	6,3	6,3	6,3 volts
Tension de plaque	100	180	250	250 volts max.
Tension de grille écran	100	75	100	125 volts max.
Tension grille	—3	—3	—3	—3 volts
Courant plaque	5,8	3,4	6,0	9,0 ma.
Courant de grille écran	1,7	0,9	1,5	2,3 ma.
Tension de polarisation* ...	—17	—13	—17	—21 volts
Résistance interne	0,3	1,0	0,8	0,65 mégohm
Conductance mutuelle	950	840	1,000	1,125 μmhos

* Pour annuler le courant cathode.

APPLICATION

Le tube Sylvania 6B7 contient deux diodes et une pentode. Il peut ainsi remplir simultanément les fonctions de détection, amplification et contrôle de volume automatique.

Ce tube possède une seule cathode, dont la surface active est partagée en deux sections: une pour les diodes, l'autre pour la section pentode.

Le tube 6B7 est utilisable sur les récepteurs alternatif, continu ou universel, ou pour automobile.

Ces doubles diodes triodes, tels que les 55, 75, 85, ont été beaucoup utilisés comme tubes combinés, amplificateur, détecteur et contrôleur de volume. La différence essentielle entre ces tubes et le 6B7 réside dans la section amplificatrice qui est une triode pour les premiers, une pentode pour le 6B7.

Quoique la section amplificatrice des doubles diode triodes ne soit généralement utilisée qu'en basse fréquence seulement, ces tubes sont plus populaires que les doubles diode pentodes. La cause principale en est le prix moins élevé. Le tube 6B7

est un tube plus coûteux à fabriquer que le tube 75; il en résulte un prix plus élevé. De plus, avec le 6B7, une résistance doit être prévue pour l'alimentation de la grille écran.

Néanmoins, dans certains cas, des exigences spéciales des circuits peuvent justifier l'accroissement de dépense due à l'usage du tube 6B7.

La comparaison des notes qui suivent avec celles concernant le tube 75, aidera dans la détermination du tube le mieux approprié à tel circuit donné.

DETECTION:

La section diode du tube 6B7 est utilisable comme détecteur. Le rendement d'un système de détection par diodes est élevé. De plus, par un choix judicieux de la résistance de charge, il est possible de réduire la distorsion au minimum.

Deux diodes étant utilisables dans ce tube, il est possible de prévoir pour chacune d'elles une fonction indépendante (par exemple une diode pour l'A.V.C., l'autre pour la détection); ou bien elles peuvent être utilisées ensemble soit en parallèle, soit dans un circuit redressant les deux alternances. En redresseur demi-onde, la tension de basse fréquence ou d'A.V.C. obtenue est d'environ le double de celle fournie par le montage redressant l'onde complète; mais le premier montage requiert un meilleur filtrage de la fréquence porteuse.

Lorsque les deux diodes sont utilisées séparément, un contrôle automatique de volume à action différée peut être obtenu par polarisation négative de la diode servant à la polarisation automatique.

Généralement, la tension régulatrice est appliquée aux grilles de contrôle de l'amplificateur H.F. ou M.F. ou aux deux. Cependant, certains circuits permettent d'assurer l'A.V.C. par application de la tension de régulation à d'autres éléments d'une pentode H.F.

AMPLIFICATION (H.F. ou M.F.):

Les circuits classiques pour une pentode sont applicables à la section pentode du tube 6B7. La caractéristique est intermédiaire entre celle des tubes à pente fixe et celle des tubes à pente variable. Cela permet un contrôle de sensibilité modéré au moyen de la variation de polarisation de la propre grille du tube 6B7.

AMPLIFICATION (B.F.):

La section pentode peut être utilisée en B.F. avec couplage par résistance au tube suivant, pour obtenir une amplification élevée. La polarisation de grille sera obtenue d'un diviseur de tension. La résistance dans le circuit de grille ne peut pas dépasser 1 mégohm.

Fonctionnement-type :

Tension de chauffage	6,3 volts
Tension d'alimentation plaque	250 volts
Tension écran	50 volts
Tension grille	—4,5 volts
Résistance de charge de plaque	0,2 mégohm
Courant plaque	0,65 ma.

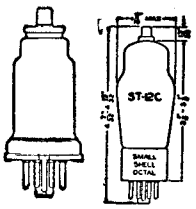
Le tube 6B7 peut également être utilisé en montage réflexe dans un récepteur où l'encombrement doit être réduit et où l'A.V.C. n'est pas essentiel. La méthode usuelle est de renvoyer la tension détectée à la section pentode déjà employée comme amplificateur M.F. Les diodes servent à la détection.



Sylvania

TYPE 6B8
TYPE 6B8G

DUO DIODE PENTODES A GAIN ELEVE



CARACTERISTIQUES

	6B8	6B8G
Tension chauffage CA. ou CC.	6,3	6,3 volts
Courant chauffage	0,3	0,3 ampère
Ampoule	8A 1	ST-12C
Capuchon	Miniature	Miniature
Culot — Petit octal 8 broches	8-E	8-E
Position de montage	Toutes	Toutes

Capacités interélectrodes (section pentode) :

Grille à la plaque (enveloppe connectée à la cathode)	0,005	0,01 $\mu\mu$f
Entrée	6,0	3,6 $\mu\mu$f
Sortie	9,0	9,5 $\mu\mu$f

Conditions limites de fonctionnement. (Voir page 9) :

Tension chauffage CA. ou CC.	6,3 volts
Courant chauffage	0,3 volt
Tension plaque	300 volts max.
Source tension grille écran	300 volts max.
Tension grille écran	125 volts max.
Dissipation plaque	2,25 watts max.
Dissipation écran	0,3 watt max.
Tension de grille	0 volt min.

Ces conditions limites s'appliquent aux types 6B7, 6B8 et 6B8G.

Conditions de fonctionnement et caractéristiques :

SECTION DIODE

Pour une tension continue plaque de 10 volts le courant dépassera **0,5** milliampère.

SECTION PENTODE

AMPLIFICATEUR CLASSE A

	6B8	6B8G**
Tension de chauffage	6,3 volts	—
Courant de chauffage	0,3 ampère	—
Tension plaque	250 volts max.	—
Tension écran	125 volts max.	—
Tension grille	—3 volts	—
Courant plaque	10 ma.	—
Courant écran	2,3 ma.	—
Polarisation de grille*	—21 volts	—
Résistance interne	0,6 mégohm max.	—
Conductance mutuelle	1,325 micromhos	—

* Pour annulation du courant cathodique.
** Voir 6B7.

APPLICATION

Les tubes Sylvania 6B8 et 6B8G, duodiode pentode, ont des caractéristiques très semblables à celles du type 6B7. Ils peuvent être utilisés comme amplificateur, détecteur et tube A.V.C. La section pentode peut être utilisée dans des circuits classiques en haute ou moyenne fréquence. En basse fréquence, la section pentode peut être utilisée dans un circuit à couplage par résistance pour procurer une amplification élevée.

Deux plaques de diode sont placées autour de la cathode commune. Chacune de ces plaques est reliée à une broche séparée.

L'application spéciale au montage réflexe est semblable à celle du type 6B7. Pour des renseignements plus détaillés, voir type 6B7.

from RMA release #82, July 6, 1936

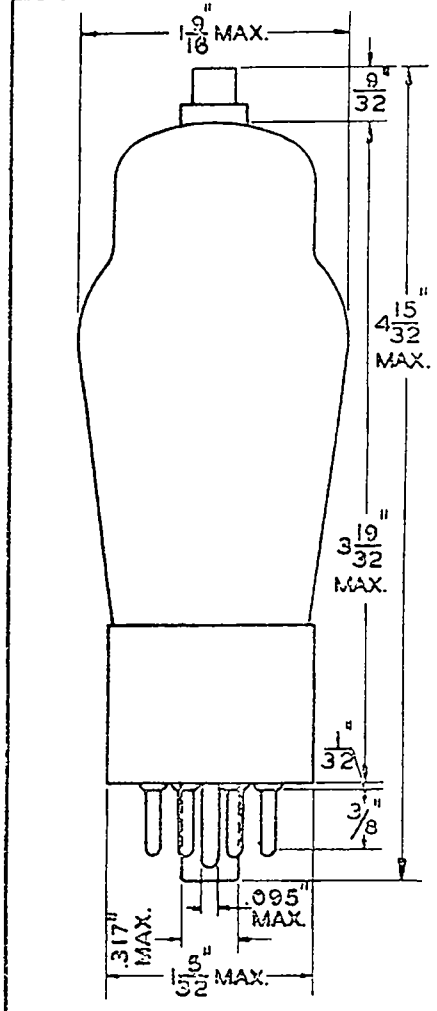
Hygrade Sylvania CORPORATION

TECHNICAL DATA

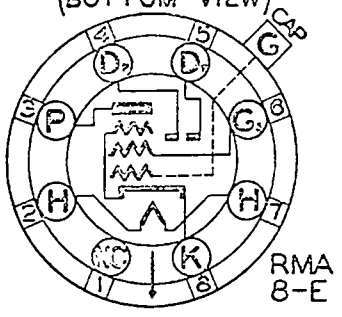
SYLVANIA TYPE 6B8G

Duodiode
High Gain Pentode

SYLVANIA
6B8G



TUBE AND BASE DIAGRAM
(BOTTOM VIEW)



CHARACTERISTICS

Heater Voltage AC or DC	6.3	Volts
Heater Current	0.3	Ampere

Direct Interelectrode Capacitances:

Grid to Plate (with tube shield)	0.007	μμF.
Input	3.3	μμF.
Output	9.5	μμF.

OPERATING CONDITIONS AND CHARACTERISTICS

DIODE UNITS

With an applied d-c plate voltage of 10 volts the space current per plate (no external load) should exceed 0.5 milliampere.

PENTODE UNIT
CLASS A AMPLIFIER

Heater Voltage	6.3	6.3	6.3	6.3	Volts
Plate Voltage	100	180	250	250*	Volts
Screen Voltage	100	75	100	125*	Volts
Grid Voltage	-3	-3	-3	-3	Volts
Plate Current	5.8	3.4	6.0	9.0	Ma.
Screen Current	1.7	0.9	1.5	2.3	Ma.
Grid Bias Voltage**	-17	-13	-17	-21	Volts
Plate Resistance	0.3	1.0	0.8	0.65	Megohm
Mutual Conductance	950	840	1000	1125	μmhos
Amplification Factor	285	840	800	730	

* Maximum
** For cathode current cut-off.

CIRCUIT APPLICATION

Sylvania Type 6B8G is a heater type duodiode pentode equipped with an octal base. This type is identical in design and electrical characteristics to Type 6B7, and may be used simultaneously as a detector, amplifier and a-v-c tube. For additional information on the application of this type refer to the circuit application notes on Type 6B7 in the Sylvania Technical Manual.

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6BA4

MECHANICAL DATA

Maximum Overall Length	2-5/16 Inches
Maximum Overall Diameter	1.005 Inches

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES

Grid to Plate	1.40 $\mu\mu$f Max.	0.90 $\mu\mu$f Min.
Grid to Cathode	2.40 $\mu\mu$f Max.	1.10 $\mu\mu$f Min.
Plate to Cathode	0.020 $\mu\mu$f Max.	

RATINGS

Heater Voltage ($\pm$ 10%)	6.3 Volts	
Heater Current	375 to 425 Ma	
Plate Voltage	200 Volts	Max.
Plate Current	20 Ma	Max.
Grid Current	1.5 μa	Max.
Transconductance	7500 μmhos	Min.
Noise Factor	12.5 db	Max.
Power Gain	12 db	Min.
Tube Seal Temperature	175° C	Max.

TYPICAL OPERATING CONDITIONS

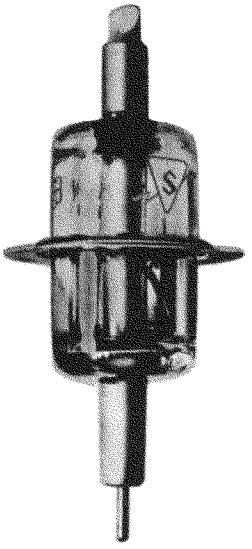
Plate Voltage	150 Volts
Plate Current	10 Ma
Transconductance	8000 μmhos
Amplification Factor	70
Cathode Resistor	100 Ohms
Noise Factor[1]	10.5 db
Power Gain[1]	14 db

NOTE:

1. Measured at 890 MC.

QUICK REFERENCE DATA

The Sylvania 6BA4 is a uhf amplifier of planar construction designed for use at uhf frequencies such as the new television channels. This tube is particularly outstanding for its high gain and low noise which may make it possible to extend the uhf television receiver range.



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ELECTRONICS DIVISION
WOBURN, MASS.

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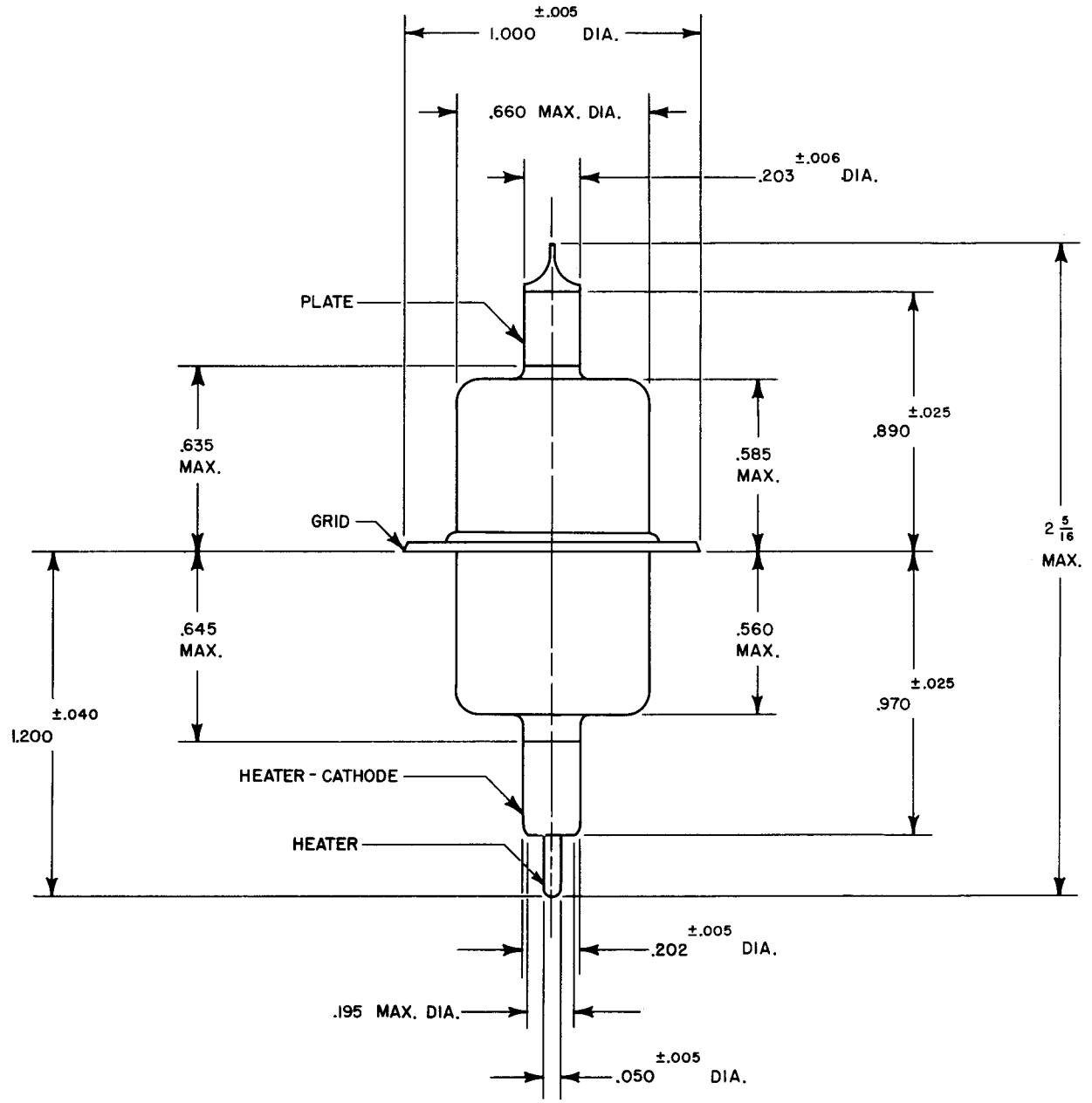
6BA4



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SYLVANIA
6BA5

MECHANICAL DATA

Bulb	T-3
Base	Flexible Leads
Basing	8DY
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	150 Ma

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[1]	Unshielded
Grid to Plate	.065	0.1 $\mu\mu$f
Input	3.4	3.2 $\mu\mu$f
Output	3.6	1.6 $\mu\mu$f

RATINGS (Design Center Values)

Plate Voltage	150 Volts Max.
Screen Voltage	140 Volts Max.
Plate Dissipation	0.7 Watt Max.
Screen Dissipation	0.3 Watt Max.
Heater-Cathode Voltage	90 Volts Max.
Grid Circuit Resistance	
Cathode Bias	1 Megohm Max.

TYPICAL OPERATION

Class A_1 Amplifier

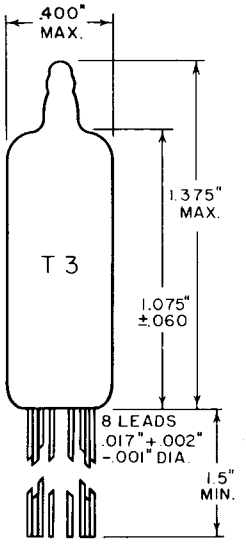
Plate Voltage	100 Volts
Screen Voltage	100 Volts
Cathode Bias Resistor	270 Ohms
Plate Current	5.5 Ma
Screen Current	2 Ma
Transconductance	2150 μmhos
Plate Resistance (approx.)	175,000 Ohms
Control Grid Bias Voltage for I_b = 10 μa	−13.5 Volts

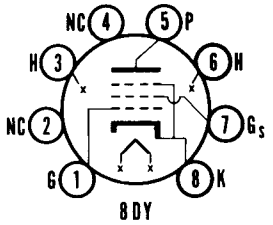
NOTE:

1. External shield of 0.405" diameter connected to cathode.

QUICK REFERENCE DATA

The Type 6BA5 is a subminiature general purpose pentode voltage amplifier.





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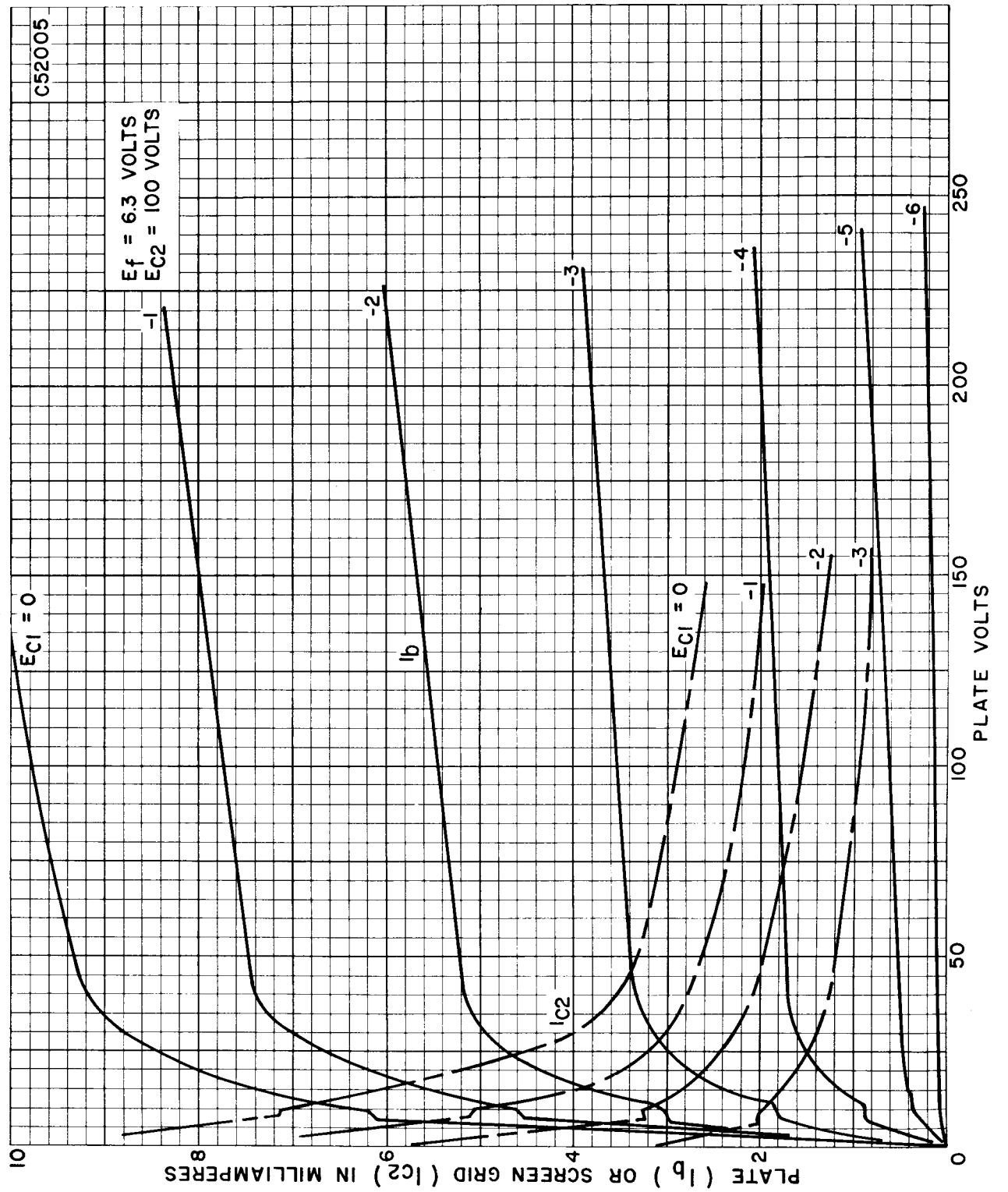
SEPTEMBER 1953

SYLVANIA

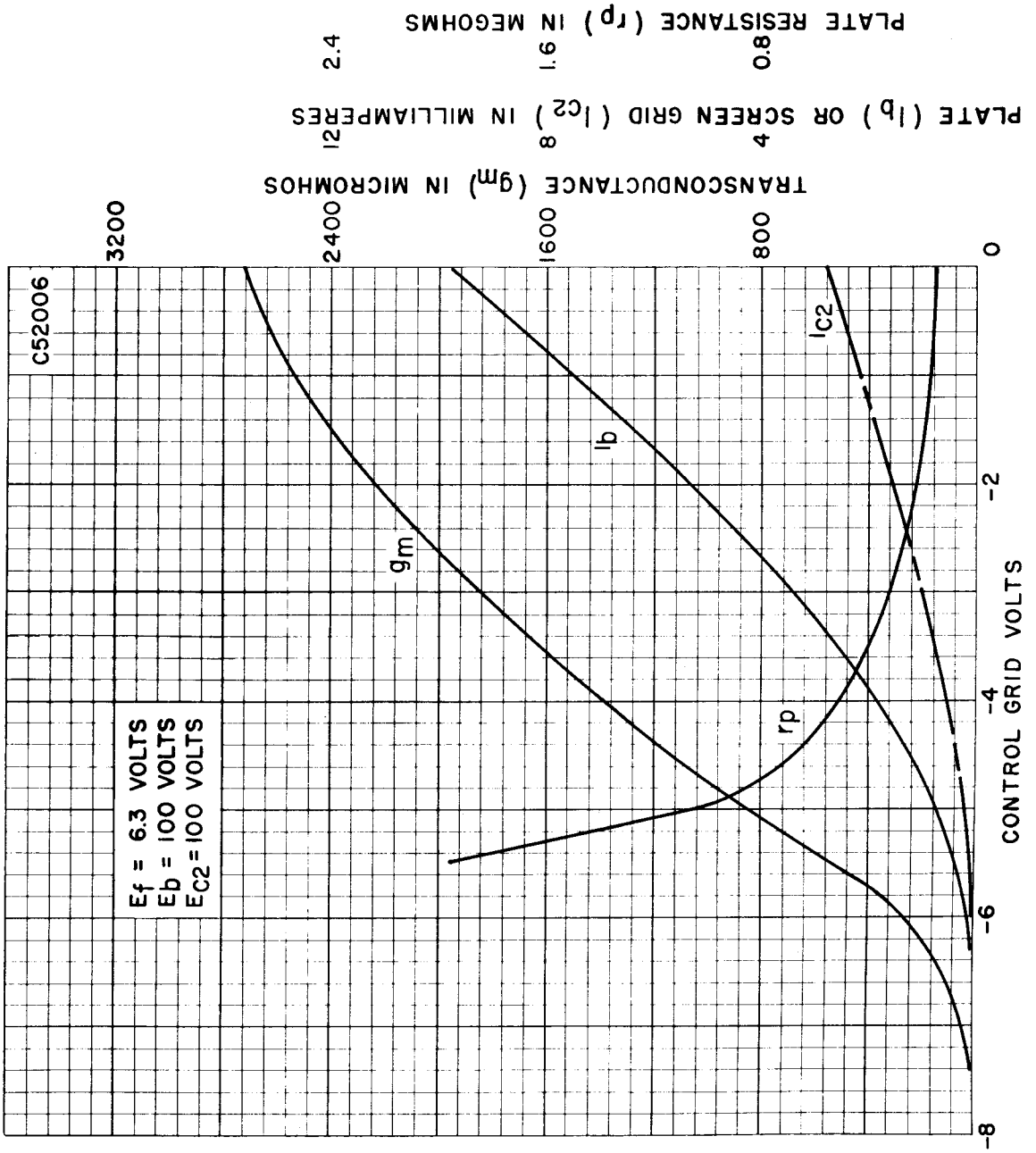
6BA5

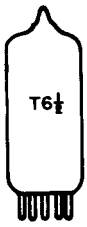
AVERAGE PLATE CHARACTERISTICS



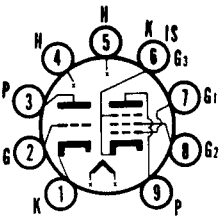
6BA5

AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPE 6BA8
6BA8A
8BA8A



TRIODE PENTODE 9DX

MECHANICAL DATA

Bulb	T-6½, Outline 6-3
Base	E9-1, Miniature Button, 9-Pin
Basing	9DX
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6BA8	6BA8A	8BA8A
Heater Voltage	6.3	6.3	8.4 Volts
Heater Current	600	600	450 Ma
Heater Warm-up Time	11	11	11 Seconds
Maximum Heater-Cathode Voltage			
D C and Peak			200 Volts
D C, Heater Positive with Respect to Cathode			100 Volts

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[1]	Unshielded
Triode		
Grid to Plate	2.2	2.2 μμf
Input	2.7	2.5 μμf
Output	1.9	0.4 μμf
Pentode		
Grid to Plate	.030	0.036 μμf Max
Input	10.0	10.0 μμf
Output	4.5	3.6 μμf
Coupling		
Pentode Grid No. 1 to Triode Plate	.003	.006 μμf Max
Pentode Plate to Triode Grid	.006	.016 μμf Max
Pentode Plate to Triode Plate	.023	.150 μμf Max

MAXIMUM RATINGS (Design Center Values)

	Triode	Pentode
Plate Voltage	300	300 Volts
Grid No. 2 Supply Voltage		300 Volts
Grid No. 2 Voltage	See Rating Chart for Type 6AM8	
Plate Dissipation	2.0	3.25 Watts
Grid No. 2 Dissipation		1.0 Watt
Negative Grid No. 1 Voltage		50 Volts
Positive Grid No. 1 Voltage		0 Volts
Grid No. 1 Circuit Resistance		
Fixed Bias	0.5	0.25 Megohm
Self Bias	1.0	1.0 Megohm

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier	Triode	Pentode
Plate Voltage	200	200 Volts
Grid No. 2 Voltage		150 Volts
Grid No. 1 Voltage	−8	0 Volts
Cathode Bias Resistor		180 Ohms
Amplification Factor	18	
Plate Resistance (approx.)	6700	400,000 Ohms
Transconductance	2700	9000 μmhos
Plate Current	8.0	13 Ma
Grid No. 2 Current		3.5 Ma
Grid No. 1 Voltage for I_b = 10 μa (approx.)	−16	−10 Volts

PLATE KNEE CHARACTERISTICS (6BA8A, 8BA8A)

E_b = 65V, E_{c2} = 150V, E_{c1} = 0V
I_b = 42 Ma, I_{c2} = 12.5 Ma

NOTES:

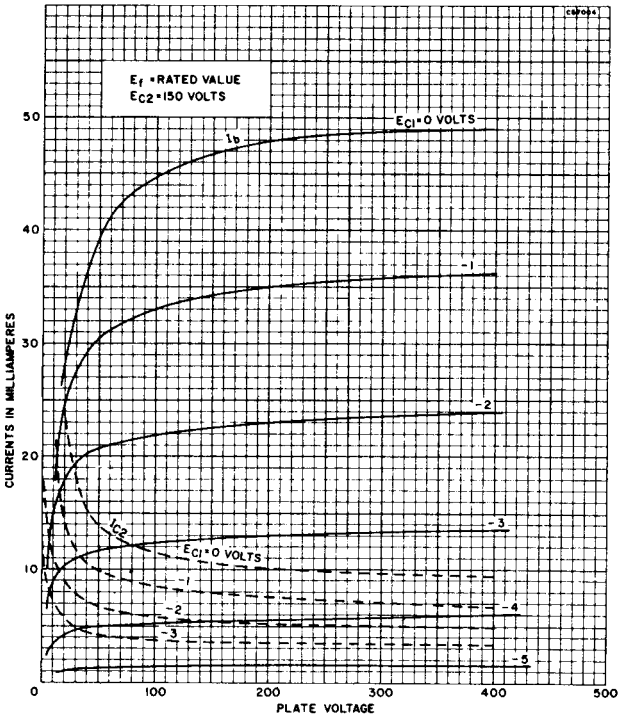
1. Shield No. 315 tied to cathode base pin of section under test.
2. The pentode section curve applies to Types 6BA8A and 8BA8A, only.

APPLICATION

The Sylvania Types 6BA8, 6BA8A and 8BA8A are intended for service in television receivers employing a series heater string. The triode may be used as a sync clipper or sync separator. The pentode section is designed primarily to serve as a video amplifier. For information on specially controlled heaters for series string operation refer to the SERIES STRING section of the Appendix.

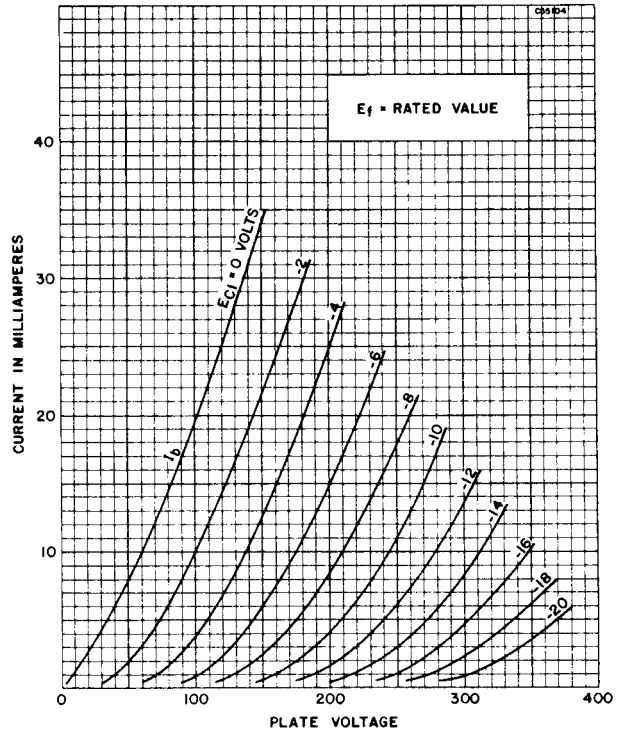
AVERAGE PLATE CHARACTERISTICS

PENTODE SECTION



AVERAGE PLATE CHARACTERISTICS

TRIODE SECTION



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SYLVANIA

6BA8A
8BA8A

MECHANICAL DATA

Bulb	T-6 ½
Base	E9-1, Miniature Button, 9-Pin
Outline	6-3
Basing	9DX
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6BA8A	8BA8A	
Heater Voltage	6.3	8.4 Volts	
Heater Current	600	450 Volts	
Heater Warm-up Time[1]	11	11 Seconds	
Heater-Cathode Voltage (Design Center Values)			
Heater Negative with Respect to Cathode			
Total DC and Peak	200	200 Volts	Max.
Heater Positive with Respect to Cathode			
DC	100	100 Volts	Max.
Total DC and Peak	200	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[2]	Unshielded
Triode		
Grid to plate: (g to p)	2.2	2.2 μμf
Input: g to (h + k)	2.7	2.5 μμf
Output: p to (h + k)	1.9	0.4 μμf
Pentode		
Grid to plate: (g1 to p)	0.03	0.04 μμf
Input: g1 to (h+k+g2+g3+ I.S.)	10.0	10.0 μμf
Output: p to (h+k+g2+g3+ I.S.)	4.5	3.6 μμf
Coupling		
Pentode Grid No. 1 to Triode Plate	0.003	0.006 μμf
Pentode Plate to Triode Grid	0.006	0.016 μμf
Pentode Plate to Triode Plate	0.023	0.150 μμf

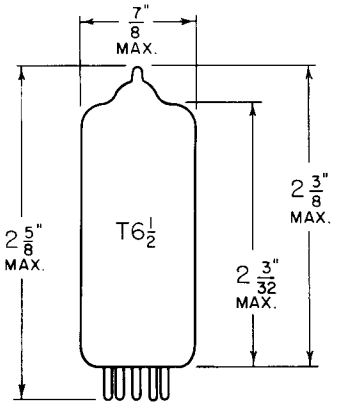
RATINGS (Design Center Values)

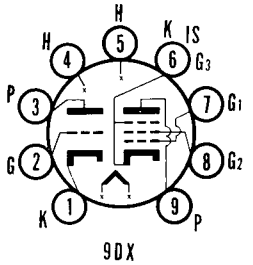
	Triode	Pentode	
Plate Voltage	300	300 Volts	Max.
Grid No. 2 Supply Voltage		300 Volts	Max.
Grid No. 2 Voltage	See Rating Chart		
Plate Dissipation	2.0	3.25 Watts	Max.
Grid No. 2 Dissipation		1.0 Watt	Max.
Negative Grid No. 1 Voltage		50 Volts	Max.
Positive Grid No. 1 Voltage		0 Volts	Max.
Grid No. 1 Circuit Resistance			
Fixed Bias	0.5	0.25 Megohm	Max.
Self Bias	1.0	1.0 Megohm	Max.

QUICK REFERENCE DATA

The Sylvania Type 6BA8A is a miniature, medium mu triode and sharp cutoff pentode. The triode section is intended for use as a sync separator and the pentode section as a video amplifier. The pentode section features a controlled plate knee characteristic. The 6BA8A incorporates a 600 ma heater and controlled heater warm-up time for operation in television receivers employing a series heater string.

The 8BA8A is identical to the 6BA8A except for heater characteristics.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

APRIL, 1957

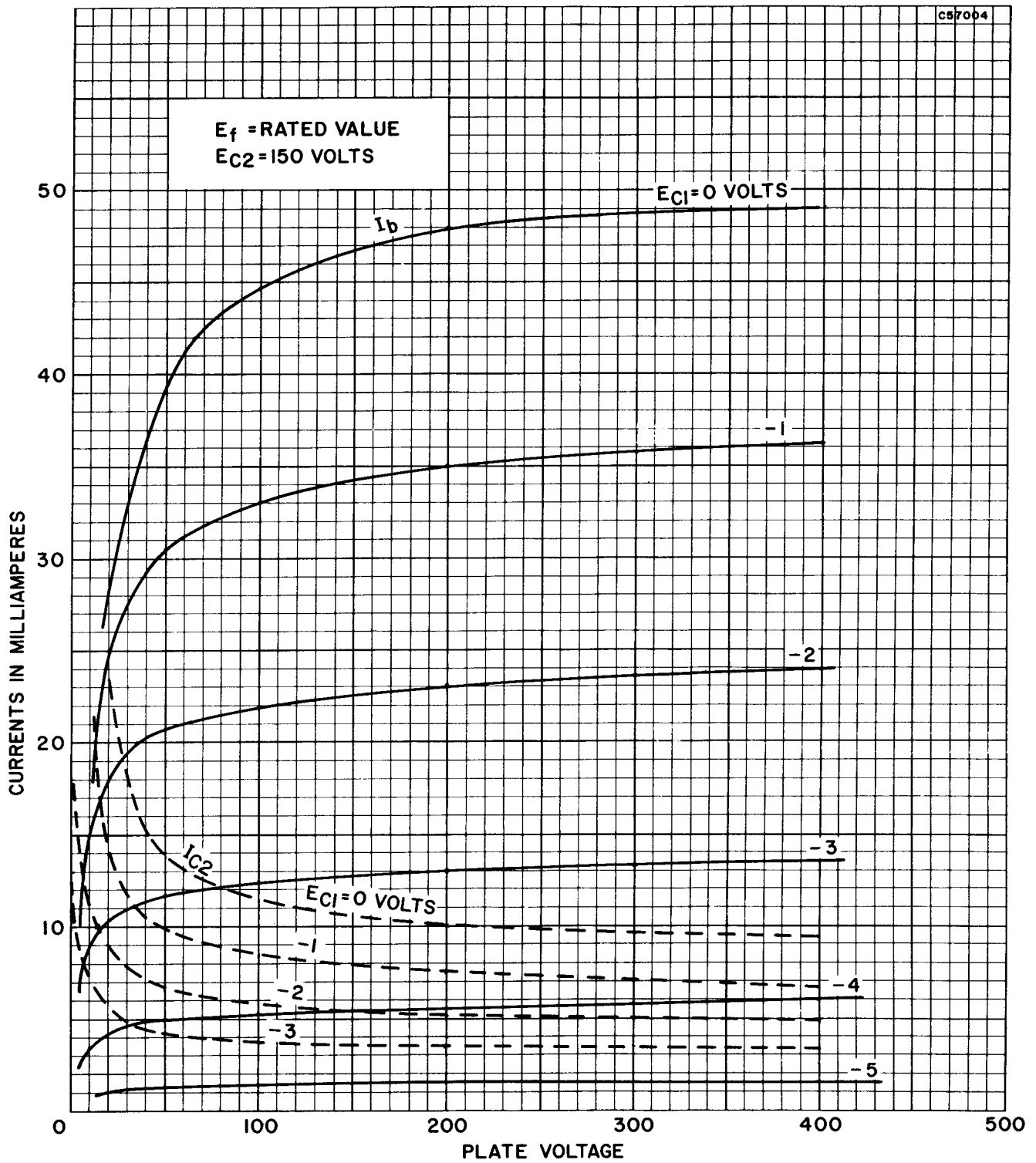
CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier	Triode	Pentode
Plate Voltage	200	200 Volts
Grid No. 2 Voltage		150 Volts
Grid No. 1 Voltage	−8	0 Volts
Cathode Bias Resistor		180 Ohms
Plate Current	8.0	13 Ma
Grid No. 2 Current		3.5 Ma
Transconductance	2700	9000 μmhos
Amplification Factor	18	
Plate Resistance (approx.)	6700	400,000 Ohms
Grid No. 1 Voltage for Ib = 10 μa (approx.)	−16	−10 Volts
Zero Bias: With Eb = 65 V, and Ec2 = 150 V; (Instantaneous Values)		
Plate Current		42 Ma
Grid No. 2 Current		12.5 Ma

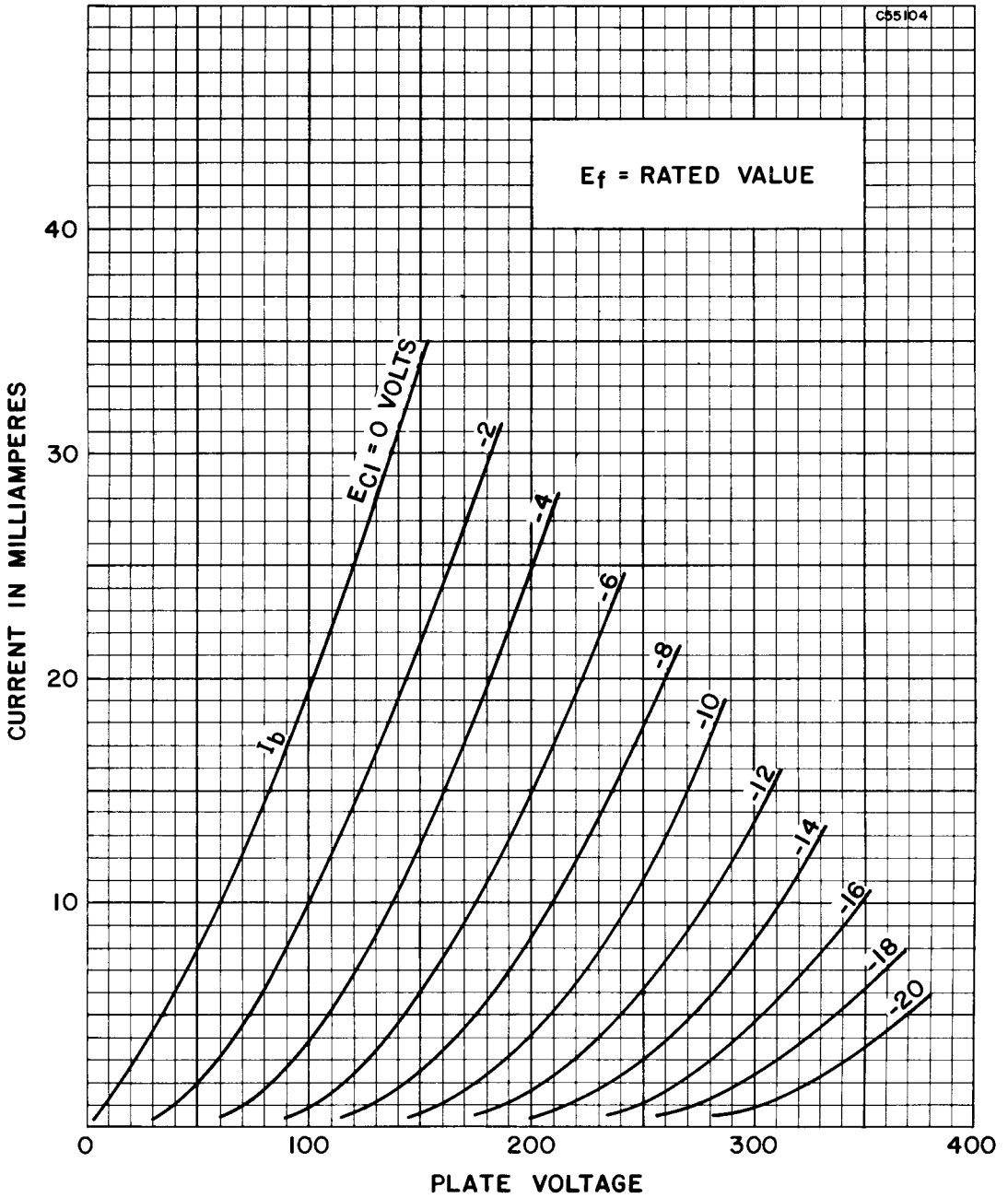
NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *Shield No. 315 tied to cathode base pin of section under test.*

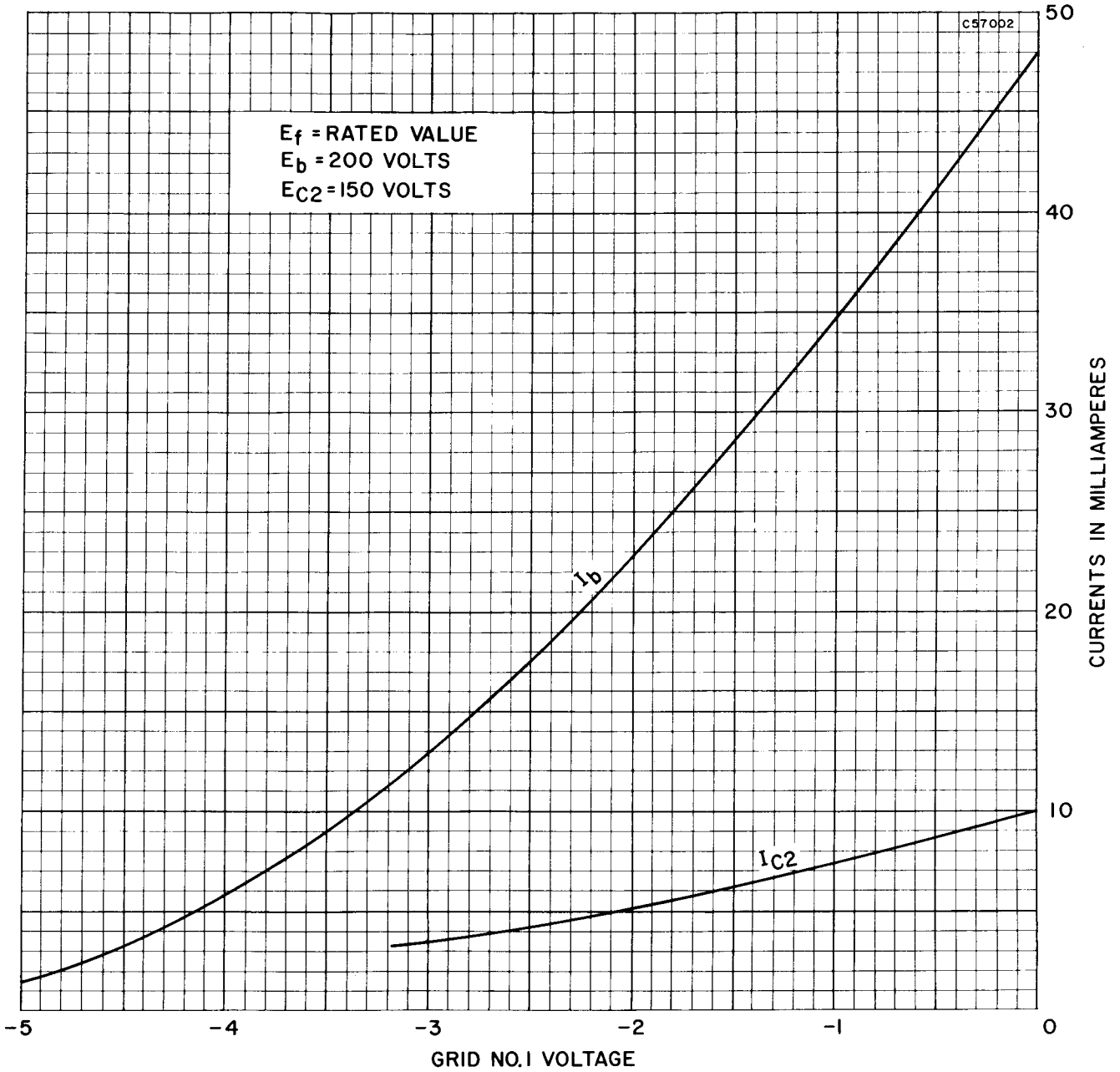
AVERAGE PLATE CHARACTERISTICS
(PENTODE SECTION)



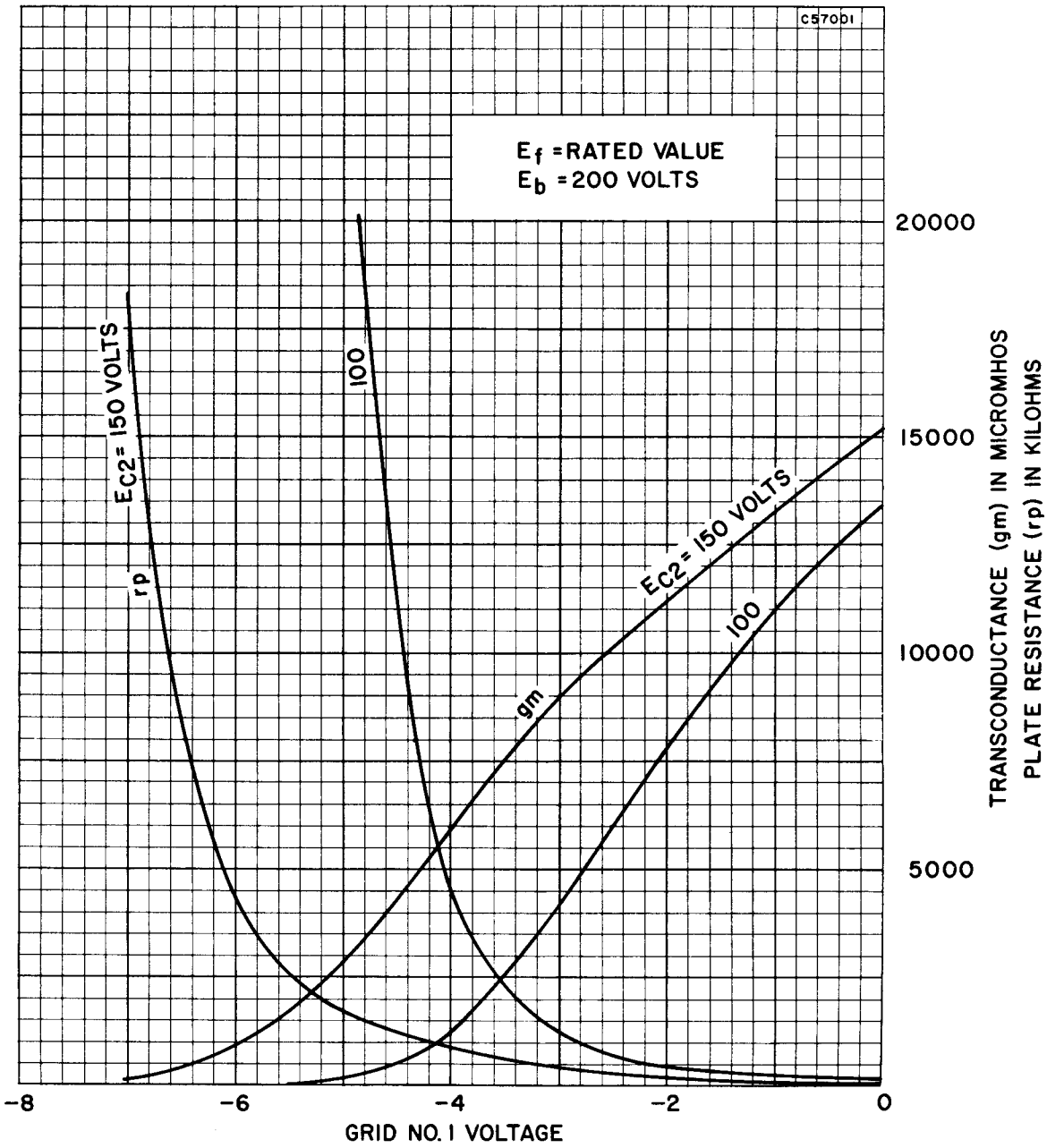
AVERAGE PLATE CHARACTERISTICS
(TRIODE SECTION)



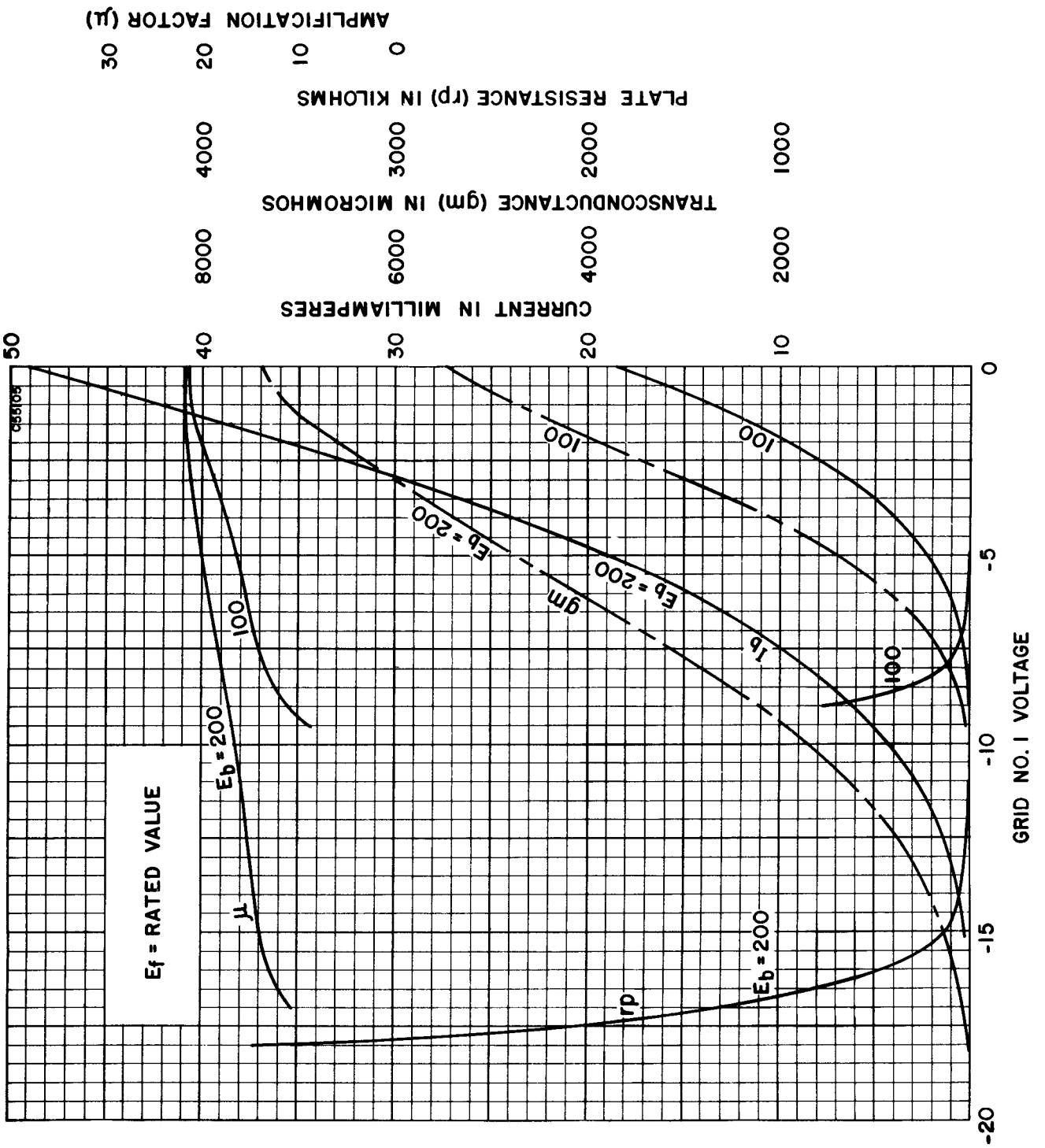
AVERAGE TRANSFER CHARACTERISTICS
(PENTODE SECTION)



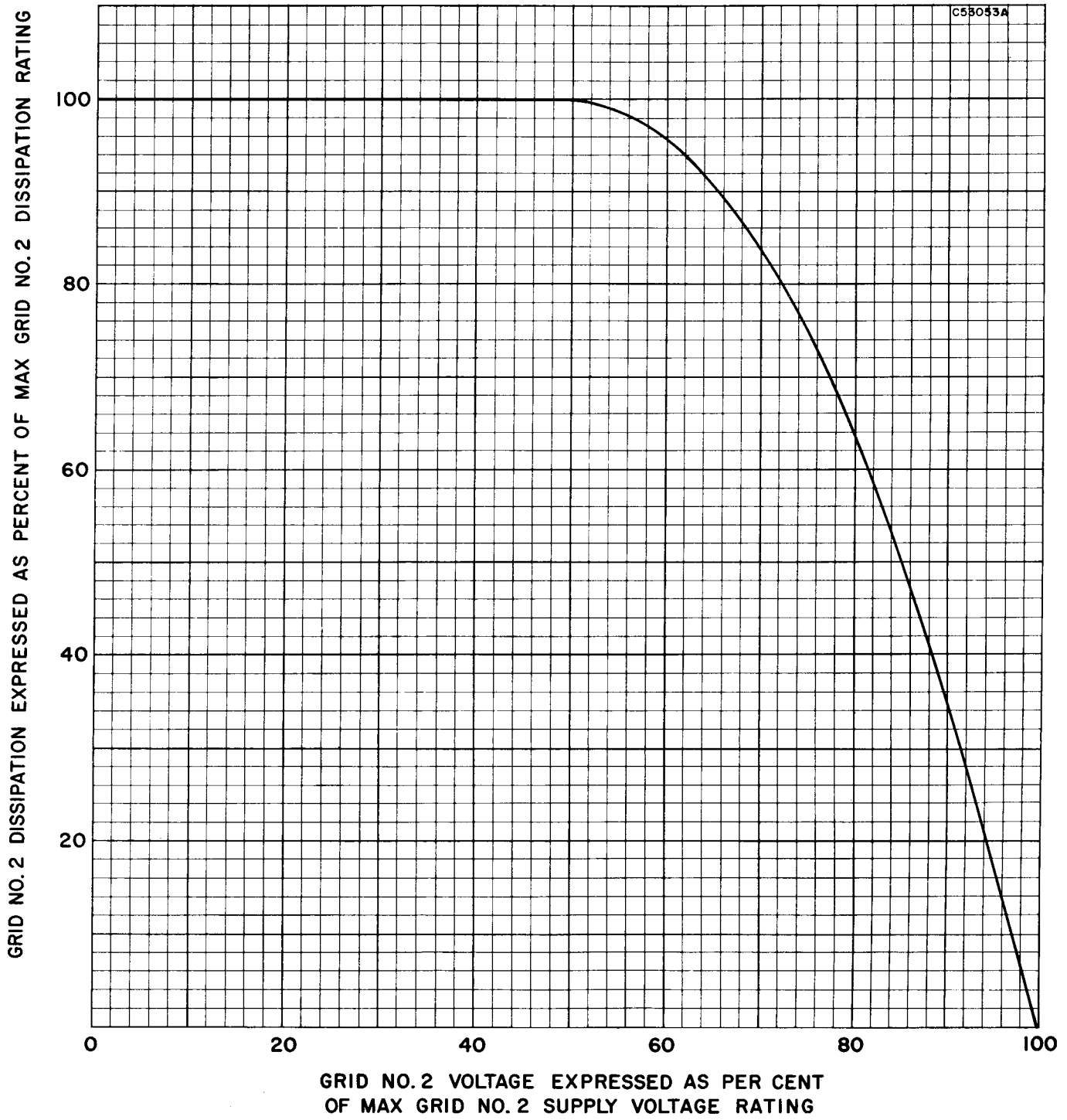
AVERAGE TRANSFER CHARACTERISTICS
(PENTODE SECTION)



AVERAGE TRANSFER CHARACTERISTICS
(TRIODE SECTION)



RATING CHART



Color Television Type

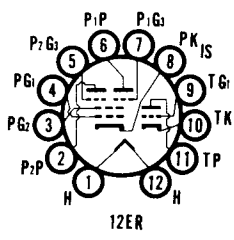
VERTICAL DEFLECTION OSC. (T) SYNC/AGC AMPLIFIER (P)

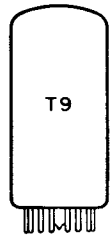
6BA11

8BA11

Medium Mu Triode and Twin Pentode

Construction.....Compactron T-9
Base .....Button 12 Pin, E12-70
Basing 12ER
Outline 9-58
Maximum Diameter .....1.188 In.
Maximum Seated Height .....2.000 In.
Maximum Overall Height .....2.375 In.





ELECTRICAL DATA

HEATER OPERATION

	8BA11	6BA11
Heater Voltage	8.4	6.3 Volts
Heater Current	450	600 Ma
Heater Warm-up Time	11	11 Seconds
Maximum Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
Total DC and Peak		200 Volts
Heater Positive with Respect to Cathode		
DC		100 Volts
Total DC and Peak		200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Pentode Section

Grid No. 3 to Plate (Each Pentode)	2.0 Pf
Grid No. 1 to All	6.0 Pf
Grid No. 3 (Each Pentode to All)	3.6 Pf
Plate (Each Pentode to All)	3.0 Pf
Grid No. 3 (Pentode 1) to Grid No. 3 (Pentode 2) (Max.)	0.026 Pf

Triode Section

Grid to Plate	2.0 Pf
Input: g1 to (k + h)	2.0 Pf
Output: p to (k + h + IS)	1.9 Pf

RATINGS (Design Maximum Rating System)

	Triode Section	Pentode Section
Plate Voltage	300	300 Volts
Grid No. 2 Voltage	—	150 Volts
Positive DC Grid No. 3 Voltage	—	3.0 Volts
Negative DC Grid No. 3 Voltage	—	50 Volts
Peak Positive Grid No. 3 Voltage	—	50 Volts

Negative DC Grid No. 1 Voltage	—	50 Volts
Plate Dissipation (Each Plate)	1.5	1.1 Watts
Grid No. 2 Dissipation	—	0.75 Watt
DC Cathode Current	20	12 Ma
Grid No. 3 Circuit Resistance (Each Grid)	—	0.5 Megohm
Grid No. 1 Circuit Resistance		
Fixed Bias	0.25	0.5 Megohm
Cathode Bias	1.0	0.5 Megohm

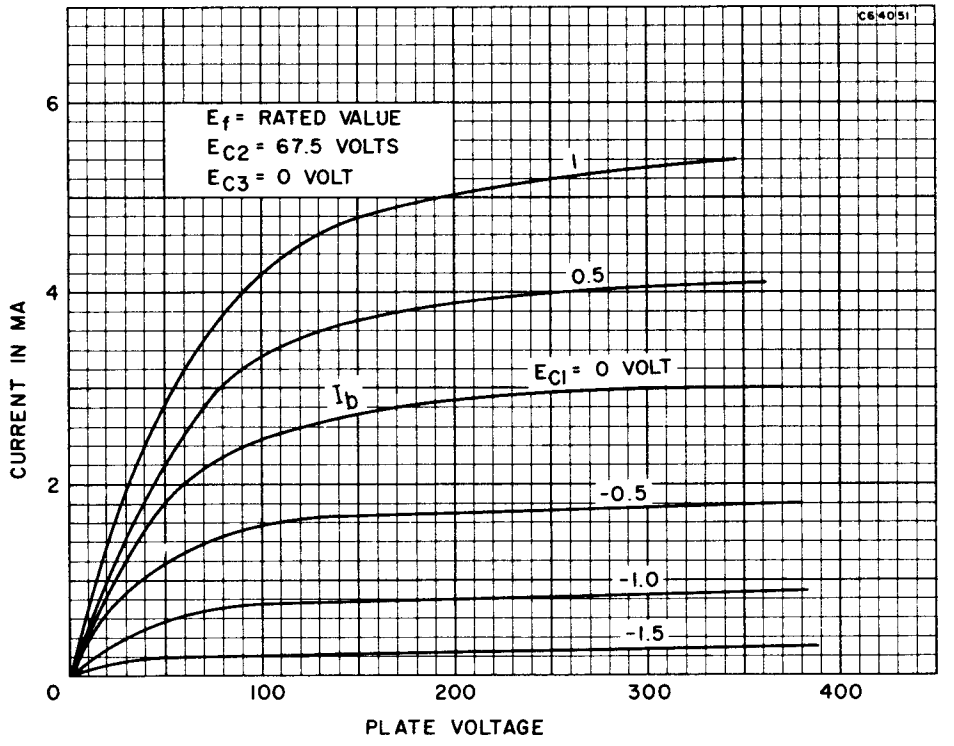
CHARACTERISTICS AND TYPICAL OPERATION

		Pentode			
	Triode Section	Each Section Separately(2)		Both Sections Operating(3)	
Plate Voltage	250	100	100	100	100 Volts
Grid No. 2 Voltage	—	67.5	67.5	67.5	67.5 Volts
Grid No. 3 Voltage	—	0	0	-10	0 Volts
Grid No. 1 Voltage	-11	0	Note 1	Note 1	Note 1 Volts
Plate Current	5.0	—	2.5	0	2.5 Ma
Grid No. 2 Current	—	—	—	7.0	4.4 Ma
Grid No. 1 Transconductance	1800	1700	—	—	— μmhos
Amplification Factor	18	—	—	—	—
Grid No. 3 Transconductance	—	—	450	—	— μmhos
Grid No. 1 Voltage Ib = 100 μa	-18	2.3	—	—	— Volts
Grid No. 3 Voltage (Approx.) For Ib = 100 μa	—	—	-3.2	—	— Volts

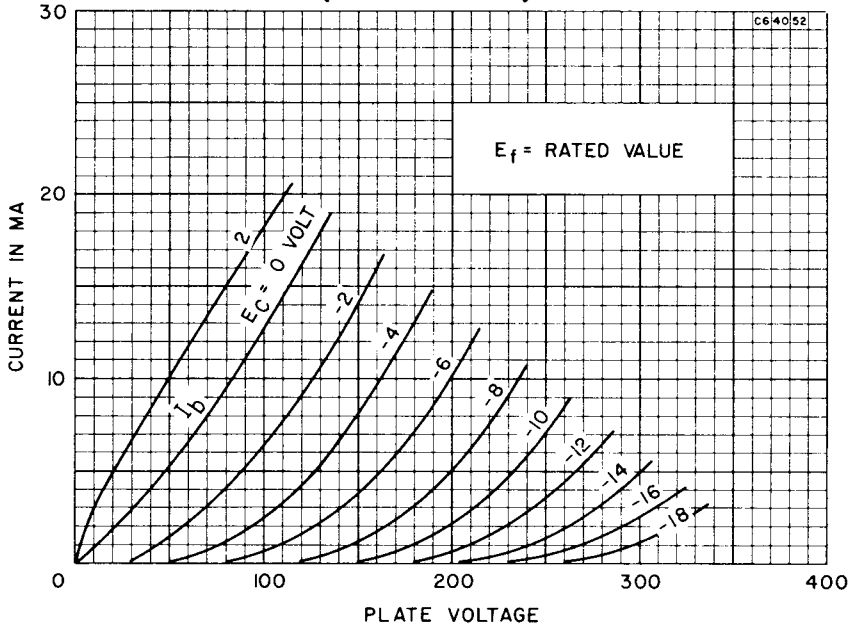
NOTES:

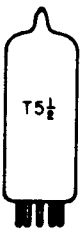
(1) Grid current adjusted for 100 μa DC.
(2) Plate and Grid No. 3 of opposite section grounded.
(3) Voltages and plate current apply to each section.

AVERAGE PLATE CHARACTERISTICS
(Pentode Section)
(with Opposite Grid No. 3 and Plate Grounded)



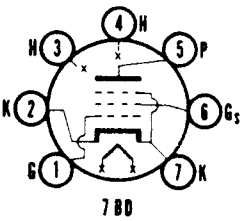
AVERAGE PLATE CHARACTERISTICS
(Triode Section)





SYLVANIA TYPE 6BC5
3BC5
4BC5

SHARP CUTOFF R F PENTODE



7BD

MECHANICAL DATA

Bulb	T-5 ½, Outline 5-2
Base	Miniature Button 7-Pin
Basing	7BD
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS	3BC5	4BC5	6BC5	
Heater Voltage	3.15	4.2	6.3	Volts
Heater Current	600	450	300	Ma
Heater Warm-up Time	11	11		Seconds
Maximum Heater-Cathode Voltage				
Total DC and Peak			200	Volts
DC Heater Positive with respect to Cathode			100	Volts

6BC5, 3BC5, 4BC5 (Cont'd)

DIRECT INTERELECTRODE CAPACITANCES

Pentode Connected	Shielded[1]	Unshielded
Grid to Plate	0.020	0.030 μμf Max
Input	6.6	6.5 μμf
Output	2.6	1.8 μμf
Triode Connected (Grid No. 2 Tied to Plate)		
Grid to Plate	2.5	2.5 μμf
Input	4.0	3.9 μμf
Output	4.3	3.0 μμf

MAXIMUM RATINGS (Design Center Values)

	Triode Connected[2]	Pentode Connected
Plate Voltage	300	300 Volts
Plate Dissipation	2.5[3]	2.0 Watts
Grid No. 2 Voltage	Plate	See Rating Chart For Type 6AM8
Grid No. 2 Supply Voltage	Plate	300 Volts
Grid No. 2 Dissipation		0.5 Watts
Positive Grid No. 1 Voltage	0	0 Volts

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier—Pentode Connected			
Plate Voltage	100	125	250 Volts
Grid No. 2 Voltage	100	125	150 Volts
Cathode Resistor	180	100	180 Ohms
Transconductance	4900	6100	5700 μmhos
Plate Resistance (approx.)	0.6	0.5	0.8 Megohm
Plate Current	4.7	8.0	7.5 Ma
Grid No. 2 Current	1.4	2.4	2.1 Ma
Grid No. 1 Voltage for $I_b = 10$ μa	-5	-6	-8 Volts
Triode Connected[2]			
Plate Voltage	250		180 Volts
Cathode Resistor	820		330 Ohms
Transconductance	4400		6000 μmhos
Plate Resistance (approx.)	9000		6000 Ohms
Amplification Factor	40		42
Plate Current	6.0		8.0 Ma

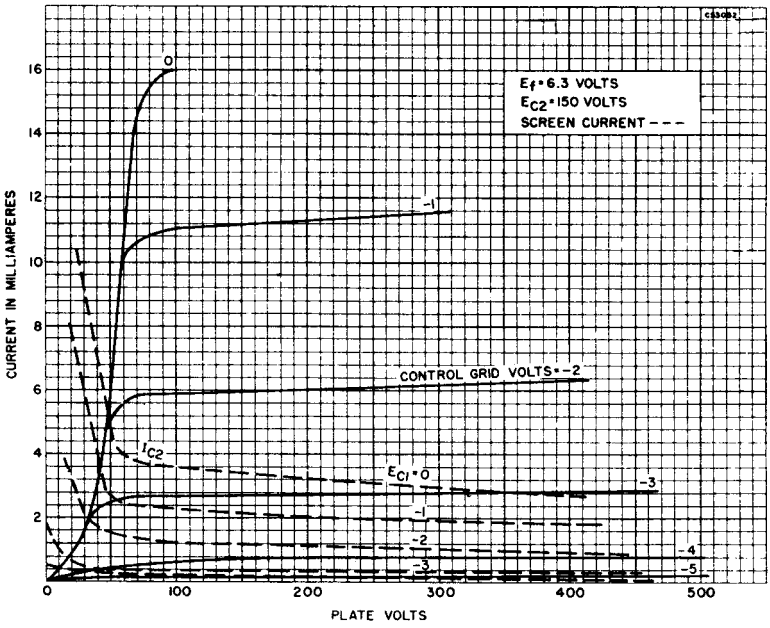
NOTES:

1. External shield No. 316 connected to pin 7.
2. Screen grid tied to plate.
3. Total current flowing to plate and screen.

APPLICATION

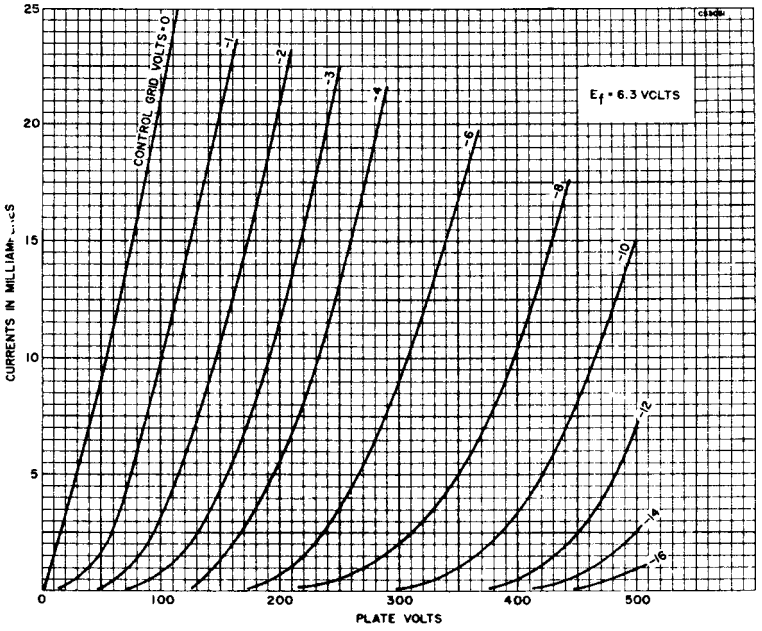
Sylvania Types 3BC5, 4BC5 and 6BC5 are sharp cutoff r f pentode amplifiers of miniature construction. They may be used at frequencies up to 400 mc and are particularly useful in television receivers where a slightly higher gain than that obtained with the similar Type 6AG5 is desired.

AVERAGE PLATE CHARACTERISTICS

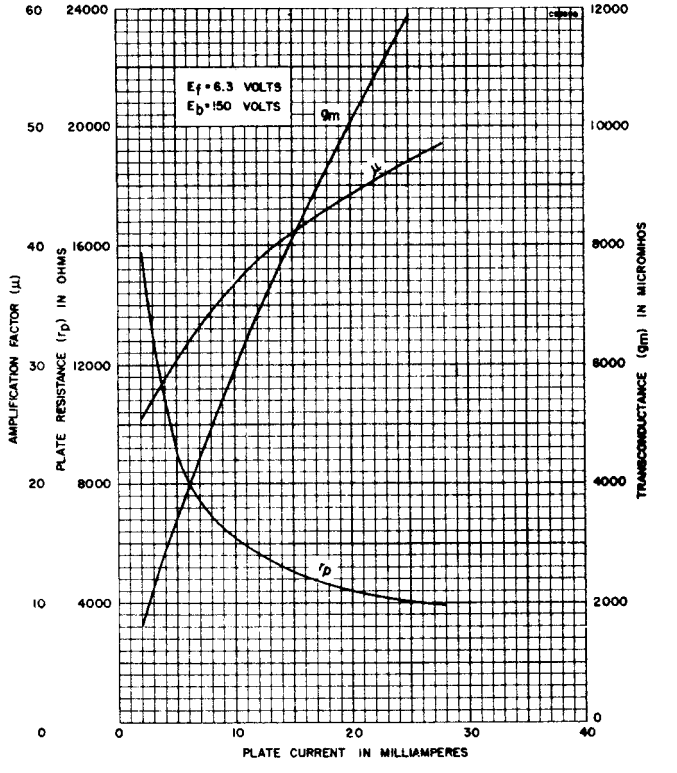


6BC5, 3BC5, 4BC5 (Cont'd)

AVERAGE PLATE CHARACTERISTICS
TRIODE CONNECTED



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA

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6BC7

MECHANICAL DATA

Bulb	T-6½
Base	E9-1 Small Button 9-Pin
Outline	6-2
Basing	9AX
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	450 Ma
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	200 Volts Max.
Heater Positive with Respect to Cathode	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Plate No. 1 to Cathode No. 1, Heater and Internal Shield	3.5 μμf
Plate No. 2 to Cathode No. 2, Heater and Internal Shield	5.5 μμf
Plate No. 3 to Cathode No. 3, Heater and Internal Shield	3.5 μμf

RATINGS (Design Center Values — Each Section)

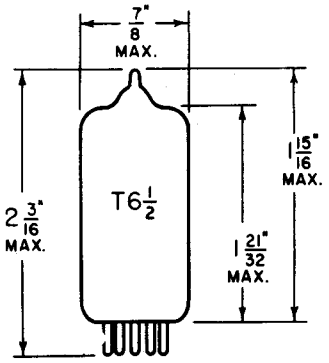
Peak Inverse Plate Voltage	330 Volts Max.
DC Output Current	12 Ma Max.
Peak Plate Current	54 Ma Max.

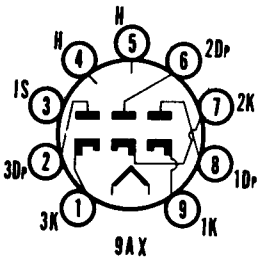
CHARACTERISTICS

Plate Current at E_b — 5 Volts	
Diode No. 1	35 Ma
Diode No. 3	35 Ma
Plate Current at E_b — 0 Volts	
Diode No. 1	21 μa Max.
Diode No. 3	21 μa Max.
Plate Current Ratio at E_b — 5 Volts	
Diode No.1:No. 3 and/or Diode No. 3:No. 1	1.3 Max.

QUICK REFERENCE DATA

The Sylvania Type 6BC7 is a miniature triple diode featuring separate unipotential cathodes for each section.





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RADIO TUBE DIVISION
EMPORIUM, PA.

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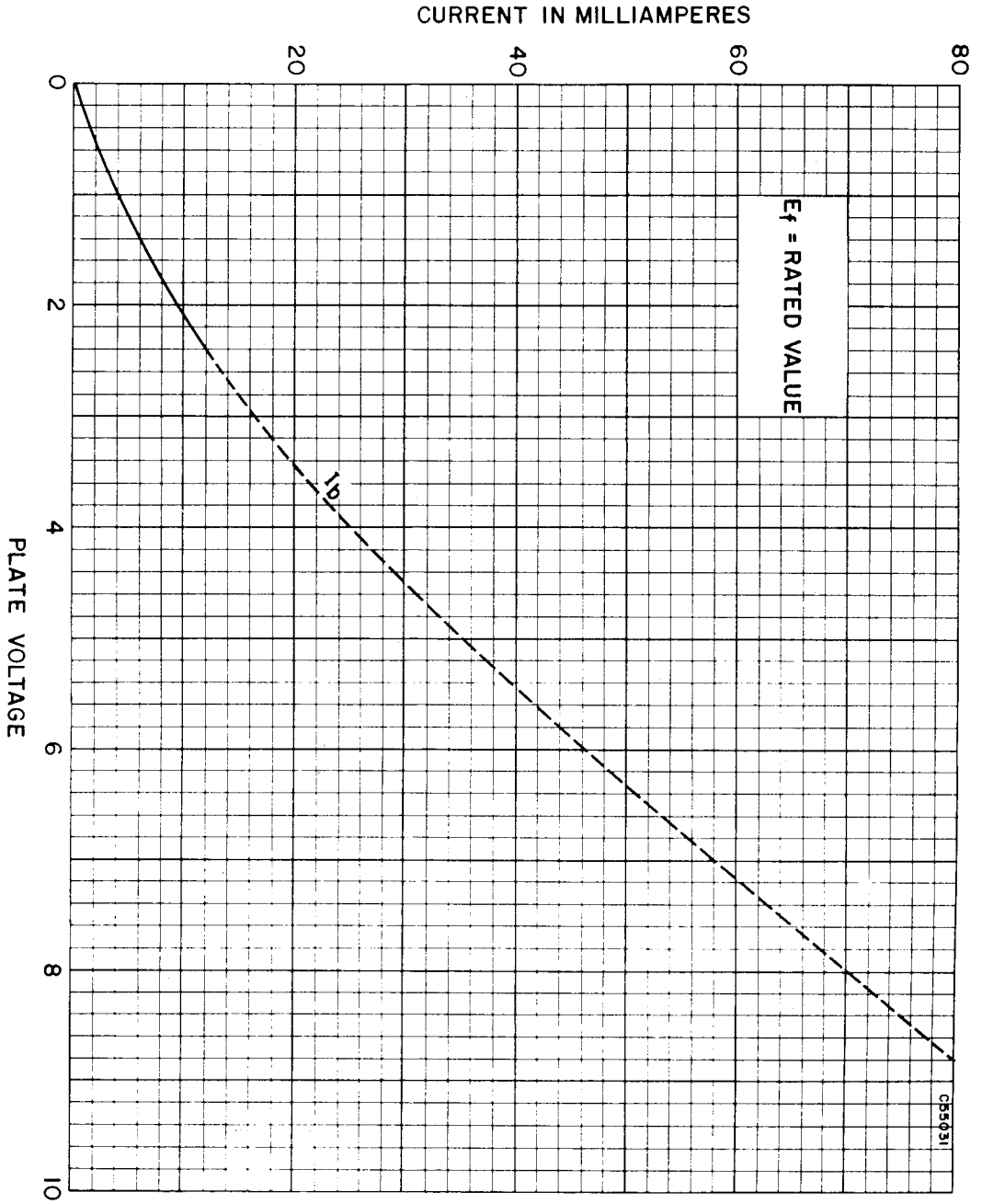
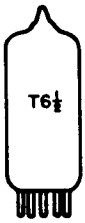
APRIL 1955

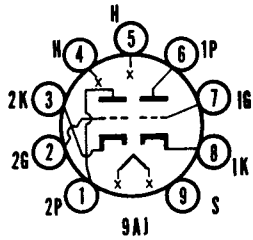
AVERAGE PLATE CHARACTERISTICS





SYLVANIA TYPE 6BC8
4BC8

MEDIUM MU DUO TRIODE



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button, 9-Pin
Outline	6-2
Basing	9AJ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6BC8	4BC8
Heater Voltage	6.3	4.2 Volts
Heater Current	400	600 Ma
Heater Warm-up Time (See Appendix)		11 Seconds
Heater-Cathode Voltage (Design Center Values)		
Heater Positive with Respect to Cathode		
D C Component	100	100 Volts Max
Total D C and Peak	200	200 Volts Max
Heater Negative with Respect to Cathode[1]		
Total D C and Peak	200	200 Volts Max

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[2]

	Section 1	Section 2
Grid to Plate	1.4	1.4 μμf
Input	2.5	2.5 μμf
Output	1.3	1.3 μμf
Heater to Cathode	2.3	2.3 μμf
Plate Section No. 1 to Plate Section No. 2	0.015	μμf
Grid Section No. 1 to Grid Section No. 2	0.007	μμf Max

RATINGS (Design Center Values—Each Section)

Plate Voltage[1]	250 Volts Max
Plate Dissipation	2 Watts Max
Cathode Current	20 Ma Max
Grid Circuit Resistance	0.5 Megohm Max

CHARACTERISTICS—(Each Section)

Class A_1 Amplifier

Plate Voltage	150 Volts
Grid Voltage	0 Volts
Cathode Bias Resistor	220 Ohms
Plate Current	10 Ma
Transconductance	6200 μmhos
Amplification Factor	35
Grid Voltage for g_m = 50 μmhos (approx.)	13 Volts

6BC8
4BC8 (Cont'd)

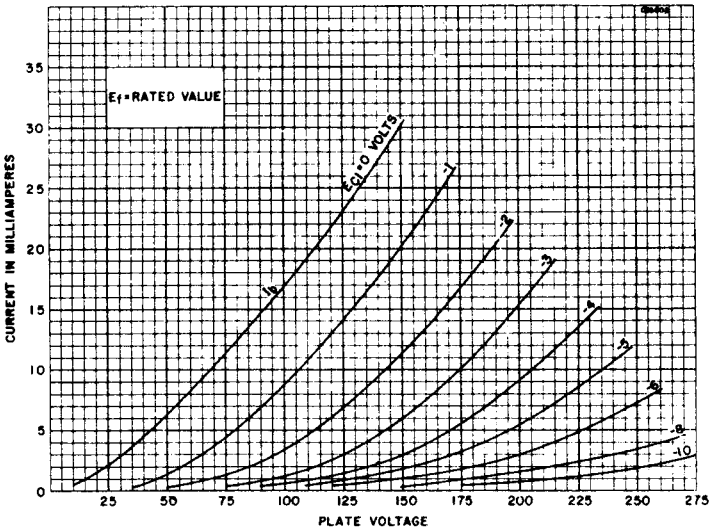
NOTES:

1. This rating may be as high as 300 volts max. under cutoff conditions when the tube is used as a cascode amplifier and the two sections are connected in series.
2. Shield No. 315.

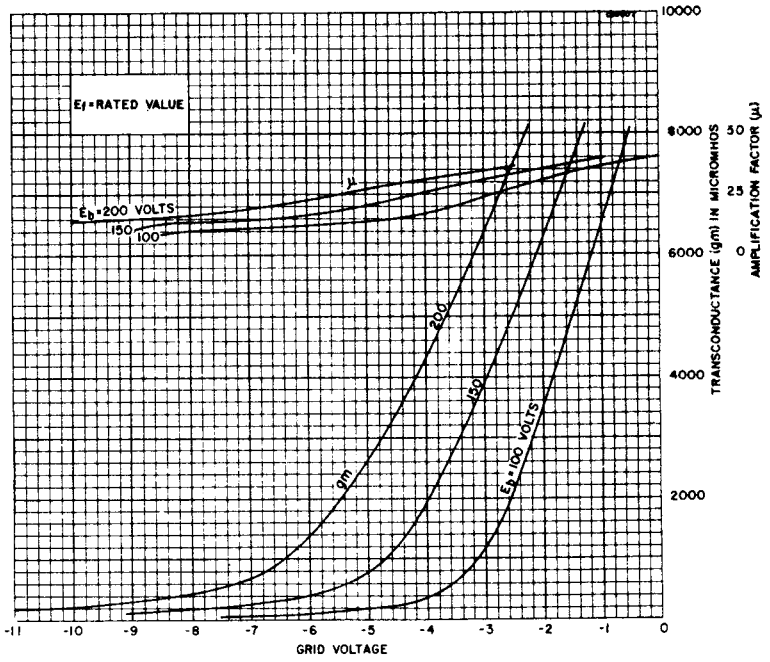
APPLICATION

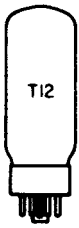
The 4BC8 and 6BC8 are twin triodes intended for application as V H F cascode amplifiers in television receivers. The 4BC8 features a 600 Ma heater and controlled heater warm-up time for operation in television receivers employing a series heater string.

AVERAGE PLATE CHARACTERISTICS



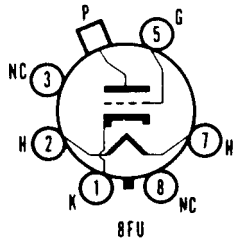
AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPE 6BD4
6BD4A

HIGH VOLTAGE REGULATOR



MECHANICAL DATA

Bulb	T-12
Base	Short Jumbo Shell Octal
Basing	8FU
Maximum Overall Length	5⅛"
Maximum Seated Height	4⅝"

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (A C or D C)	6.3 Volts
Heater Current	600 Ma
Maximum Peak Heater-Cathode Voltage	180 Volts

DIRECT INTERELECTRODE CAPACITANCES

Grid to Plate	1.0 μμf
Input	3.8 μμf
Output	0.04 μμf Max

MAXIMUM RATINGS (Design Center Values)

	6BD4	6BD4A	
D C Plate Voltage	20000	27000	Volts
Unregulated D C Supply Voltage	40000	55000	Volts
Grid Voltage			
D C Value	−125	−125	Volts
Peak Value	−550	−550	Volts
D C Plate Current	1.5	1.5	Ma
Plate Dissipation	20	25	Watts
Grid Circuit Resistance			
With Unregulated Supply with Equivalent Resistance of More Than 8 Megohms	3.0	4.0	Megohms
With Unregulated Supply with Equivalent Resistance of Less Than 8 Megohms	See Curve A	See Curve B	

CHARACTERISTIC

Amplification Factor	1650

WARNING

The high voltage at which the 6BD4 is operated may be extremely dangerous to the user. Great care should be taken during the adjustment of circuits.

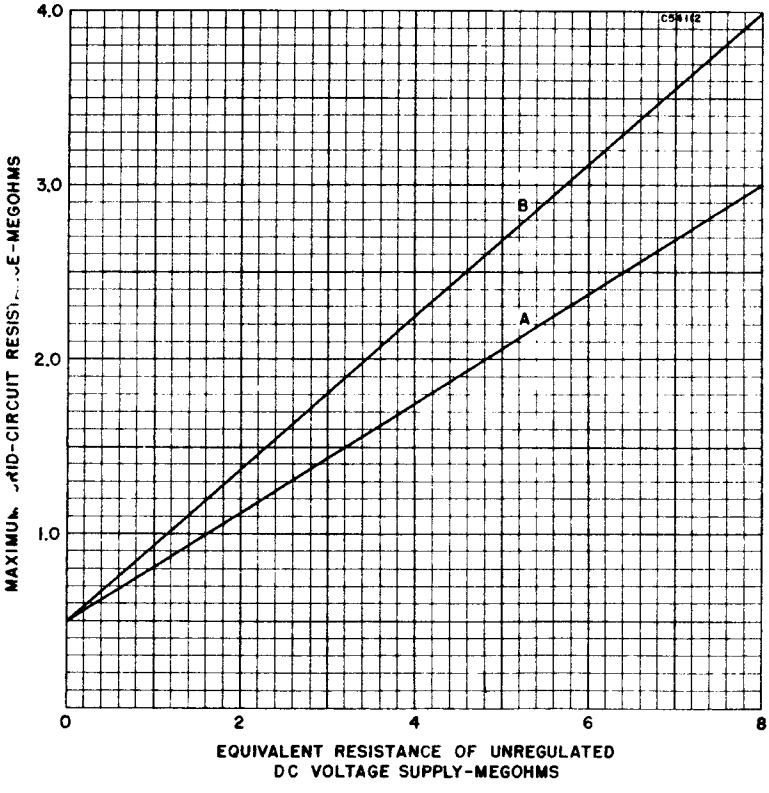
Operation of the 6BD4 at plate voltages above 16,000 volts (absolute value) results in the production of X-rays which can constitute a health hazard unless adequately shielded.

APPLICATION

The Types 6BD4 and 6BD4A are beam triode, high-voltage, low current regulators, which may be used to supply regulated voltages for color television picture tubes. The principal difference between Types 6BD4 and 6DB4A is the maximum value of regulated voltage that may be obtained.

6BD4, 6BD4A (Cont'd)

GRID CIRCUIT RESISTANCE



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MECHANICAL DATA

Bulb	T-12
Base	B6-73, Short Jumbo Shell Octal, 6-Pin
Top Cap	C1-1, Small
Outline	See Drawing
Basing	8FU
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	600 Ma
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	180 Volts Max.
Heater Positive with Respect to Cathode	180 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

Grid to Plate	1.0 $\mu\mu$f
Input	3.8 $\mu\mu$f
Output	0.04 $\mu\mu$f Max.

RATINGS (Design Center Values)

Voltage Control Service

DC Plate Voltage	27000 Volts Max.
Unregulated DC Supply Voltage	55000 Volts Max.
Grid Voltage	
DC	−125 Volts Max.
Peak	−550 Volts Max.
DC Plate Current	1.5 Ma Max.
Plate Dissipation	25 Watts Max.
Grid Circuit Resistance	
With Unregulated Supply Having an Equivalent Resistance of at Least 8 Megohms	4 Megohms Max.
With Unregulated Supply Having an Equivalent Resistance Less Than 8 Megohms	See Fig. 1

CHARACTERISTICS

Amplification Factor	1650

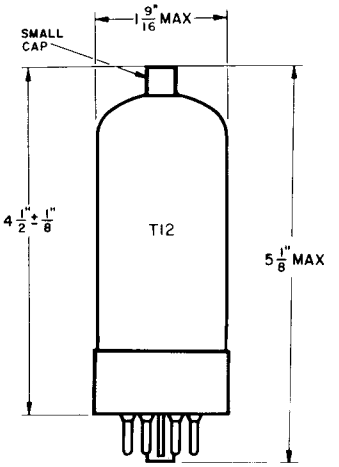
TYPICAL OPERATION

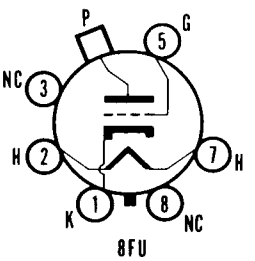
Shunt Voltage Regulator

Unregulated Supply		
DC Voltage	29800	36300 Volts
Equivalent Resistance	8	8 Megohms
Voltage Divider Values		
R1 (5 watts)	120	220 Megohms
R2 (2 watts)	1	1 Megohms
R3 (½ watt)	2	3 Megohms
Reference Voltage Supply		
DC Value	500	500 Volts
Equivalent Resistance	1000	1000 Ohms

QUICK REFERENCE DATA

The Sylvania Type 6BD4A is a low current, sharp cutoff, beam triode designed for use as a voltage regulator in high voltage, low current supplies. The 6BD4A has a maximum plate voltage rating of 27,000 volts, a maximum plate current rating of 1.5 Ma and a maximum plate dissipation of 25 watts. With the exception of its higher plate voltage rating and plate dissipation the 6BD4A is identical to the Type 6BD4.





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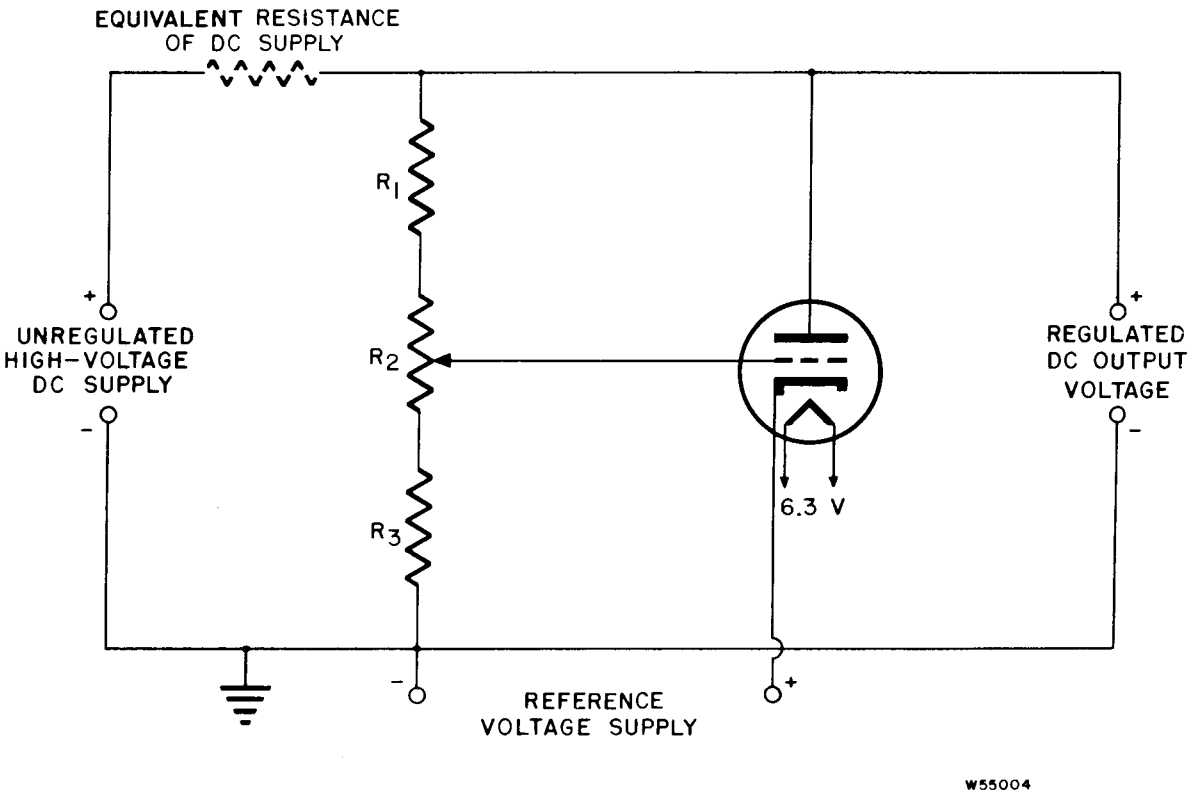
TYPICAL OPERATION (Continued)

Effective Grid-Plate Transconductance	138	116 μmhos
DC Plate Current		
For Load Current of 0 Ma	1055	1035 μa
For Load Current of 1 Ma	100	100 μa
Regulated DC Output Voltage		
For Load Current of 0 Ma	20000	27000 Volts
For Load Current of 1 Ma	19700	26500 Volts

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode voltage or 16,000 volts, whichever is less.

SHUNT REGULATOR CIRCUIT



AVERAGE TRANSFER CHARACTERISTICS

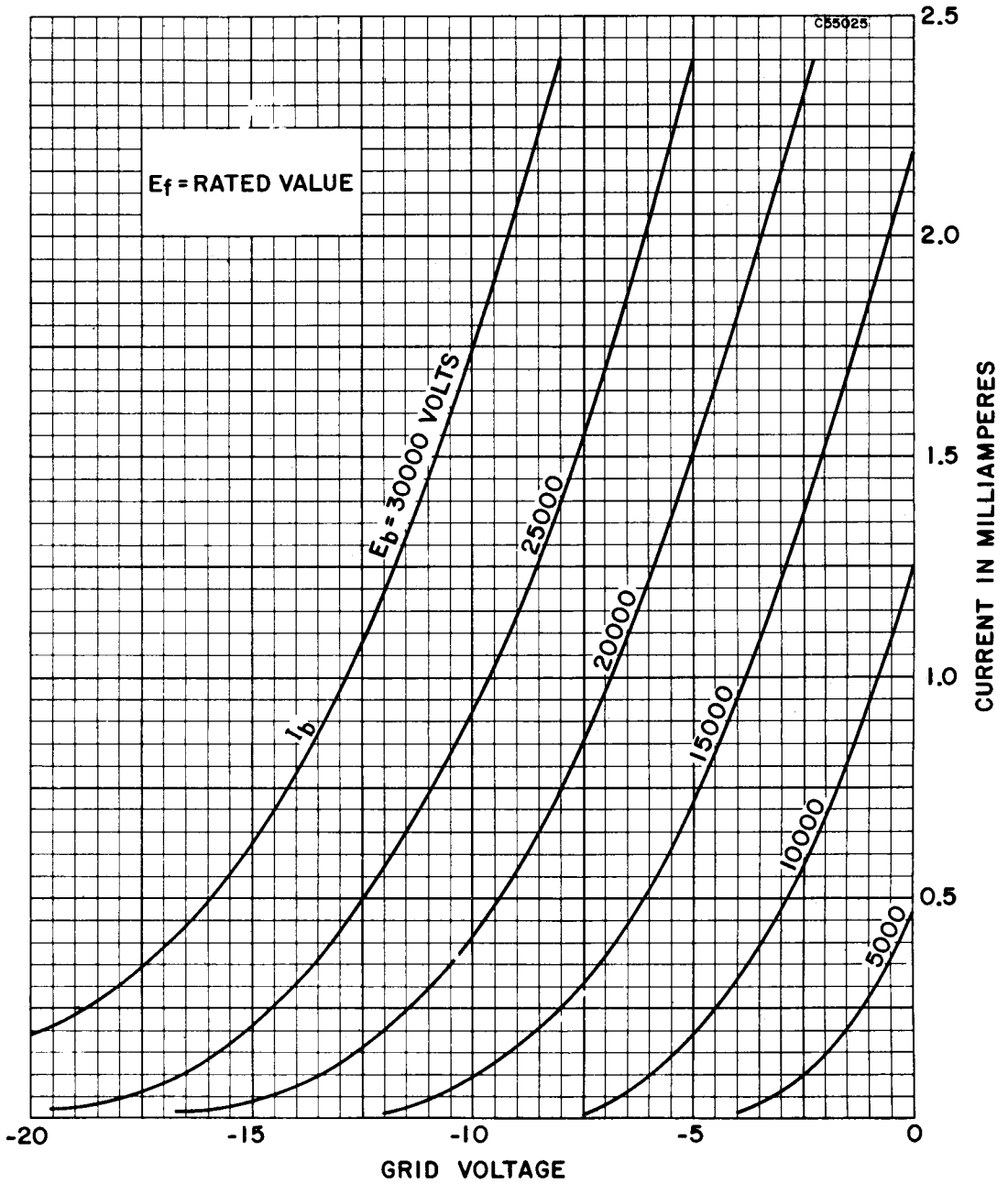
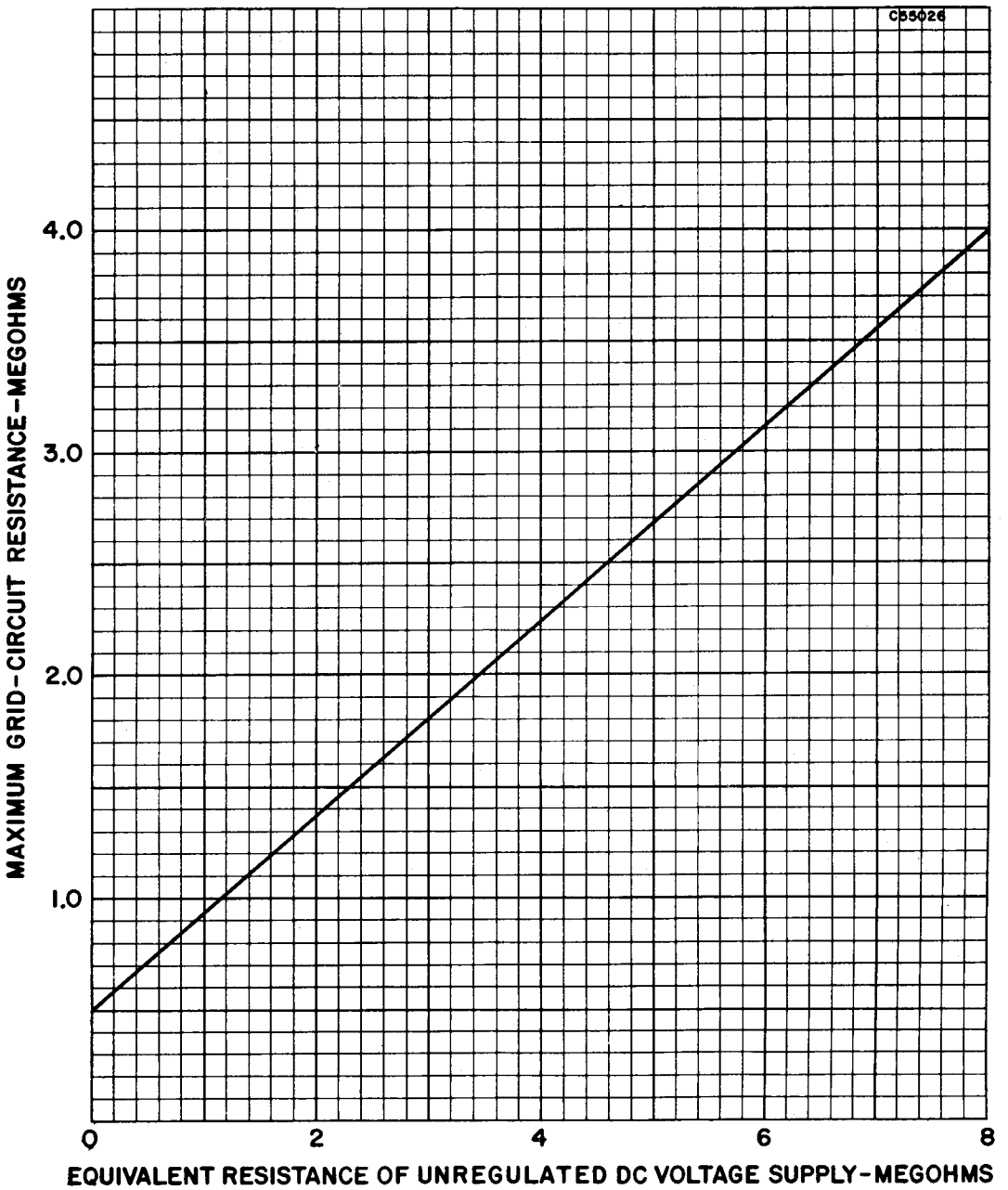


FIGURE 1
Maximum Grid Circuit Resistance vs.
Equivalent Resistance of Unregulated
DC Voltage Supply



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6BD6

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Basing	7BK
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3	Volts
Heater Current	300	Ma
Heater-Cathode Voltage	90	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[1]	Unshielded
Grid to Plate	0.005	0.004 μμf Max.
Input	4.3	4.3 μμf
Output	5.0	5.0 μμf

RATINGS (Design Center Values)

Plate Voltage	300	Volts Max.
Screen Voltage	125	Volts Max.
Plate Dissipation	4.0	Watts Max.
Screen Dissipation	0.4	Watts Max.
Cathode Current	14	Ma Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier

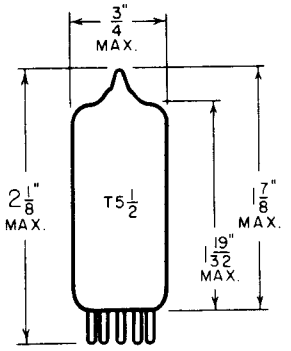
Plate Voltage	100	250 Volts
Supressor Grid Voltage[2]	0	0 Volts
Screen Grid Voltage	100	100 Volts
Control Grid Voltage	-1	-3 Volts
Plate Current	13	9 Ma
Screen Current	5	3.5 Ma
Plate Resistance	0.12	0.7 Megohm
Transconductance	2350	2000 μmhos
Control Grid Voltage for gm = 10 μmhos	-35	-35 Volts

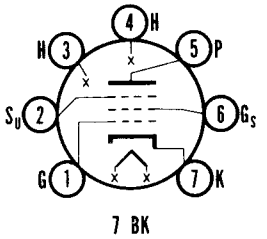
NOTES:

1. *With external shield No. 316 connected to pin 7 (cathode).*
2. *Pin 2 connected to pin 7 at socket.*

QUICK REFERENCE DATA

The Sylvania Type 6BD6 is a miniature remote cut-off pentode designed for service as a radio frequency or intermediate frequency amplifier. Electrically, the Type 6BD6 is similar to the Type 6SK7GT.





7 BK

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MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9EG
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	5BE8	6BE8	
Heater Voltage (AC or DC)	4.7	6.3	Volts
Heater Current	600	450	Ma
Heater Warm-up Time[1]	11		Seconds
Heater-Cathode Voltage (Design Center Values)			
Heater Negative with Respect to Cathode			
Total DC and Peak	200	200	Volts Max.
Heater Positive with Respect to Cathode			
DC	100	100	Volts Max.
Total DC and Peak	200	200	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Approx.)

Triode		
Grid to Plate (g to p)	1.8	μμf
Input: g to (k + pentode g3 + I.S. + h)	2.8	μμf
Output: p to (k + pentode g3 + I.S. + h)	1.5	μμf
Pentode		
Grid to Plate (g1 to p)	0.040	μμf Max.
Input: g1 to (k + g2 + h)	4.4	μμf
Output: p to (k + g2 + g3 + triode k + I.S. + h)	2.6	μμf
Plate to (k + g2 + h)	0.30	μμf
Coupling		
Triode Grid to Pentode Plate	0.010	μμf
Pentode Grid No. 1 to Triode Plate	0.009	μμf
Triode Plate to Pentode Plate	0.065	μμf

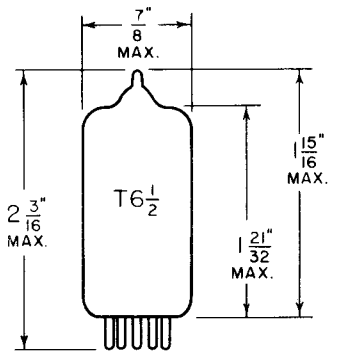
RATINGS (Design Center Values)

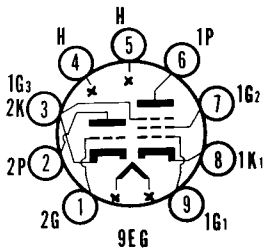
	Triode	Pentode	
Plate Voltage	300	300	Volts Max.
Grid No. 2 Supply Voltage		300	Volts Max.
Grid No. 2 Voltage	See Rating Chart		
Plate Dissipation	2.5	2.8	Watts Max.
Grid No. 2 Dissipation		0.5	Watt Max.
Positive Grid No. 1 Voltage	0	0	Volts Max.
Grid No. 1 Circuit Resistance[2]			
Fixed Bias	0.5	0.25	Megohm Max.
Self Bias	1.0	1.0	Megohm Max.

QUICK REFERENCE DATA

The Sylvania Type 6BE8 is a miniature, medium mu triode and sharp cutoff pentode intended for use as a v h f oscillator mixer. The basing is unique in that the pentode No. 3 grid and internal shield are connected to the triode cathode.

The 5BE8 employs controlled heater warm-up time for service in series string television recievers. Except for heater current and voltage the 5BE8 is identical to the 6BE8.





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OCTOBER 1955

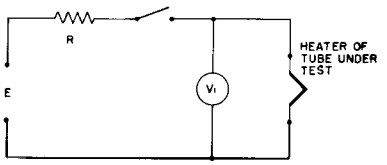
CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier[3]

	Triode	Pentode	
Plate Voltage	150	250	Volts
Grid No. 2 Voltage		110	Volts
Grid No. 1 Voltage	0	0	Volts
Cathode Bias Resistor	56	68	Ohms
Amplification Factor	40		
Plate Resistance (approx.)	.005	0.4	Megohm
Transconductance	8500	5200	μmhos
Plate Current	18	10	Ma
Grid No. 2 Current		3.5	Ma
Grid No. 1 Voltage (approx.) for I_b = 10 μa	-12	-10	Volts

NOTES:

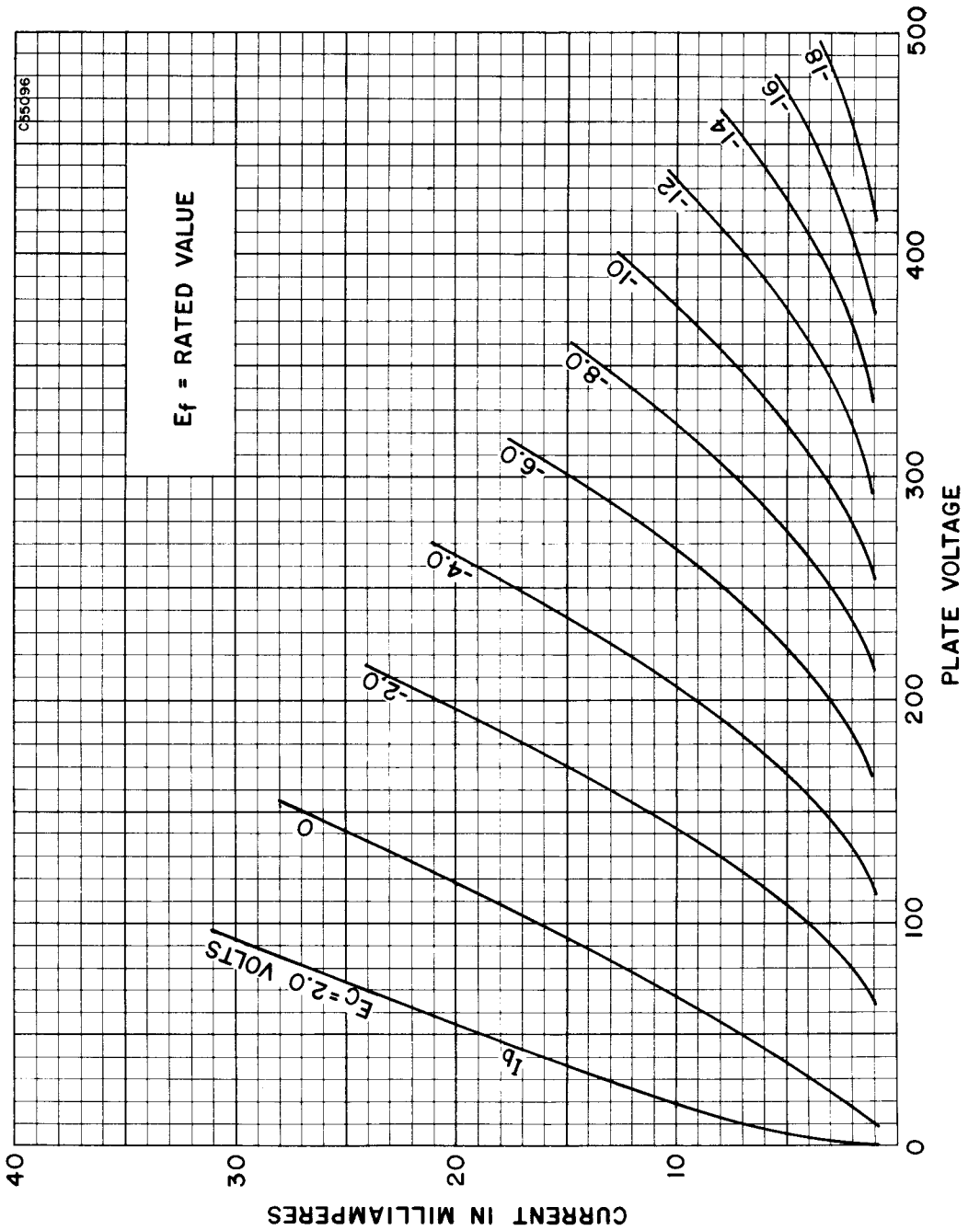
1. *Heater Warm-up Time is defined as the time required in the circuit shown below for the voltage across the heater terminals to increase from zero to the heater test voltage (V1). The conditions used in conjunction with the test circuit depend upon the rated heater voltage and current of the tube under test. For this type: E = 18.8 Volts, R = 23.6 Ohms, V1 = 3.75 Volts.*



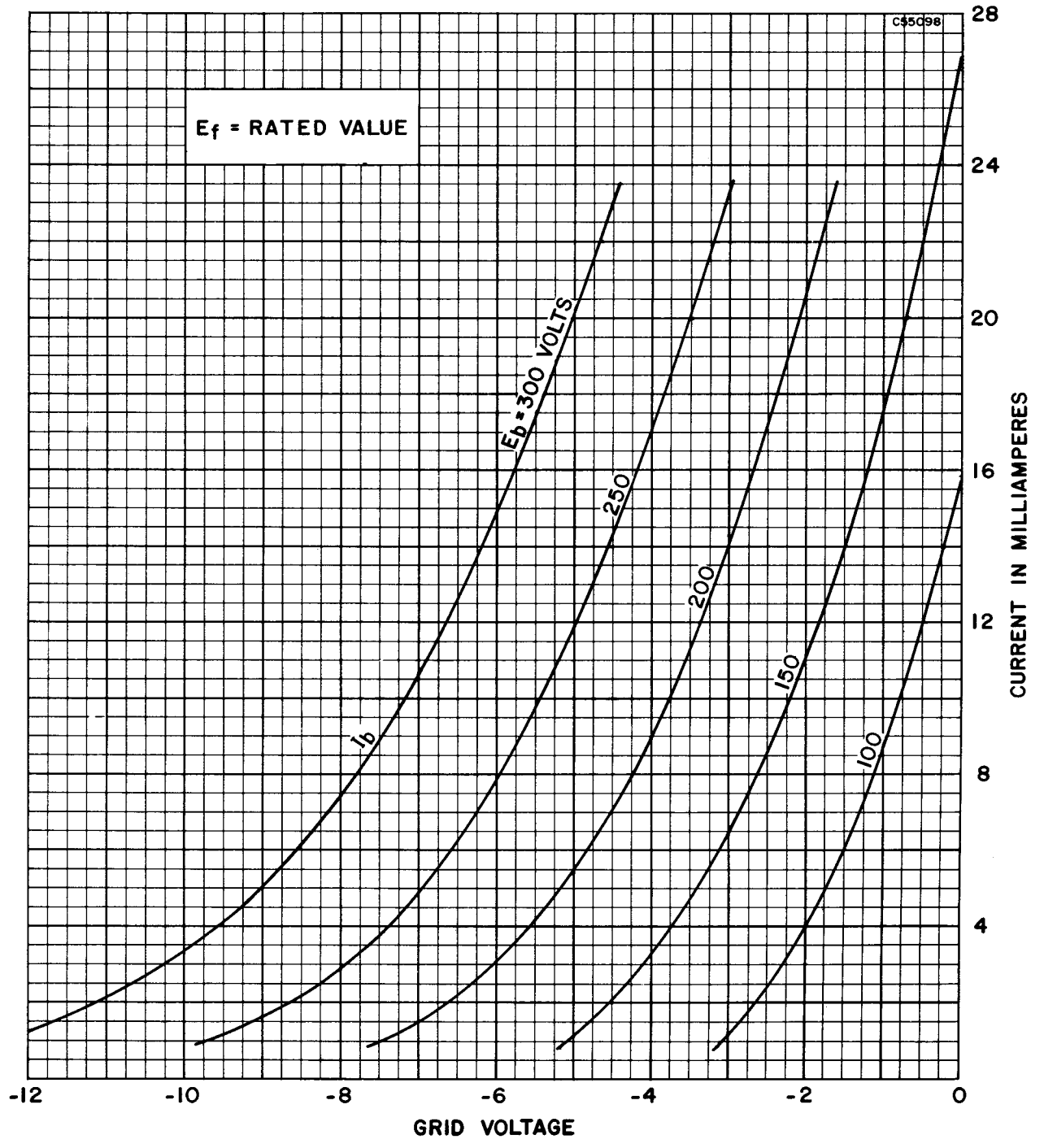
E — Applied Voltage, RMS or DC
R — Total Series Resistance
V1 — Heater Test Voltage, RMS or DC (80% Rated Heater Voltage)

2. *If either unit is operating at maximum rated conditions, Grid No. 1 Circuit Resistance for both units shall not exceed the stated values.*
3. *When reading characteristics of the pentode section all triode elements shall be at ground potential. Thus, because of internal connections to Pin No. 3, the pentode suppressor will also be at ground.*

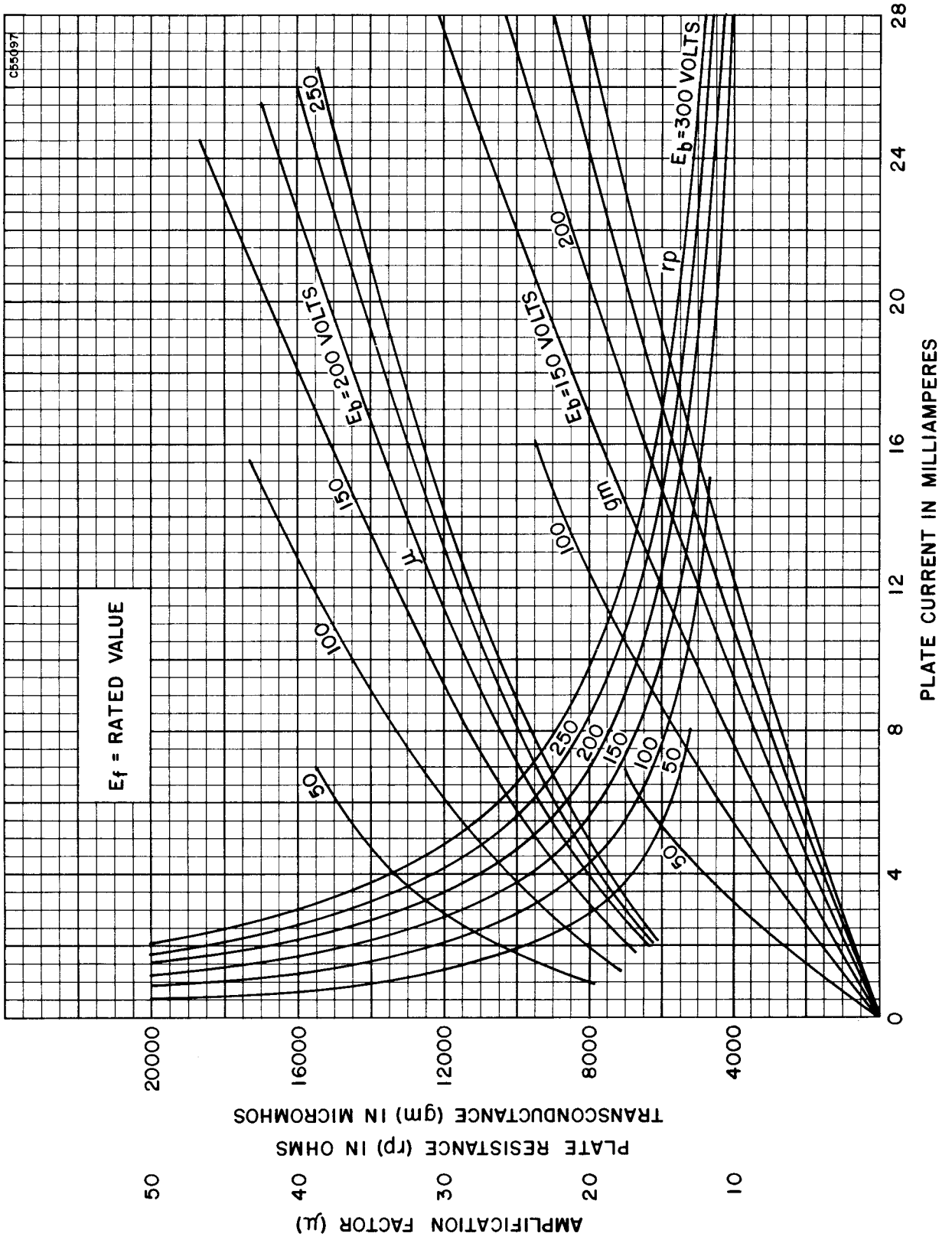
AVERAGE PLATE CHARACTERISTICS
(TRIODE SECTION)



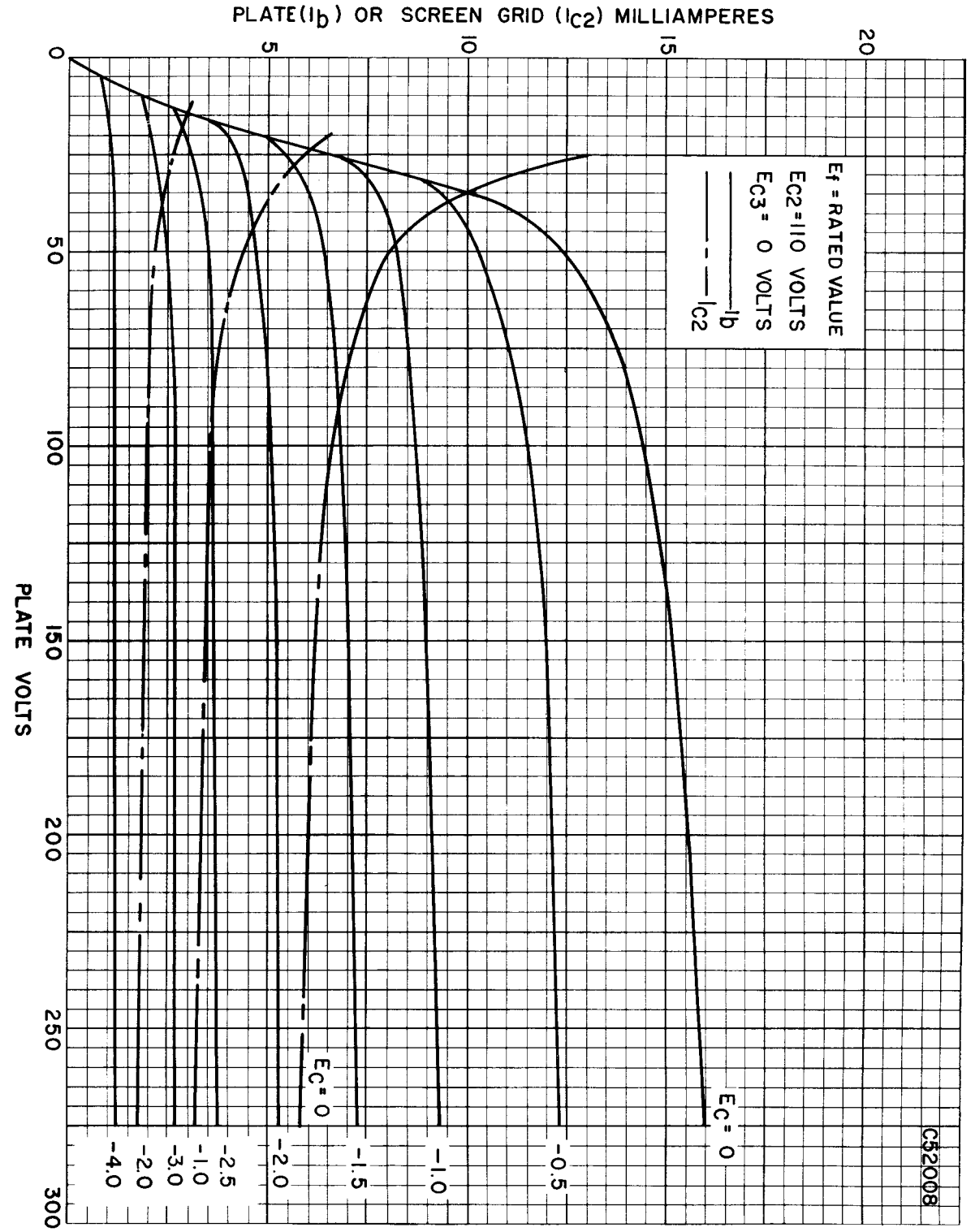
AVERAGE TRANSFER CHARACTERISTICS
(TRIODE SECTION)



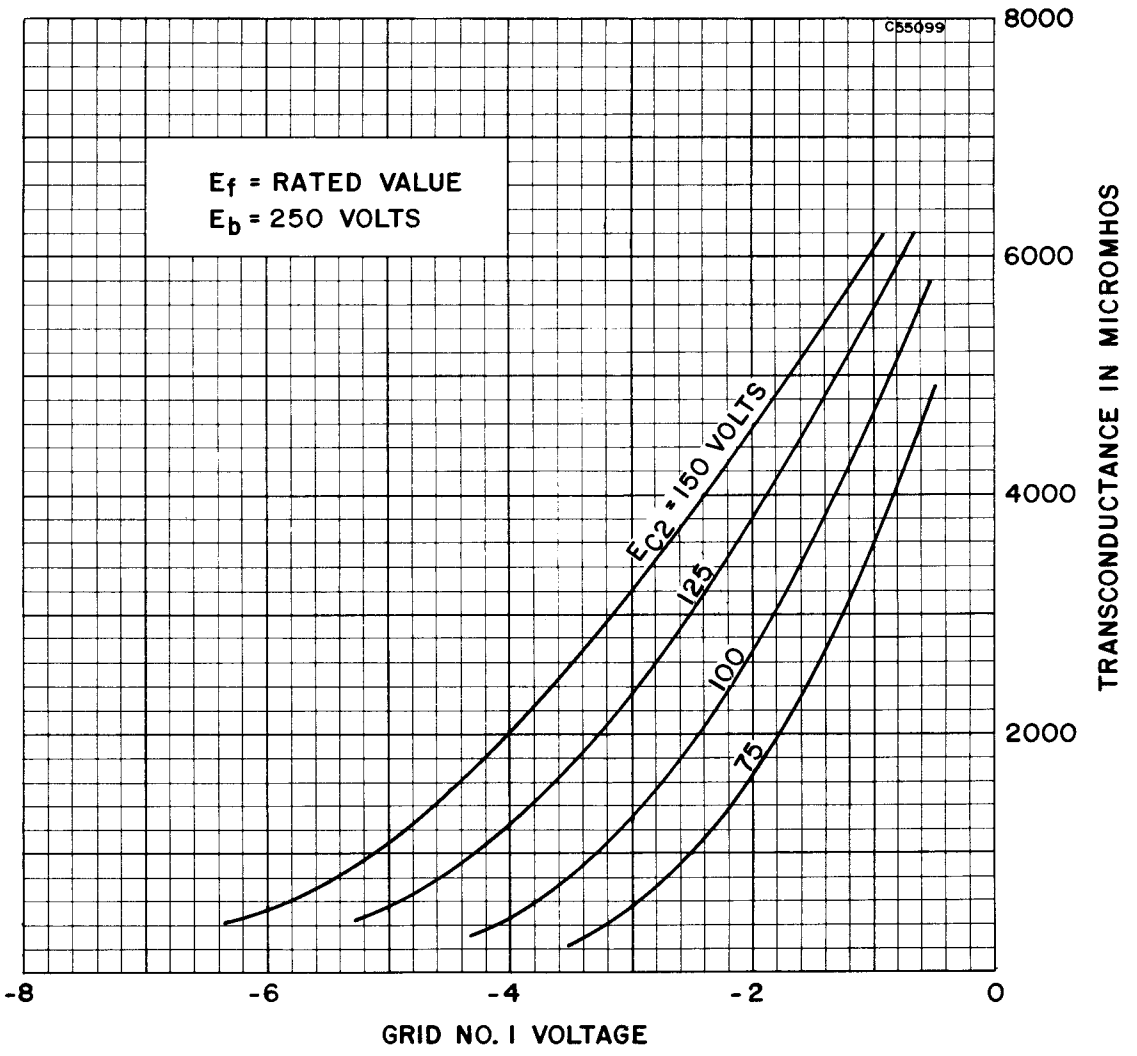
AVERAGE CHARACTERISTICS
(TRIODE SECTION)



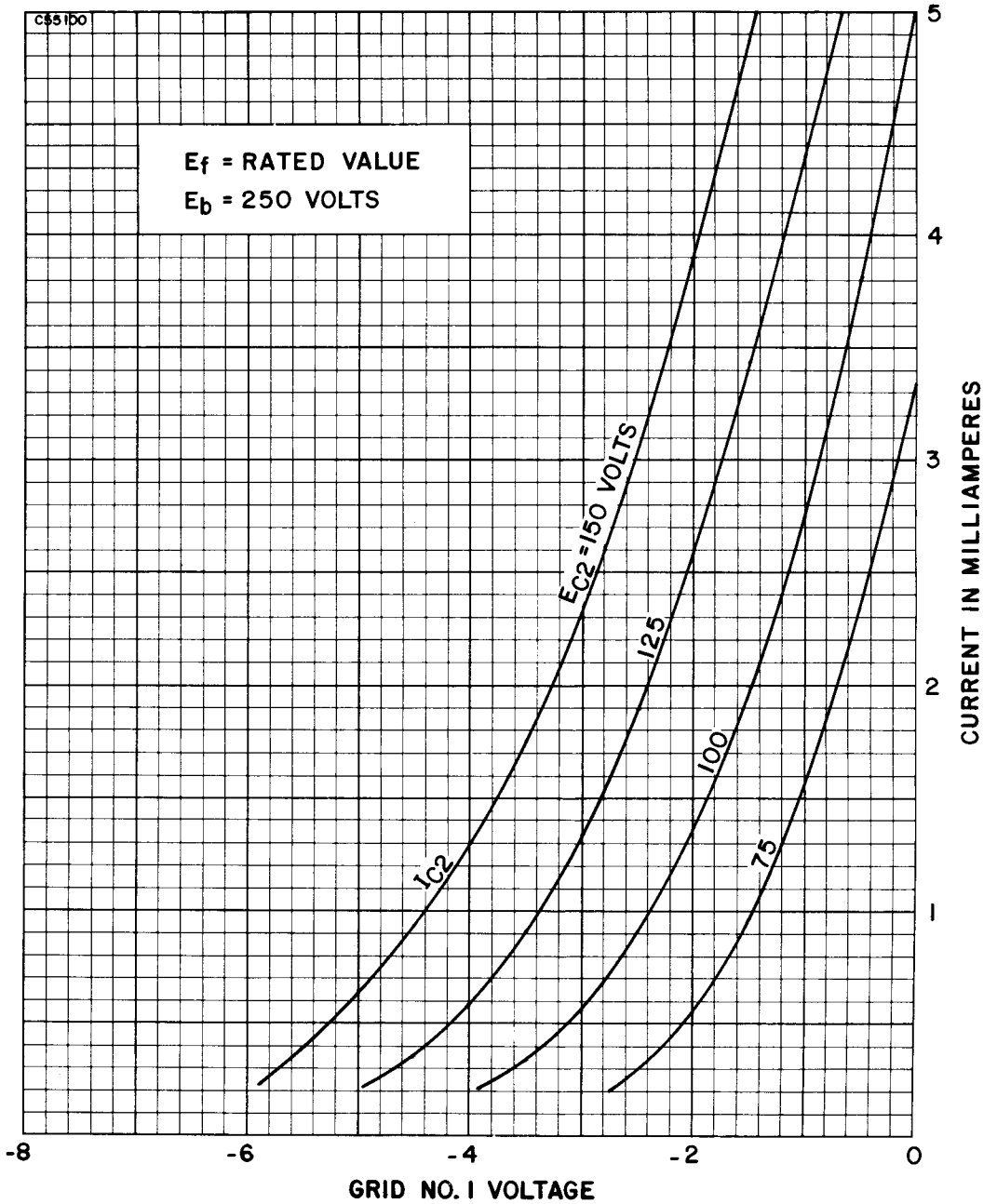
AVERAGE PLATE CHARACTERISTICS
(PENTODE SECTION)



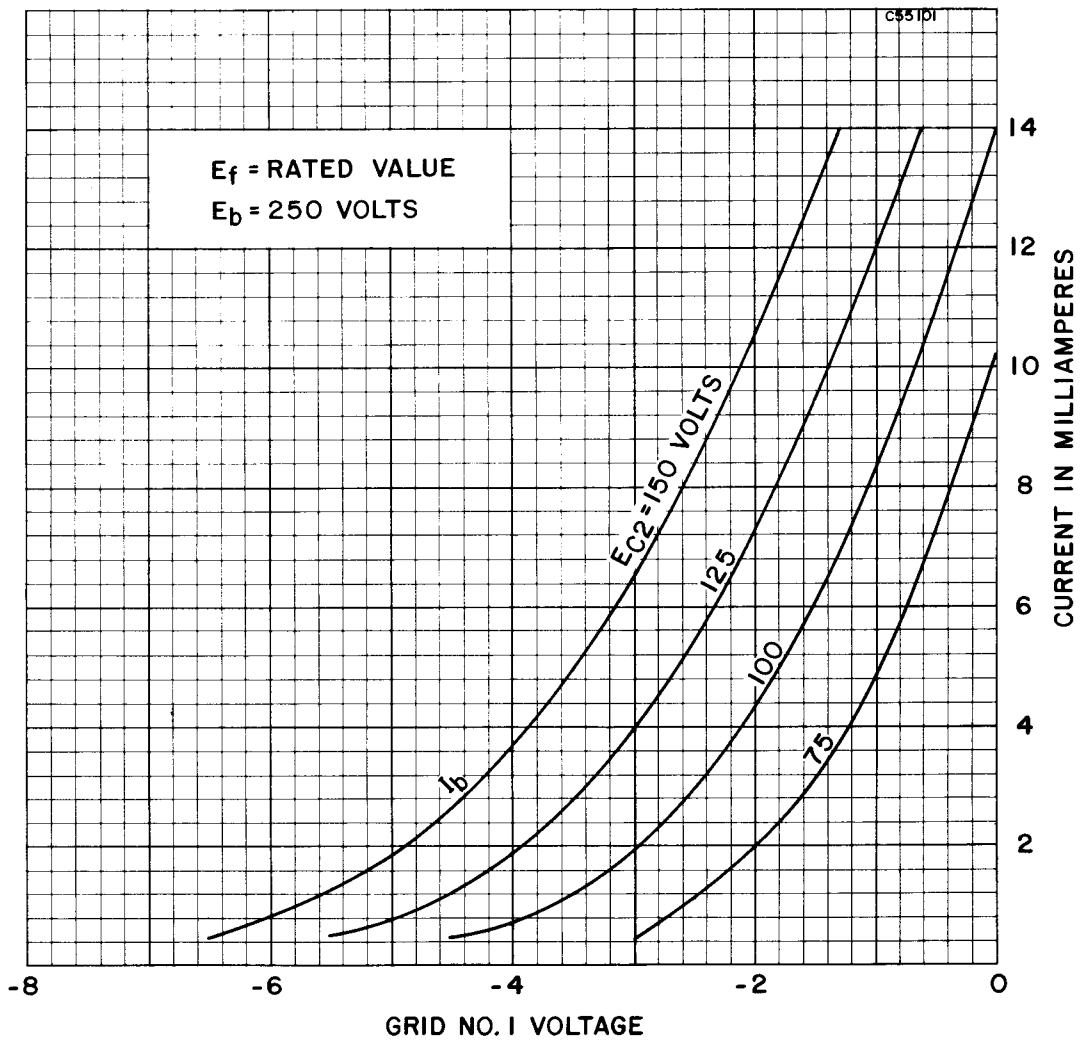
AVERAGE TRANSFER CHARACTERISTICS
(PENTODE SECTION)



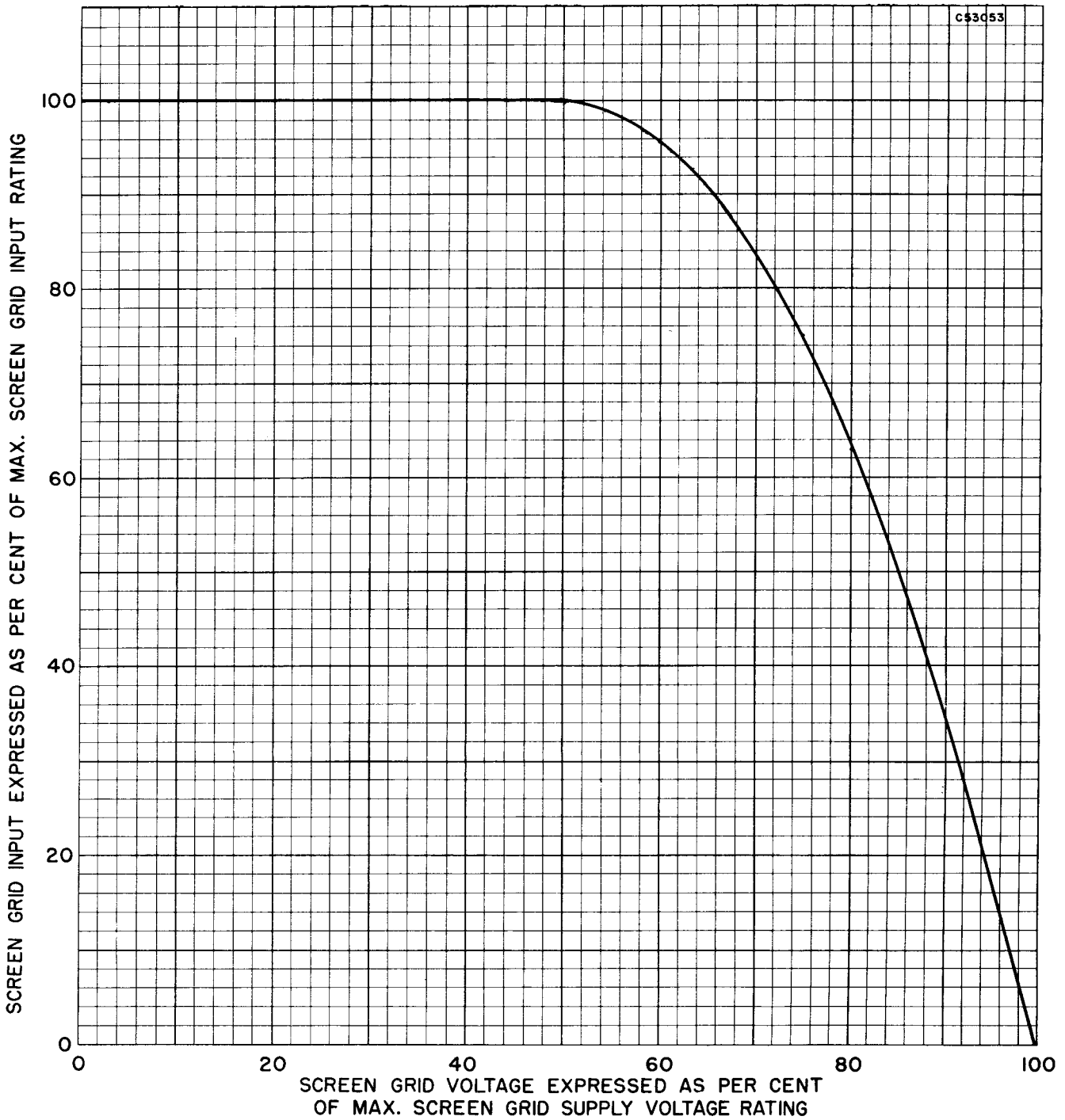
AVERAGE TRANSFER CHARACTERISTICS
(PENTODE SECTION)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE SECTION)



RATING CURVE



ADVANCE DATA

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3	Volts
Heater Current	450	Ma
Heater Warm-up Time[1]	11	Seconds

NOTE:

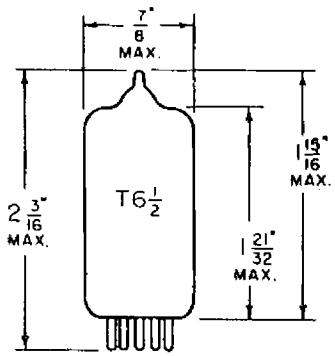
1. Heater Warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

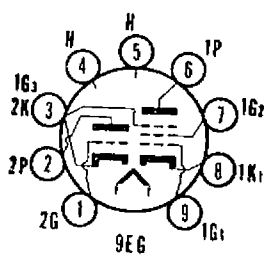
QUICK REFERENCE DATA

The Sylvania Type 6BE8A is a miniature medium mu triode and sharp cutoff pentode intended for use as a VHF oscillator mixer. The basing is unique in that the pentode No. 3 grid and internal shield are connected to the triode cathode.

The 6BE8A features controlled heater warm-up time and is intended for use in television receivers employing a series heater string.

The 6BE8A is identical to the 6BE8 except for controlled heater warm-up time.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

October 26, 1956

from JETEC release #1783, Nov. 12, 1956

SYLVANIA

engineering data service

SYLVANIA

6BF6

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Basing	7BT
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3	Volts
Heater Current	300	Ma
Peak Heater-Cathode Voltage	90	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[1]	Unshielded
Grid to Plate	2.0	2.0 μμf
Grid to Cathode	1.8	1.8 μμf
Plate to Cathode	1.4	1.1 μμf

RATINGS (Design Center Values)

Plate Voltage	300	Volts Max.
Plate Dissipation	2.5	Watts Max.
Positive Grid Voltage	0	Volts Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier

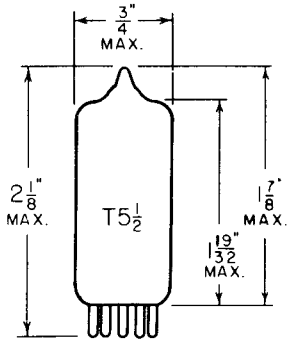
Plate Voltage	250	Volts
Grid Voltage	−9	Volts
Plate Current	9.5	Ma
Transconductance	1900	μmhos
Plate Resistance	8500	Ohms
Amplification Factor	16	
Load Resistance	10,000	Ohms
Power Output	300	MW
Total Harmonic Distortion	6.5	Percent
Average Diode Current Per Plate With 10 Volts d c Applied	0.8	Ma

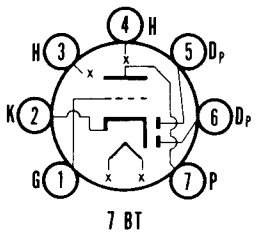
NOTE:

1. RETMA shield No. 316.

QUICK REFERENCE DATA

The Sylvania Type 6BF6 is a miniature twin diode, medium mu triode. It is designed for service as a combined detector, amplifier and automatic volume control tube. Electrically, the Type 6BF6 is similar to the Type 6SR7.





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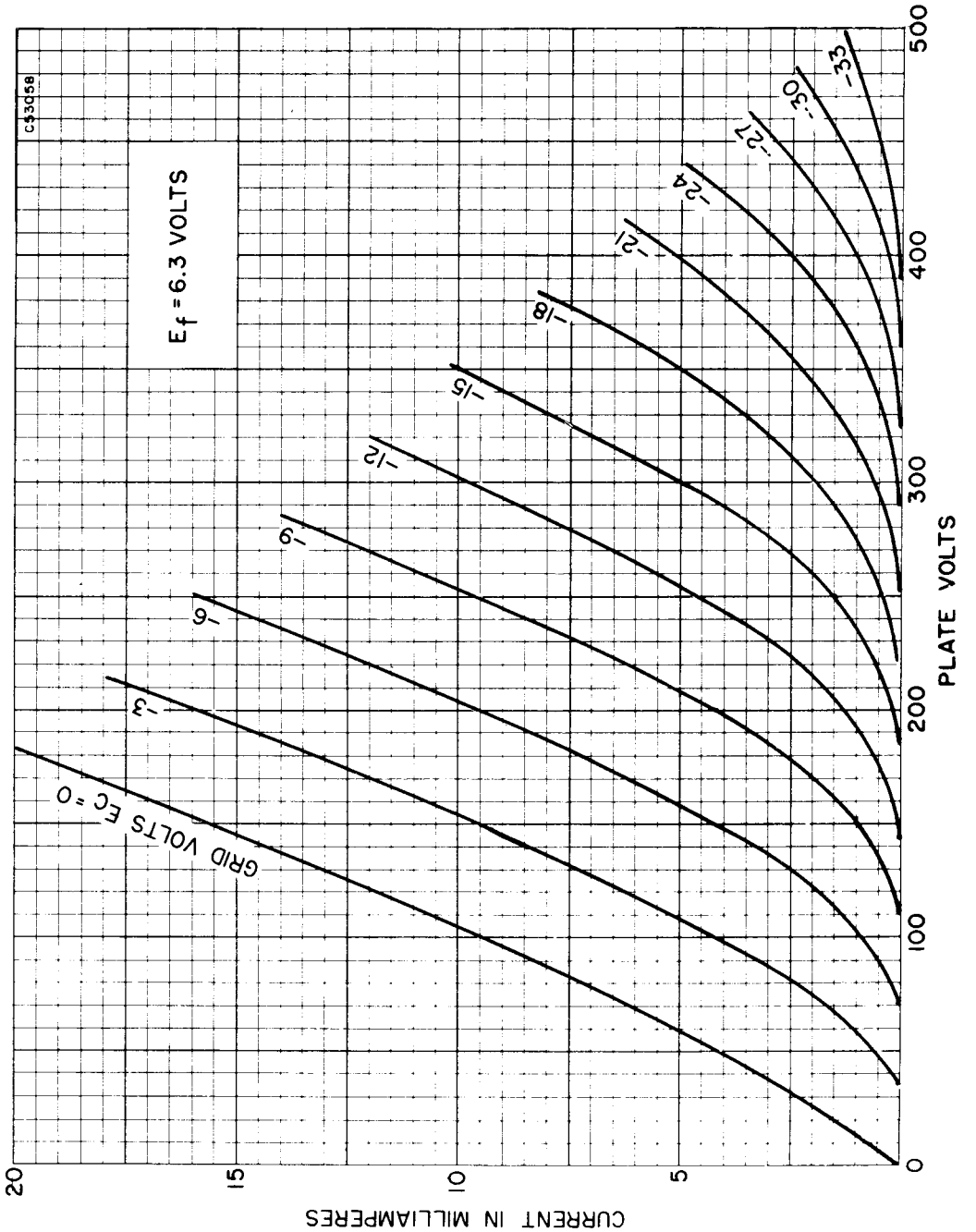
NOVEMBER 1953

SYLVANIA

6BF6

AVERAGE PLATE CHARACTERISTICS

EACH SECTION



SYLVANIA

TYPE 6BF7A

JETEC Registration Data

DOUBLE TRIODE

The Type 6BF7A is a subminiature medium-mu double triode, designed for service where severe conditions of mechanical shock and vibration are encountered.

MECHANICAL DATA

GENERAL

Style ..... subminiature
Cathode ..... coated unipotential
Bulb T-3
Base ..... E8-10, Subminiature Button Flexible Leads
Outline 3-2
Basing 8DG

Connections:

Lead 1 - #2 plate	Lead 5 - #1 cathode
Lead 2 - #2 grid	Lead 6 - heater
Lead 3 - heater	Lead 7 - #1 grid
Lead 4 - #2 cathode	Lead 8 - #1 plate

Maximum Diameter ..... 0.400 inch
Maximum Overall Bulb Length 1.500 inches
Minimum Lead Length ..... 1.500 inches
Mounting Position ..... any

RATINGS(1)

Maximum Impact Acceleration(2) ... 450 g
Maximum Vibrational Acceleration For Extended Periods(3) ..... 2.5 g
Maximum Bulb Temperature ..... 250 °C

ELECTRICAL DATA

GENERAL

Heater Voltage (ac or dc) ..... 6.3 volts
Heater Current ..... 300 ma

Direct Interelectrode Capacitances:

	Unshielded	Shielded(4)
Grid to Plate (each section)	1.5	1.5 μμf
Input (each section)..	2.0	2.0 μμf
Output:		
Section 1	0.28	1.6 μμf
Section 2	0.30	2.0 μμf
Grid to Grid	0.009	0.008 μμf
Plate to Plate	0.75	0.55 μμf

RATINGS(1)-Absolute Values

Heater Voltage ..... 6.3(±10%) volts
Maximum Plate Voltage (dc) .... 120 volts
Maximum Plate Dissipation (each section) ..... 1.1 watts
Maximum Heater-Cathode Voltage ..... ±200 volts

CHARACTERISTICS (each section)

Conditions:
Heater Voltage ..... 6.3 volts
Plate Voltage (dc) ..... 100 volts
Cathode Bias Resistor ..... 100 ohms
Plate Current ..... 8 ma
Transconductance ..... 4,800 μmhos
Amplification Factor 35

Grid Voltage for 10 μa Plate Current ..... -7.5 volts

Noise Output Voltage(5), maximum ..... 100 mv

Notes

(1) Limitations beyond which normal tube performance and tube life may be impaired.

(2) Forces in any direction as applied by the Navy Type High-Impact (Flyweight) Shock Machine for Electronic Devices, or equivalent.

(3) Vibrational forces in any direction at 60 cycles per second for a period exceeding 100 hours.

(4) With external shield of 0.405 inch diameter connected to cathode of section under test.

(5) Across plate resistor of 2,000 ohms, with applied vibrational acceleration of 15 g at 40 cycles per second, sections tied in parallel.

from RTMA release #1129, Nov. 14, 1952

SYLVANIA

engineering data service

SYLVANIA

6BG6G

MECHANICAL DATA

Bulb	ST-16
Base	Medium Shell Octal
Basing	5BT
Cap	Small
Cathode	Unipotential
Mounting Position	Vertical, Base Up or Down; Horizontal, With Plane of Pins 2 and 7 Vertical

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	900 Ma

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Control Grid to Plate	0.65 $\mu\mu$f Max.
Input	11.0 $\mu\mu$f
Output	6.5 $\mu\mu$f

RATINGS (Design Center Values — except as noted)

Horizontal Deflection Amplifier[1]

DC Plate Supply Voltage	700 Volts Max.
Peak Positive Plate Voltage	6600 Volts Abs. Max.
Peak Negative Plate Voltage	1500 Volts Max.
DC Plate Current	100 Ma Max.
Plate Dissipation	20 Watts Max.
Screen Voltage	350 Volts Max.
Screen Dissipation	3.2 Watts Max.
Negative Control Grid Voltage	50 Volts Max.
Peak Negative Control Grid Voltage	400 Volts Max.
Control Grid Resistance	1.0 Megohm Max.
Heater-Cathode Voltage	135 Volts Max.
Bulb Temperature (at hottest point)	210° C Max.

TYPICAL OPERATING CONDITIONS[2]

Horizontal Deflection Amplifier[1]

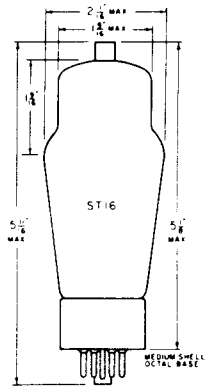
DC Plate Supply Voltage	
From DC Power Supply	400 Volts
From DC Boost	150 Volts
Total Plate Supply Voltage	550 Volts
Screen Voltage	250 Volts
Cathode Bias Resistor	100 Ohms
Control Grid Signal Voltage	
Sawtooth Component	75 Volts
Negative Peaking Component	50 Volts
Plate Current	85 Ma
Screen Current	10 Ma
Peak Cathode Current	300 Ma
Average Control Grid Current	30 μa
Peak Positive Plate Voltage	5500 Volts
Peak Negative Plate Voltage	550 Volts
Control Grid Circuit Resistance	1.0 Megohm

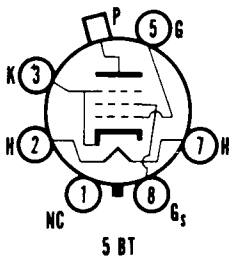
NOTES:

1. *For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations: Federal Communications Commission", the duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.*
2. *For 17" 70° deflection CR tube with 12 Kv second anode voltage.*

QUICK REFERENCE DATA

Pentode beam power amplifier designed for use as a horizontal deflection driver tube in television receivers using electromagnetic deflection.





5 BT

SYLVANIA ELECTRIC PRODUCTS INC.

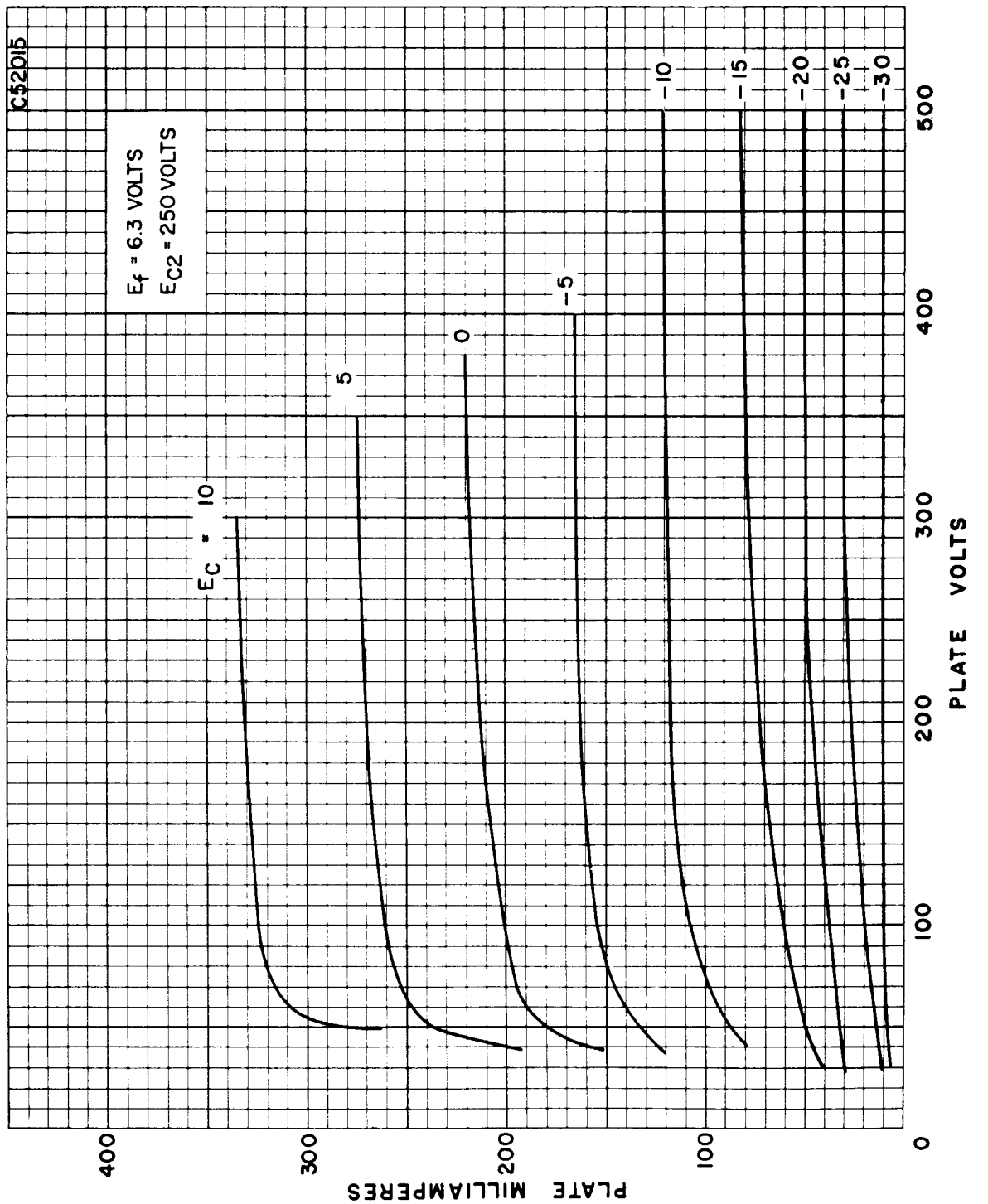
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

MAY 1952

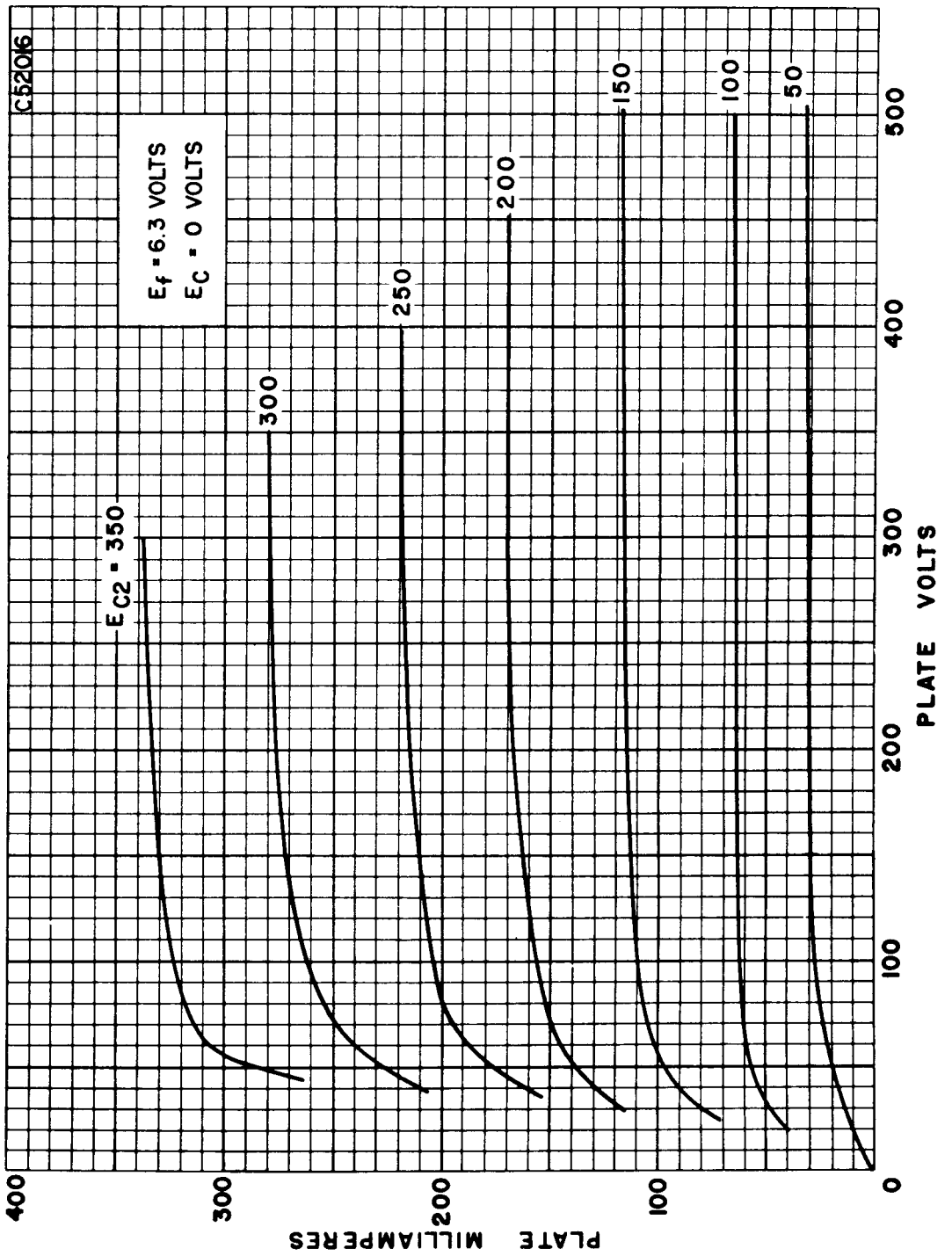
SYLVANIA

6BG6G

AVERAGE PLATE CHARACTERISTICS



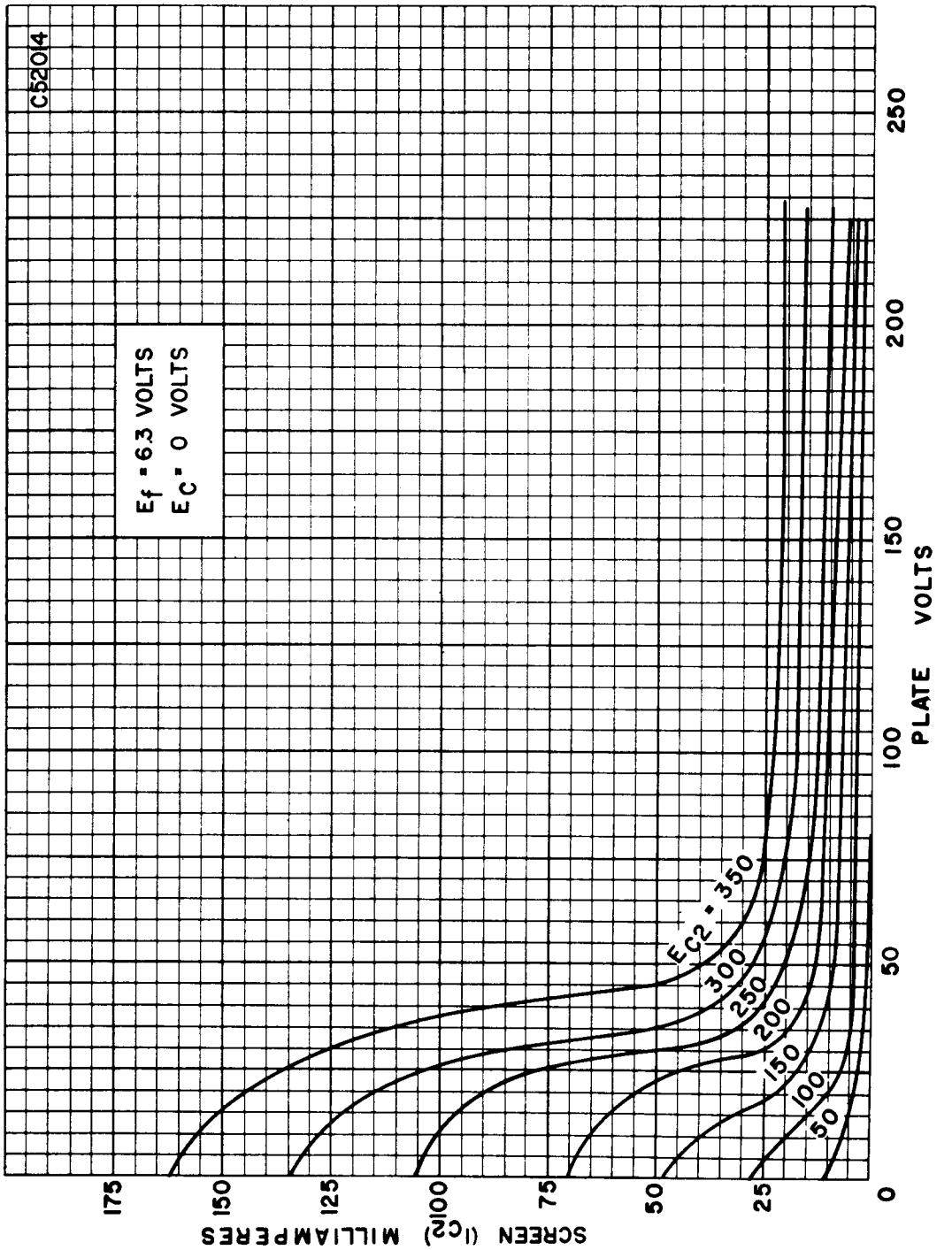
AVERAGE PLATE CHARACTERISTICS



SYLVANIA

6BG6G

AVERAGE CHARACTERISTICS



SYLVANIA ELECTRIC

from RMA release #847B, March 15, 1951

RTMA Registration Data

TYPE 6BG7

DOUBLE TRIODE

MECHANICAL DATA

Style	subminiature
Cathode	coated, unipotential
Bulb	T-3
Base	E8-9, Subminiature Button--8 Pin
Outline	3-5
Maximum Diameter	0.400 inch
Maximum Overall Length	1.75 inches
Maximum Seated Height	1.50 inches
Mounting Position	any
Basing	8DG-0-0

Pin Connections:

Pin 1 .. #2 triode plate	Pin 5 .. #1 triode cathode
Pin 2 .. #2 triode grid	Pin 6 .. heater
Pin 3 .. heater	Pin 7 .. #1 triode grid
Pin 4 .. #2 triode cathode	Pin 8 .. #1 triode plate

ELECTRICAL DATA

GENERAL

Direct Interelectrode Capacitances:

	Shielded(1)	*Not Shielded*	
Grid to Plate (each section)	1.5	1.5	μμf
Input (each section)	2.0	2.0	μμf
Output:			
Section #1	1.6	0.28	μμf
Section #2	2.0	0.30	μμf
Grid to Grid	0.008	0.009	μμf
Plate to Plate	0.55	0.75	μμf

Heater Voltage (ac or dc)	6.3	volts
Heater Current	300	milliamps

MAXIMUM RATINGS --*Design Center System*

Plate Voltage, maximum	110	volts
Plate Dissipation, maximum (each section)	1.0	watt
Heater-Cathode Voltage, maximum	90	volts

CHARACTERISTICS *(each section)*

Conditions:		
Heater Voltage (ac or dc)	6.3	volts
Plate Voltage (dc)	100	volts
Cathode-Bias Resistor	100	ohms
Plate Current	8.0	milliamps
Amplification Factor	35	
Transconductance	4,800	micromhos
Plate Resistance	7,000	ohms
Grid Voltage for 10 μamps Plate Current	-7.5	volts

(1) External shield of 0.405 inch diameter connected to cathode.

ADVANCE DATA

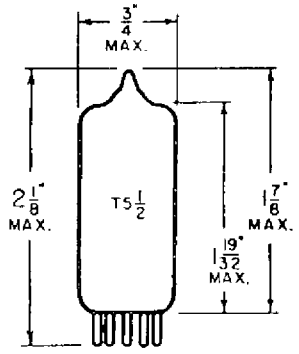
CHARACTERISTICS

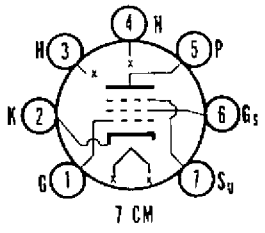
The Sylvania Type 6BJ6A, except for controls on formation of interface impedance, is identical to Type 6BJ6 as defined in E.I.A. release number 541A.

The interface impedance control consists of a life test conducted for 500 hours with the filament operating with 6.9 volts imposed. The other tube elements are unconnected simulating operation at cutoff conditions. Following life test the sample tubes are measured at conditions Ef = 5.7 V; Eb = Ec2 = Ec3 = 70 Vdc; and Ec1 adjusted for Ib = 4.0 mAdc. The maximum allowable value for interface impedance is 70 ohms.

QUICK REFERENCE DATA

The Sylvania Type 6BJ6A is a miniature, remote cutoff pentode designed for service as an R-F or I-F amplifier. Type 6BJ6A features low heater current, low input and output capacitances and relatively high gm.

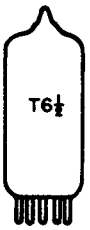




SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION
Prepared and Released by The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

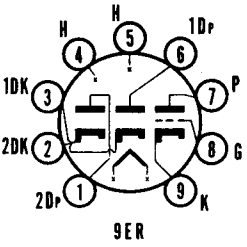
August 22, 1958

from JETEC release #2276, Sept. 8, 1958



SYLVANIA TYPE 6BJ8

MEDIUM MU TRIODE
DOUBLE DIODE



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-3
Basing	9ER
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	600 Ma
Heater Warm-up Time[1]	11 Seconds
Heater-Cathode Voltage (Design Center Values)	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
DC	100 Volts Max.
Total DC and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Diode Section	
No. 1 Diode Plate to No. 1 Diode Cathode + Heater	1.9 $\mu\mu$f
No. 2 Diode Plate to No. 2 Diode Cathode + Heater	1.9 $\mu\mu$f
No. 1 Diode Cathode to No. 1 Diode Plate + Heater	4.6 $\mu\mu$f
No. 2 Diode Cathode to No. 2 Diode Plate + Heater	4.6 $\mu\mu$f
Triode Section	
Grid to Plate	2.6 $\mu\mu$f
Input: g to (h + Tk)	2.8 $\mu\mu$f
Output: p to (h + Tk)	0.31 $\mu\mu$f
Coupling	
No. 1 Diode Plate to Triode Grid	0.070 $\mu\mu$f Max.
No. 2 Diode Plate to Triode Grid	0.11 $\mu\mu$f Max.
No. 1 Diode Cathode to All:	
1 Dk to (h+Tk+2Dk+Tp+1Dp+Tg+2Dp)	4.8 $\mu\mu$f
No. 2 Diode Cathode to All:	
2 Dk to (h+Tk+1Dk+Tp+1Dp+2Dp+Tg)	4.8 $\mu\mu$f
No. 1 Diode Plate to No. 2 Diode Plate	0.060 $\mu\mu$f Max.
No. 1 Diode Plate to All:	
1 Dp to (h+Tk+1Dk+2Dk+Tp+2Dp+Tg)	3.0 $\mu\mu$f
No. 2 Diode Plate to All:	
2 Dp to (h+Tk+1Dk+2Dk+Tp+1Dp+Tg)	3.0 $\mu\mu$f

MAXIMUM RATINGS—Each Section

(Design Center Values—Except as Noted)

	Class A_1 Amplifier	Vertical Deflection Amplifier
Triode Section		
Plate Voltage	300	300 Volts
Peak Positive Pulse Plate Voltage (Abs. Max.)		1200 Volts
Peak Negative Pulse Grid Voltage		250 Volts
Positive DC Grid Voltage	0	0 Volts
Maximum Plate Dissipation[3]	3.5	3.5 Watts
Average Cathode Current	20	20 Ma
Peak Cathode Current		70 Ma
Grid Circuit Resistance		
Self Bias	1.0	2.2 Megohms
Fixed Bias	1.0	Megohms
Diode Section		
Peak Plate Current, (each plate)		54 Ma
DC Current, (each plate)		9 Ma

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier		**Triode Section**
Plate Voltage	90	250 Volts
Grid Voltage	0	−9 Volts
Plate Current	13.5	8.0 Ma
Transconductance	4700	2800 μmhos
Amplification Factor	22	20
Plate Resistance (approx.)	4700	7150 Ohms
Plate Current at E_c = −12.5 Volts DC		1.7 Ma
Grid Voltage (approx.) for I_b = 10 μa	−7	−18 Volts

CHARACTERISTICS AND TYPICAL OPERATION (Cont'd)

	Diode Section
Average Current Each Plate at 10 Volts D C[4]	50 Ma
Voltage Drop Each Section at I_b = 9 Ma DC	2.6 Volts

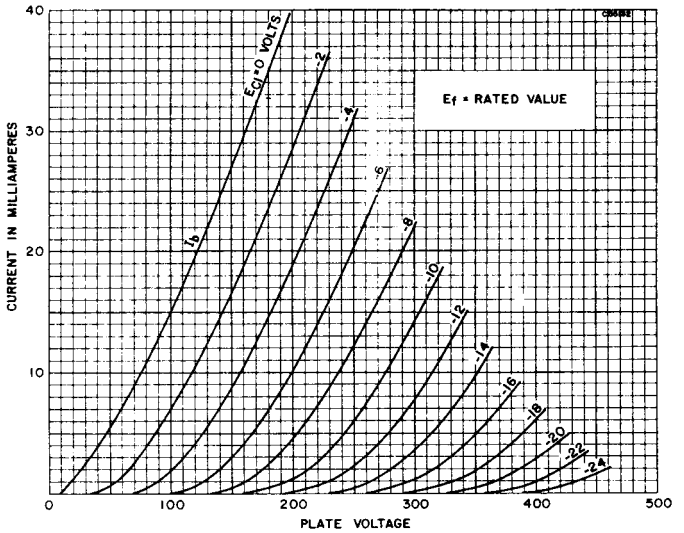
NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three times the rated heater voltage divided by the rated heater current.
2. For operation in a 525 line, 30-frame system as described in "Standards of Good Engineering Practice for Television Stations; Federal Communications Commission." The duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.
3. In stages operating with grid leak bias, an adequate cathode bias resistor or other suitable means is required to protect the tube in the absence of excitation.
4. Test conditions only.

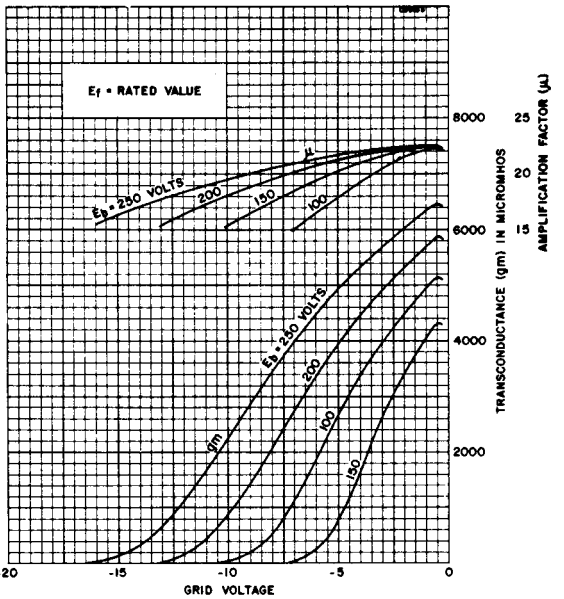
APPLICATION

The Sylvania Type 6BJ8 is a miniature, medium mu triode, double diode intended for use as a phase splitter, phase comparator and vertical deflection amplifier. The tube features controlled heater warm-up time to insure dependable operation in series string receivers and separate cathode connections for each section.

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



MECHANICAL DATA

Bulb	T-12
Base	B8-71, Short Jumbo Shell Octal, 8-Pin
Top Cap	C1-1, Small
Outline	See Drawing
Basing	8GC
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	200 Ma
Peak Heater-Cathode Voltage	
Heater Negative with respect to Cathode	225 Volts Max.
Heater Positive with Respect to Cathode	Not Recommended

DIRECT INTERELECTRODE CAPACITANCES

Grid to Plate	.03 $\mu\mu$f
Input	2.6 $\mu\mu$f
Output	1.0 $\mu\mu$f Max.

RATINGS (Design Center Values)

Voltage Control Service

DC Plate Voltage	25000 Volts Max.
Unregulated DC Supply Voltage	55000 Volts Max.
Grid Voltage	
DC	−125 Volts Max.
Peak	−400 Volts Max.
DC Plate Current	1.5 Ma Max.
Plate Dissipation	25 Watts Max.
Grid Circuit Resistance	3 Megohms Max.

CHARACTERISTICS

Amplification Factor	2000

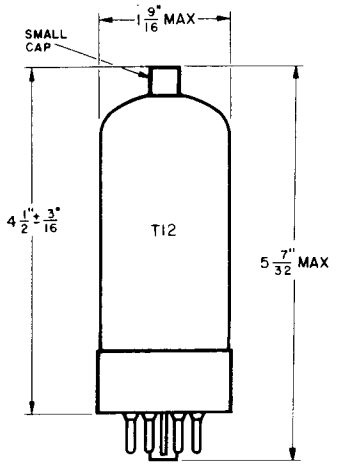
TYPICAL OPERATION

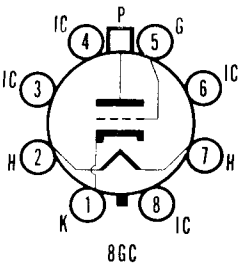
Shunt Voltage Regulator

Unregulated Supply	
DC Voltage	36000 Volts
Equivalent Resistance	11 Megohms
Voltage Divider Values	
R1 (5 watts)	220 Megohms
R2 (2 watts)	1 Megohm
R3 (½ watt)	.82 Megohm
Reference Voltage Supply	
DC Value	200 Volts
Equivalent Resistance	1000 Ohms
Effective Grid-Plate Transconductance	200 μmhos
DC Plate Current	
For Load Current of 0 Ma	1000 μa
For Load Current of 1 Ma	45 μa
Regulated DC Output Voltage	
For Load Current of 0 Ma	25000 Volts
For Load Current of 1 Ma	24500 Volts

QUICK REFERENCE DATA

The Sylvania Type 6BK4 is a low current, sharp cutoff, beam triode designed for use as a voltage regulator in high voltage, low current supplies. The 6BK4 has a maximum plate voltage rating of 25,000 volts, a maximum plate current rating of 1.5 Ma and a maximum plate dissipation of 25 watts.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

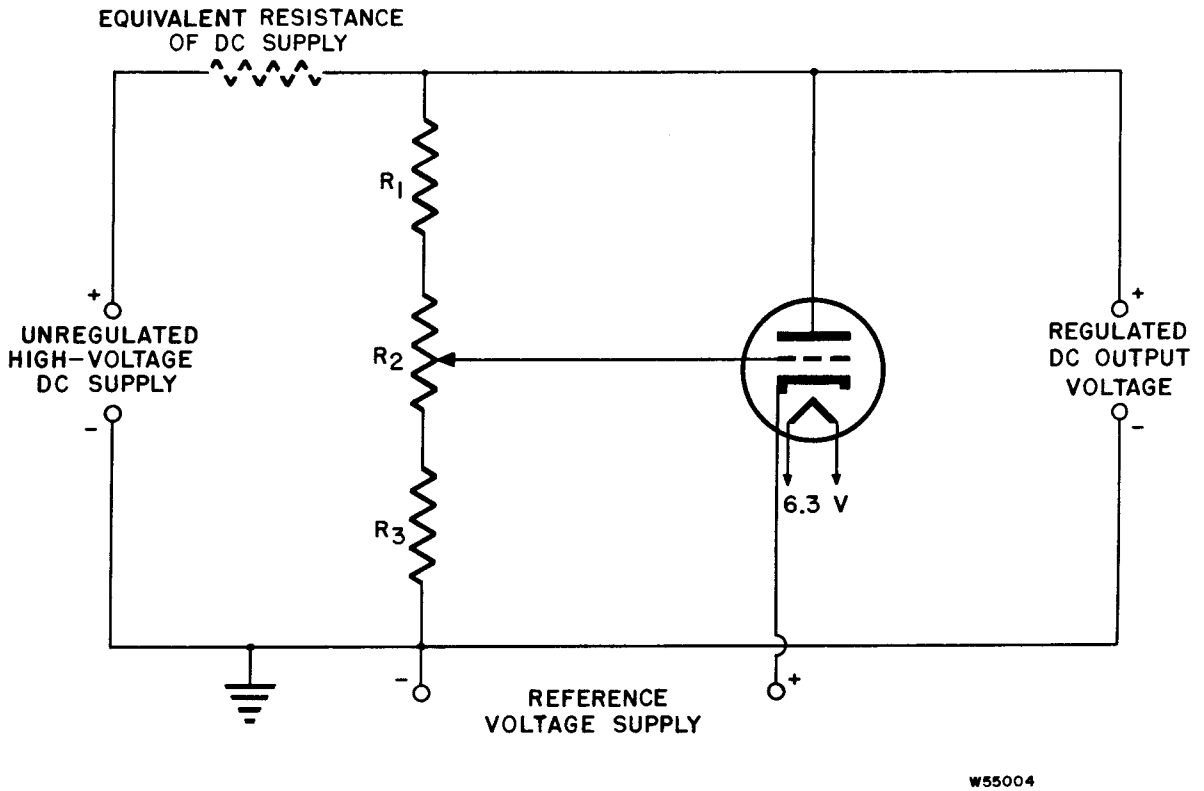
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

APRIL 1955

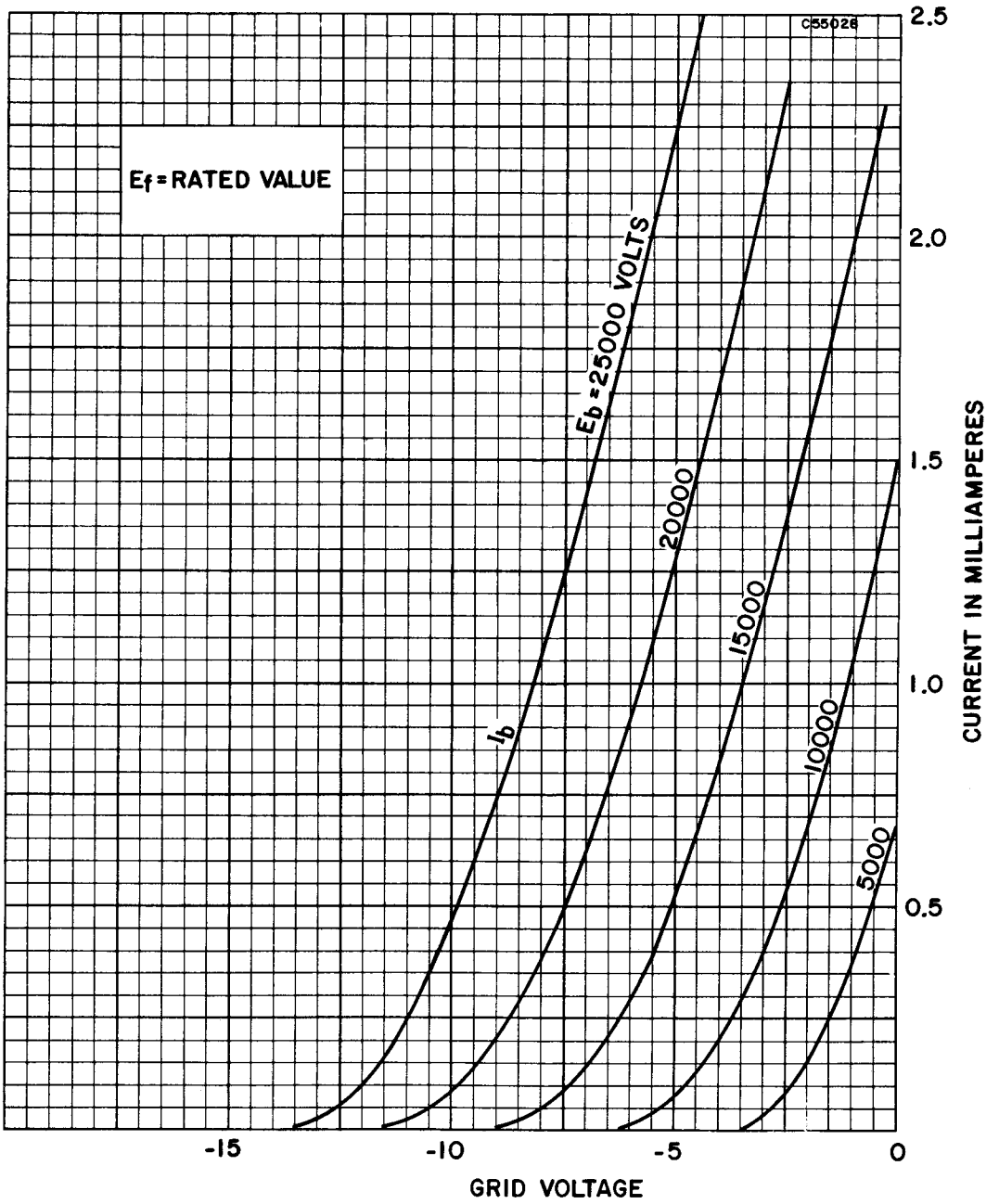
WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

SHUNT REGULATOR CIRCUIT



AVERAGE TRANSFER CHARACTERISTICS



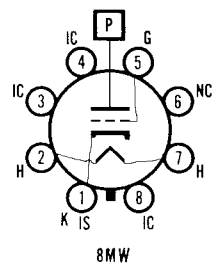
6BK4C/6EL4A

Color Television Type

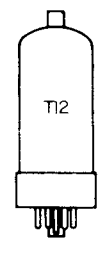
SHUNT VOLTAGE REGULATOR

Sharp Cutoff Beam Pentode

Construction	Octal T-12
Base	B8-71 or B8-118
Top Cap	Small C1-1 or C1-34
Basing	8MW
Outline	12-36
Maximum Diameter	1.720 In.
Maximum Seated Height	4.438 In.
Maximum Overall Height	5.000 In.



8MW



ELECTRICAL DATA

HEATER OPERATION

Heater Voltage	6.3 Volts
Heater Current	200 Ma
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	450 Volts
Heater Positive with Respect to Cathode	Not Recommended

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	1.0 Pf
Input	2.6 Pf
Output (Max.)	1.0 Pf

RATINGS (Design Maximum Rating System)

Voltage Control Service

DC Plate Voltage (Abs. Max.)	27,000 Volts
Unregulated DC Supply Voltage (Abs. Max.)	60,000 Volts
Grid Voltage	
DC (Max.)	−135 Volts
Peak (Max.)(1)	−440 Volts
DC Plate Current (Abs. Max.)	1.6 Ma
Plate Dissipation (Max.)	40 Watts
Grid Circuit Resistance (Abs. Max.)(2)	3 Megohms

CHARACTERISTICS AND TYPICAL OPERATION

Shunt Voltage Regulator

Unregulated Supply	
DC Voltage	36,000 Volts
Equivalent Resistance	11 Megohms
Voltage Divider Values	
R1 (5 Watts)	220 Megohms
R2 (2 Watts)	1 Megohm
R3 (½ Watt)	0.82 Megohm
Reference Voltage Supply	
DC Value	200 Volts
Equivalent Resistance	1000 Ohms
Effective Grid-Plate Transconductance	200 μmhos
DC Plate Current	
For Load Current of 0 Ma	1000 μa
For Load Current of 1 Ma	45 μa
Regulated DC Output Voltage	
For Load Current of 0 Ma	25,000 Volts
For Load Current of 1 Ma	24,500 Volts
Amplification Factor	2000

X-RADIATION CHARACTERISTIC

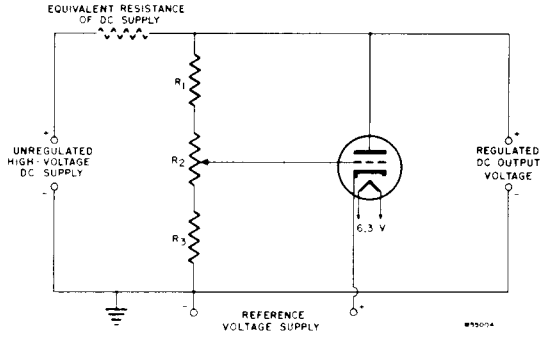
Maximum X-Radiation (3)	1.5 mR/h

NOTES:

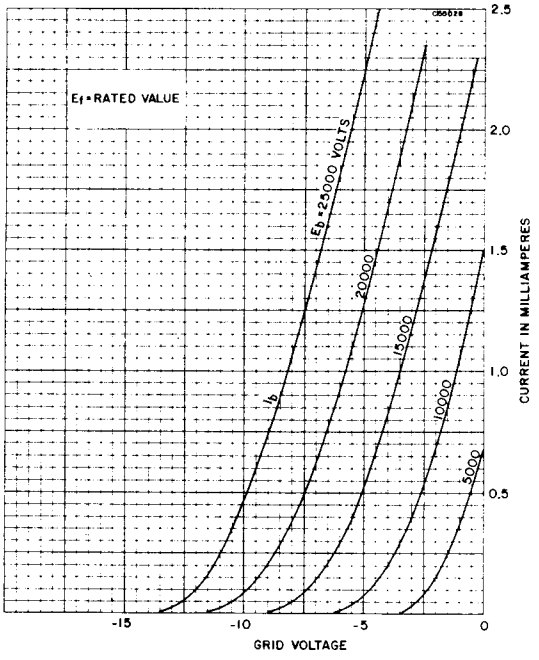
(1) Peak value for maximum of 20 seconds during equipment warm-up.
(2) With flyback transformer high voltage supply.
(3) Statistical value controlled on a lot sampling basis

X-RADIATION WARNING: The high voltages associated with this tube type result in the production of X-radiation which may constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Precautions must be exercised during the servicing of equipment to assure that all shielding components are replaced to their intended positions before the equipment is operated.

SHUNT REGULATOR CIRCUIT



TRANSFER CHARACTERISTICS (6BK4C/6EL4A)



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RMA Registration Data

TYPE 6BK6

DOUBLE - DIODE TRIODE

MECHANICAL DATA

Style	miniature
Cathode	coated, unipotential
Bulb	T-5 1/2
Base	E7-1, miniature button 7-pin
Outline	5-3
Maximum Diameter	3/4 inch
Maximum Overall Length	2 5/8 inches
Maximum Seated Height	2 3/8 inches
Basing	7BT-0-2

Pin Connections:

Pin 1 .. grid	Pin 5 .. #2 diode plate
Pin 2 .. cathode, diode shield	Pin 6 .. #1 diode plate
Pin 3 .. heater	Pin 7 .. triode plate
Pin 4 .. heater	

Mounting Position ..... any

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES

	without shield	*with shield*(1)	
#2 Diode Input: #2p to (h+k+i.s.)	1.0	1.0	μμf
#1 Diode Input: #1p to (h+k+i.s.)	1.0	1.0	μμf
#1 Diode Plate to Grid, maximum	.013	.01	μμf

RATINGS -- *Design Center Values*

Heater Voltage (ac or dc)	6.3	volts
Maximum Heater-Cathode Voltage	90	volts
Maximum Plate Voltage (dc)	300	volts
Maximum Positive Grid Voltage (dc)	0	volts
Maximum Continuous Diode Current (each plate)	1.0	milliamp

CHARACTERISTICS

Heater Voltage	6.3	6.3	volts
Heater Current	300	300	milliamps
Plate Voltage (dc)	100	250	volts
Grid Voltage (dc)	-1	-2	volts
Plate Resistance	80,000	62,500	ohms
Plate Current	0.5	1.2	milliamps
Transconductance	1,250	1,600	micromhos
Amplification Factor	100	100	
Average Diode Current, at 10 volts dc (each plate)		4.0	milliamps

(1) External shield #316 connected to Pin 2.

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6BK7

MECHANICAL DATA

Bulb	T-6½
Base	Small Button 9-Pin
Basing	9AJ
Cathode	Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	450 Ma

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)[1]

	Section 1		Section 2
Grid to Plate	1.9		1.9 μμf
Input	3.0		3.0 μμf
Output	1.1		1.0 μμf
Heater to Cathode	3.2		3.4 μμf
Grid to Grid (Max.)		0.003	μμf
Plate to Plate (Max.)		0.075	μμf
Ground Grid Operation			
Plate to Cathode	0.24		0.24 μμf
Input	6.0		6.0 μμf
Output	2.8		2.6 μμf

RATINGS (Design Center Values)

Plate Voltage	300 Volts Max.
Plate Dissipation (Each Section)	2.7 Watts Max.
Heater-Cathode Voltage[2]	90 Volts Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier (Each Section)

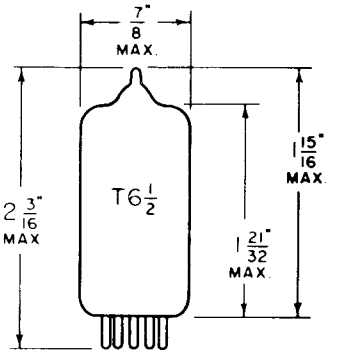
Plate Voltage	100	150 Volts
Cathode Bias Resistor	120	56 Ohms
Plate Current	9.0	18 Ma
Transconductance	6100	8500 μmhos
Amplification Factor	37	40
Plate Resistance	6100	4700 Ohms
Grid Voltage for I_b = 10 μa	-9	-12 Volts

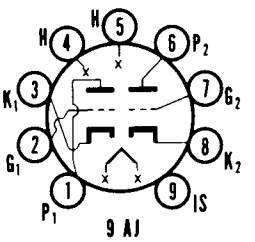
NOTES:

1. *Section 1 connects to Pins 6, 7 and 8. Section 2 connects to Pins 1, 2 and 3.*
2. *When operated as a cascode amplifier and the two sections are connected in series, the heater-cathode voltage of the grounded grid stage may be as high as 250 volts maximum with the heater negative with respect to the cathode.*

QUICK REFERENCE DATA

Miniature medium mu twin triode designed for use as a cascode amplifier below approximately 300 mc. Shielding between sections minimizes internal capacity coupling.





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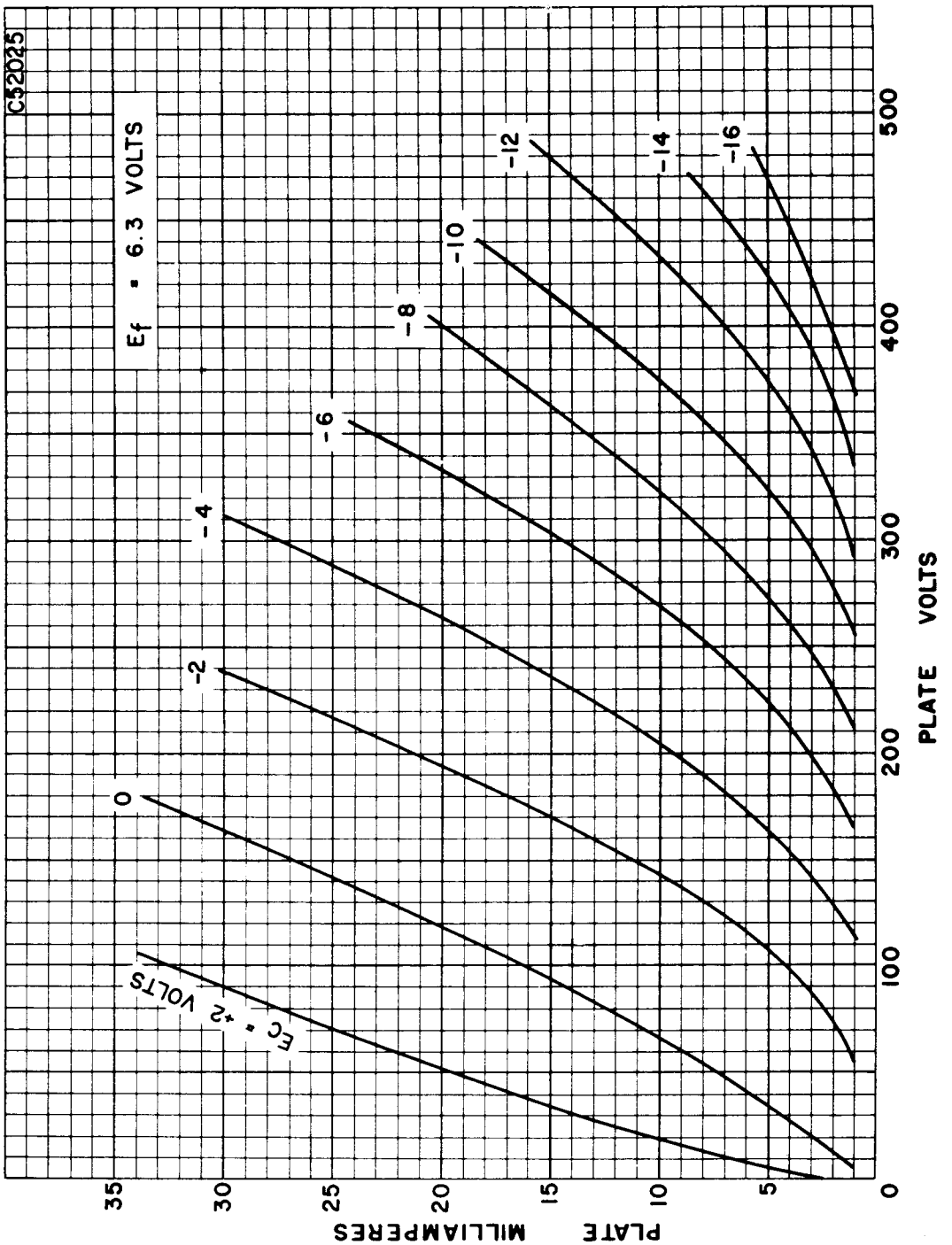
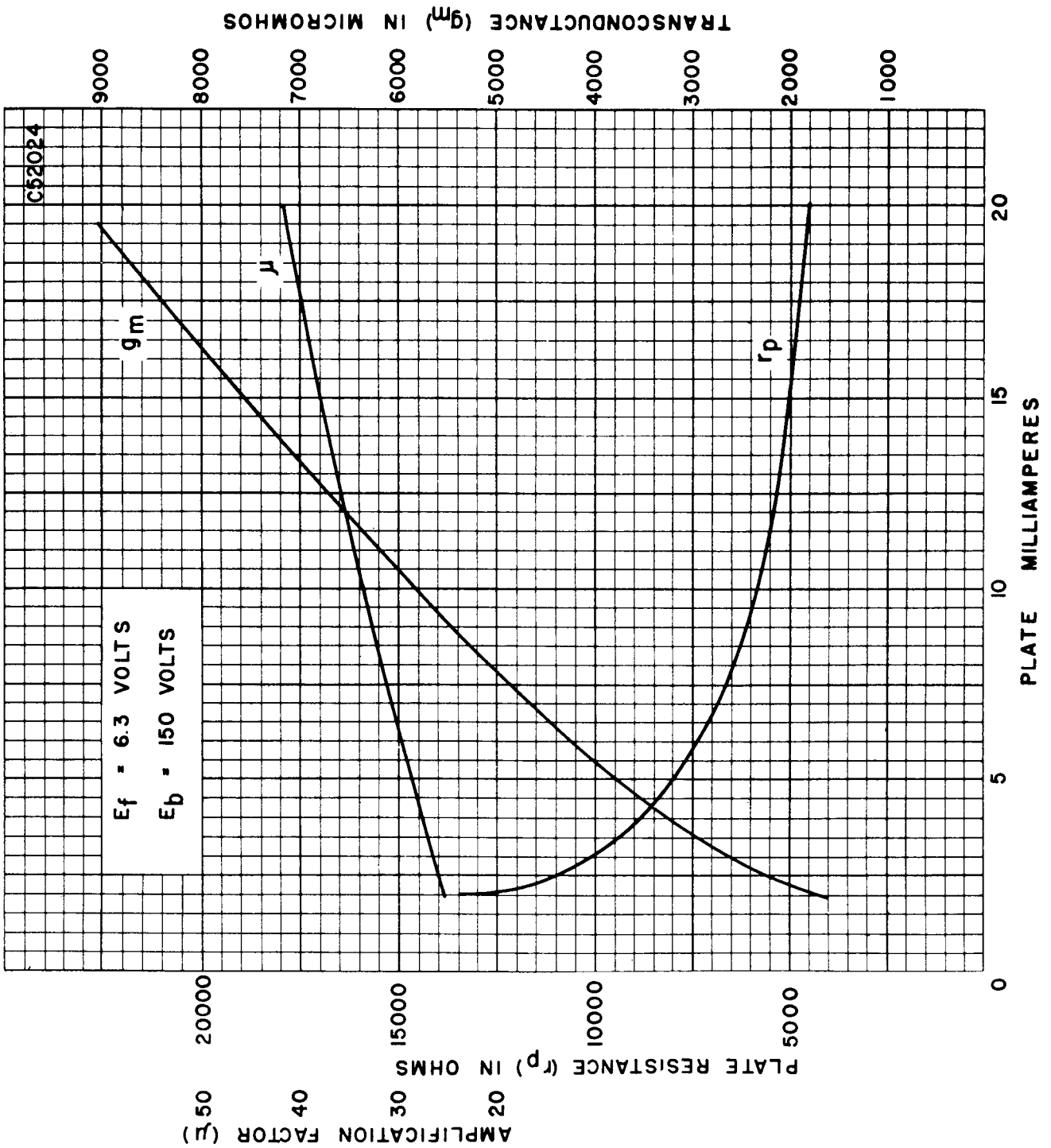
AVERAGE PLATE CHARACTERISTICS



AVERAGE CHARACTERISTICS



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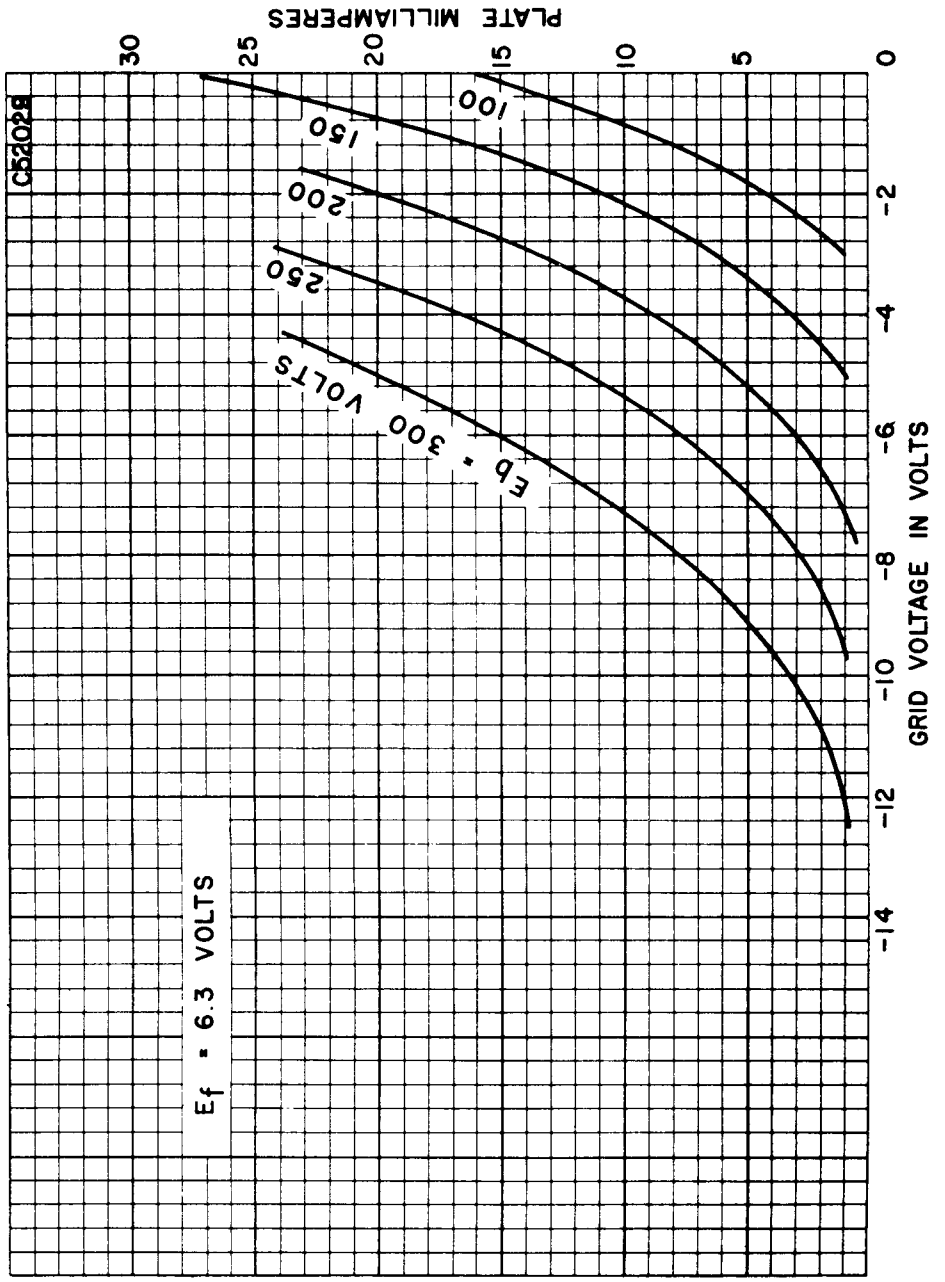
AVERAGE CHARACTERISTICS



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6BL4

MECHANICAL DATA

Bulb	T-12
Base	B8-71, Short Jumbo Shell Octal 8-Pin
Outline	See Drawing
Basing	8GB
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	3.0 Amperes
Heater-Cathode Voltage[1]	
Heater Positive with Respect to Cathode	
DC	100 Volts Max.
Total DC and Peak	300 Volts Max.
Heater Negative with Respect to Cathode	
DC	900 Volts Max.
Total DC and Peak (Absolute Value)	4500 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Approx.)

Plate to Heater and Cathode	11.5 $\mu\mu$f
Cathode to Heater and Plate	16 $\mu\mu$f
Heater to Cathode	5 $\mu\mu$f

RATINGS (Design Center Values — Except as Noted)

Damper Service[2]

Peak Inverse Plate Voltage (Absolute Value)	4500 Volts	Max.
Peak Plate Current	1200 Ma	Max.
DC Plate Current	200 Ma	Max.
Plate Dissipation	8.0 Watts	Max.

NOTES:

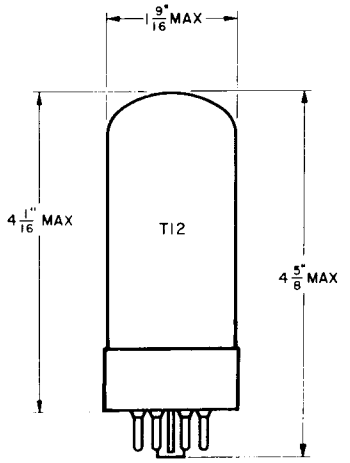
1. *Design center values except as noted.*
2. *For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations; Federal Communications Commission", the duty cycle of the voltage pulse must not exceed 15% of one horizontal scanning cycle.*

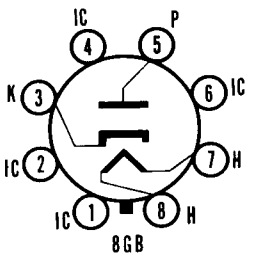
WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

QUICK REFERENCE DATA

The Sylvania Type 6BL4 is a a half-wave rectifier employing an indirectly heated cathode and a T-12 envelope. It is designed for application as a damper diode in color television receivers.





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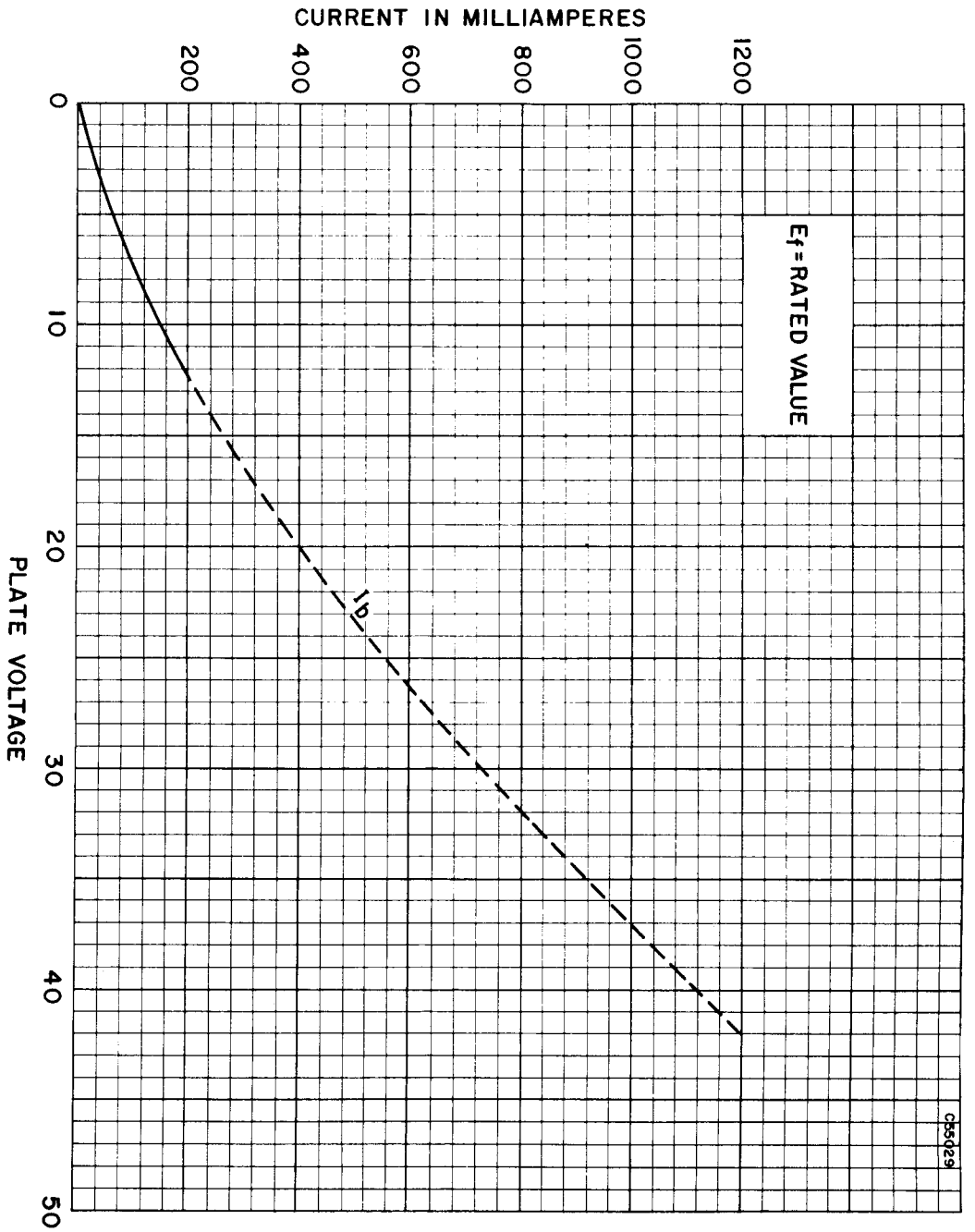
RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

APRIL 1955

AVERAGE PLATE CHARACTERISTICS



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6BL6

MECHANICAL DATA

Base	A4-76, Peewee 4 Pin
Cap	C1-3, Skirted Miniature
Cooling	Convection and Conduction. Contact rings are to make direct peripheral contact with metallic parts of the external cavity.
Mounting Position	Any

Connections:

Pin 1 — Control Electrode	Lower Contact Ring — 1st Resonator
Pin 2 — Heater	Upper Contact Ring — 2nd Resonator
Pin 3 — Cathode	Cap — Reflector
Pin 4 — Heater	

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage, AC or DC (±8%)	6.3 Volts
Heater Current	750 Ma

RATINGS (Absolute Values)

Resonator Voltage	350 Volts	dc Max.
Resonator Current	35 Ma	dc Max.
Reflector Voltage	−750 Volts	dc Max.
	−15 Volts	dc Min.
Control Electrode Voltage	+1 Volt	dc Max.
	−500 Volts	dc Max.
Heater-Cathode Voltage	±45 Volts	dc Max.
Power Input	12 Watts	Max.
Seal Temperature	175°C	Max.

GENERAL

Reflector Mode	1-3/4	2-3/4	3-3/4	
Frequency	4000	4500	6500	Mc
	1600	2100	3600	Mc

TYPICAL OPERATION

CW Oscillator, Fig. 1

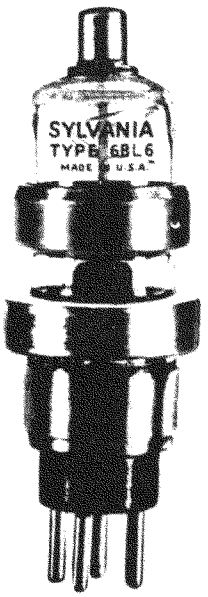
Reflector Mode	1-3/4	2-3/4	3-3/4	
Cavity Mode	3/4	3/4	5/4	
Frequency	2800	3200	5000	Mc
Resonator Voltages	325	325	325	Volts
Cathode Current	28	26	25	Ma
Reflector Voltage (approx.)	−220	−120	−220	Volts
Power Output	250	100	60	Mw
Electronic Tuning Range (Between Half Power Points)	6	6	6	Mc

APPLICATION DATA

The Sylvania Type 6BL6 is a broadband reflex klystron designed for cw operation. In conjunction with external cavity resonators, this tube operates over the frequency range from 550 to 3800 megacycles in three modes. The 6BL6 is particularly adapted for use in signal generators, spectrum analyzers or local oscillator applications where broadband frequency coverage is needed.

QUICK REFERENCE DATA

The Sylvania Type 6BL6 is a broadband reflex klystron, 1600 to 6500 Mc. It is designed for service as a CW oscillator using an external cavity.



SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

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APPLICATION DATA

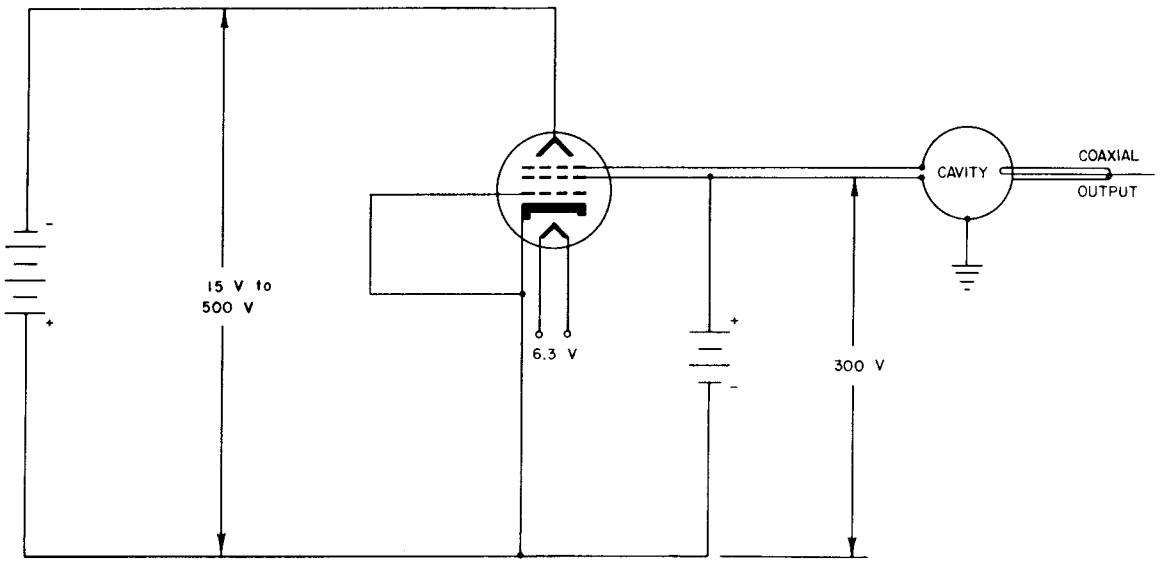
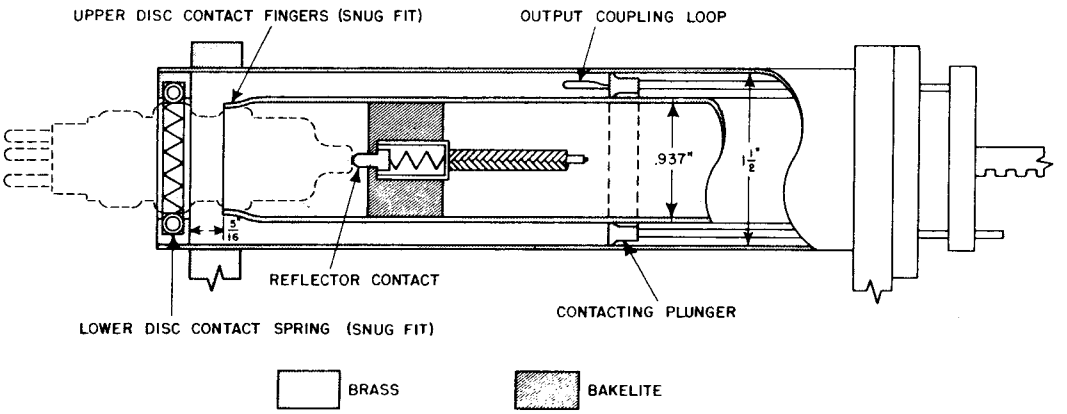


FIG. 1 — CW OSCILLATOR CIRCUIT EMPLOYING THE 6BL6 REFLEX KLYSTRON

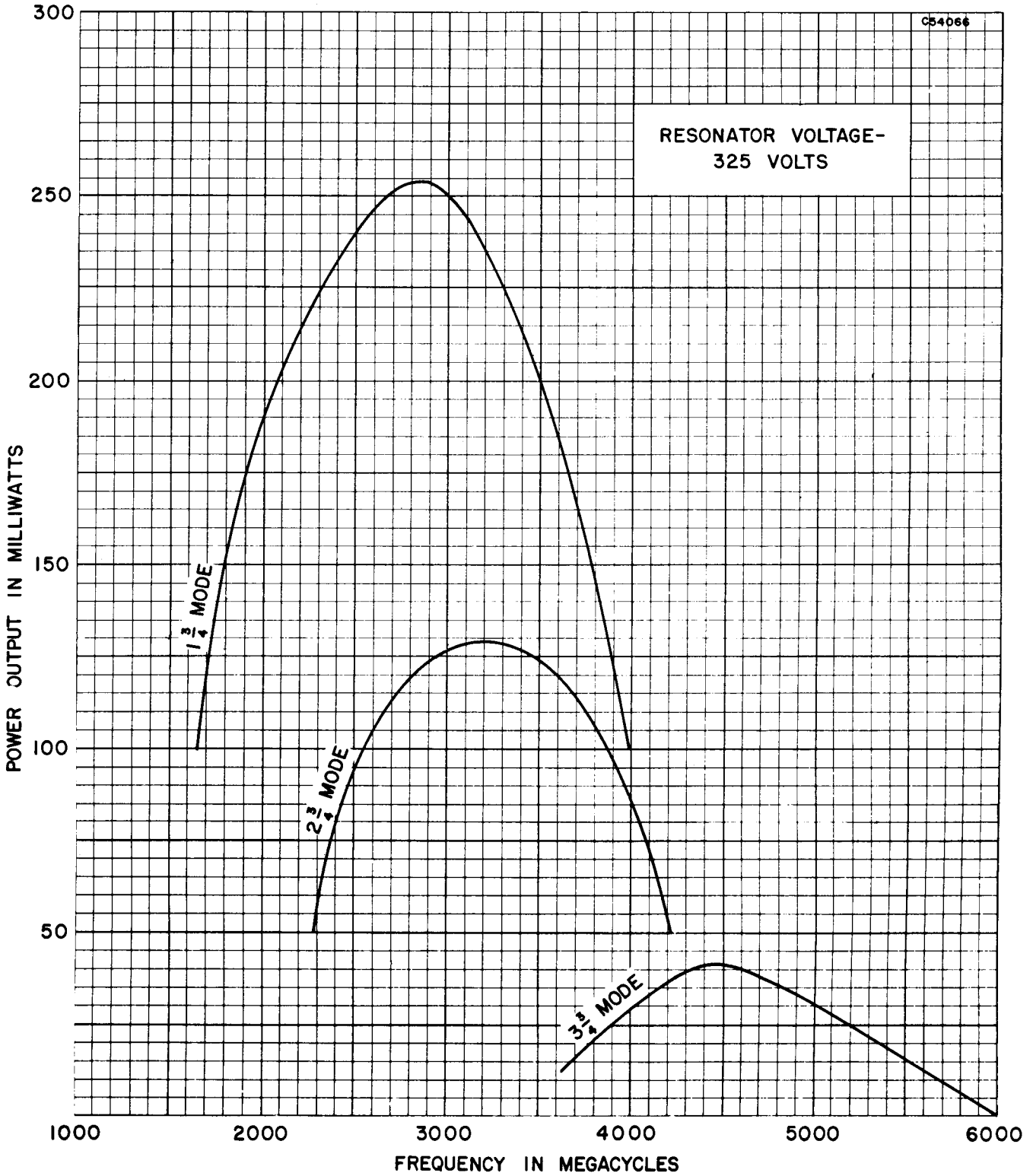


Recess in Contact Plunger	1/2"	Loop Size for 3000-5000 mc	9/32"
Loop Size for 800-3500 mc	9/16"	Loop Width for Both Ranges	.175"

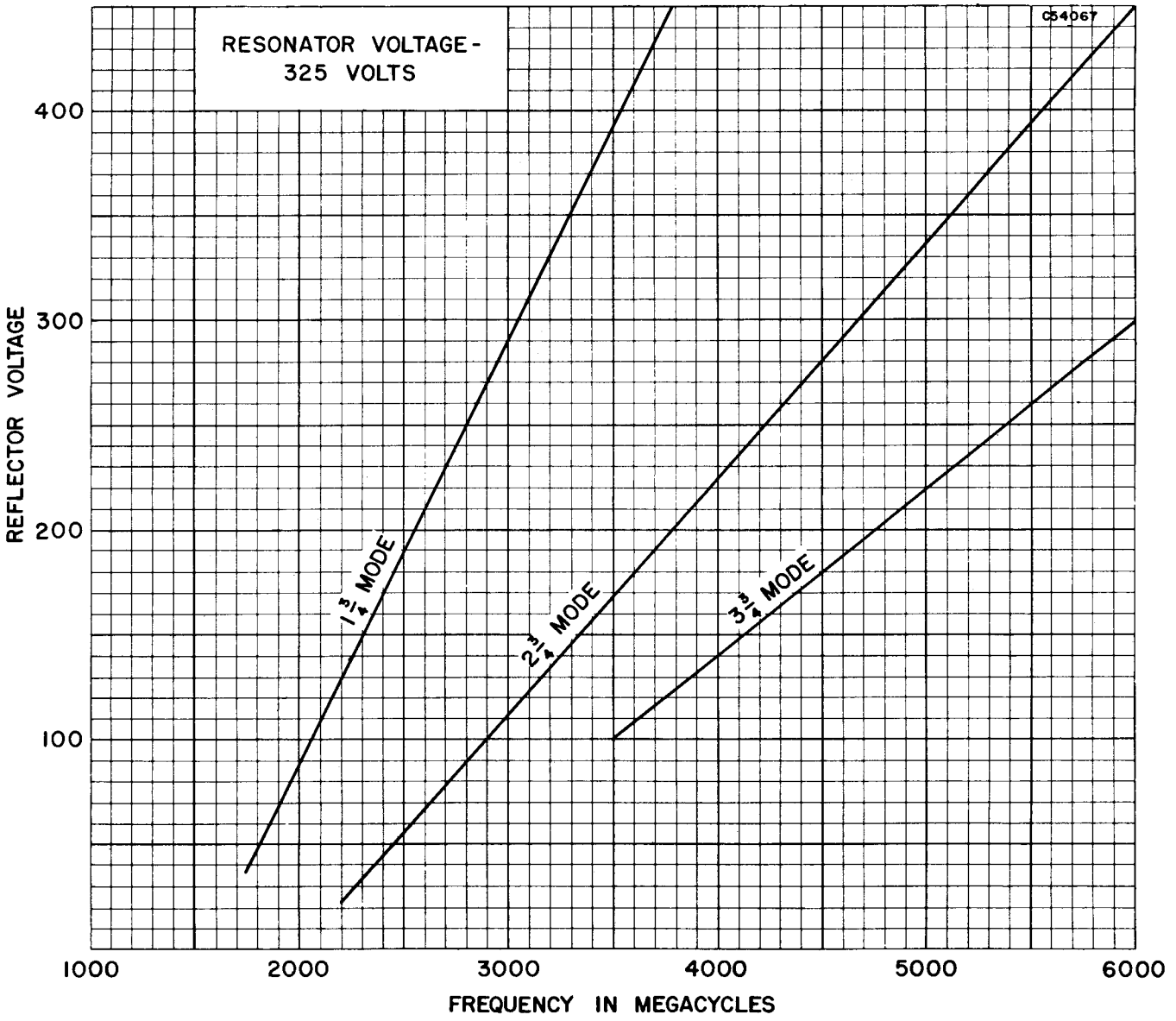
The length is determined by the frequency of operation and the range of plunger motion is set by the frequency band to be covered.

FIG. 2 — DIAGRAM OF A TYPICAL COAXIAL CAVITY FOR USE WITH THE 6BL6 SHOWING ESSENTIAL DIMENSIONS

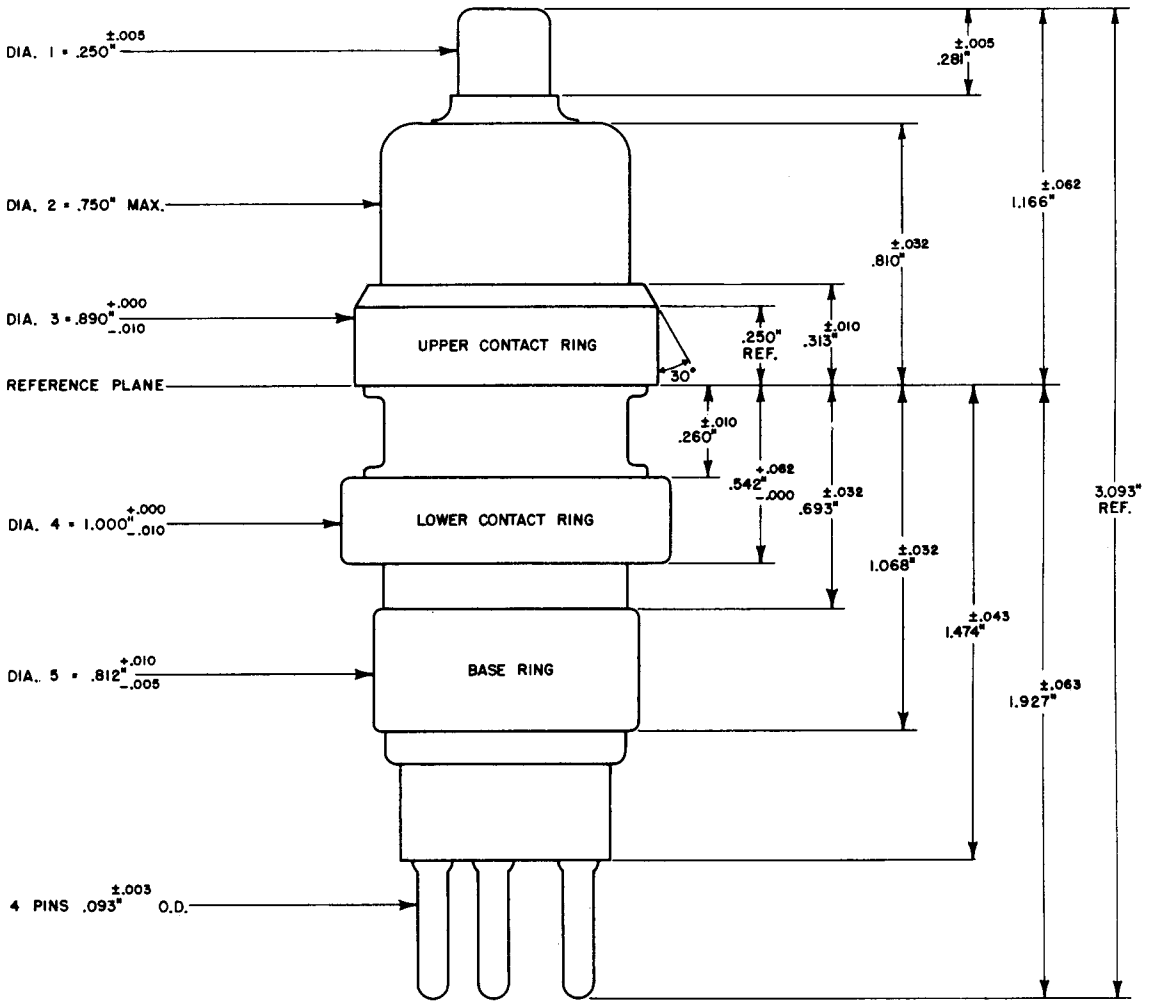
AVERAGE CHARACTERISTICS

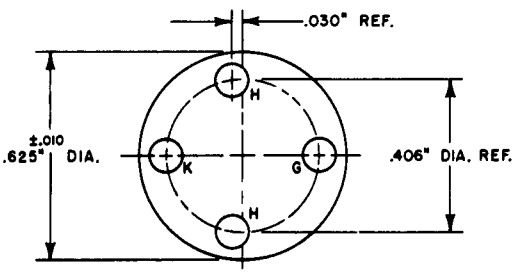


AVERAGE CHARACTERISTICS



OUTLINE DRAWING





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6BM6

MECHANICAL DATA

Base	A4-76, Peewee 4 Pin
Cap	C1-3, Skirted Miniature
Cooling	Convection and Conduction. Contact rings are to make direct peripheral contact with metallic parts of the external cavity.
Mounting Position	Any

Connections:

Pin 1 — Control Electrode	Lower Contact Ring — 1st Resonator
Pin 2 — Heater	Upper Contact Ring — 2nd Resonator
Pin 3 — Cathode	Cap — Reflector
Pin 4 — Heater	

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage AC or DC (±8%)	6.3 Volts
Heater Current	650 Ma

RATINGS (Absolute Values)

Resonator Voltage	350 Volts	dc Max.
Resonator Current	29 Ma	dc Max.
Reflector Voltage	-700 Volts	dc Max.
	-15 Volts	dc Min.
Control Electrode Voltage	+1 Volt	dc Max.
	-50 Volts	dc Max.
Heater-Cathode Voltage	±45 Volts	dc Max.
Power Input	10 Watts	Max.
Seal Temperature	175°C	Max.

GENERAL

Reflector Mode	1-3/4	2-3/4	3-3/4	
Frequency	2300	3000	3800	Mc
	550	1100	1500	Mc

TYPICAL OPERATION

CW Oscillator

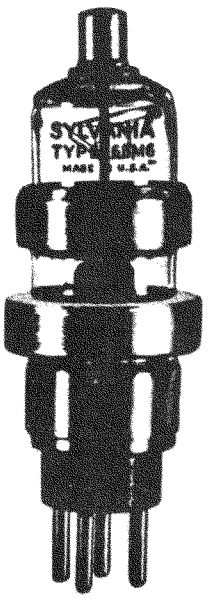
Reflector Mode	1-3/4	2-3/4	3-3/4	
Cavity Mode	3/4	3/4	5/4	
Frequency	1500	2200	3000	Mc
Resonator Voltage	325	300	325	Volts
Cathode Current	18	15	18	Ma
Reflector Voltage (approx.)	-235	-200	-250	Volts
Power Output	175	70	50	Mw
Electronic Tuning Range (Between Half Power Points)	6	6	6	Mc

APPLICATION DATA

The Sylvania Type 6BM6 is a broadband reflex klystron designed for cw operation. In conjunction with external cavity resonators, this tube operates over the frequency range from 550 to 3800 megacycles in three modes. The 6BM6 is particularly adapted for use in signal generator, spectrum analyzer, or local oscillator applications where broadband frequency coverage is needed.

QUICK REFERENCE DATA

The Sylvania Type 6BM6 is a broadband reflex klystron, 550 to 3800 Mc It is designed for service as a CW oscillator using an external cavity.



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ELECTRONICS DIVISION
WOBURN, MASS.

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5-54-84

APPLICATION DATA

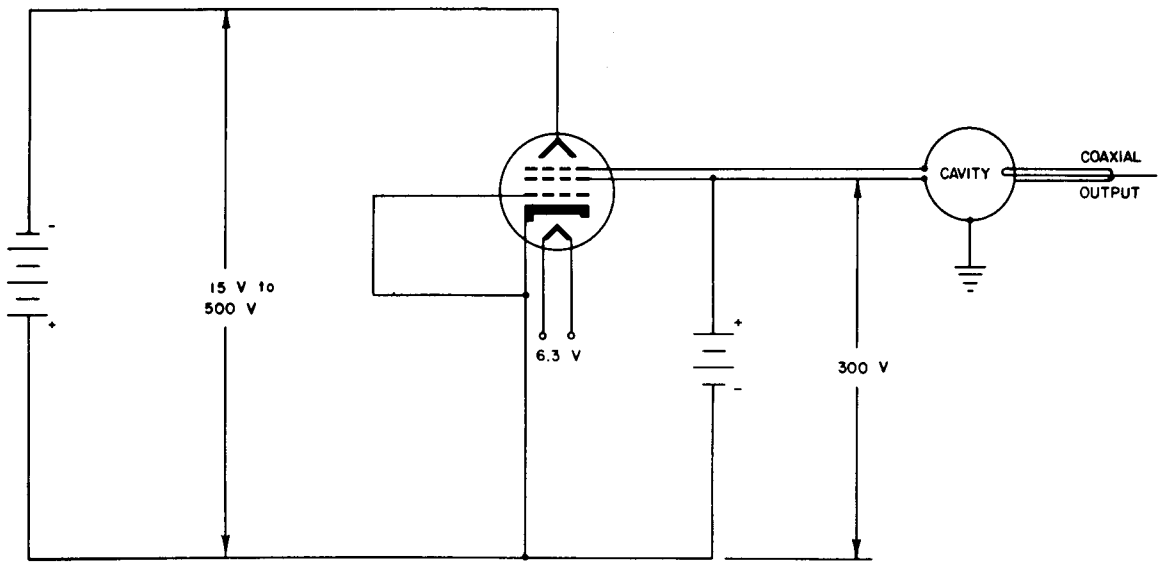
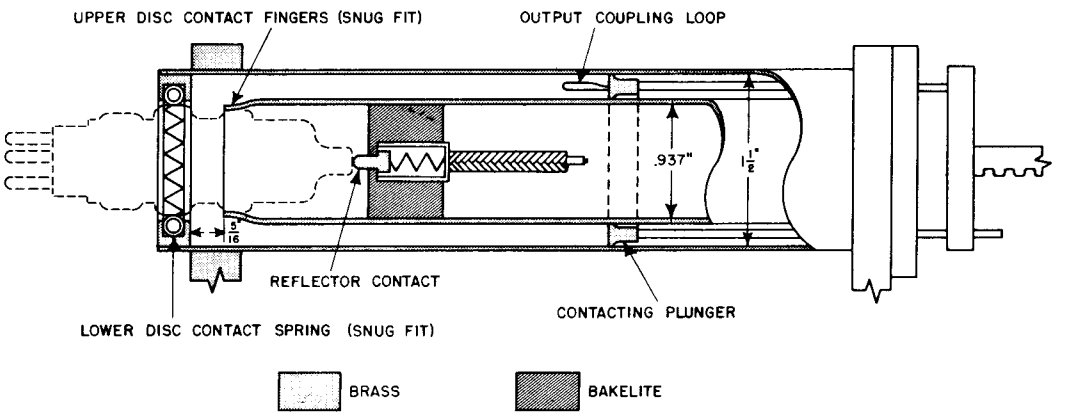


FIG. 1 — OSCILLATOR CIRCUIT EMPLOYING THE 6BM6 REFLEX KLYSTRON

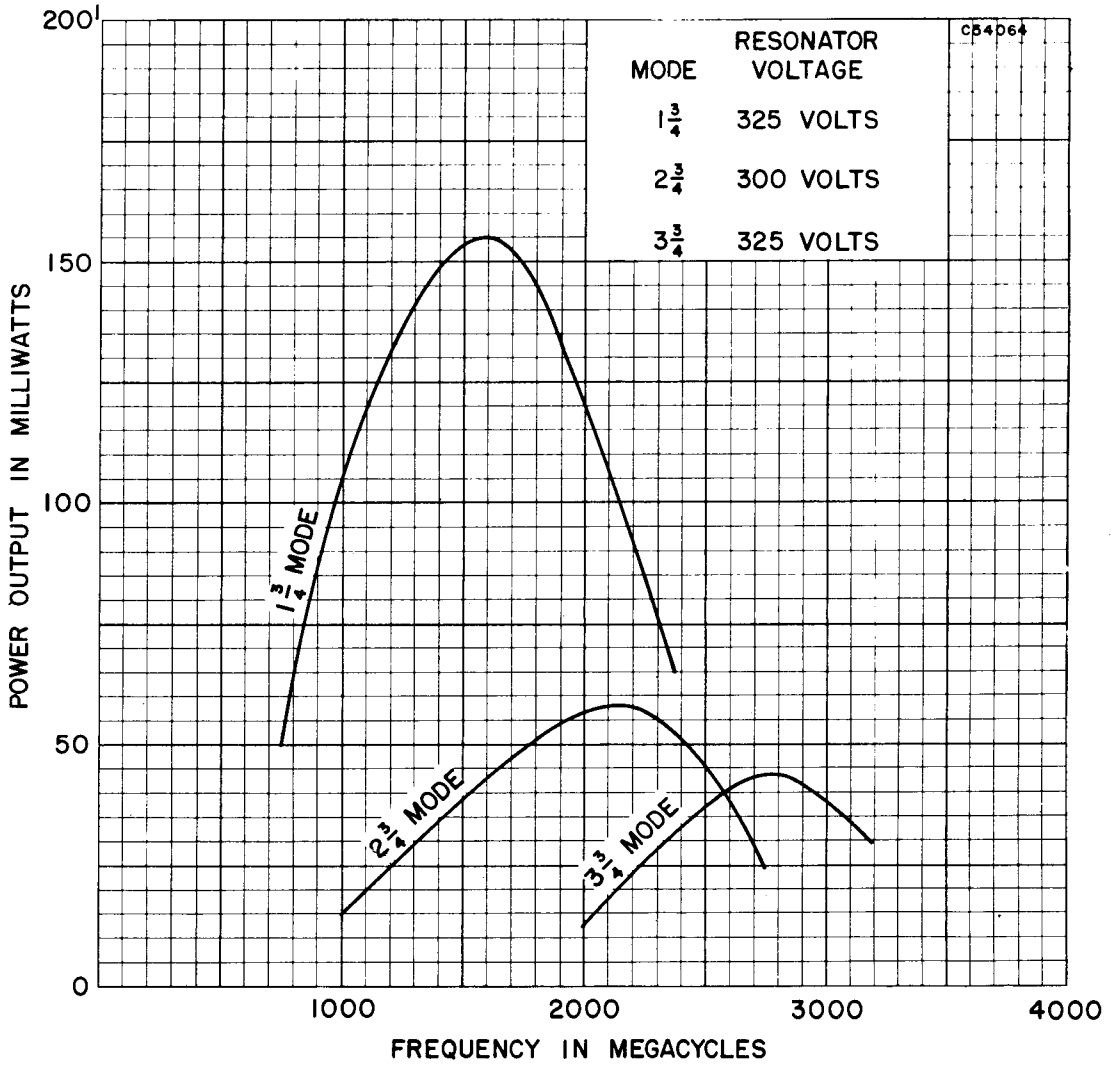


Recess in Contact Plunger	1/2"	Loop Size for 3000-5000 mc	9/32"
Loop Size for 800-3500 mc	9/16"	Loop Width for Both Ranges	.175"

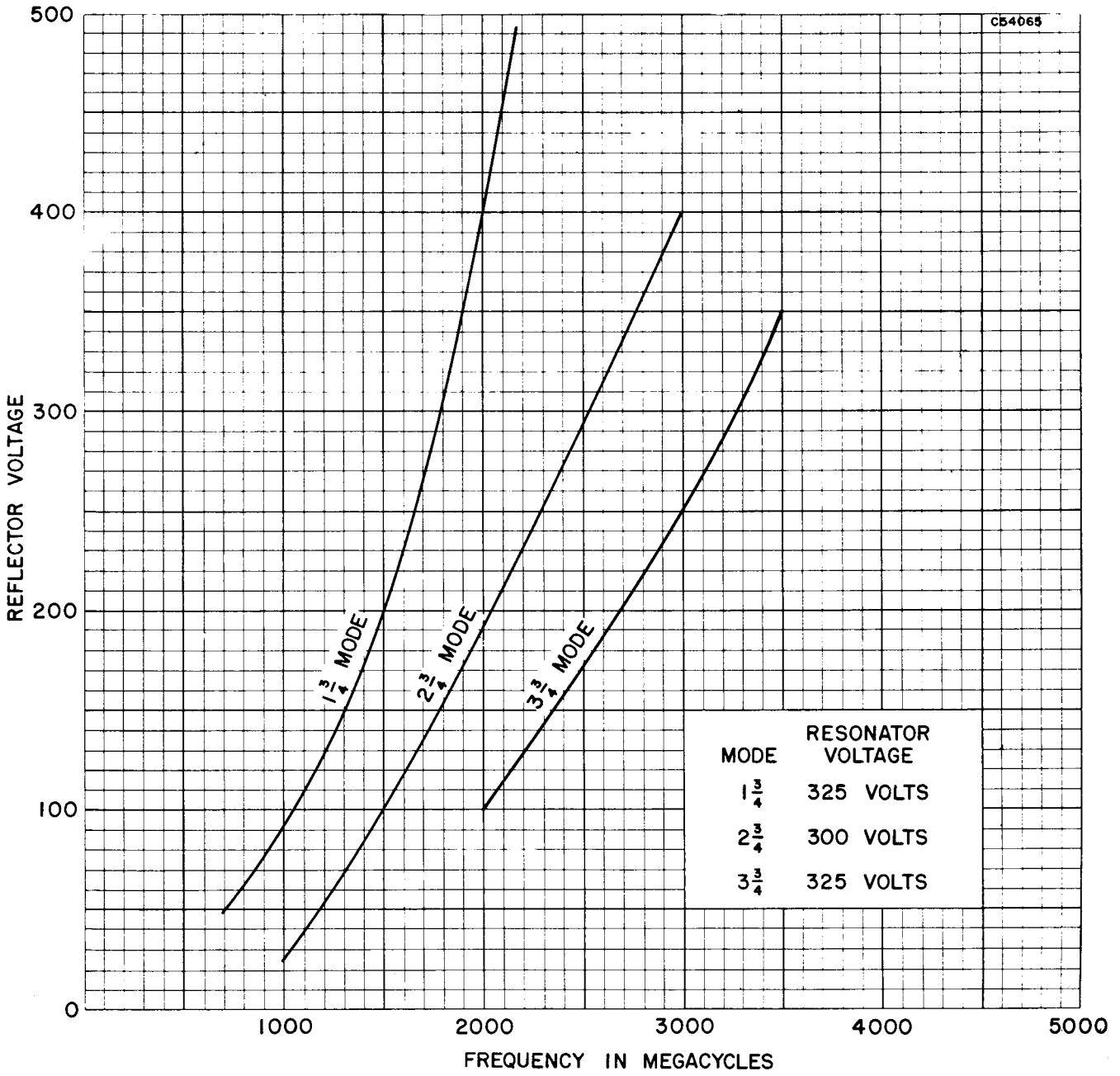
The length is determined by the frequency of operation and the range of plunger motion is set by the frequency band to be covered.

FIG. 2 — DIAGRAM OF A TYPICAL COAXIAL CAVITY FOR USE WITH THE 6BL6 SHOWING ESSENTIAL DIMENSIONS

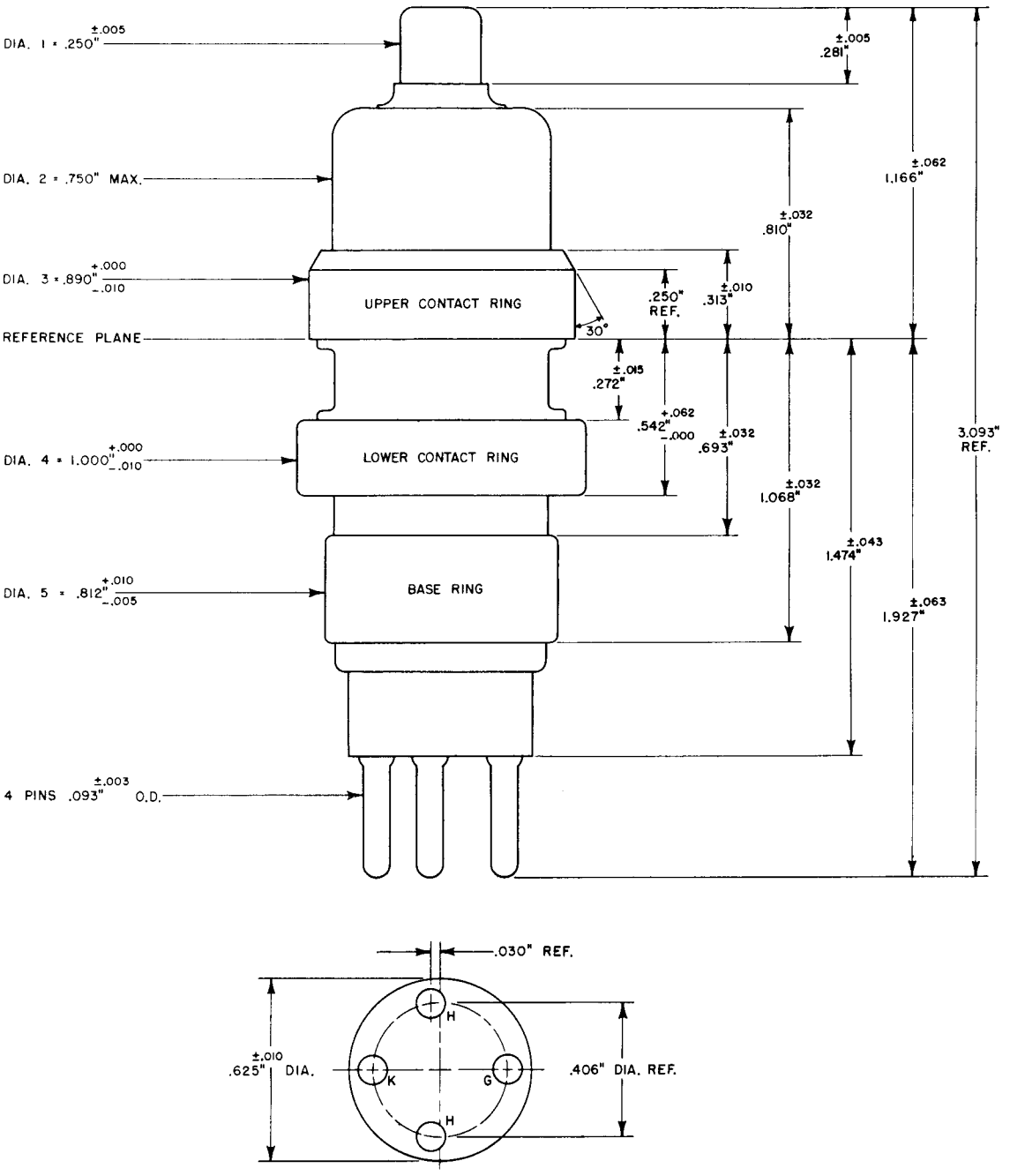
AVERAGE CHARACTERISTICS



AVERAGE CHARACTERISTICS



OUTLINE DRAWING



SYLVANIA

engineering data service

SYLVANIA

6BM6A

MECHANICAL DATA

Base . . . . . A4-76, Peewee 4 Pin
Cap . . . . . C1-3, Skirted Miniature
Cooling . . . . . Convection and Conduction. Contact rings are to make direct peripheral contact with metallic parts of the external cavity.
Mounting Position . . . . . Any
Connections:
Pin 1 — Control Electrode . . Lower Contact Ring — 1st Resonator
Pin 2 — Heater . . . . . Upper Contact Ring — 2nd Resonator
Pin 3 — Cathode . . . . . Cap — Reflector
Pin 4 — Heater . . . . .

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage, AC or DC (±10%) . . . . . 6.3 Volts
Heater Current . . . . . 650 Ma

RATINGS (Absolute Values)

Resonator Voltage	350 Volts	dc Max.
Resonator Current	29 Ma	dc Max.
Reflector Voltage	−700 Volts	dc Max.
	−15 Volts	dc Min.
Control Electrode Voltage	+1 Volt	dc Max.
	−500 Volts	dc Max.
Heater-Cathode Voltage	±45 Volts	dc Max.
Power Input	10 Watts	Max.
Seal Temperature	175°C	Max.

GENERAL

Reflector Mode	1-3/4	2-3/4	3-3/4	
Frequency	2300	3000	3800	Mc
	550	1100	1500	Mc

TYPICAL OPERATION

CW Oscillator

Reflector Mode	1-3/4	2-3/4	3-3/4	
Cavity Mode	3/4	3/4	5/4	
Frequency	1500	2200	3000	Mc
Resonator Voltage	325	300	325	Volts
Cathode Current	18	15	18	Ma
Reflector Voltage (approx.)	−235	−200	−250	Volts
Control Electrode (Full Power Output)	−300	−300	−300	Volts
Power Output	175	70	50	Mw
Electronic Tuning Range (Between Half Power Points)	6	6	6	Mc

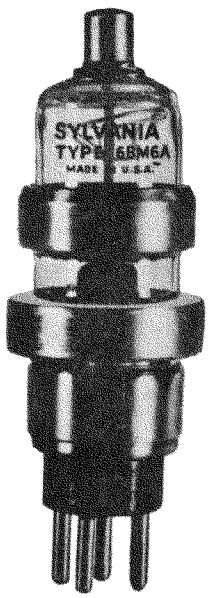
Pulse Modulated Oscillator

For pulse operation, the general conditions are the same except as noted below: The peak power output with the tube modulated by the control electrode is not more than 1.5 db below the cw output within the rated frequency range.

Control Electrode Voltage	−300 Volts
Pulse Modulation Voltage	+300 Volts
Pulse Repetition Rate	40-4000 PPS
Minimum Pulse Duration	0.5 μsec.
Rise Time	0.1 μsec.
Decay Time	0.1 μsec.
Jitter	.15 μsec.

QUICK REFERENCE DATA

The Sylvania Type 6BM6A is a broadband reflex klystron, 550 to 3800 Mc. It is designed for service as a CW or pulse modulated oscillator using an external cavity.



SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

5-54-85

APPLICATION DATA

The Sylvania 6BM6A is a broadband reflex klystron designed for cw or pulsed operation in conjunction with external cavity resonators. This tube operates over the range from 1500 to 3000 Mc in three modes. The 6BM6A is particularly adapted for use in signal generators, spectrum analyzers or local oscillator applications where broadband frequency coverage is needed.

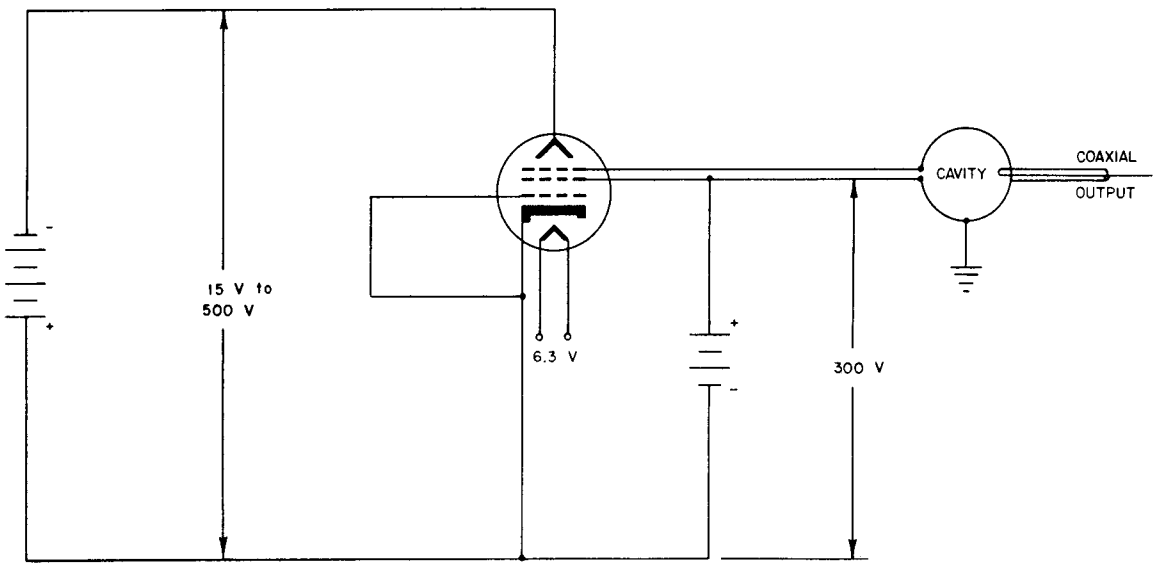


FIG. 1 — CW OSCILLATOR CIRCUIT EMPLOYING THE 6BM6A REFLEX KLYSTRON

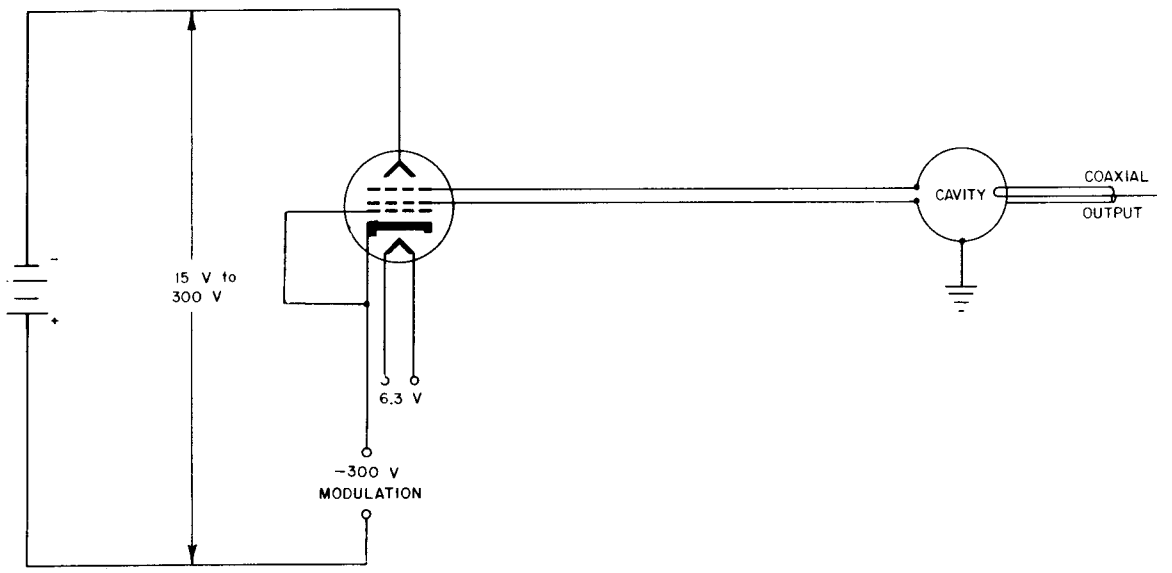
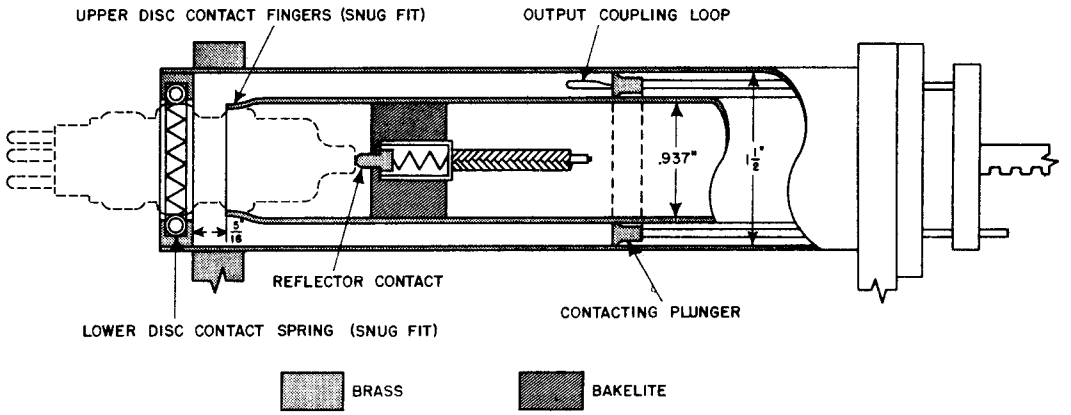


FIG. 2 — PULSE MODULATED OSCILLATOR CIRCUIT EMPLOYING THE 6BM6A REFLEX KLYSTRON

APPLICATION DATA

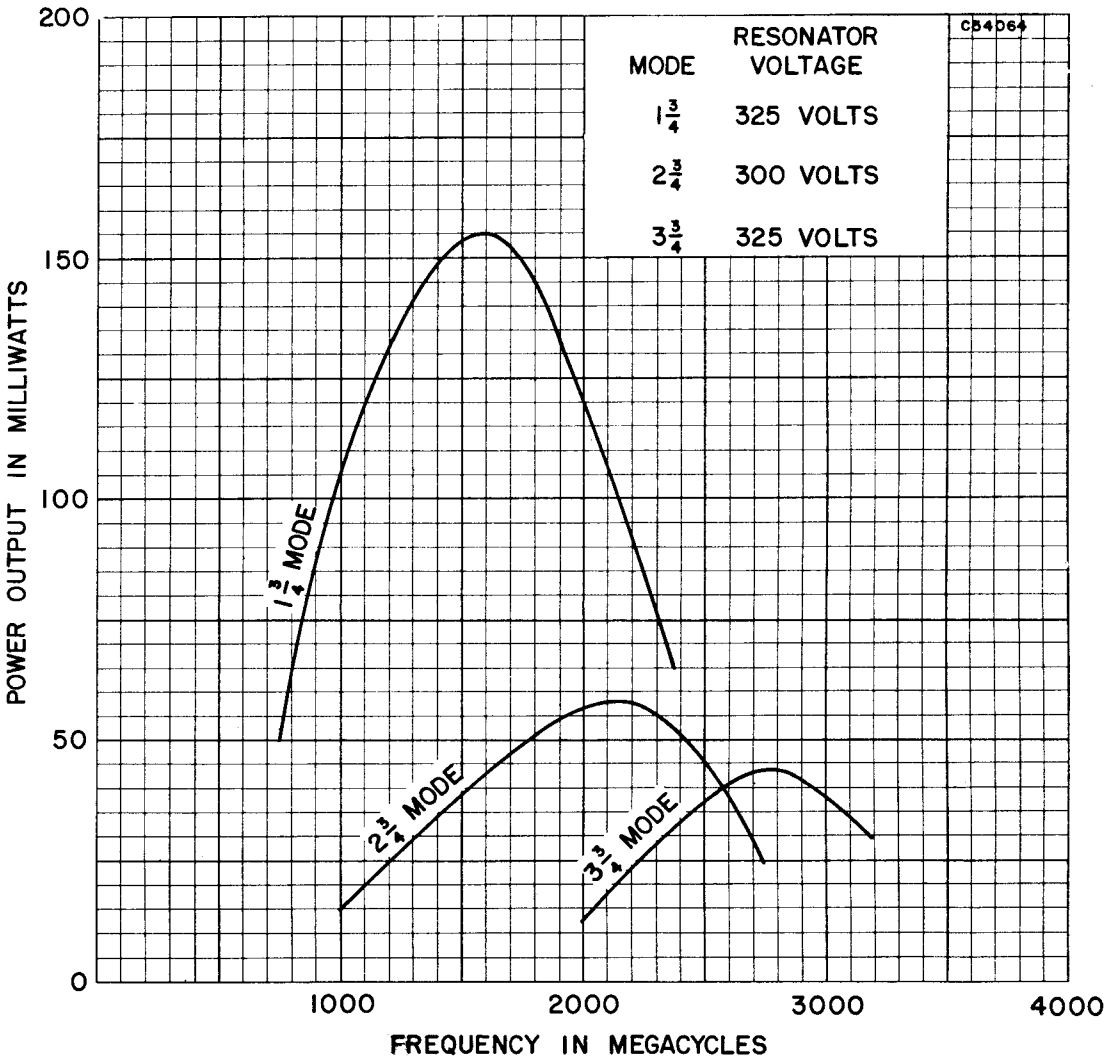


Recess in Contact Plunger	1/2"	Loop Size for 3000-5000 mc	9/32"
Loop Size for 800-3500 mc	9/16"	Loop Width for Both Ranges	.175"

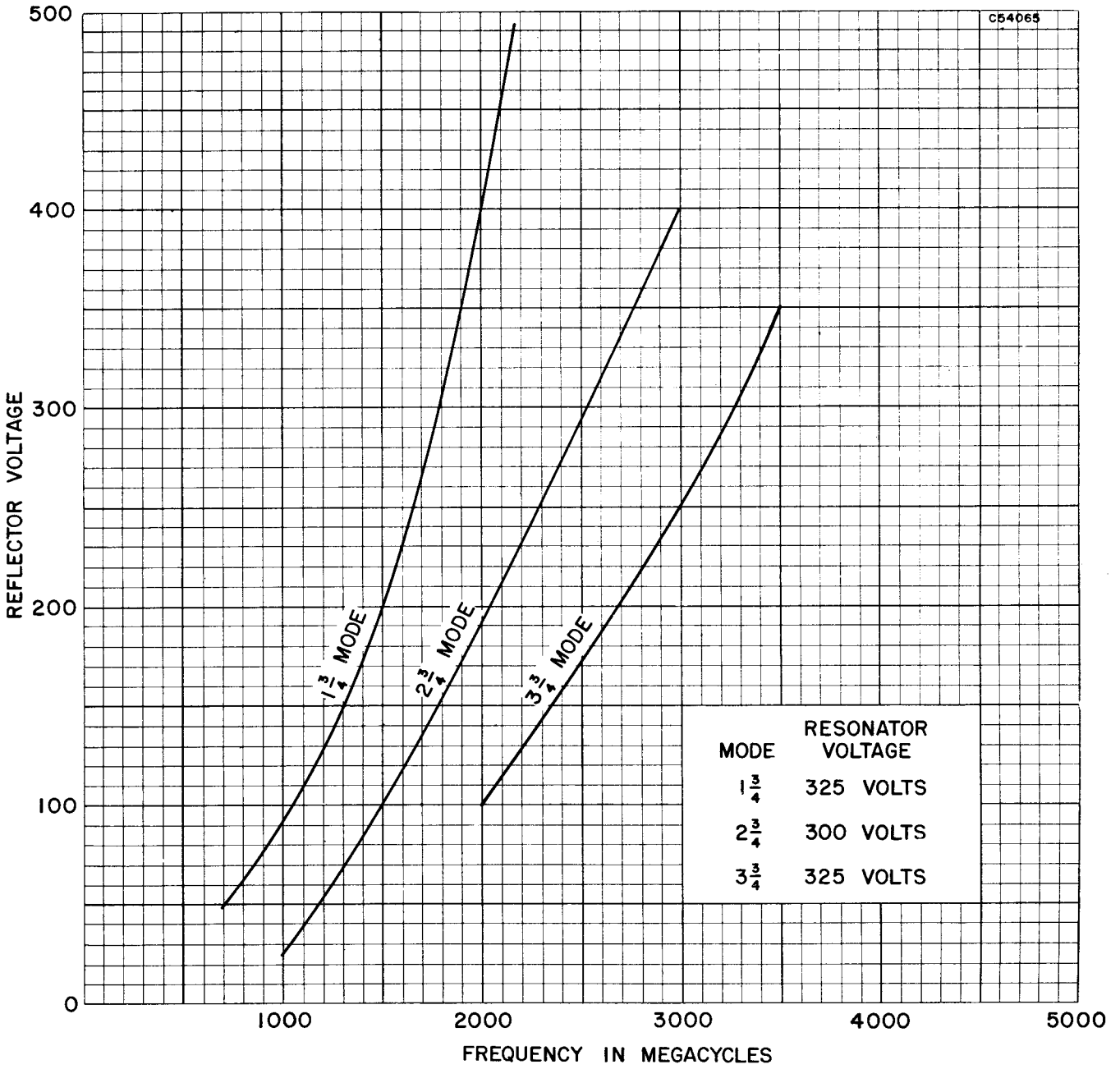
The length is determined by the frequency of operation and the range of plunger motion is set by the frequency band to be covered.

AVERAGE CHARACTERISTICS

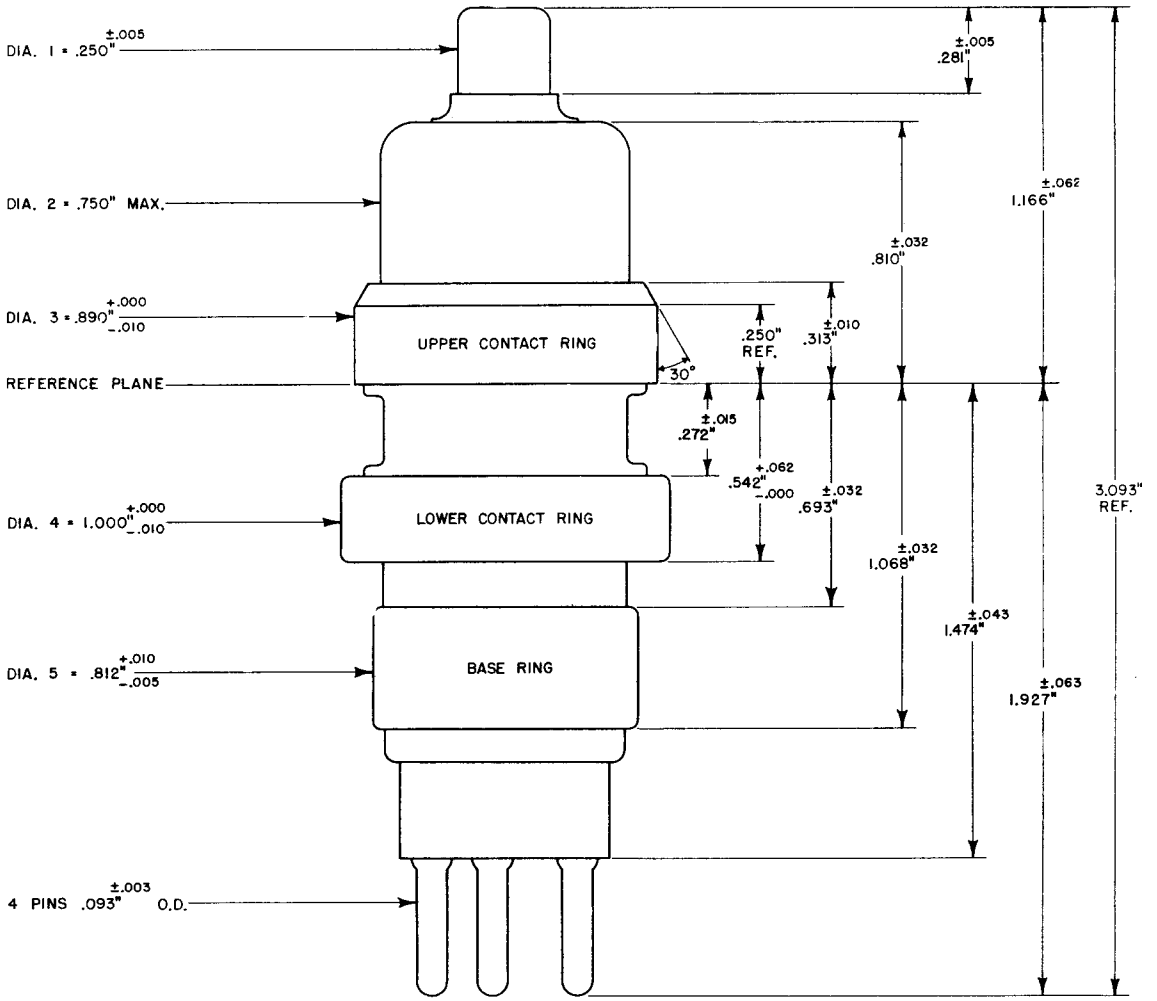
FIG. 3 — DIAGRAM OF A TYPICAL COAXIAL CAVITY FOR USE WITH THE 6BM6A REFLEX KLYSTRON

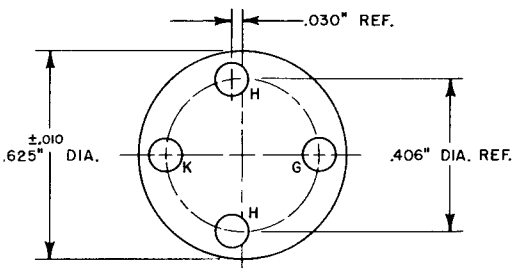


AVERAGE CHARACTERISTICS



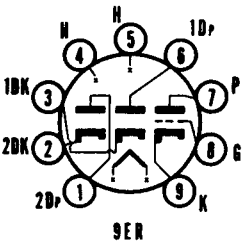
OUTLINE DRAWING







SYLVANIA TYPE 6BN8 8BN8



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-3
Basing	9ER
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6BN8	8BN8	
Heater Voltage	6.3	8.4	Volts
Heater Current	600	450	Ma
Heater Warm-up Time[1]	11	11	Seconds
Heater-Cathode Voltage (Triode and Diodes Design Center Values)			
Heater Negative with Respect to Cathode			
Total D C and Peak	200	200	Volts Max.
Heater Positive with with Respect to Cathode			
D C	100	100	Volts Max.
Total D C and Peak	200	200	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode	
Grid to Plate	2.5 μμf
Input: g to (h + Tk)	3.6 μμf
Output: p to (h + Tk)	0.25 μμf
Diodes	
No. 1 Diode Plate to No. 1 Diode Cathode + Heater	1.9 μμf
No. 2 Diode Plate to No. 2 Diode Cathode + Heater	1.9 μμf
No. 1 Diode Cathode to No. 1 Diode Plate + Heater	4.8 μμf
No. 2 Diode Cathode to No. 2 Diode Plate + Heater	4.8 μμf

SYLVANIA TYPE 6BN8, 8BN8 (Cont'd)

DIRECT INTERELECTRODE CAPACITANCES (Unshielded) (Cont'd)

Coupling	
No. 1 Diode Plate to Triode Grid	0.060 μμf Max.
No. 2 Diode Plate to Triode Grid	0.10 μμf Max.
No. 1 Diode Cathode to All: 1Dk to (h + Tk + 2Dk + Tp + 1Dp + Tg + 2Dp)	5.0 μμf
No. 2 Diode Cathode to All: 2Dk to (h + Tk + 1Dk + Tp + 1Dp + 2Dp + Tg)	5.0 μμf
No. 1 Diode Plate to No. 2 Diode Plate	0.070 μμf Max.
No. 1 Diode Plate to All: 1Dp to (h + Tk + 1Dk + 2Dk + Tp + 2Dp + Tg)	3.0 μμf
No. 2 Diode Plate to All: 2Dp to (h + Tk + 1Dk + 2Dk + Tp + 1Dp + Tg)	3.0 μμf

MAXIMUM RATINGS (Design Center Values)

	Triode Section
Plate Voltage	300 Volts
Positive D C Grid Voltage	0 Volts
Plate Dissipation	1.5 Watts
Grid Circuit Resistance	1.0 Megohm
	Diode Section
Peak Plate Current (Each Plate)	54 Ma
D C Current (Each Plate)	9 Ma

CHARACTERISTICS AND TYPICAL OPERATION

		Triode Section
Class A_1 Amplifier		
Plate Voltage	100	250 Volts
Grid Voltage	−1	−3 Volts
Plate Current	1.5	1.6 Ma
Transconductance	3500	2500 μmhos
Amplification Factor	75	70
Plate Resistance (approx.)	21,000	28,000 Ohms
Grid Voltage (approx.) for Ib = 10 μa	−2.5	−5.5 Volts
		Diode Section
Average Current Each Plate at 10 Volts D C[2]		50 Ma
Voltage Drop Each Section at Ib = 9 Ma D C		2.6 Volts

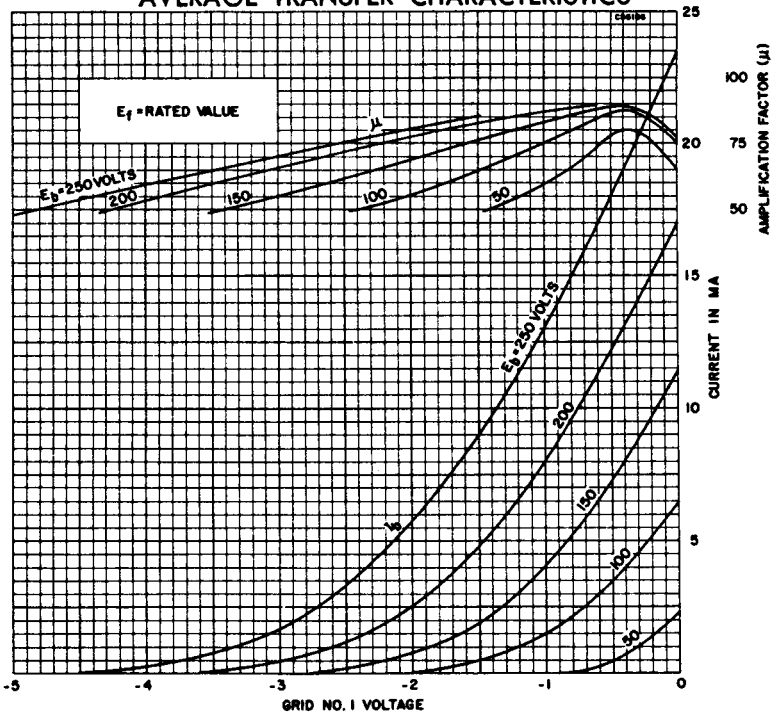
NOTE:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.
2. Test conditions only.

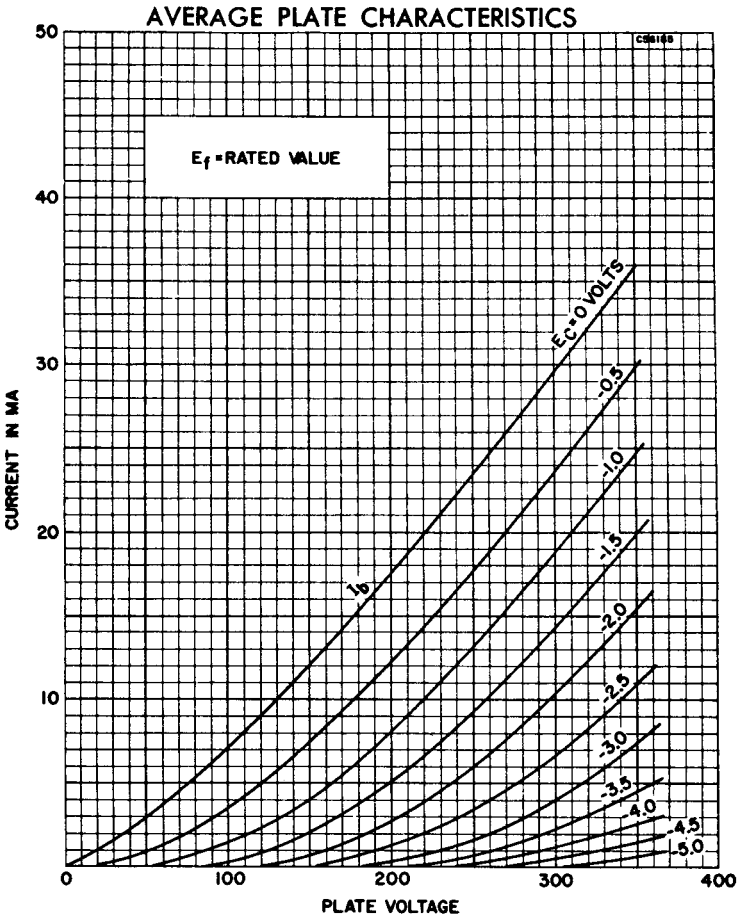
APPLICATION DATA

The Sylvania Type 6BN8 is a miniature, high mu triode, double diode intended for application in color and monochrome television receivers. The tube features separate cathode connections for each section and controlled heater warm-up time to insure dependable operation in series string receivers.
The 8BN8 is identical to the 6BN8 except for heater characteristics.

AVERAGE TRANSFER CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



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6BQ6G

MECHANICAL DATA

Bulb	ST-12
Base	B7-2 Small Shell Octal
Basing	6AM
Top Cap	C1-2 or C1-3 Skirted Miniature
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	1.2 Amperes
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Approximate)

Grid to Plate	0.6 $\mu\mu$f
Input	15 $\mu\mu$f
Output	7.5 $\mu\mu$f

RATINGS (Design Center Values — Except as Noted)

Horizontal Deflection Amplifier[1]

DC Plate Supply Voltage (Boost + DC Power Supply)	600 Volts	Max.
Peak Positive Plate Voltage (Abs. Max.)	6000 Volts	
Peak Negative Plate Voltage	1250 Volts	Max.
Plate Dissipation[2]	11 Watts	Max.
Peak Negative Grid #1 Voltage	300 Volts	Max.
DC Grid #2 Voltage	175 Volts	Max.
Grid #2 Dissipation	2.5 Watts	Max.
Average Cathode Current	110 Ma	Max.
Peak Cathode Current	400 Ma	Max.
Grid #1 Circuit Resistance	0.47 Megohm	Max.
Bulb Temperature (At Hottest Point)	200° C	Max.

AVERAGE CHARACTERISTICS

Pentode Operation: With E_b=250 V, E_{c2}=150 V and E_{c1}=-22.5 V

Plate Current	55 Ma
Grid #2 Current	2.1 Ma
Transconductance	5500 μmhos
Plate Resistance	20,000 Ohms

Zero Bias: With E_b=60 V and E_{c2}=150 V (Instantaneous Values)

Plate Current	225 Ma
Grid #2 Current	25 Ma

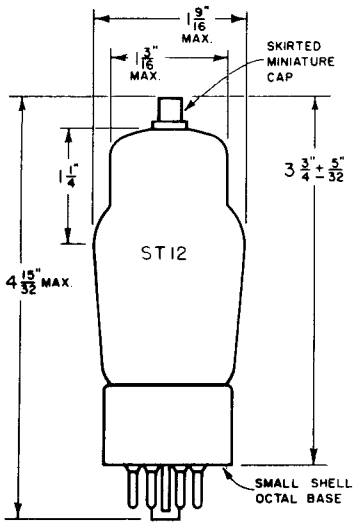
Cutoff: For I_b=1 ma with E_b=250 V and E_{c2}=150 V

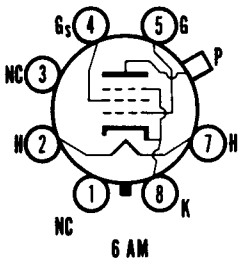
Grid #1 Voltage (approx.)	-46 Volts

Triode Amplification Factor: With E_b=E_{c2}=150 V and E_{c1}=22.5 V 4.3

QUICK REFERENCE DATA

Beam power amplifier designed for use as a driver tube in horizontal deflection amplifiers. It is identical to the type 6BQ6GT except for bulb size. The larger ST-12 bulb provides a better safety margin for dissipation.





6 AM

SYLVANIA ELECTRIC PRODUCTS INC.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

APRIL 1953

SYLVANIA

6BQ6G

NOTES:

1. *For operation in a 525-line, 30-frame system as described in "Standards of Good Engineering Practice for Television Broadcasting Stations; Federal Communications Commission". The duty cycle of the voltage pulse not to exceed 15% of a scanning cycle.*
2. *In stages operating with grid leak bias, an adequate cathode bias resistor or other suitable means is required to protect the tube in the absence of excitation.*

SYLVANIA

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SYLVANIA

6BQ6GT

MECHANICAL DATA

Bulb	T-9
Base	Intermediate Shell Octal
Basing	6AM
Top Cap	Skirted Miniature
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	1.2 Amperes
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Approximate)

Grid to Plate	0.6 $\mu\mu$f
Input	15 $\mu\mu$f
Output	7.5 $\mu\mu$f

RATINGS (Design Center Values — Except as Noted)

Horizontal Deflection Amplifier[1]

DC Plate Supply Voltage (Boost + DC Power Supply)	550 Volts	Max.
Peak Positive Plate Voltage (Abs. Max.)	5500 Volts	
Peak Negative Plate Voltage	1250 Volts	Max.
Plate Dissipation[2]	11 Watts	Max.
Peak Negative Grid #1 Voltage	300 Volts	Max.
DC Grid #2 Voltage	175 Volts	Max.
Grid #2 Dissipation	2.5 Watts	Max.
Average Cathode Current	110 Ma	Max.
Peak Cathode Current	400 Ma	Max.
Grid #1 Circuit Resistance	0.47 Megohm	Max.
Bulb Temperature (At Hottest Point)	220° C	Max.

AVERAGE CHARACTERISTICS

Pentode Operation: With E_b=250 V, E_{c2}=150 V and E_{c1}= -22.5 V

Plate Current	55 Ma
Grid #2 Current	2.1 Ma
Transconductance	5500 μmhos
Plate Resistance	20,000 Ohms

Zero Bias: With E_b=60 V and E_{c2}=150 V (Instantaneous Values)

Plate Current	225 Ma
Grid #2 Current	25 Ma

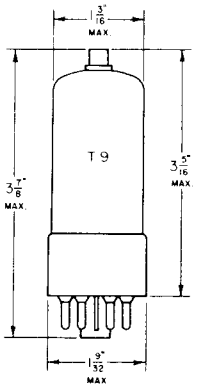
Cutoff: For I_b=1 ma with E_b=250 V and E_{c2}=150 V

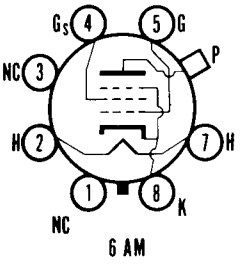
Grid #1 Voltage (approx.)	-46 Volts

Triode Amplification Factor: With E_b=E_{c2}=150 V and E_{c1}=-22.5 V	4.3

QUICK REFERENCE DATA

The Sylvania Type 6BQ6GT is a beam power amplifier designed for use as a driver tube in horizontal deflection amplifiers. It is identical to the type 6BQ6G except for bulb size.





6 AM

SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

MARCH 1954

SYLVANIA

6BQ6GT

TYPICAL OPERATION

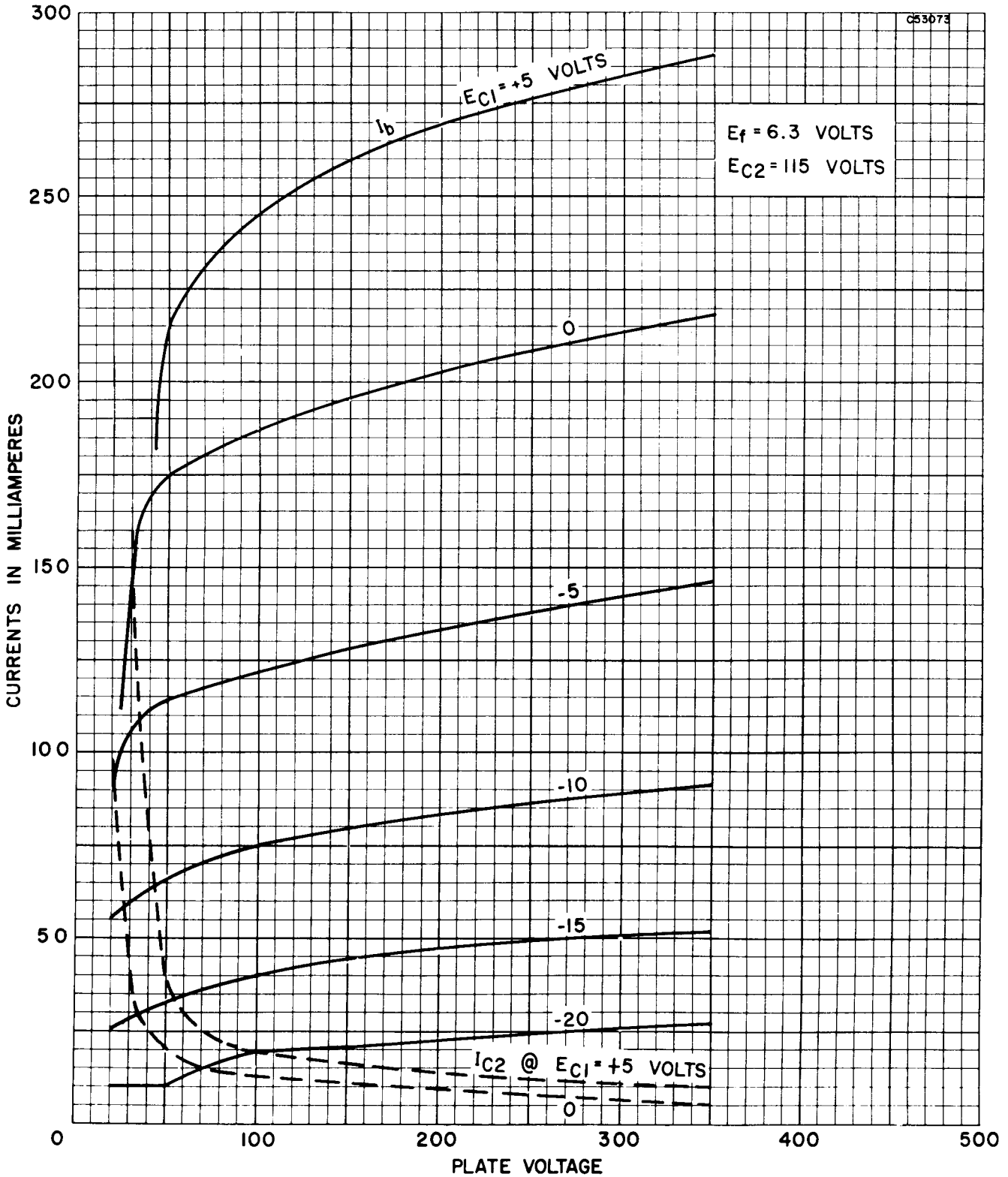
Horizontal Deflection Amplifier, 70° Picture Tube

Plate Supply Voltage	310 Volts
Average Plate Voltage (Boost + Supply)	540 Volts
Peak Positive Plate Voltage	
DC Component + Pulse	4600 Volts
Average Plate Current	79 Ma
Peak Plate Current	270 Ma
Plate Dissipation	7.0 Watts
Grid No. 2 Voltage	140 Volts
Grid No. 2 Current	11.2 Ma
Grid No. 2 Dissipation	1.57 Watts
Grid No. 1 Input Voltage	
Peak to Peak	130 Volts
Sawtooth Component	65 Volts
Anode Voltage (Picture Tube)	15.7 Kv
Anode Current (Picture Tube)	100 μa

NOTES:

1. *For operation in a 525-line, 30-frame system as described in "Standards of Good Engineering Practice for Television Broadcasting Stations; Federal Communications Commission". The duty cycle of the voltage pulse not to exceed 15% of a scanning cycle.*
2. *In stages operating with grid leak bias, an adequate cathode bias resistor or other suitable means is required to protect the tube in the absence of excitation.*

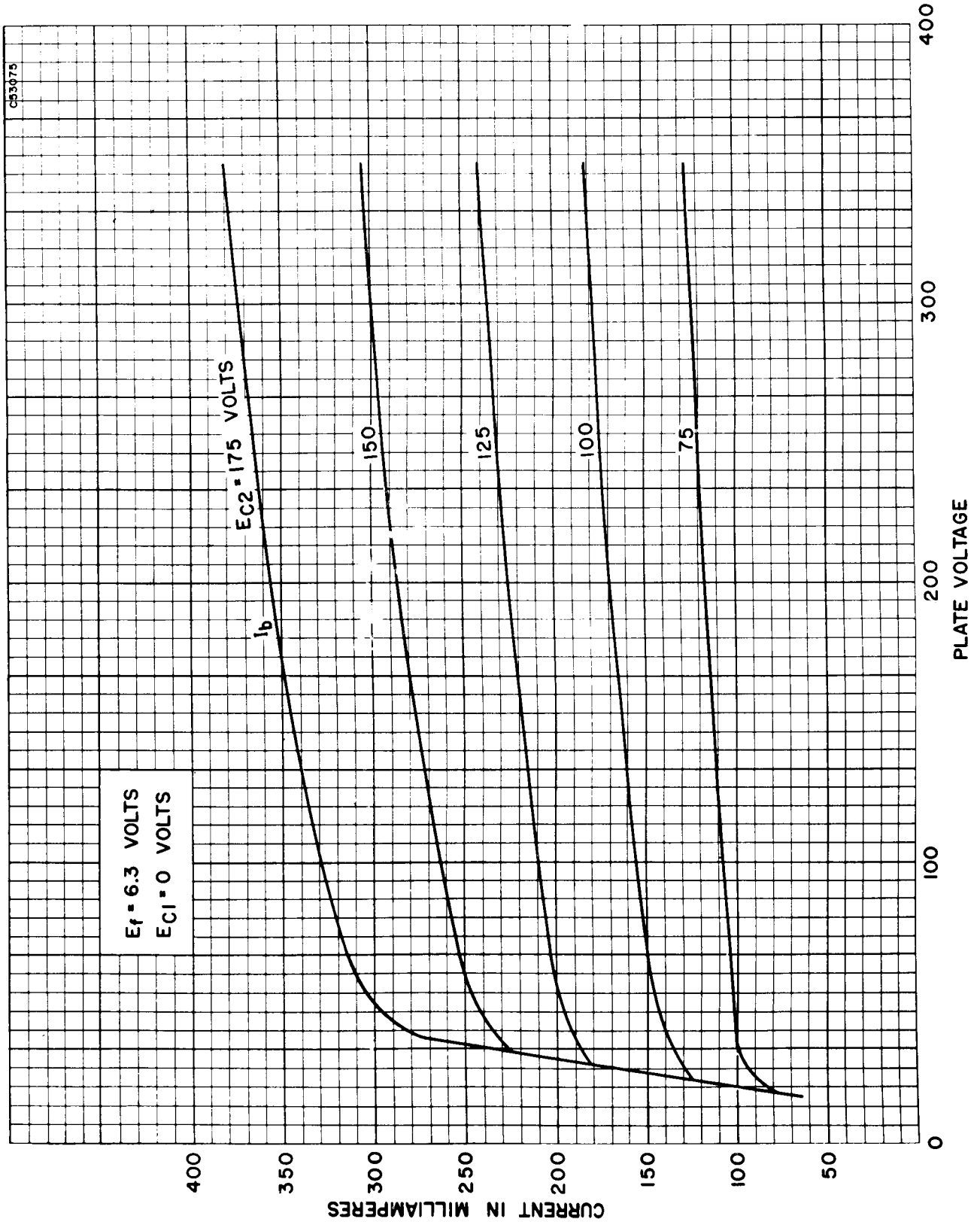
AVERAGE PLATE CHARACTERISTICS



SYLVANIA

6BQ6GT

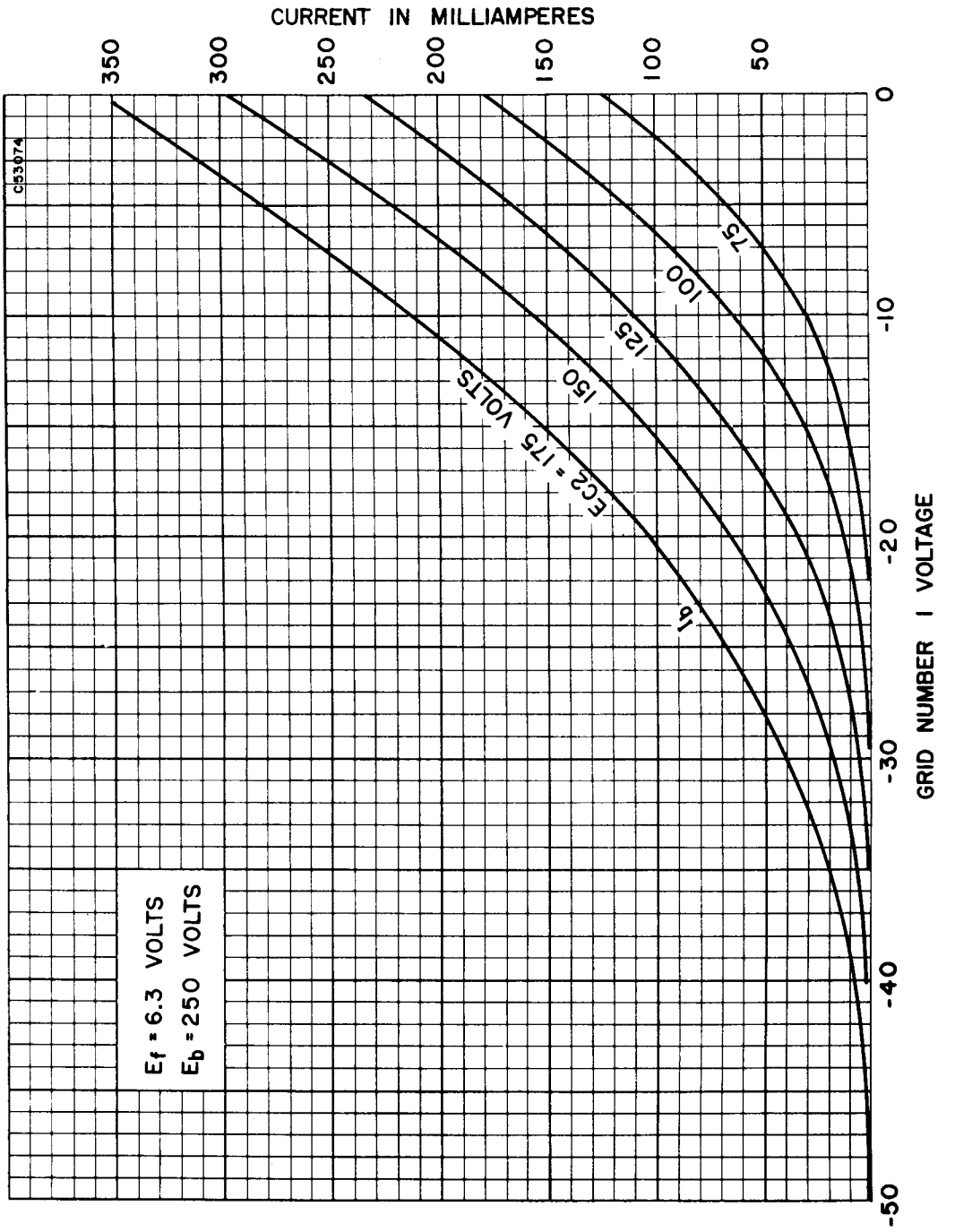
AVERAGE PLATE CHARACTERISTICS



SYLVANIA

6BQ6GT

AVERAGE PLATE CHARACTERISTICS



SYLVANIA ELECTRIC

RMA Registration Data

TYPE 6BT6

DOUBLE - DIODE TRIODE

MECHANICAL DATA

Style	miniature
Cathode	coated, unipotential
Bulb	T-5 1/2
Base	E7-1, miniature button 7-pin
Outline	5-3
Maximum Diameter	3/4 inch
Maximum Overall Length	2 5/8 inches
Maximum Seated Height	2 3/8 inches
Basing	7BT-0-2

Pin Connections:

Pin 1 .. grid	Pin 5 .. #2 diode plate
Pin 2 .. cathode, diode shield	Pin 6 .. #1 diode plate
Pin 3 .. heater	Pin 7 .. triode plate
Pin 4 .. heater	

Mounting Position ..... any

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES

	without shield	*with shield*(1)	
#2 Diode Input: #2p to (h+k+i.s.)	1.0	1.0	μμf
#1 Diode Input: #1p to (h+k+i.s.)	1.0	1.0	μμf
#1 Diode Plate to Grid, maximum	.013	.01	μμf

RATINGS -- *Design Center Values*

Heater Voltage (ac or dc)	6.3	volts
Maximum Heater-Cathode Voltage	90	volts
Maximum Plate Voltage (dc)	300	volts
Maximum Positive Grid Voltage (dc)	0	volts
Maximum Continuous Diode Current (each plate)	1.0	milliamp

CHARACTERISTICS

Heater Voltage	6.3	6.3	volts
Heater Current	300	300	milliamps
Plate Voltage (dc)	100	250	volts
Grid Voltage (dc)	-1	-3	volts
Plate Resistance	54,000	58,000	ohms
Plate Current	0.8	1.0	milliamp
Transconductance	1,300	1,200	micromhos
Amplification Factor	70	70	

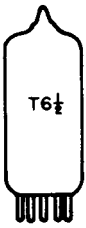
Diode Current, at 10 volts dc (each plate)

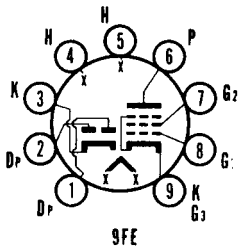
Minimum	1.5	milliamps
Average	4.0	milliamps

(1) External shield #316 connected to Pin 2.

SYLVANIA TYPE 6BT8
5BT8

DUODIODE
SHARP CUTOFF PENTODE





MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9FE
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	5BT8	6BT8
Heater Voltage	4.7	6.3 Volts
Heater Current	600	450 Ma
Heater Warm-up Time[1]	11	Seconds
Heater Negative with Respect to Cathode		
Total D C and Peak		200 Volts Max.
Heater Positive with Respect to Cathode		
D C		100 Volts Max.
Total D C and Peak		200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Pentode Section

Grid No. 1 to Plate	.04 μμf Max.
Input	7.0 μμf
Output	2.3 μμf

Diode (Each Section)

Plate to (h + k)	1.3 μμf
Cathode to (h + p)	3.0 μμf

Coupling

Pentode Grid No. 1 to Diode Plate	0.005 μμf
Pentode Plate to Diode Plate	0.020 μμf

RATINGS (Design Center System)

Plate Voltage	300 Volts Max.
Grid No. 2 Supply Voltage	300 Volts Max.
Grid No. 2 Voltage	See 6AM8 Rating Chart
Positive Grid No. 1 Voltage	0 Volts Max.
Plate Dissipation	2.0 Watts Max.
Grid No. 2 Input	0.5 Watts Max.
Grid No. 1 Circuit Resistance	
Fixed Bias	0.25 Megohm Max.
Self Bias	1.0 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

Plate Voltage	200 Volts
Grid No. 2 Voltage	150 Volts
Cathode Bias Resistor	180 Ohms
Plate Current	9.5 Ma
Grid No. 2 Current	2.8 Ma
Transconductance	6200 μmhos
Plate Resistance (approx.)	300,000 Ohms
Grid No. 1 Voltage for I_b = 10 μamp (approx.)	−8 Volts
Average Diode Current with 10 Volts D C Applied (Each Section)	8.0 Ma

NOTE:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.

APPLICATION

The Sylvania Types 5BT8 and 6BT8 have a double diode and sharp cutoff pentode contained in one envelope. The pentode section may be used as an IF amplifier, video amplifier, a gc amplifier or reactance tube. Type 5BT8 has controlled heater warm-up time for series string operation.

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 6BU6

DOUBLE - DIODE TRIODE

MECHANICAL DATA

Style	miniature
Cathode	coated, unipotential
Bulb	T-5 1/2
Base	E7-1, miniature button 7-pin
Outline	5-3
Maximum Diameter	3/4 inch
Maximum Overall Length	2 5/8 inches
Maximum Seated Height	2 3/8 inches
Basing	7BT-0-2

Pin Connections:

Pin 1 .. grid	Pin 5 .. #2 diode plate
Pin 2 .. cathode, diode shield	Pin 6 .. #1 diode plate
Pin 3 .. heater	Pin 7 .. triode plate
Pin 4 .. heater	

Mounting Position ..... any

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES

	without shield	*with shield*(1)	
#2 Diode Input: #2p to (h+k+i.s.)	1.0	1.0	μμf
#1 Diode Input: #1p to (h+k+i.s.)	1.0	1.0	μμf
#1 Diode Plate to Grid, maximum	.013	.01	μμf

RATINGS -- *Design Center Values*

Heater Voltage (ac or dc)	6.3	volts
Maximum Heater-Cathode Voltage	90	volts
Maximum Plate Voltage (dc)	300	volts
Maximum Positive Grid Voltage (dc)	0	volts
Maximum Continuous Diode Current (each plate)..	1.0	milliamp

CHARACTERISTICS AND TYPICAL OPERATION

Heater Voltage	6.3	volts
Heater Current	300	milliamps
Plate Voltage (dc)	250	volts
Grid Voltage (dc)	-9	volts
Plate Current	9.5	milliamps
Plate Resistance	8,500	ohms
Transconductance	1,900	micromhos
Amplification Factor	16	
Load Resistance	10,000	ohms
Total Harmonic Distortion	6.5	percent
Power Output	300	milliwatts
Average Diode Current, at 10 volts dc (each plate)	4.0	milliamps

(1) External shield #316 connected to Pin 2.

Color Television Type

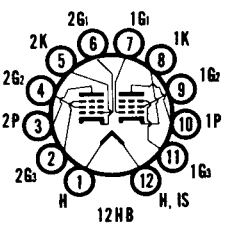
COLOR DEMODULATOR

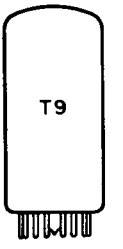
6BV11

12BV11

Twin Dual Control Sharp Cutoff Pentode

Construction.....Compactron T-9
Base .....Button 12 Pin, E12-70
Basing 12HB
Outline 9-59
Maximum Diameter .....1.188 In.
Maximum Seated Height .....2.250 In.
Maximum Overall Height .....2.625 In.





ELECTRICAL DATA

HEATER OPERATION

	12BV11	6BV11
Heater Voltage	12.6	6.3 Volts
Heater Current	450	900 Ma
Heater Warm-up Time	11	— Seconds

NOTE: *To obtain the unique characteristics of this tube, an internal shield is tied to the heater Pin No. 12. To assure proper operation Pin No. 12 must be tied directly to ground.*

DIRECT INTERELECTRODE CAPACITANCES (Unshielded) (Each Section)

Grid No. 1 to Plate	0.10 Pf
Grid No. 3 to Plate	3.2 Pf
Input: g1 to (h + k + g2 + g3 + IS)	7.0 Pf
Grid No. 3 to All	8.5 Pf
Grid No. 1 to Grid No. 3	0.08 Pf

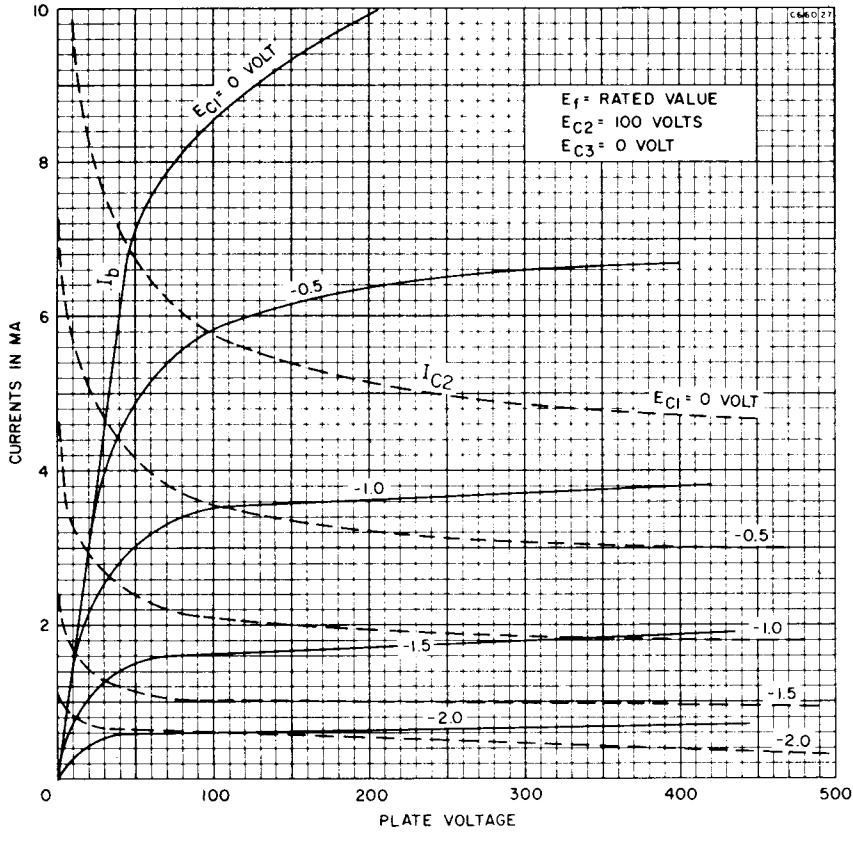
RATINGS (Design Maximum Rating System) (Each Section)

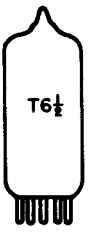
DC Plate Voltage (Max.)	300 Volts
Positive Grid No. 3 Voltage (DC and Peak) (Max.)	25 Volts
Negative Grid No. 3 Voltage (DC and Peak) (Max.)	100 Volts
DC Grid No. 2 Supply Voltage (Max.)	300 Volts
DC Grid No. 2 Voltage (Max.)	See Rating Chart (Gen. Info. Sec.)
Positive Grid No. 1 Voltage (Max.)	0 Volt
Negative Grid No. 1 Voltage (Max.)	50 Volts
Plate Dissipation (Max.)	1.7 Watts
Grid No. 3 Input (Max.)	0.1 Watt
Grid No. 2 Input (Ec2 up to 150 V) (Max.)	1.0 Watt
Grid No. 2 Input (Ec2 Between 150 V to 300 V)	See Rating Chart (Gen. Info. Sec.)
Grid No. 3 Circuit Resistance (Max.)	0.68 Megohm
Grid No. 1 Circuit Resistance	
Fixed Bias (Max.)	0.22 Megohm
Self Bias (Max.)	0.47 Megohm

CHARACTERISTICS AND TYPICAL OPERATION (Each Section)

Plate Supply Voltage	150 Volts
Grid No. 3 Voltage	0 Volt
Grid No. 2 Supply Voltage	100 Volts
Cathode Resistor	180 Ohms
Plate Current	3.1 Ma
Grid No. 2 Current	2.4 Ma
Grid No. 1 Transconductance	3200 μmhos
Grid No. 3 Transconductance	390 μmhos
Plate Resistance (Approx.)	0.17 Megohm
Ec1 for Ib = 75 μa (Approx.)	−3.5 Volts
Ec3 for Ib = 85 μa (Approx.)	−5.5 Volts
Amplification Factor (g3-P)	67

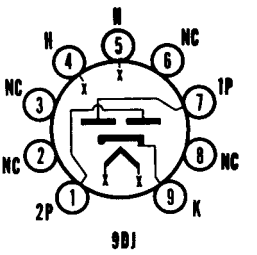
AVERAGE PLATE CHARACTERISTICS
(Each Section)





SYLVANIA TYPE 6BW4
12BW4

FULL WAVE RECTIFIER



MECHANICAL DATA

Bulb	T-6½
Base	E9-1 Miniature Button, 9-Pin
Outline	6-3
Basing	9DJ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6BW4	12BW4
Heater Voltage[3] A C or D C	6.3	12.6 Volts
Heater Current	900	450 Ma
Maximum Heater Cathode Voltage		
Heater Negative, D C	450	Volts

MAXIMUM RATINGS (Design Center Values)[1]

Rectifier Service

Peak Inverse Plate Voltage	1275 Volts
A C Plate Supply Voltage Each Plate, R M S (See Rating Chart I)	450 Volts
D C Output Current	See Rating Chart 1
Steady State Peak Plate Current Each Plate (See Rating Chart II)	350 Ma
Transient Peak Plate Current Each Plate (See Rating Chart III)	2.0 Amperes

AVERAGE CHARACTERISTICS

Tube Voltage Drop	
Tube Conducting:	
100 Ma Each Plate	40 Volts

TYPICAL OPERATION

Full Wave Rectifier—Capacitor Input Filter

A C Plate Supply Voltage Each Plate, R M S[2]	325 Volts
Filter Input Capacitor	40 μf
Effective Plate Supply Resistance, Each Plate	82 Ohms
D C Output Current	100 Ma
D C Output Voltage at Filter Input	330 Volts

Full Wave Rectifier—Choke Input Filter

A C Plate Supply Voltage Each Plate, R M S[2]	450 Volts
Filter Input Choke	10 Henrys
D C Output Current	100 Ma
D C Output Voltage at Filter Input	360 Volts

NOTES:

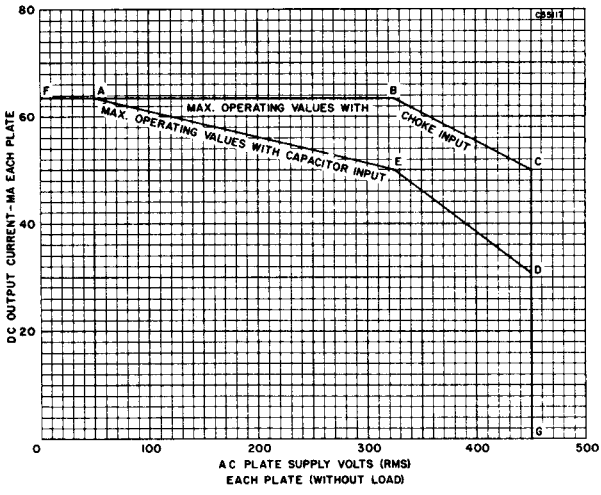
1. See "Interpretation of Rating Charts."
2. A C plate voltage is measured without load.
3. The 12BW4 is intended to be used in automotive service from a nominal 12 volt battery source. The heater is therefore designed to operate over the 10.0 to 15.9 voltage range encountered in this type of service. The maximum ratings of the tube provide for an adequate safety factor such that the tube will withstand the wide variation in supply voltages.

APPLICATION

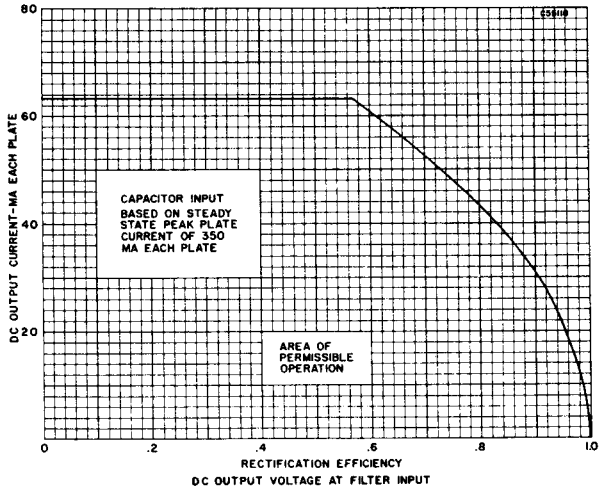
The Sylvania 6BW4 and 12BW4 are miniature cathode type full wave rectifiers featuring relatively high output current capabilities. The 12BW4 is intended primarily for use in auto receivers having a 12 volt heater supply.

6BW4, 12BW4 (Cont'd)

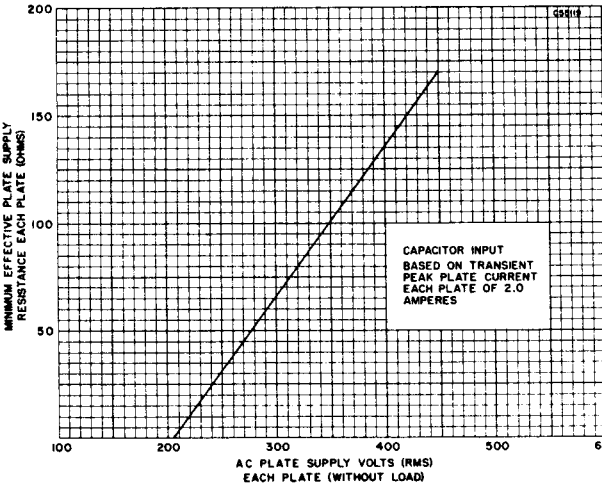
RATING CHART I



RATING CHART II



RATING CHART III



SYLVANIA

engineering data service 6BY8

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-3
Basing	9FN
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts	
Heater Current	600 Ma	
Heater Warm-up Time[1]	11 Seconds	
Heater Cathode Voltage (Design Center Values)		
Heater Negative with Respect to Cathode		
Total DC and Peak	200 Volts	Max.
Heater Positive with Respect to Cathode		
DC	100 Volts	Max.
Total DC and Peak	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[2]

Grid to Plate	0.0035 μμf	Max.
Input: g1 to (h+k+g2+g3+I.S.)	5.5 μμf	
Output: p to (h+k+g2+g3+I.S.)	5.0 μμf	
Diode Plate to All: D_p to (h+D_k+k+g1+g2+g3+p+I.S.)	4.8 μμf	

RATINGS (Design Center System)

Pentode Section

Plate Voltage	300 Volts	Max.
Grid No. 2 Voltage	See Rating Chart	
Grid No. 2 Supply Voltage	300 Volts	Max.
Negative Grid No. 1 Voltage	50 Volts	Max.
Positive Grid No. 1 Voltage	0 Volts	Max.
Plate Dissipation	3 Watts	Max.
Grid No. 2 Dissipation	0.65 Watts	Max.

Diode Section

Peak Inverse Plate Voltage	430 Volts	Max.
Peak Plate Current	180 Ma	Max.
DC Plate Current	45 Ma	Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier

Plate Voltage	100	250	250 Volts
Grid No. 3 Voltage	Connected to Cathode at Socket		
Grid No. 2 Voltage	100	125	150 Volts
Cathode Resistor	150	100	68 Ohms
Plate Current	5.0	7.6	10.6 Ma
Grid No. 2 Current	2.1	3.0	4.3 Ma
Transconductance	3900	4500	5200 μmhos
Plate Resistance (approx.)	0.5	1.5	1.0 Megohms
Ec1 for Ib = 10 μa (approx.)	−4.2	−5.5	−6.5 Volts
Average Diode Current with 10 Volts DC applied (Test Condition Only)			60 Ma

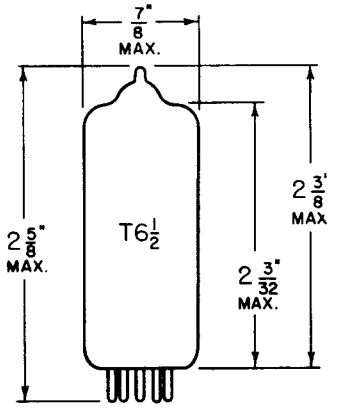
NOTES:

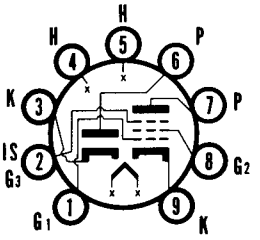
1. *Heater Warm-up Time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External Shield No. 315 connected to Pentode Cathode.*

QUICK REFERENCE DATA

The Sylvania Type 6BY8 has a sharp cutoff pentode and high perveance diode contained in one envelope. The diode section is similar to one section of a 6AL5 and is intended for limiter or detector applications. The pentode section is similar to a 6AU6 and is intended for use as an rf or if amplifier.

Type 6BY8 has a controlled heater warm-up time for series string operation.





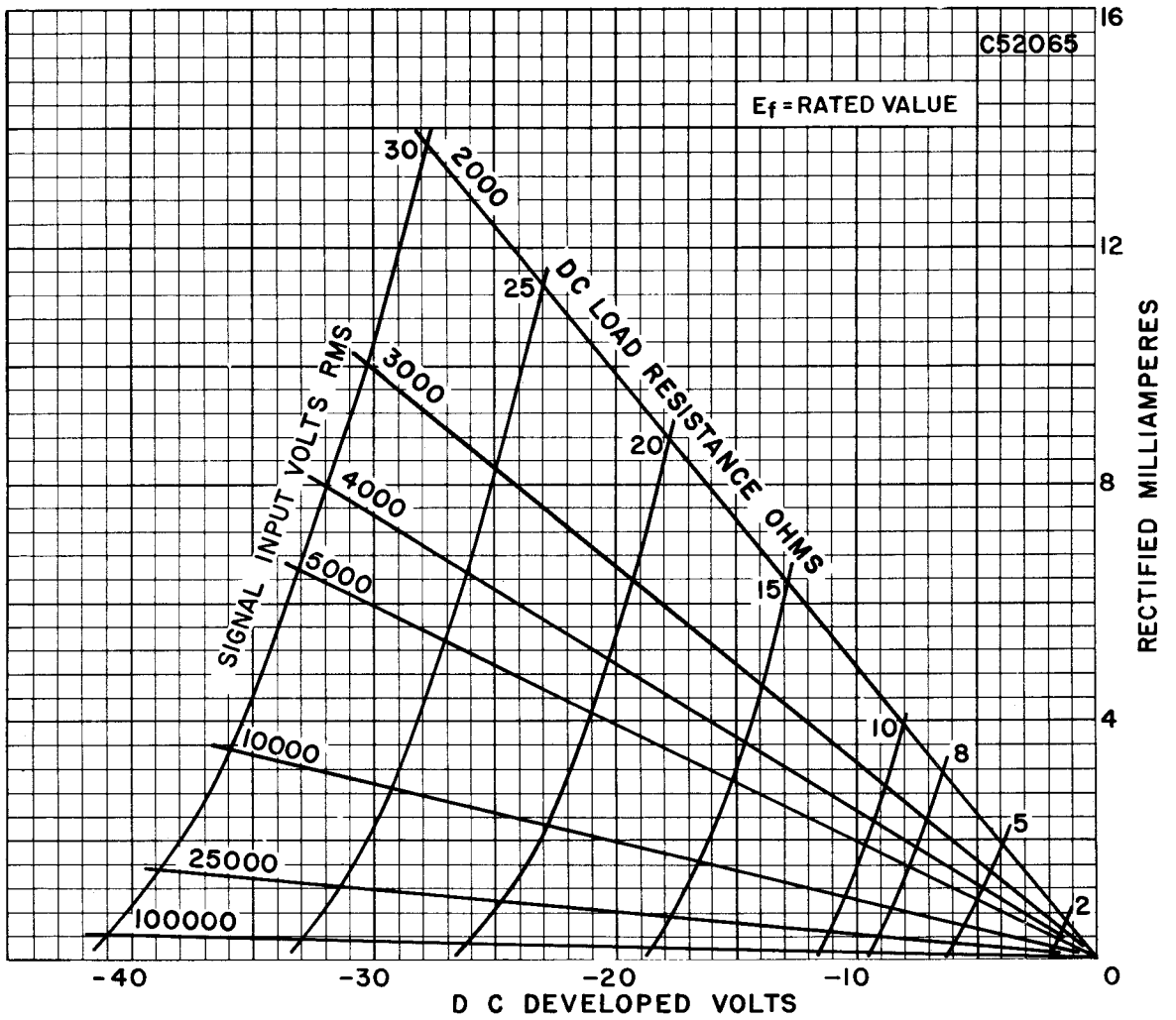
9FN

SYLVANIA ELECTRIC PRODUCTS INC.

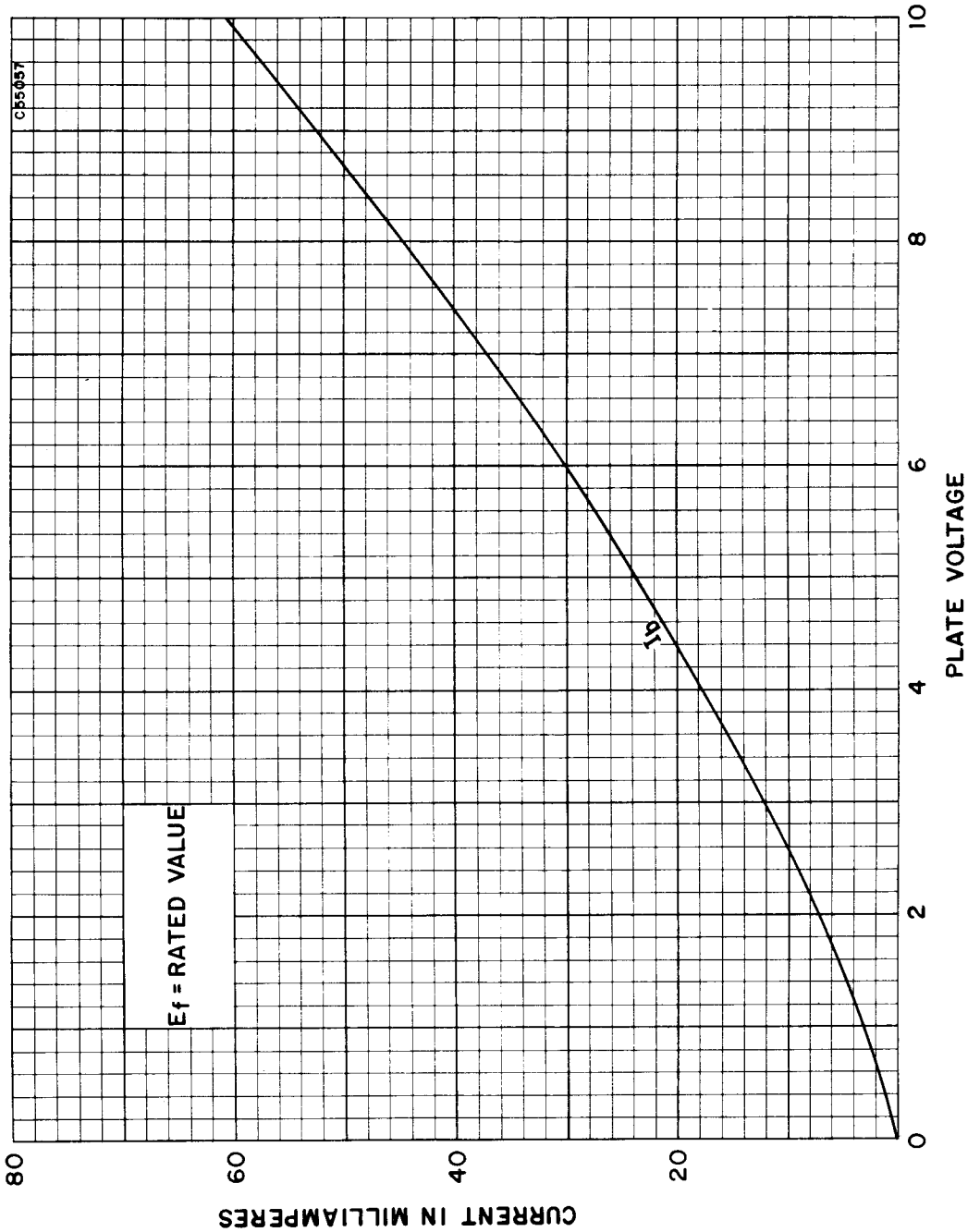
RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
JUNE, 1957

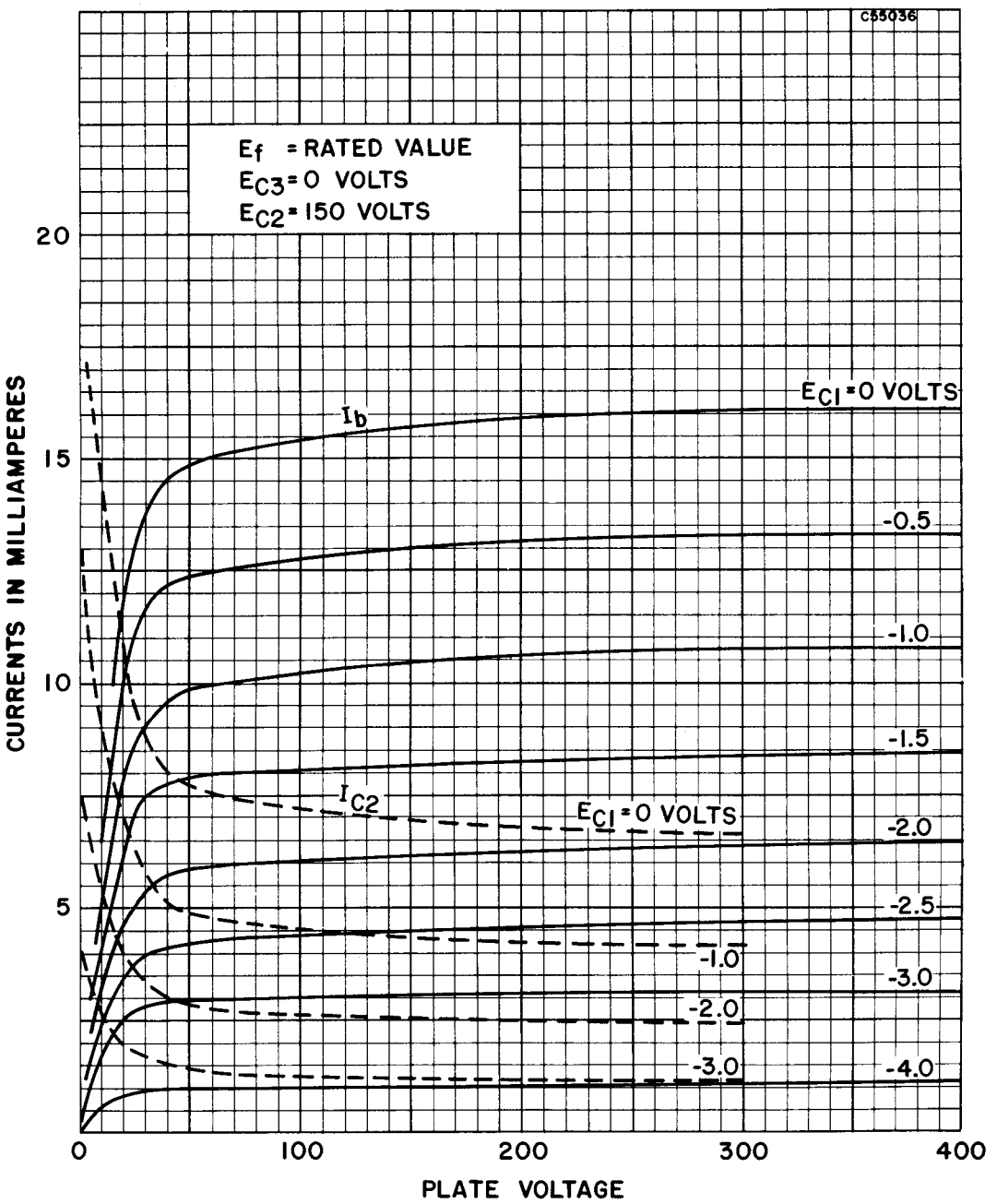
AVERAGE OPERATING CHARACTERISTICS
HALF WAVE RECTIFICATION—SINGLE DIODE



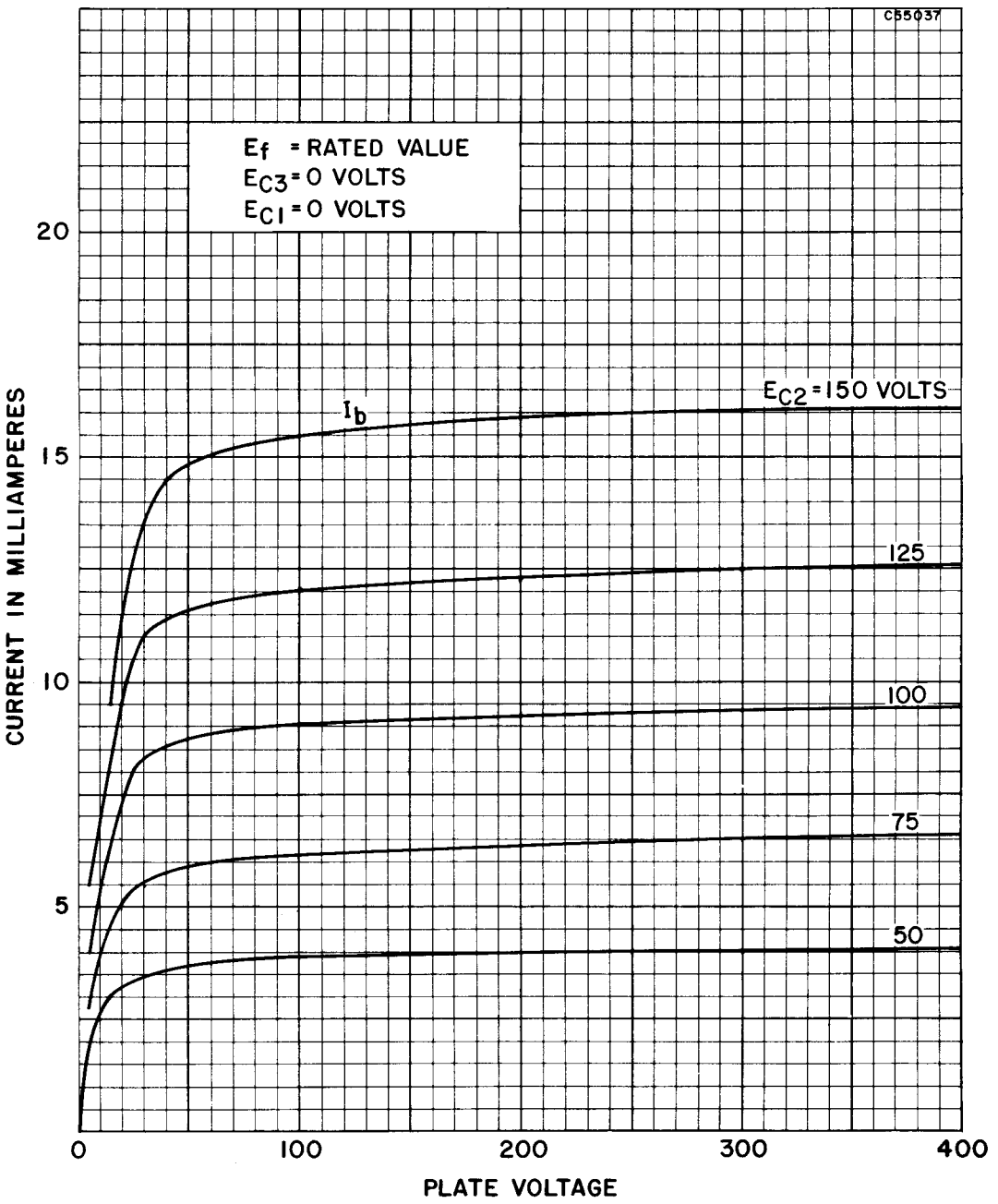
AVERAGE CHARACTERISTICS
(DIODE SECTION)



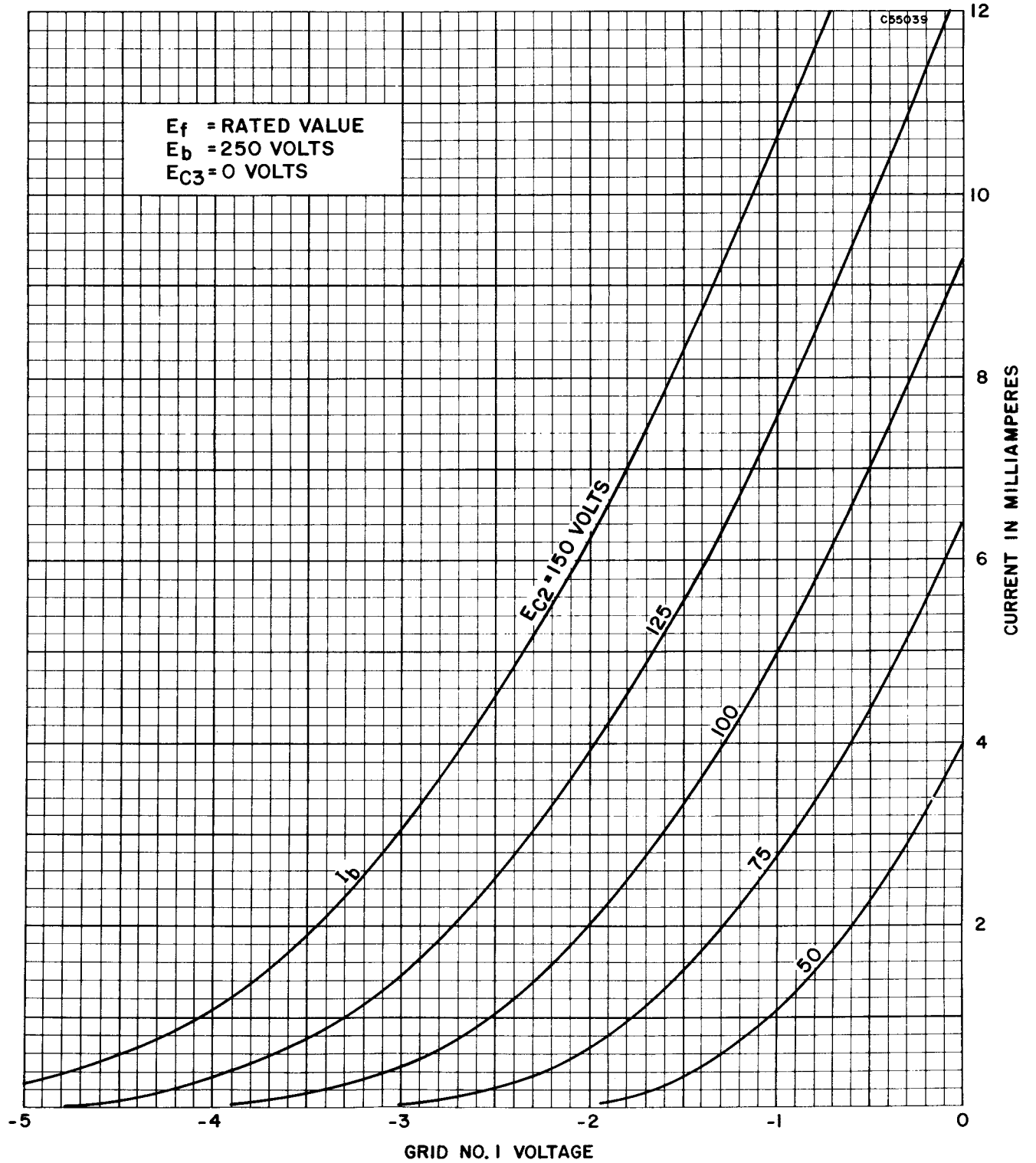
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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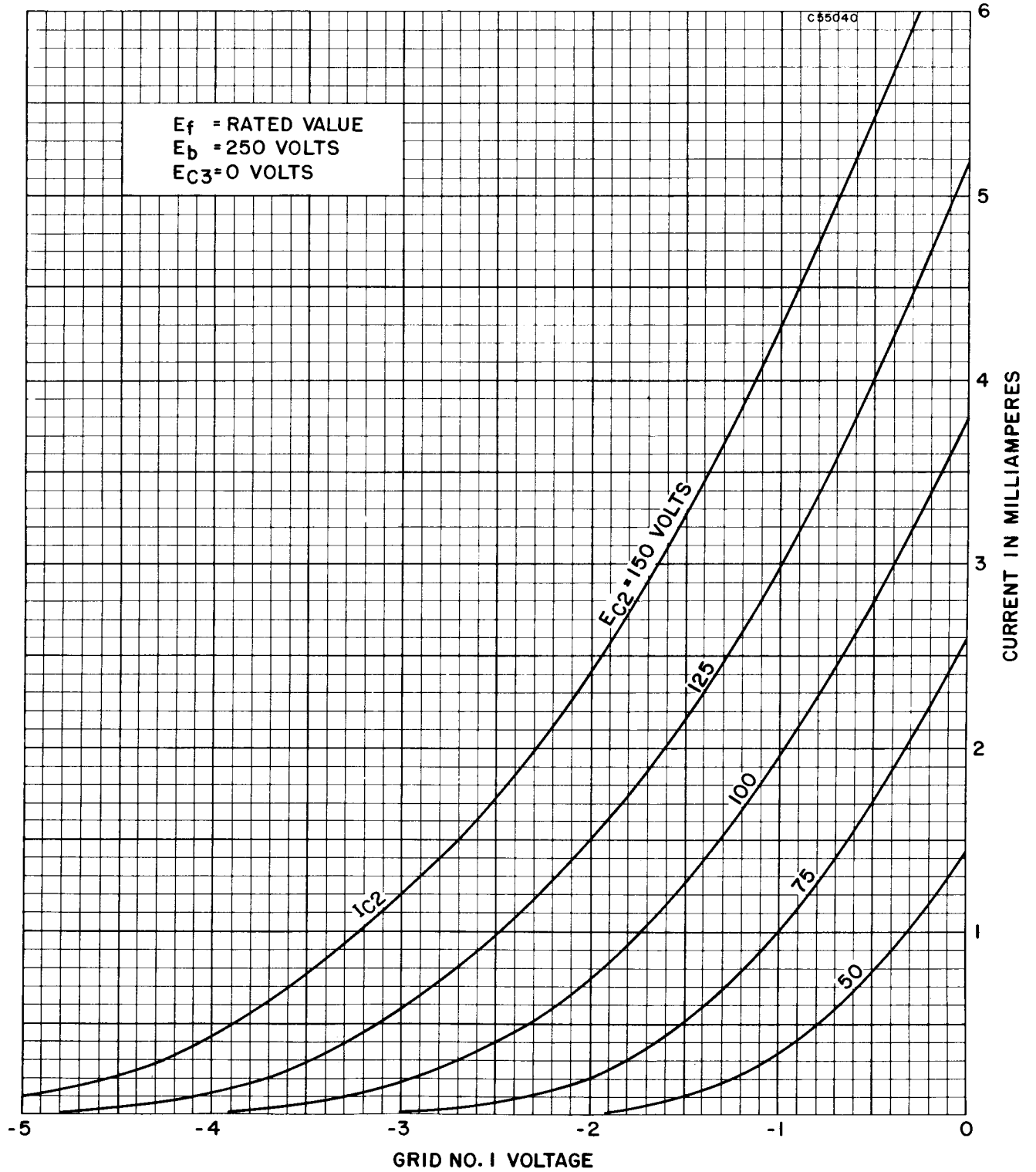

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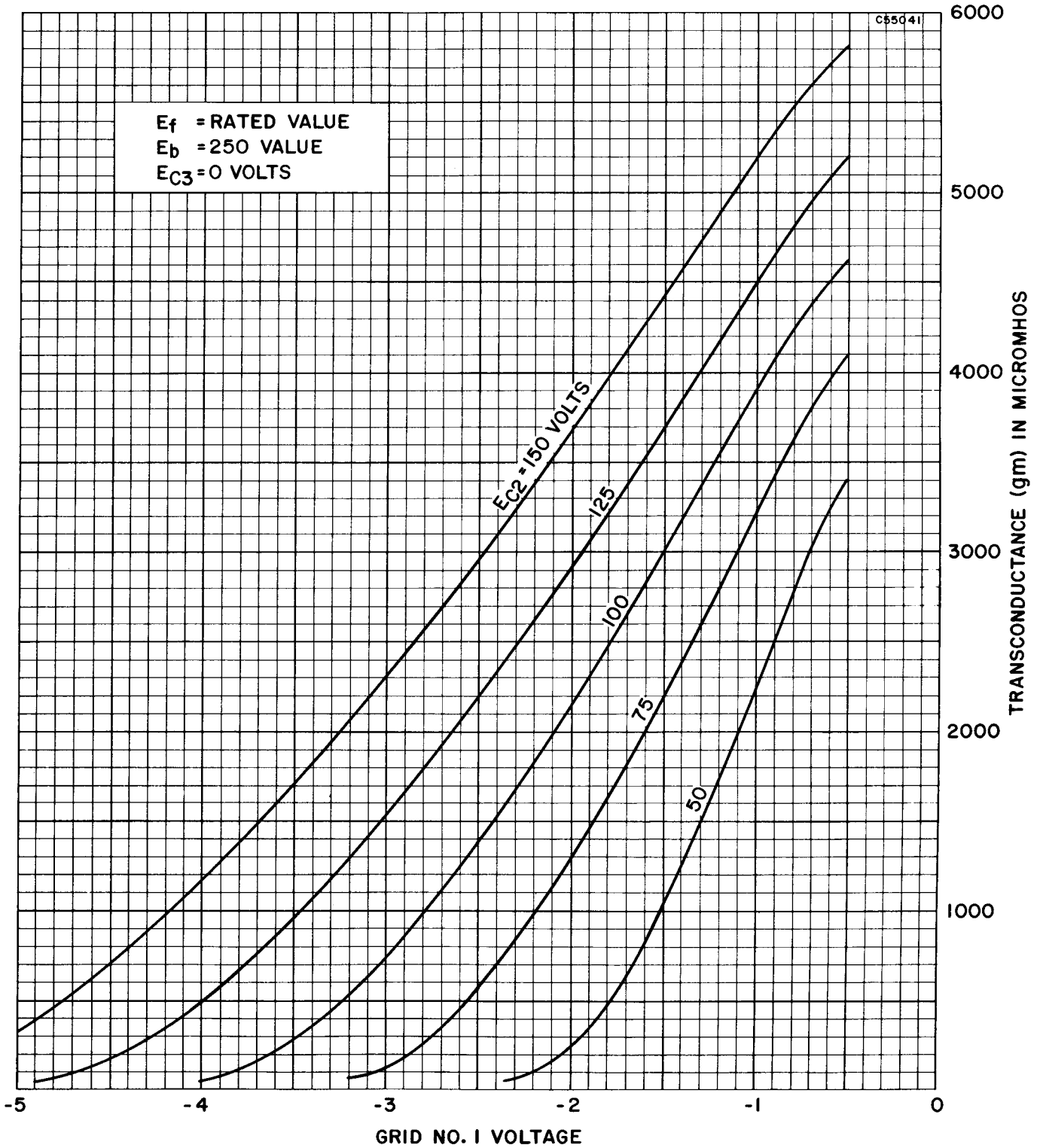
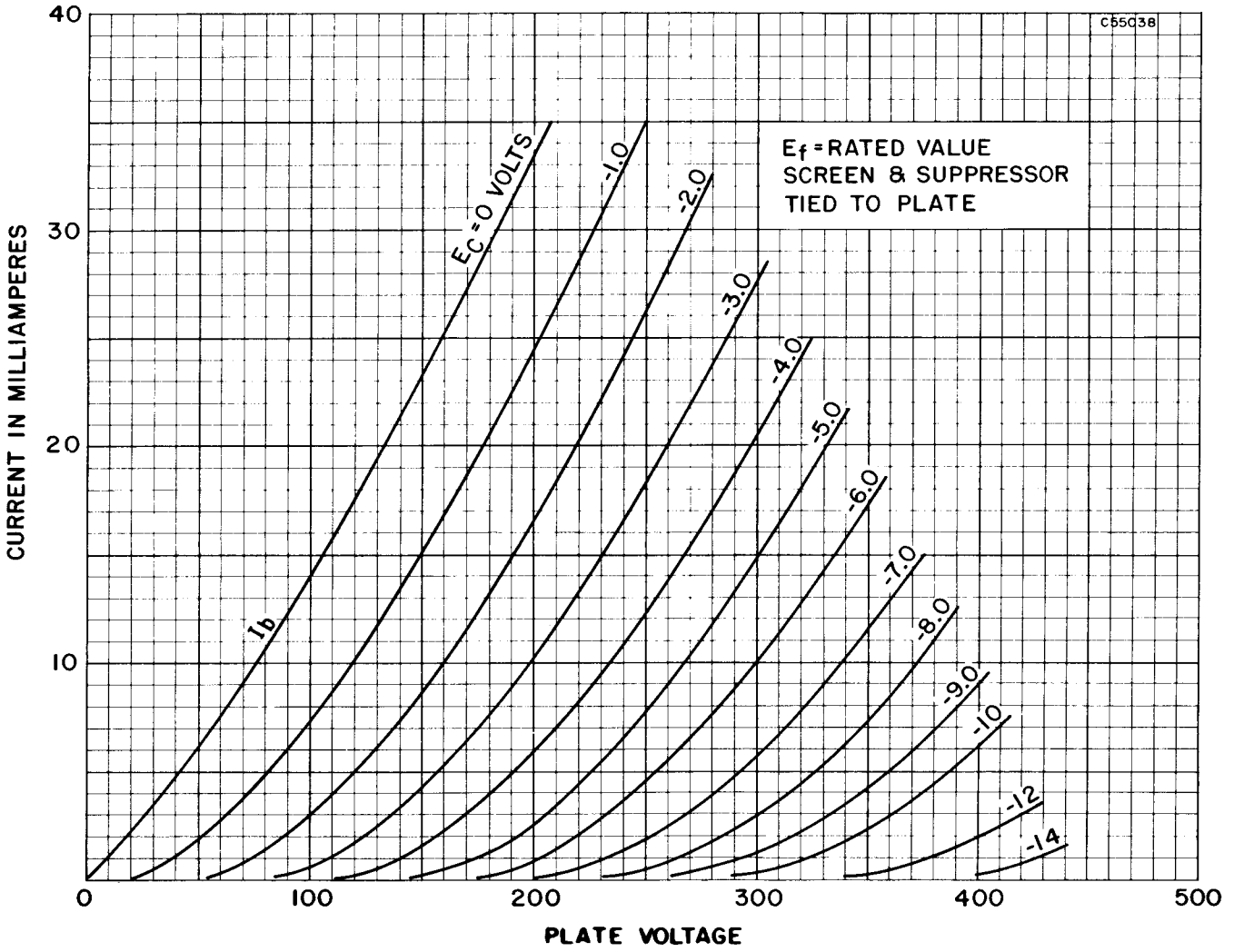
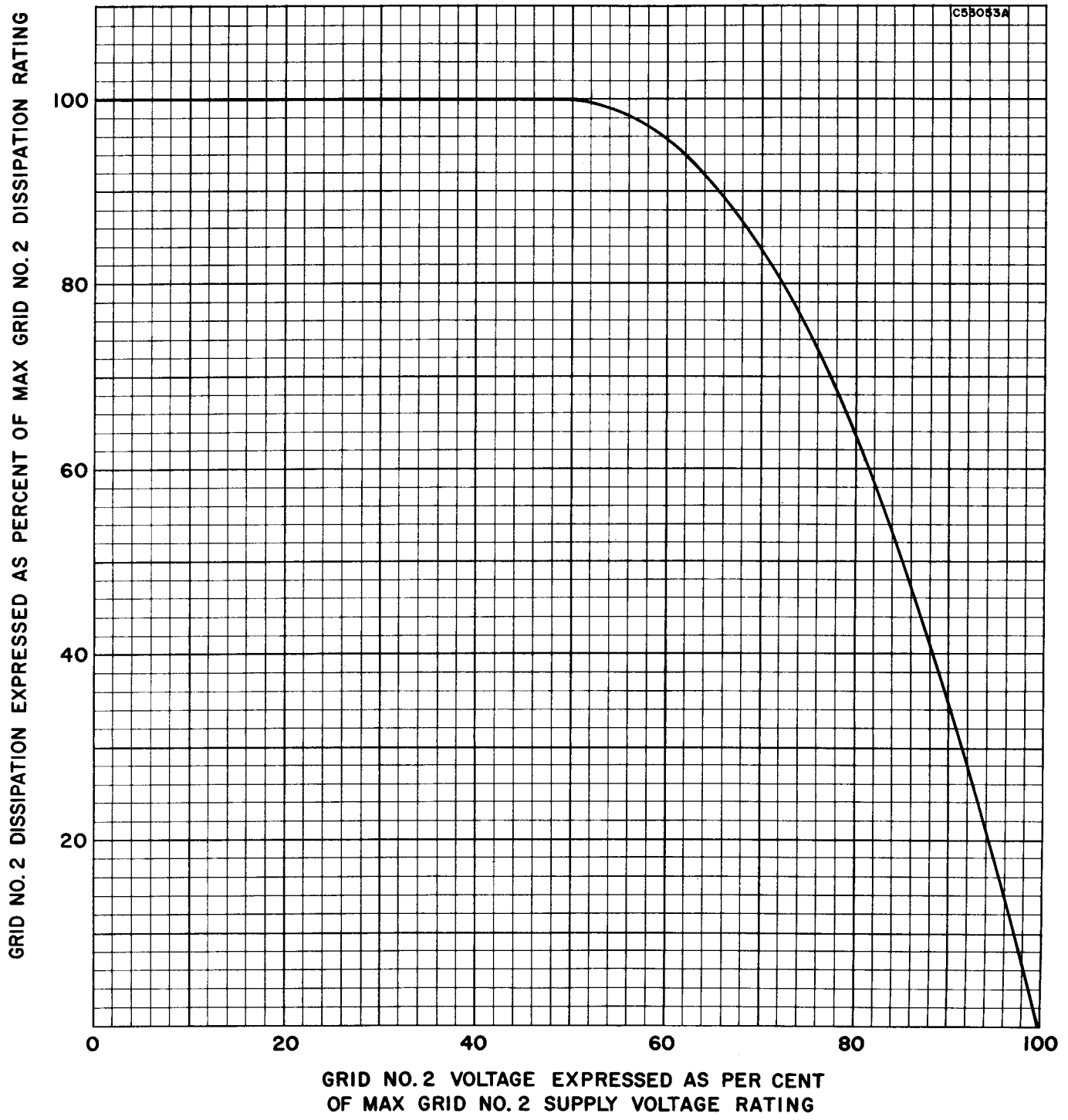


AVERAGE TRANSFER CHARACTERISTICS
(TRIODE CONNECTED)



RATING CHART

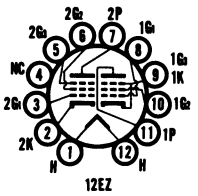


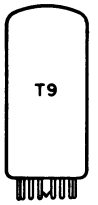
6BY11

AUDIO OUTPUT AMPLIFIER FM DETECTOR

Power Pentode and Dual-Control Pentode

Construction.....Compactron T-9
Base E12-70
Basing 12EZ
Outline 9-59
Maximum Diameter .....1.188 In.
Maximum Seated Height .....2.000 In.
Maximum Overall Height .....2.250 In.





ELECTRICAL DATA

HEATER OPERATION

Heater Voltage	6.3 Volts
Heater Current	1200 Ma
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES

	Without Shield
Section No. 1	
Grid to Plate	0.28 pf
Input: g to (h + 1k + 1g2 + 1g3 + IS)	12.0 pf
Output: p to (h + 1k + 1g2 + 1g3 + IS)	7.0 pf
Section No. 2	
Grid No. 1 to Plate (Max.)	0.40 pf
Grid No. 3 to Plate	3.2 pf
Grid No. 1 to (h + 2k + 2g2 + 2g3 + IS)	7.0 pf
Grid No. 3 to (h + 2k + 2g2 + 2g3 + 2p + IS)	8.0 pf
Grid No. 1 to Grid No. 3	0.15 pf
Plate No. 1 to Plate No. 2	0.18 pf

RATINGS (Design Maximum Rating System)

Section No. 1	
Plate Voltage	200 Volts
Screen Voltage	150 Volts
Plate Dissipation	10 Watts
Screen Dissipation	1.8 Watts
DC Cathode Current	65 Ma
Grid No. 1 Circuit Resistance	
Cathode Bias	1.0 Megohms
Section No. 2	
Plate Voltage	300 Volts
Suppressor Voltage	25 Volts
Screen Supply Voltage	300 Volts
Positive DC Grid Voltage	0 Volt
Plate Dissipation	1.7 Watts
Screen Dissipation	1.0 Watts

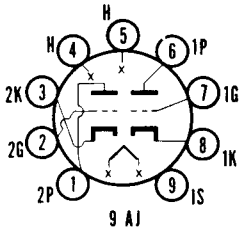
AVERAGE CHARACTERISTICS

Section No. 1, Class A1 Amplifier	
Plate Voltage	170 Volts
Screen Voltage	140 Volts
Grid No. 1 Voltage	−3.0 Volts
Peak AF Grid Voltage	15 Volts
Plate Resistance (Approx.)	33,000 Ohms
Transconductance	4900 μmhos
Zero Signal Plate Current	74 Ma
Maximum Signal Plate Current	76 Ma
Zero Signal Screen Current	3.9 Ma
Maximum Signal Screen Current	8.3 Ma
Load Resistance	2500 Ohms
Total Harmonic Distortion (Approx.)	10 Percent
Maximum Signal Power Output	4.0 Watts
Section No. 2	
Plate Voltage	150 Volts
Suppressor Voltage	0 Volt
Screen Voltage	100 Volts
Cathode Resistor	180 Ohms
Plate Resistance (Approx.)	110,000 Ohms
Transconductance (G1)	2500 μmhos
Transconductance (G3)	850 μmhos
Plate Current	1.3 Ma
Screen Current	2.1 Ma
Ec1 for Ib = 20 μa	−4.0 Volts
Ec3 for Ib = 50 μa	−3.0 Volts



SYLVANIA TYPE 6BZ8
4BZ8

MEDIUM MU DUO TRIODE
SEMI-REMOTE CUTOFF



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9AJ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	4BZ8	6BZ8
Heater Voltage (ac or dc)	4.2	6.3 Volts
Heater Current	600	400 Ma
Heater Warm-up Time[1]	11	Seconds
Heater-Cathode Voltage (Design Max. Values)[2]		
Heater Negative with Respect to Cathode		200 Volts
Heater Positive with Respect to Cathode		200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[3]

Cascode Operation	Section No. 1	Section No. 2
Grid to Plate	1.15	— μμf
Plate to Cathode	—	0.15 μμf
Triode No. 1 Plate to Triode No. 2 Plate	0.010	— μμf

RATINGS[2] (Design Maximum Values)

Plate Voltages	250 Volts Max.
Plate Dissipation	2.2 Watts Max.
Cathode Current	20 Ma Max.
Grid Circuit Resistance	0.1 Megohm Max.

CHARACTERISTICS

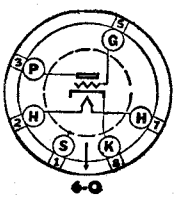
Class A_1 Amplifier	
Plate Voltage	125 Volts
Cathode Resistor	100 Ohms
Plate Current	10 Ma
Transconductance	8000 Ohms
Amplification Factor	45
Plate Resistance	5600 Ohms
Grid Voltage (approx.) for Gm = 50 μmhos	−13 Volts
Cascode Operation at Eb = 250 Volts, E_{c_1} = −0.5 Volts	
Transconductance	10,000 μmhos
Plate Current	15 Ma

NOTES:

1. Heater Warm-up Time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.
2. Design-Maximum Ratings are the limiting values expressed with respect to bogie tubes at which satisfactory tube life can be expected to occur. To obtain satisfactory circuit performance, therefore, the equipment designer must establish the circuit design so that no design-maximum value is exceeded with a bogie tube under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, and environmental conditions.
3. Use external shield No. 315.

APPLICATION

The Sylvania Type 6BZ8 is a miniature, medium mu, semi-remote cutoff double triode designed for use in low noise VHF amplifier application and particularly for cascode operation.
The 4BZ8 is identical to the 6BZ8 except for heater characteristics. The 4BZ8 has a 600 ma heater and controlled heater warm-up time and is intended for use in series heater string television receivers.

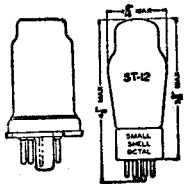


6-Q

Sylvania

TYPE 6C5
TYPE 6C5G

SUPER TRIODES AMPLIFICATEURS DETECTEURS



CARACTERISTIQUES

	6C5	6C5G
Tension chauffage CA. ou CC.	6,3	6,3 volts
Courant chauffage	0,3	0,3 ampère
Ampoule	8A-2	ST-12
Culot — Petit octal 6 broches	6-Q	6-Q
Position de montage	Toutes	Toutes

Capacités directes interélectrodes :

Grille à plaque	2,0	2,2 $\mu\mu f$
Entrée	3,0	4,4 $\mu\mu f$
Sortie	11,0	12,0 $\mu\mu f$

Conditions limites de fonctionnement. (Voir page 9) :

Tension chauffage CA. ou CC.	6,3 volts
Courant chauffage	0,3 ampère
Tension plaque	250 volts max.
Tension grille	0 volt min.
Dissipation plaque	2,5 watts max.

Conditions de fonctionnement et caracteristiques :

AMPLIFICATEUR CLASSE A

Tension de chauffage	6,3 volts
Tension de plaque	250 volts max.
Tension grille*	—8 volts
Courant plaque	8 ma.
Résistance interne	10,000 ohms
Conductance mutuelle	2,000 μmhos
Cœfficient d'amplification	20

* La résistance C. C. dans le circuit grille ne doit pas dépasser 1 mégohm.

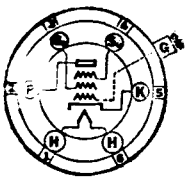
APPLICATION

Les tubes triode Sylvania 6C5 et 6C5G sont très semblables au type 76, mais ont des caractéristiques meilleures. Comme le tube 76, ils sont recommandés pour remplir les fonctions de détecteur, amplificateur ou oscillateur.

Les principales différences de caractéristiques résident dans les valeurs des capacités interélectrodes, dans la tension de polarisation, dans la conductance mutuelle et le coefficient d'amplification, ces deux dernières valeurs étant plus élevées que pour le 76.

Pour les renseignements détaillés, voir type 76.

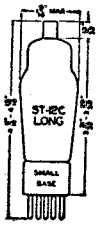
Un schéma-type de récepteur toutes ondes équipé avec tubes métal se trouve à la fin de ce Manuel. Le schéma comporte un tube 6C5 comme oscillateur séparé. On notera que la broche n° 1 du type 6C5 est connectée à une cage interne pour raisons de blindage.



Sylvania

TYPE 6C6

AMPLIFICATEUR TRIGRILLE



CARACTERISTIQUES

Tension chauffage CA. ou CC. ... ... 6,3 volts
Courant chauffage ... ... 0,3 ampère
Ampoule ... ... ST-12C longue
Culot ... ... petit métal
Culot — Petit 6 broches 6-F
Position de montage ... ... Toutes

Capacités directes interélectrodes :

(PENTODE)

Grille à plaque (avec blindage) ... ... 0,007 $\mu\mu$f **max.**
Entrée (G à toutes autres électrodes, excepté P) ... 5,0 $\mu\mu$f.
Sortie (P à toutes autres électrodes, excepté G) ... 6,5 $\mu\mu$f.

(TRIODE)

(Grilles Gs et Su connectées à P)

Grille à plaque ... ... 2,0 $\mu\mu$f **max.**
Entrée (G à F+K+blindage interne) ... ... 3,0 $\mu\mu$f
Sortie (P à F+K+blindage interne) ... ... 10,5 $\mu\mu$f

Conditions limites de fonctionnement. (Voir page 9) :

AMPLIFICATEUR CLASSE A

	Triode	Pentode
Tension chauffage CA. ou CC.	6,3	6,3 volts
Courant chauffage	0,3	0,3 ampère
Tension plaque	250	300 volts max.
Source tension grille écran	—	300 volts max.
Tension grille écran	—	125 volts max.
Dissipation plaque	1,75	0,75 watt max.
Dissipation grille	—	0,10 watt max.
Tension polarisation grille ext.	0	0 volt min.

Conditions de fonctionnement et caractéristiques :

	Triode		Pentode	
Tension de chauffage	6,3	6,3	6,3	**6,3 volts**
Tension de plaque	180	250	100	**250 volts max.**
Tension de grille	—5,3	—8	—3	—3 volts
Tension de grille écran	(con. P)	—	100	100 volts max.
Grille de suppression	(con. P)	Reliée à la cathode.		
Courant plaque	5,3	6,5	2,0	2,0 ma.
Courant de grille écran ...	—	—	0,5	0,5 ma.
Résistance interne...	0,011	0,01	1,0	1,5 még. min.
Conductance mutuelle	1,800	1,900	1,185	1,225 μmhos
Coefficient d'amplification ...	20	20		

APPLICATION.

Le tube Sylvania 6C6 est un amplificateur pentode pour H.F., à pente fixe. Il est utilisable comme détecteur et amplificateur pour recpteur CA, CC, universel et automobile. La grille de suppression est connectée à une broche séparée.

Le tube 6C6 est particulièrement utile comme détecteur polarisé, à cause de son aptitude à fournir une tension modulée importante avec peu de distorsion pour un signal de haute fréquence faible appliqué à la grille de contrôle, pourvu que le système de couplage soit satisfaisant.

Le type 6C6 peut être utilisé comme amplificateur H.F., lorsque le signal appliqué à la grille est relativement faible, c'est-à-dire de l'ordre du volt. Dans un tel cas, la tension de grille ou la tension de grille écran, ou toutes deux, peuvent être rendues variables pour assurer le contrôle de volume. Lorsque le signal est plus grand, un tube à pente variable doit être utilisé pour éviter la transmodulation et la distorsion de modulation.

La résistance de charge, dans le circuit plaque, doit être le plus élevée possible. Une impédance accordée convient bien pour un amplificateur M.F. Le gain par étage peut atteindre 100 ou plus. Pour d'autres applications, exigeant une sensibilité uniforme dans une large bande de fréquence, il est nécessaire d'utiliser des dispositifs de couplage convenables.

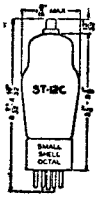
Le tube 6C6 peut être employé comme premier détecteur dans un superhétérodyne, mais un tube à pente variable doit lui être préféré lorsqu'il s'agit de recevoir des signaux de grande amplitude et si le contrôle de volume doit être appliqué en outre à cet étage.



Sylvania

TYPE 6C8G

AMPLIFICATEUR DOUBLE TRIODE



CARACTERISTIQUES

Tension de chauffage CA. ou CC.	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12C
Culot — Petit octal 8 broches	8-G
Position de montage	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension chauffage CA. ou CC.	6,3 volts
Courant chauffage	0,3 volt
Tension plaque	250 volts max.
Dissipation plaque	1,0 watt max.

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A (1 triode)

Tension de chauffage CA. ou CC.	6,3 volts
Tension plaque	250 volts max.
Tension grille	—4,5 volts
Courant plaque	3,2 ma.
Résistance interne	22,500 ohms
Conductance mutuelle	1,600 μmhos
Cœfficient d'amplification	36

Fonctionnement-type en inversion de phase :

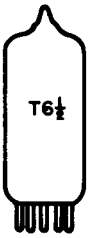
Tension d'alimentation plaque	250	250 volts
Tension grille	—3	—3 volts
Courant plaque par section	1,7	1,0 ma.
Résistance de charge	50,000	100,000 ohms
Résistance de polarisation automatique	900	1,500 ohms
Résistance de fuite de grille du tube suivant	100,000	500,000 ohms
Tension d'amplification	45	48
Tension efficace maximum de sortie	60	80 volts

APPLICATION

Le type Sylvania 6C8G est un amplificateur double triode spécialement destiné à l'amplification de tension ou à l'inversion de phase. Les plaque, grille et cathode de chaque triode sont connectées à des broches séparées, ce qui permet l'adaptation à des circuits spéciaux.

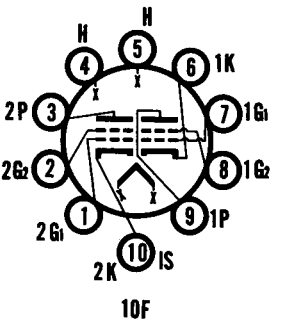
La différence de potentiel entre cathode et filament doit être maintenue aussi faible que possible. En inverseur de phase, la résistance cathodique ne doit pas être shuntée par une capacité. Il est évident que la résistance de fuite de grille du tube suivant est déterminée uniquement par le type de tube utilisé dans cet étage.

Il n'est pas recommandé de mettre le filament du 6C8G en série avec les filaments d'autres tubes de la série 0,3 amp. pour être alimentés directement par le secteur, le filament du 6C8G pouvant brûler lors d'une surtension du réseau.



SYLVANIA TYPES 6C9 17C9

VHF DUO TETRODE



10F

MECHANICAL DATA

Bulb	T-6½
Base	E10-73, 10 Pin, Center Pin Added to E9-1 Base
Outline	6-13
Basing	10F
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

	17C9 Series	6C9 Parallel	
Heater Voltage	16.8	6.3[1]	Volts
Heater Current	150[1]	400	Ma

Ratings (Design Maximum Values)

	Min-Max	Min-Max	
Heater Voltage[2]	- -	5.7 - 6.9	Volts
Heater Current[2]	140 - 160	.. - ..	Ma
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
Total D C and Peak	200	200	Volts
Heater Positive with Respect to Cathode			
D C	100	100	Volts
Total D C and Peak	200	200	Volts

DIRECT INTERELECTRODE CAPACITANCES (Shielded)

	Section 1	Section 2	
Grid No. 1 to Plate	.055	.06	μμf Max.
Input: 2g1 to (h+2k,I.S.+2g2+E.S.)	..	4.2	μμf
1g1 to (h+1k,1g2,+2k,I.S.+E.S.)	4.4	..	μμf
Output: 2p to (h+2k,I.S.+2g2+E.S.)	..	2.2	μμf
1p to (h+1k,+1g2+2k,I.S.+E.S.)	2.2	..	μμf
Heater to Cathode	4.2	4.8	μμf
Coupling:			
Section 1 Plate to Section 2 Plate		.003	μμf Max.
Section 1 Grid No. 1 to Section 2 Grid No. 1		.001	μμf Max.
Section 1 Grid No. 1 to Section 2 Plate		.001	μμf Max.
Section 2 Grid No. 1 to Section 1 Plate		.032	μμf Max.

RATINGS (Design Maximum Values)

Plate Voltage	250 Volts Max.
Grid No. 2 Supply Voltage	180 Volts Max.
Grid No. 2 Voltage	See 6AM8 Rating Chart
Plate Dissipation (Both Plates)	2.5 Watts Max
Plate Dissipation (Each Section)	1.5 Watts Max
Grid No. 2 Dissipation (Each Section)	0.5 Watts Max
Cathode Current (Each Section)	20 Ma Max.

CHARACTERISTICS AND TYPICAL OPERATION (Each Section)

Plate Voltage	125 Volts
Grid No. 2 Voltage	80 Volts
Grid No. 1 Voltage	−1 Volt
Plate Current	10 Ma
Grid No. 2 Current	1.5 Ma
Transconductance	8000 μmhos
Plate Resistance (approx.)	0.1 Megohm
Grid No. 1 Voltage for Ib = 20 μa (approx.)	−6 Volts

NOTES:

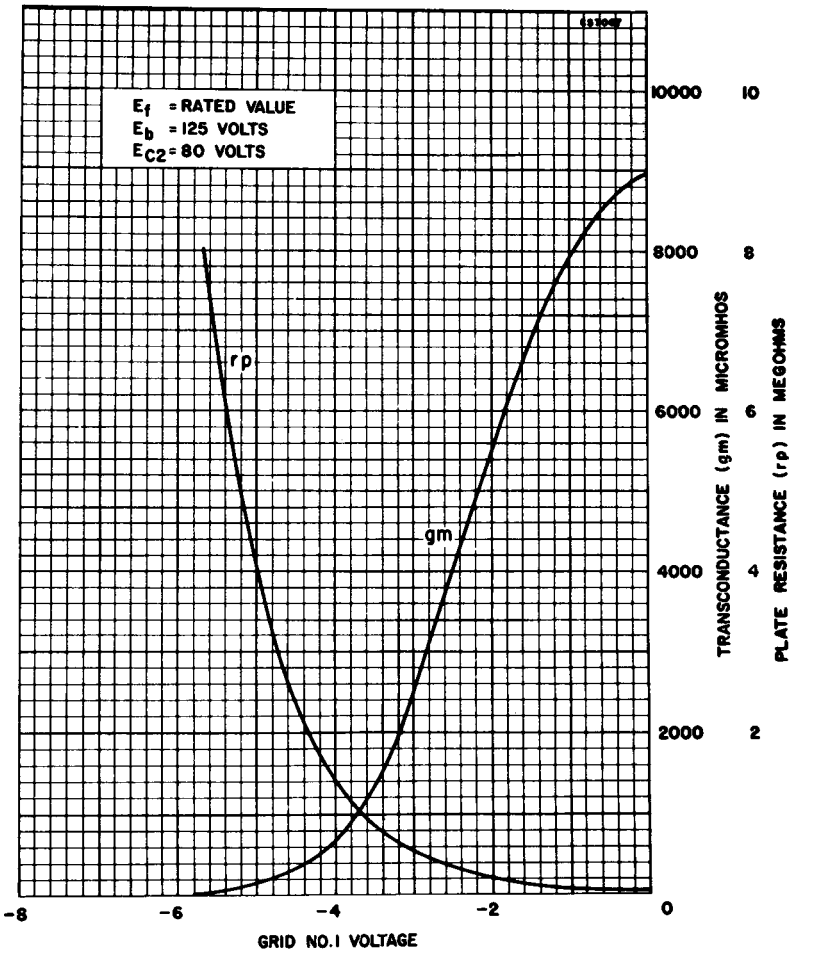
1. For series/parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current/voltage.
2. Heater voltage supply variations shall be restricted to maintain heater voltage/current within the specified values.

APPLICATION

Types 6C9 and 17C9 are duo tetrodes contained in a T-6½ 10 pin bulb. They are designed for service as VHF RF amplifiers and VHF autodyne mixers. Except for heater characteristics, Types 6C9 and 17C9 are identical.

SYLVANIA TYPES 6C9, 17C9 (Cont'd)

AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA

engineering data service

SYLVANIA
6CA5
12CA5, 17CA5
25CA5

MECHANICAL DATA

Bulb	T-5 ½
Base	E7-1, Miniature Button 7-Pin
Outline	5-3
Basing	7CV
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6CA5	12CA5	17CA5	25CA5		
Heater Voltage	6.3	12.6	16.8	25.0	Volts	
Heater Current	1200	600	540	300	Ma	
Heater Warm-up Time[1]		11	11		Seconds	
Heater-Cathode Voltage (Design Center Values)						
Heater Negative with Respect to Cathode						
Total DC and Peak	200	200	200	200	Volts	Max.
Heater Positive with Respect to Cathode						
DC	100	100	100	100	Volts	Max.
Total DC and Peak	200	200	200	200	Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.5 μμf
Input	15 μμf
Output	9.0 μμf

RATINGS (Design Center Values)

Plate Voltage	130 Volts	Max.
Grid No. 2 Voltage	130 Volts	Max.
Positive Grid No. 1 Voltage	0 Volts	Max.
Plate Dissipation	5.0 Watts	Max.
Grid No. 2 Dissipation	1.4 Watts	Max.
Grid No. 1 Circuit Resistance		
Fixed Bias	0.1 Megohm	Max.
Cathode Bias	0.5 Megohm	Max.
Bulb Temperature at Hottest Point	180° C	

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier

Plate Voltage	110	125 Volts
Grid No. 2 Voltage	110	125 Volts
Grid No. 1 Voltage	-4.0	-4.5 Volts
Peak AF Grid No. 1 Voltage	4.0	4.5 Volts
Zero-Signal Plate Current	32	37 Ma
Maximum-Signal Plate Current	31	36 Ma
Zero-Signal Grid No. 2 Current	3.5	4.0 Ma
Maximum-Signal Grid No. 2 Current	7.5	11 Ma
Transconductance	8100	9200 μmhos
Plate Resistance (Approx.)	16,000	15,000 Ohms
Load Resistance	3500	4500 Ohms
Maximum-Signal Power Output	1.1	1.5 Watts
Total Harmonic Distortion (Approx.)	5	6 Percent

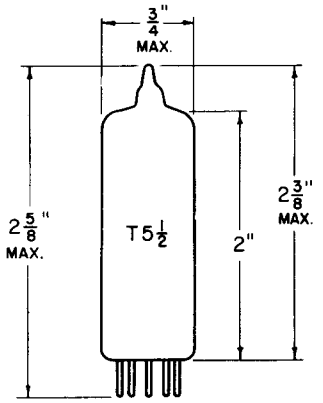
NOTE:

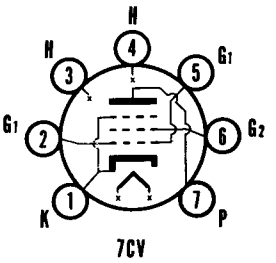
1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*

QUICK REFERENCE DATA

The Sylvania Types 6CA5, 12CA5, 17CA5, and 25CA5 are miniature beam power pentodes designed for service as audio output amplifiers. They feature high power sensitivity at relatively low plate and screen voltages.

Types 12CA5 and 17CA5 have controlled heater warm-up time for series string operation.





7CV

SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
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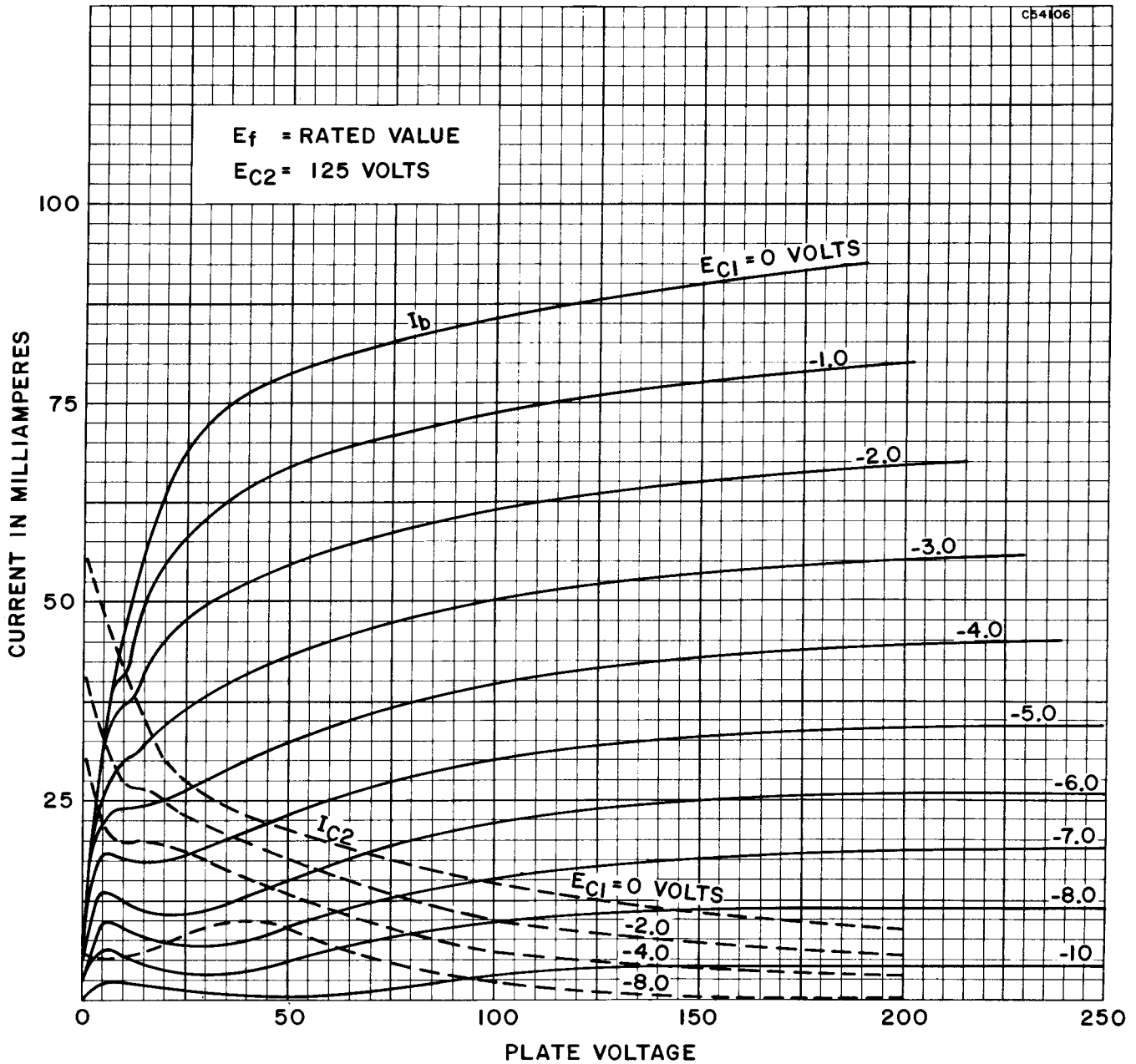
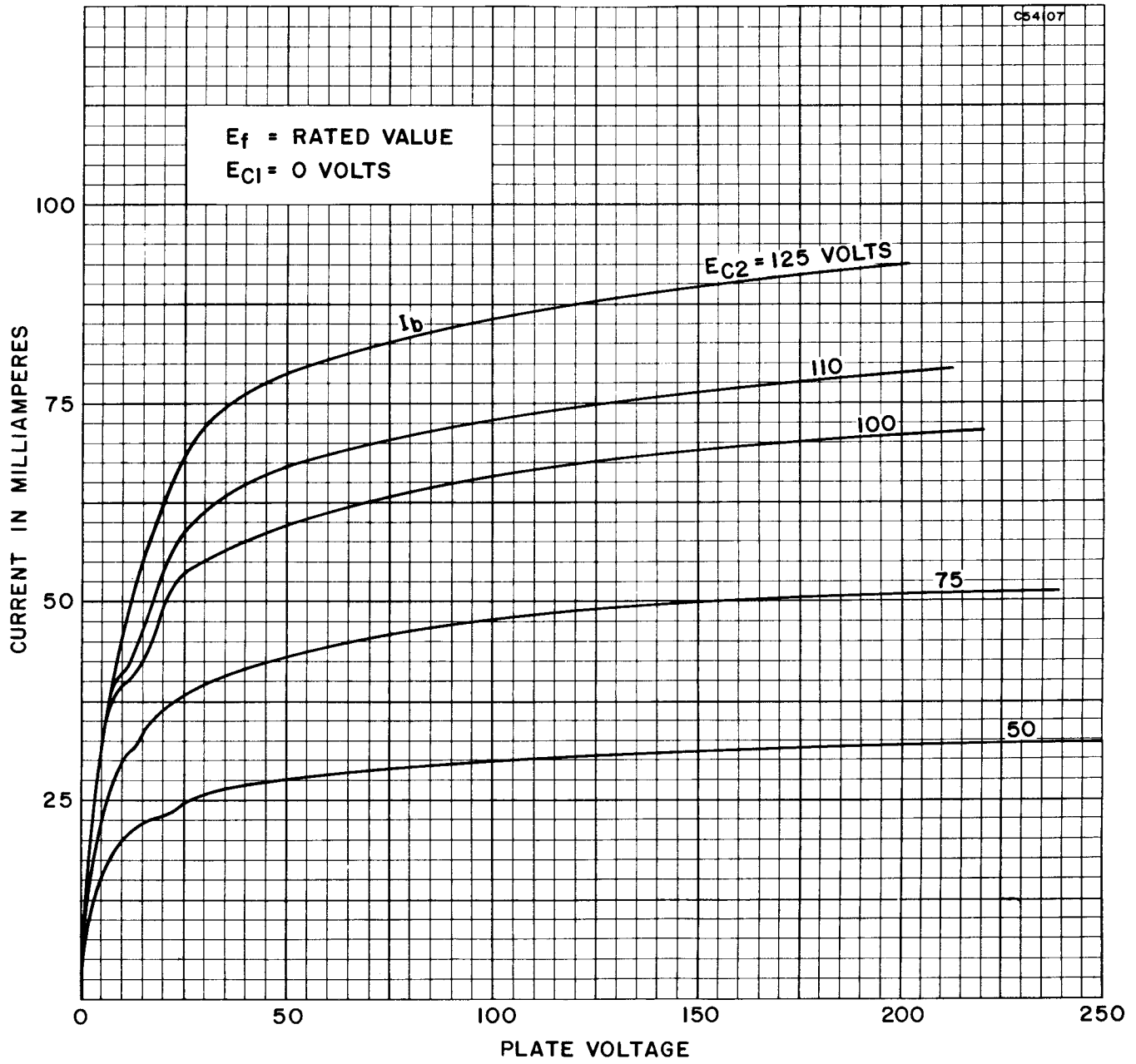
EMPORIUM, PENNSYLVANIA
FEBRUARY, 1957

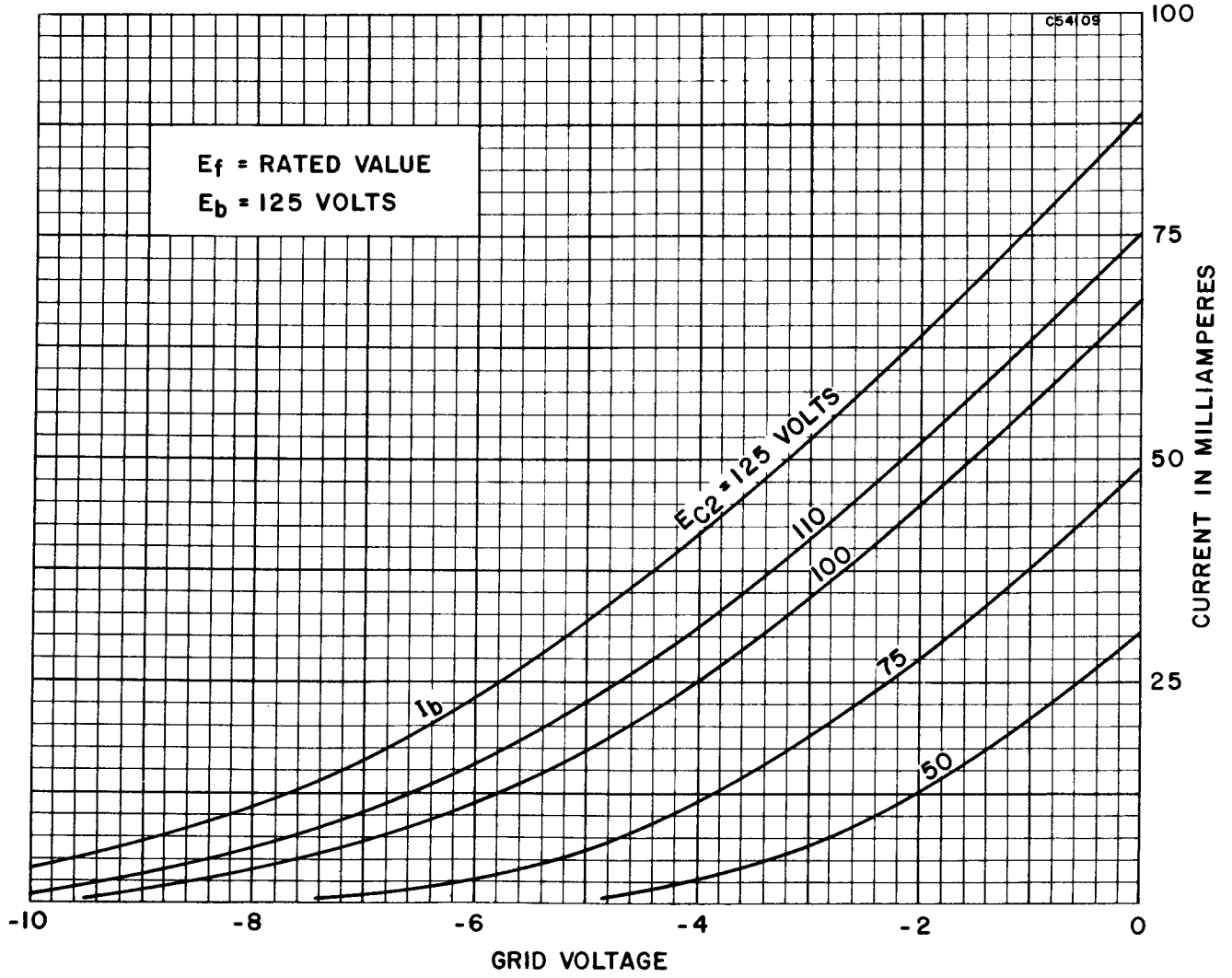
AVERAGE PLATE CHARACTERISTICS



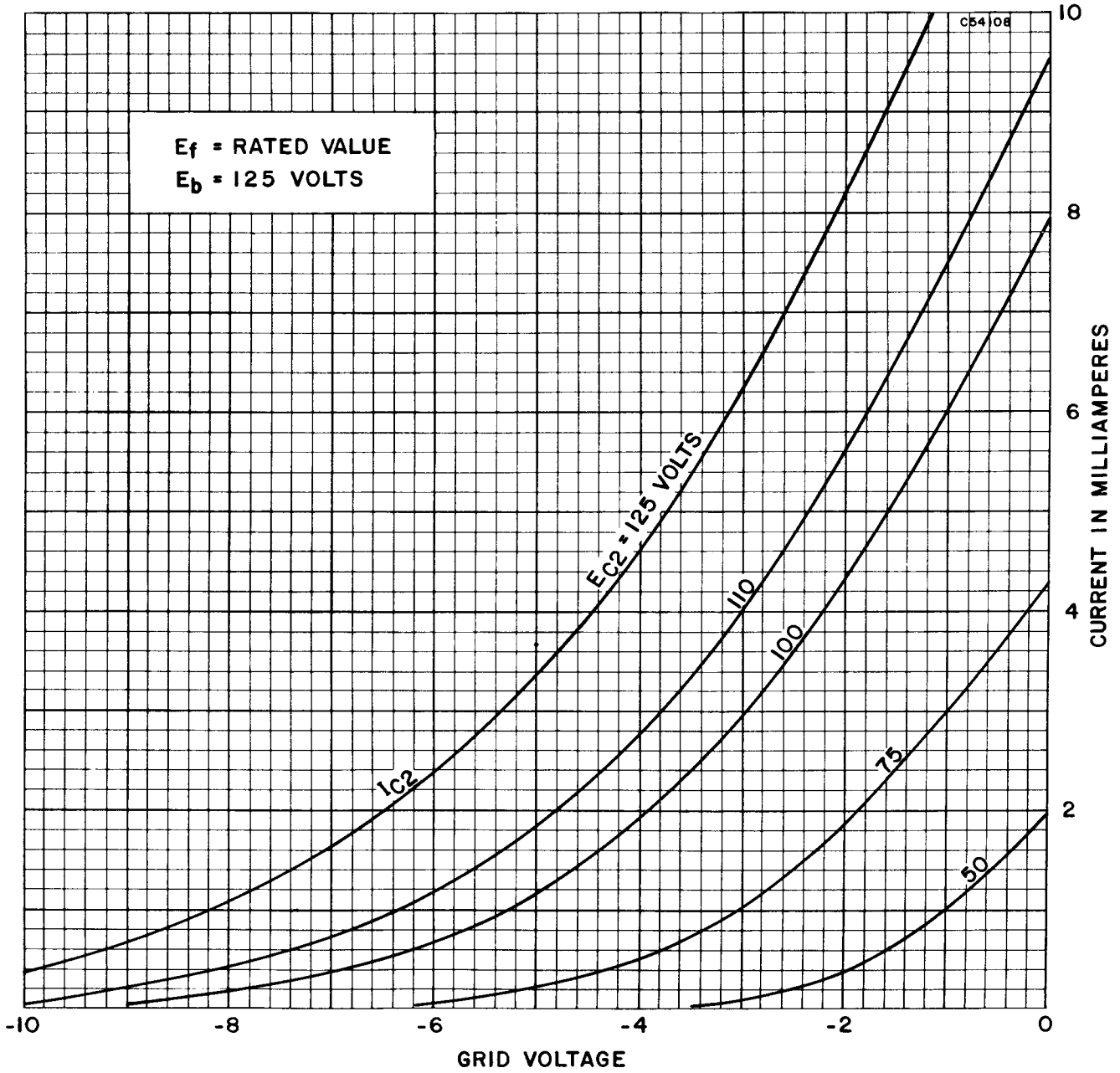
AVERAGE PLATE CHARACTERISTICS



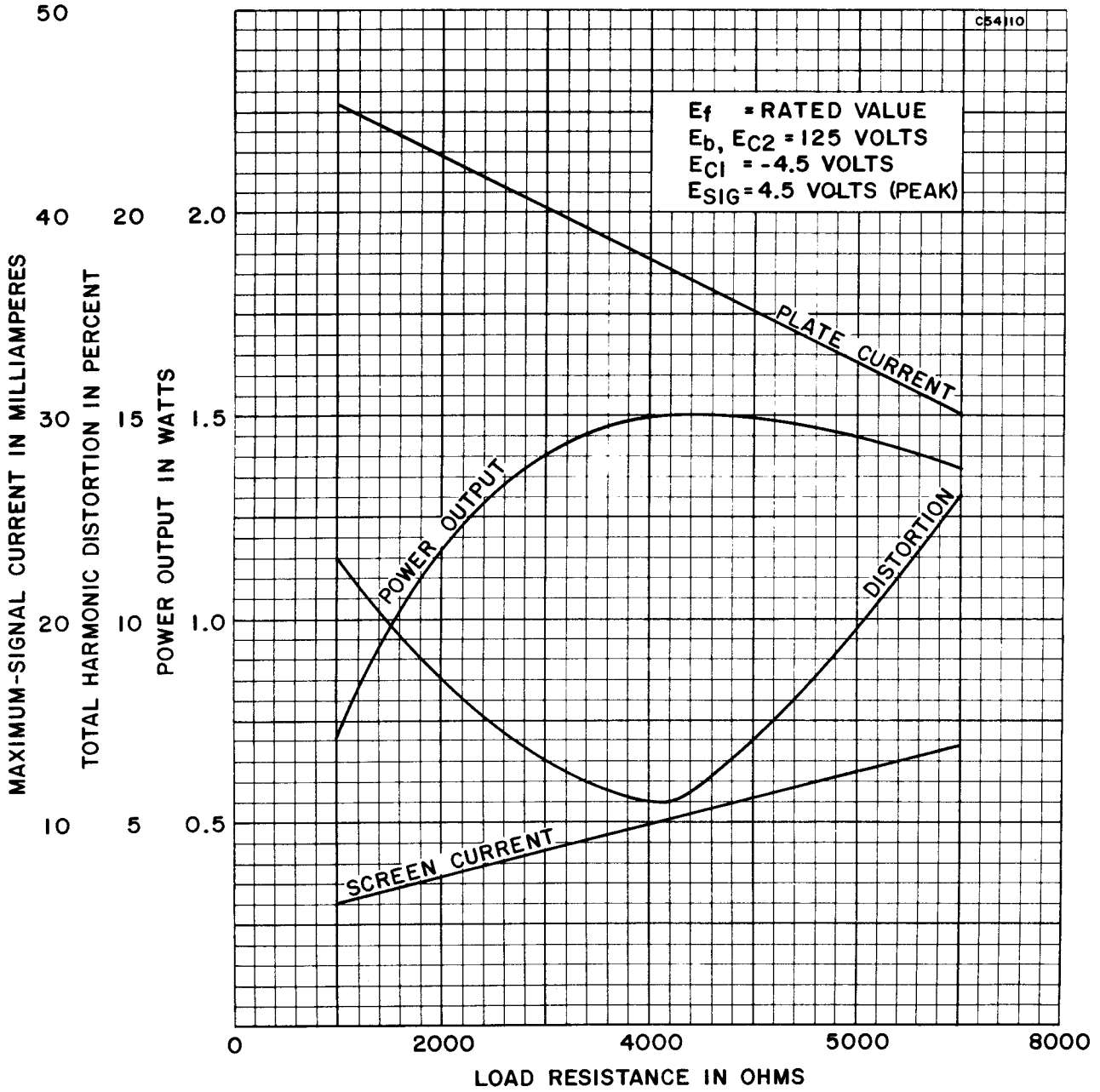
AVERAGE TRANSFER CHARACTERISTICS



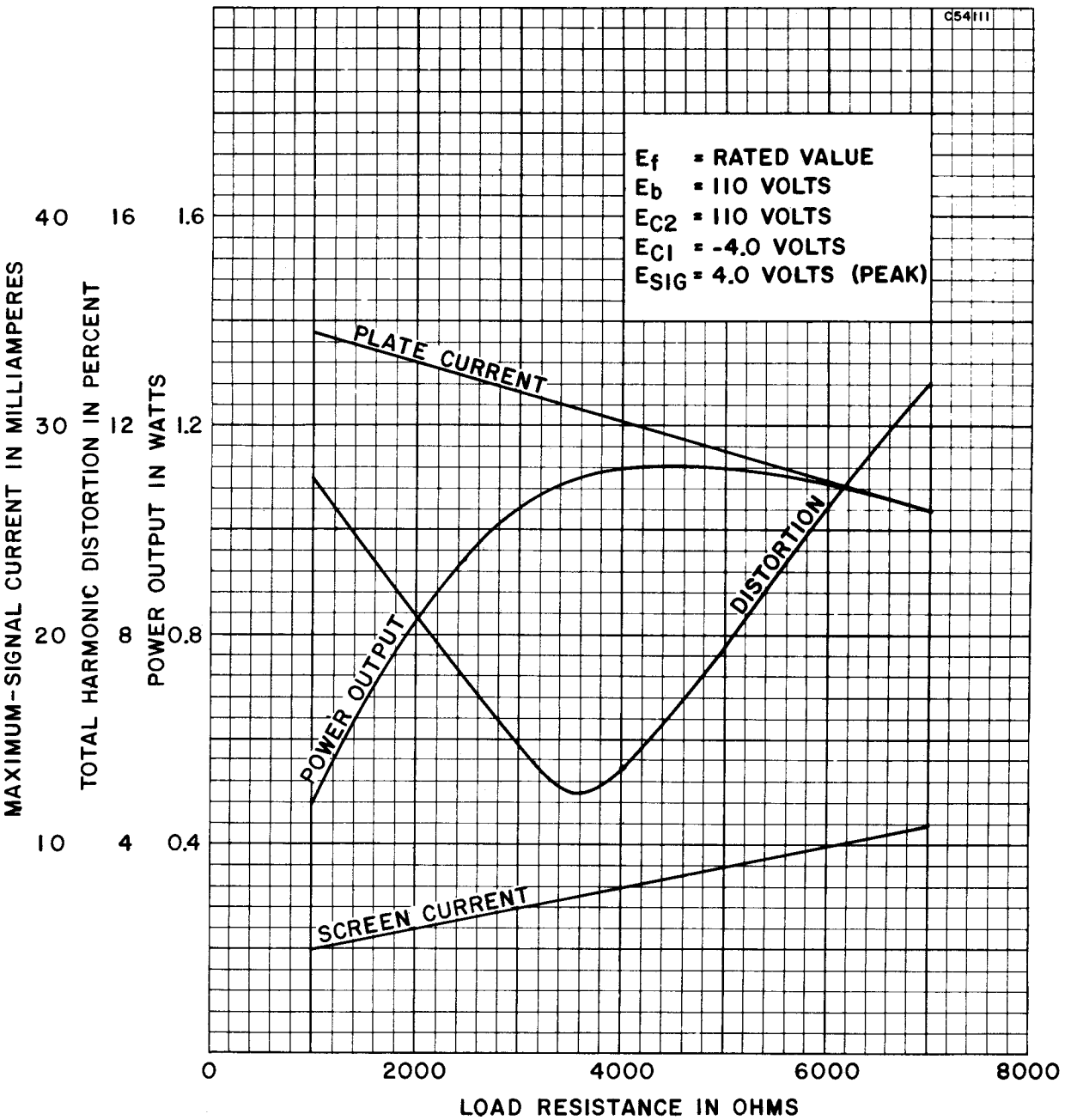
AVERAGE TRANSFER CHARACTERISTICS



AVERAGE OPERATION CHARACTERISTICS



AVERAGE OPERATION CHARACTERISTICS



MECHANICAL DATA

	6CB5
Bulb	ST-16
Base	B8-71, Short Jumbo Shell Octal, 8-Pin
Basing	8GD
Top Cap	C1-1 Small
Cathode	Coated Unipotential
Mounting Position	Any

	6CB5A
Bulb	T-12
Base	B8-71, Short Jumbo Shell Octal, 8-Pin or B8-118 Short Medium Shell Octal 8-Pin
Basing	8GD
Top Cap	C1-1 Small
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts	
Heater Current	2.5 Amperes	
Heater-Cathode Voltage (Design Center Values)		
Heater Negative with Respect to Cathode		
Total DC and Peak	200 Volts	Max.
Heater Positive with Respect to Cathode		
DC	100 Volts	Max.
Total DC and Peak	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Approx.)

	6CB5A	6CB5
Grid to Plate	0.4	0.8 $\mu\mu$f
Input	22	24 $\mu\mu$f
Output	10	10 $\mu\mu$f

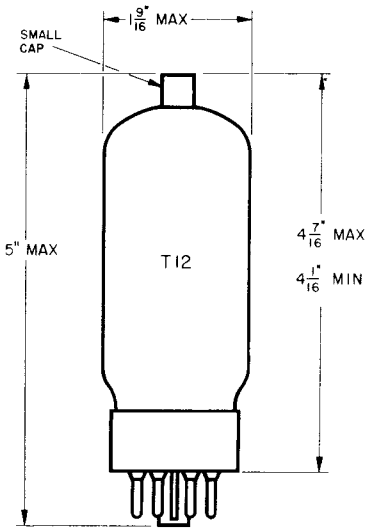
RATINGS (Design Center Values—Except as Noted)

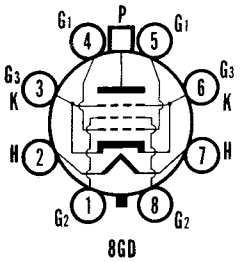
Horizontal Deflection Amplifier[1]

	6CB5A	6CB5	
DC Plate Supply Voltage (Boost + DC Power Supply)	800	700 Volts	Max.
Peak Positive-Pulse Plate Voltage (Abs. Max.)	6800	6800 Volts	
Peak Negative-Pulse Plate Voltage	1500	1500 Volts	Max.
Plate Dissipation[2]	23	23 Watts	Max.
Negative DC Grid No. 1 Voltage	50	50 Volts	Max.
Peak Negative-Pulse Grid No. 1 Voltage	200	200 Volts	Max.
DC Grid No. 2 Voltage	200	200 Volts	Max.
DC Cathode Current	220	Ma	Max.
Peak Cathode Current	770	Ma	Max.
Grid No. 2 Dissipation	3.6	3.6 Watts	Max.
DC Plate Current		200 Ma	Max.
Grid No. 1 Circuit Resistance	0.47	0.47 Megohm	Max.
Bulb Temperature (at hottest point)	220°	210° C	Max.

QUICK REFERENCE DATA

The Sylvania Types 6CB5 and 6CB5A are beam power amplifiers designed for use primarily as horizontal deflection amplifiers in color television receivers. The 6CB5A is contained in a T-12 bulb and has a higher DC plate supply voltage than the 6CB5. It also is completely interchangeable with the 6CB5.





8GD

SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
APRIL, 1957

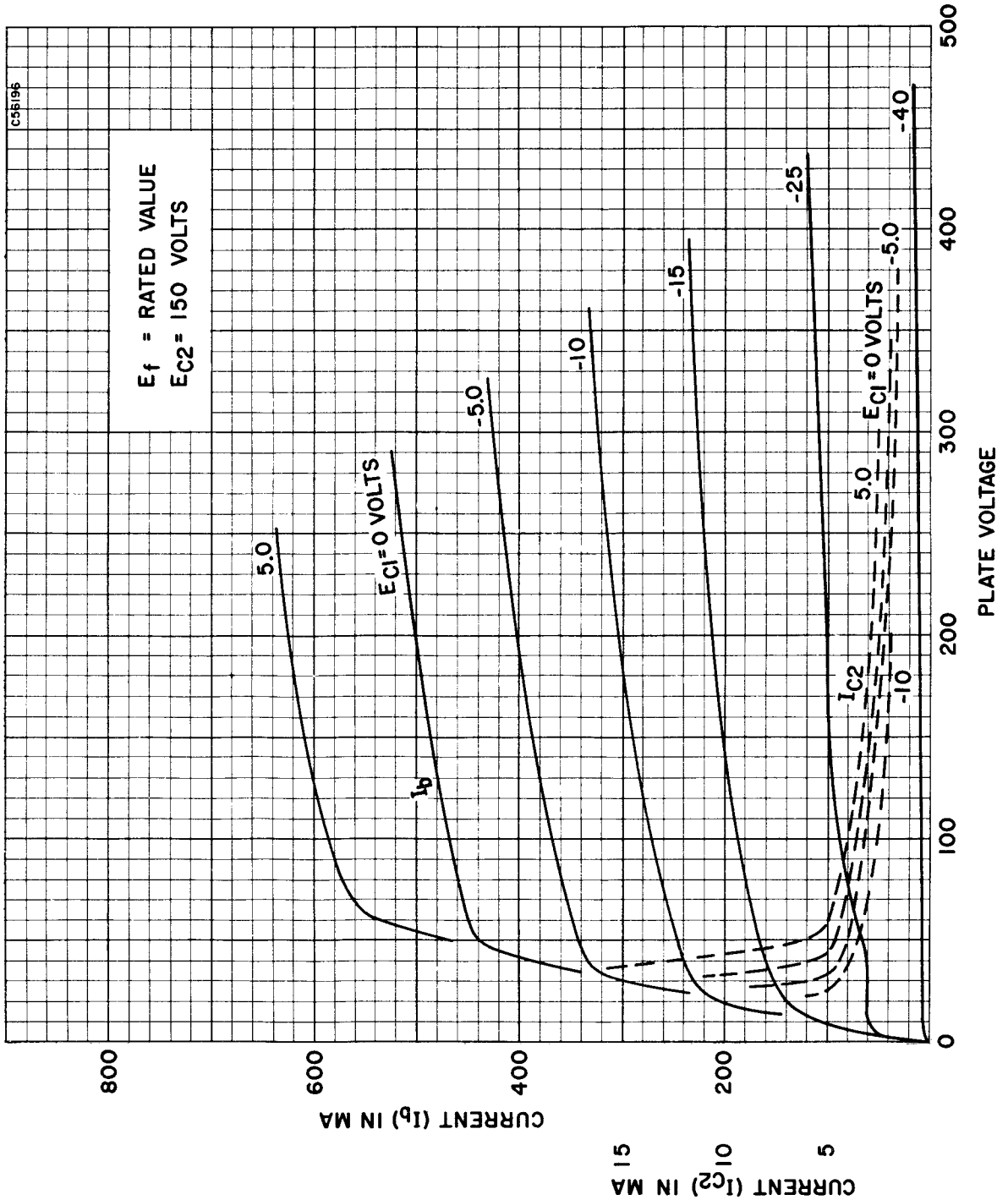
AVERAGE CHARACTERISTICS

	6CB5	6CB5A
Plate Voltage	75	175 Volts
Grid No. 2 Voltage	150	175 Volts
Grid No. 1 Voltage	0	30 Volts
Plate Current	460[3]	90 Ma
Grid No. 2 Current	42[3]	6.0 Ma
Transconductance		8800 μmhos
Plate Resistance		5000 Ohms
Triode Amplification Factor		3.8
Grid No. 1 Voltage (approx.) for Ib = 1 Ma.		−60 Volts

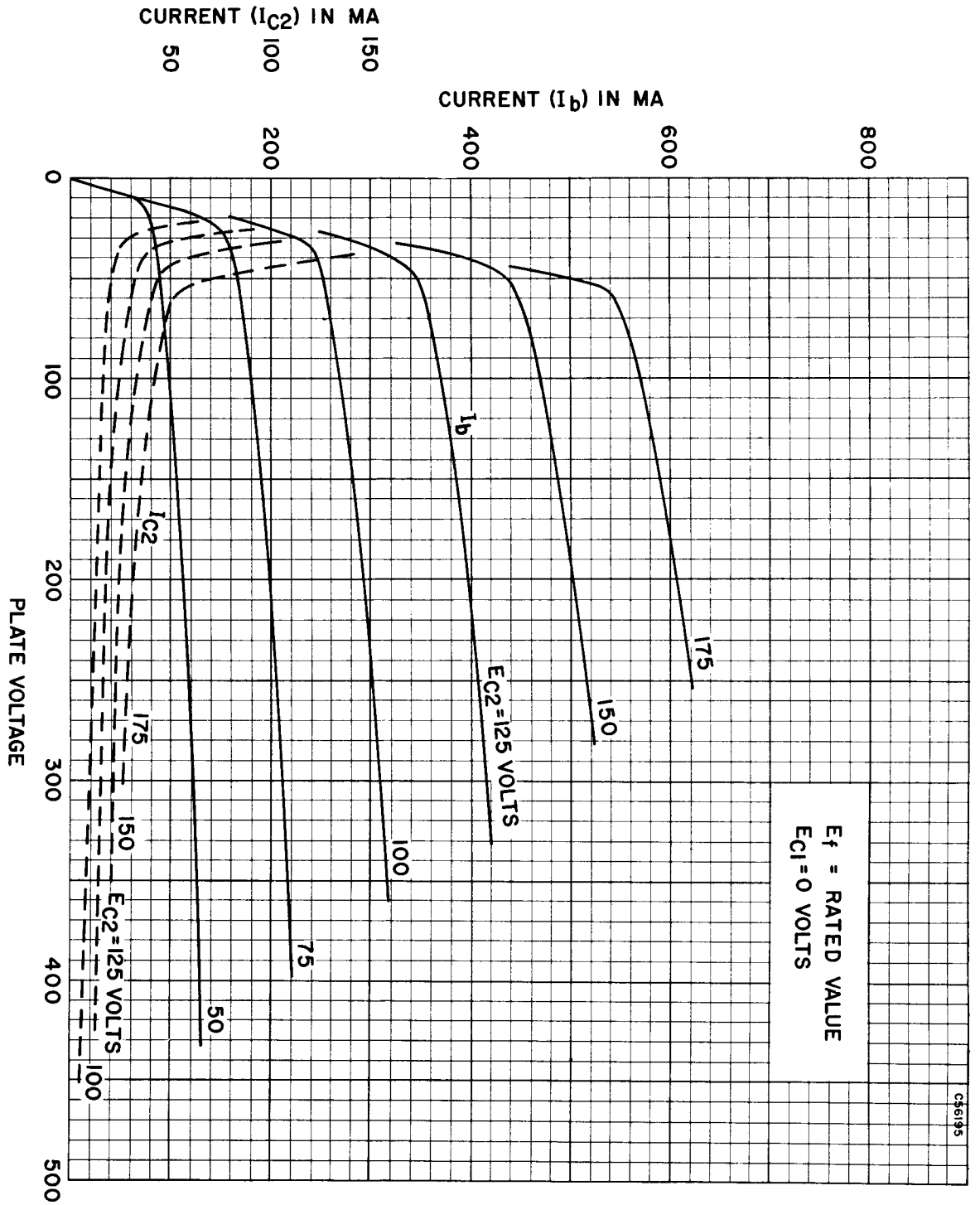
NOTES:

1. *For operation in a 525-line, 30-frame system as described in "Standards of Good Engineering Practice for Television Broadcasting Stations; Federal Communications Commission". The duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.*
2. *In stages operating with grid-leak bias, an adequate cathode bias resistor or other suitable means is required to protect the tube in the absence of excitation.*
3. *Test condition only.*

AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



SYLVANIA

engineering data service

SYLVANIA

6CD6G

MECHANICAL DATA

Bulb	ST-16
Base	B6-13 Medium Shell Octal, 6-Pin
Basing	5BT
Top Cap	C1-1 Small
Cathode	Coated Unipotential
Mounting Position	Vertical[1]

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	2.5 Amperes
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Approximate)

Grid to Plate	0.6 $\mu\mu$f
Input	25 $\mu\mu$f
Output	9.5 $\mu\mu$f

RATINGS (Design Center Values — Except as Noted)

Horizontal Deflection Amplifier[2]

DC Plate Supply Voltage (Boost + DC Power Supply)	700 Volts	Max.
Peak Positive Plate Voltage (Abs. Max.)	6600 Volts	
Peak Negative Plate Voltage	1500 Volts	Max.
Plate Dissipation[3]	15 Watts	Max.
Peak Negative Grid #1 Voltage	200 Volts	Max.
DC Grid #2 Voltage	175 Volts	Max.
Grid #2 Dissipation	3.0 Watts	Max.
Average Cathode Current	200 Ma	Max.
Peak Cathode Current	700 Ma	Max.
Grid #1 Circuit Resistance	0.47 Megohm	Max.
Bulb Temperature (At Hottest Point)	210° C	Max.

AVERAGE CHARACTERISTICS

Pentode Operation: With E_b=175 V, E_{c2}=175 V and E_{c1}=-30 V

Plate Current	75 Ma
Grid #2 Current	5.5 Ma
Transconductance	7700 μmhos
Plate Resistance	7200 Ohms

Zero Bias: With E_b=60 V and E_{c2}=100 V (Instantaneous Values)

Plate Current	230 Ma
Grid #2 Current	21 Ma

Cutoff: For I_b=1 ma with E_b=175 V and E_{c2}=175 V

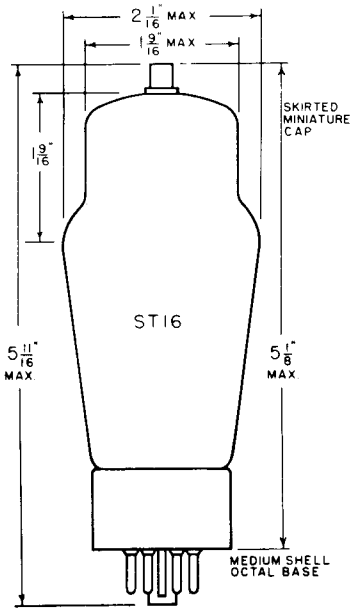
Grid #1 Voltage (approx.)	-55 Volts

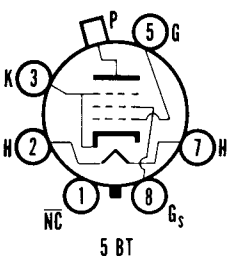
Triode Amplification Factor: With

E_b=E_{c2}=175 V and E_{c1}=-30 V	3.9

QUICK REFERENCE DATA

The Sylvania Type 6CD6G is a beam power amplifier designed for use as a horizontal deflection amplifier in television receivers.





5 BT

SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

MARCH 1954

SYLVANIA

6CD6G

TYPICAL OPERATION

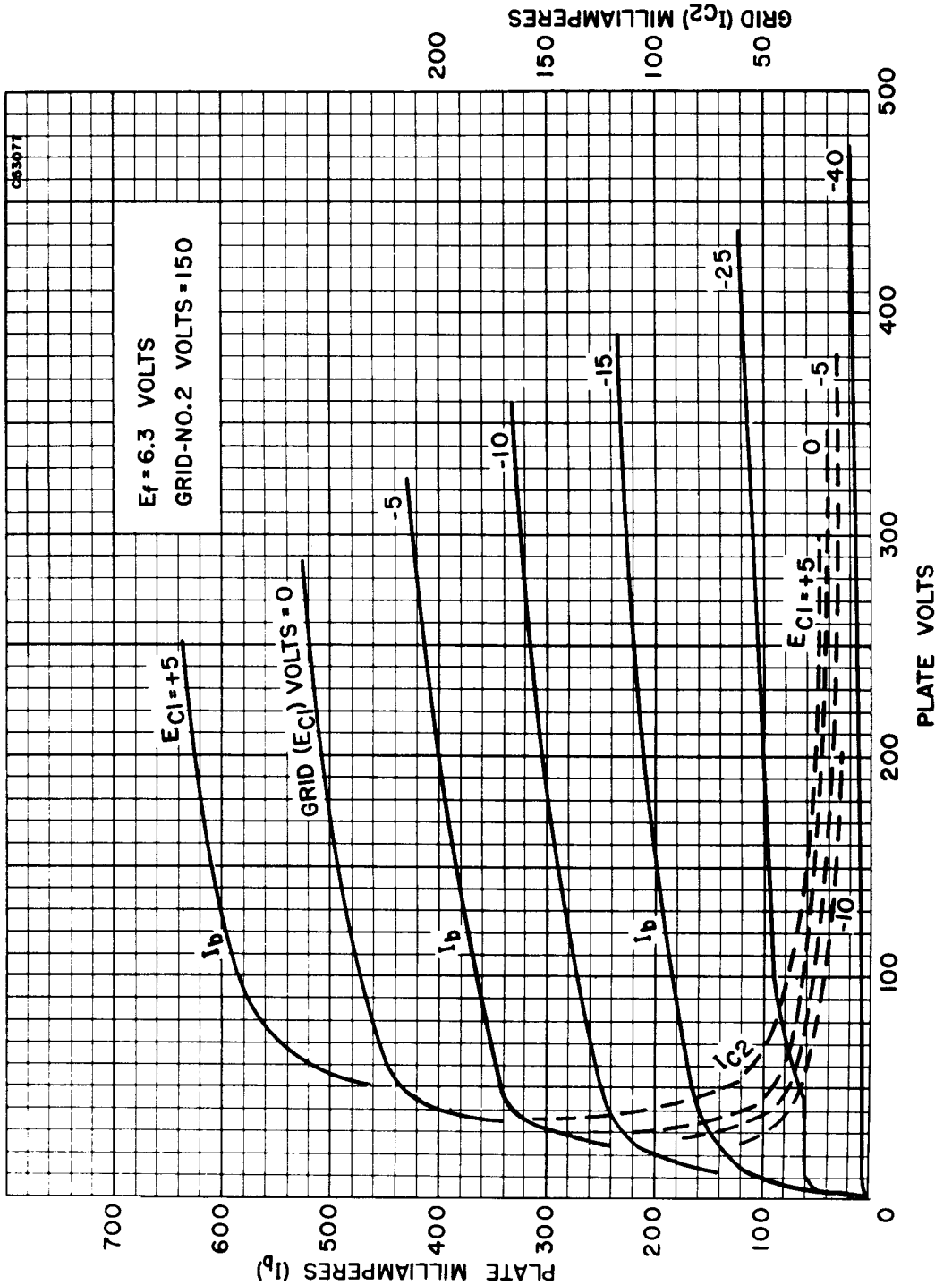
Horizontal Deflection Amplifier, 90° Picture Tube

Plate Supply Voltage	300 Volts
Average Plate Voltage (Boost + Supply)	620 Volts
Peak Positive Plate Voltage	
DC Component + Pulse	5600 Volts
Average Plate Current	113 Ma
Peak Plate Current	380 Ma
Plate Dissipation	11.0 Watts
Grid No. 2 Voltage	125 Volts
Grid No. 2 Current	16 Ma
Grid No. 2 Dissipation	2 Watts
Grid No. 1 Input Voltage	
Peak to Peak	180 Volts
Sawtooth Component	140 Volts
Anode Voltage (Picture Tube)	17.2 Kv
Anode Current (Picture Tube)	100 μa

NOTES:

1. *Horizontal operation permitted if plane of Pins 2 and 7 is vertical.*
2. *For operation in a 525-line, 30-frame system as described in "Standards of Good Engineering Practice for Television Broadcasting Stations; Federal Communications Commission". The duty cycle of the voltage pulse not to exceed 15% of a scanning cycle.*
3. *In stages operating with grid leak bias, an adequate cathode bias resistor or other suitable means is required to protect the tube in the absence of excitation.*

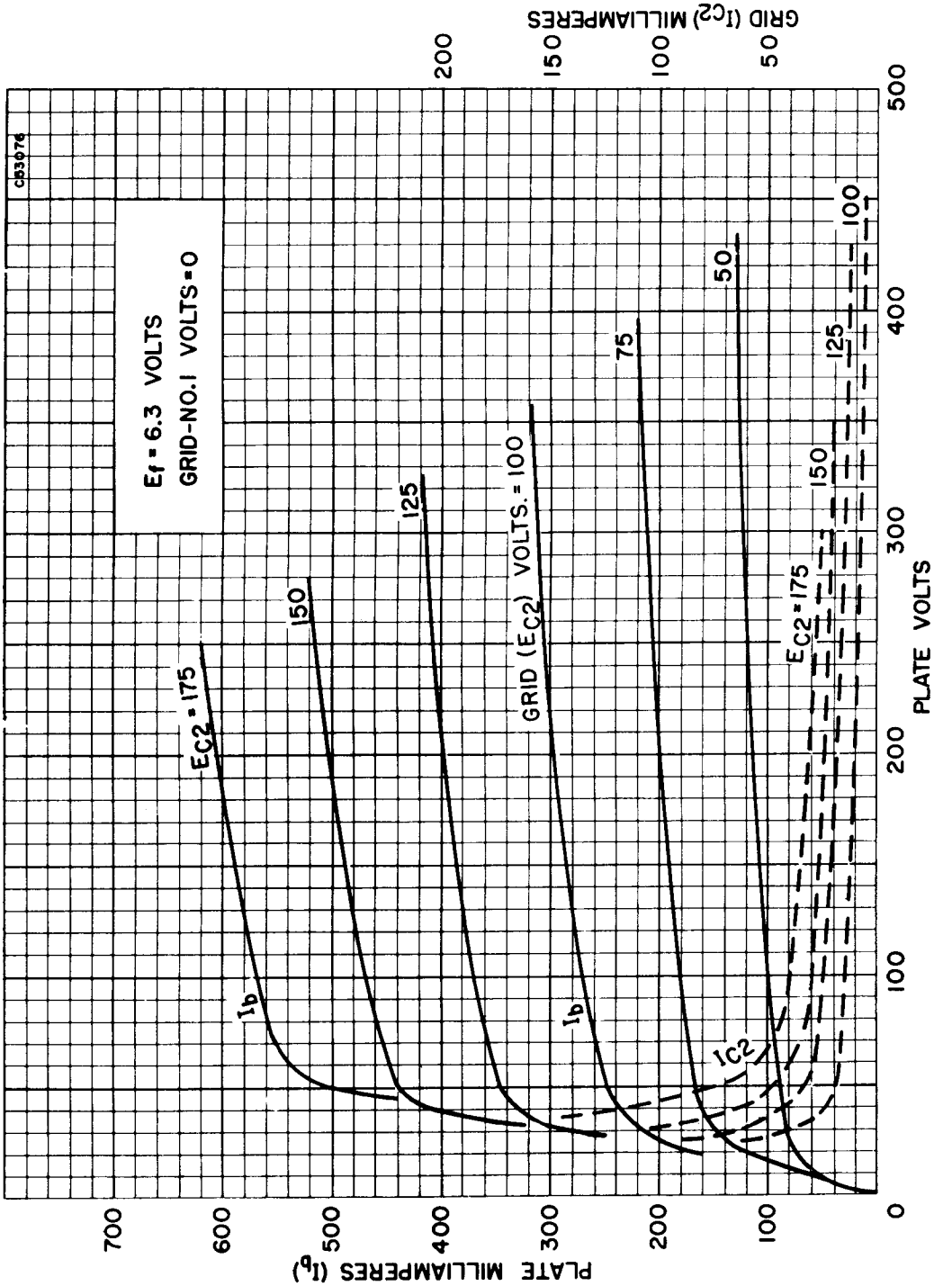
AVERAGE PLATE CHARACTERISTICS



SYLVANIA

6CD6G

AVERAGE PLATE CHARACTERISTICS



SYLVANIA ELECTRIC

RTMA Registration Data

TYPE 6CG6

REMOTE-CUTOFF PENTODE

MECHANICAL DATA

Style	miniature
Cathode	coated, unipotential
Bulb	T-5 1/2
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Maximum Diameter	3/4 inch
Maximum Overall Length	2 1/8 inches
Maximum Seated Height	1 7/8 inches
Mounting Position	any
Basing	7BK-0-2

Pin Connections:

Pin 1 .. grid #1	Pin 5 .. plate
Pin 2 .. grid #3, internal shield	Pin 6 .. grid #2
Pin 3 .. heater	Pin 7 .. cathode
Pin 4 .. heater	

ELECTRICAL DATA

GENERAL

Direct Interelectrode Capacitances:

Values apply both with and without external shield(1)

Grid #1 to Plate, maximum	0.008	μμf
Input	5.0	μμf
Output	5.0	μμf
Heater Voltage (ac or dc)	6.3	volts
Heater Current	300	milliamps

RATINGS -- *Design Center System*

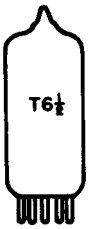
Maximum Plate Voltage (dc)	300	volts
Maximum Grid #2 Voltage (dc)	150	volts
Maximum Positive Grid #1 Voltage (dc)	0	volts
Maximum Plate Dissipitation	4.0	watts
Maximum Screen Dissipitation	0.75	watts
Maximum Heater-Cathode Voltage	± 90	volts

CHARACTERISTICS

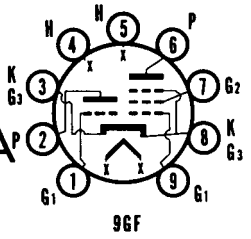
Conditions:		
Heater Voltage (ac or dc)	6.3	volts
Plate Voltage (dc)	250	volts
Grid #3 Voltage	0(2)	volts
Grid #2 Voltage (dc)	150	volts
Grid #1 Voltage (dc)	-8	volts
Plate Current (dc)	9.0	milliamps
Grid #2 Current (dc)	2.3	milliamps
Transconductance	2,000	micromhos
Plate Resistance	0.72	megohms
Grid #1 Voltage for 40 μmhos Transconductance	-24	volts

(1) External Shield #316 connected to pins 2 and 7.

(2) Pin 2 connected to Pin 7 at socket.



SYLVANIA TYPE 6CG8
6CG8A[P]
5CG8



MEDIUM MU TRIODE
SHARP CUTOFF PENTODE

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9GF
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	5CG8	6CG8	6CG8A
Heater Voltage	4.7	6.3	6.3 Volts
Heater Current	600	450	450 Ma
Heater Warm-up Time[1]	11		11 Seconds
Heater-Cathode Voltage (Design Center Values)			
Heater Negative with Respect to Cathode			
Total D C and Peak			200 Volts Max.
Heater Positive with Respect to Cathode			
D C			100 Volts Max.
Total D C and Peak			200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[2]	Unshielded
Triode Section		
Grid to Plate	1.5	1.5 μμf
Grid to (k + h)	3	2.6 μμf
Plate to (k + h)	1	0.05 μμf
Pentode Section		
Grid No. 1 to Plate	0.016	0.03 μμf Max.
Grid No. 1 to (k+g3+g2+h)	5	4.8 μμf
Plate to (k+g3+g2+h)	1.6	0.9 μμf
Coupling		
Pentode Grid No. 1 to Triode Plate	0.04	0.05 μμf Max.
Pentode Plate to Triode Plate	0.007	0.05 μμf Max.
Heater to Cathode	5.5[3]	5.5 μμf

6CG8, 6CG8A, 5CG8 (Cont'd)

MAXIMUM RATINGS (Design Center Values)

Converter Service	Triode Section	Pentode Section
Plate Voltage	250	250 Volts
Grid No. 2 Supply Voltage		250 Volts
Grid No. 2 Voltage		See 6AM8 Rating Chart
Plate Dissipation	1.5	2 Watts
Negative Grid No. 1 Voltage	40	40 Volts
Positive Grid No. 1 Voltage	0	0 Volt
Grid No. 2 Input:		
For Grid No. 2 Voltages up to 150 Volts		0.5 Watt
For Grid No. 2 Voltages Between 150 and 300 Volts		See 6AM8 Rating Chart
Grid No. 1 Input	0.5	Watt
Grid No. 1 Circuit Resistance		
Fixed Bias		0.1 Megohm
Self Bias		0.5 Megohm

AVERAGE CHARACTERISTICS	Triode Section	Pentode Section
Plate Voltage	100	250 Volts
Grid No. 2 Voltage		150 Volts
Plate Current	8.5	7.7 Ma
Grid No. 2 Current		1.6 Ma
Cathode Bias Resistor	100	200 Ohms
Amplification Factor	40	
Plate Resistance (approx.)	6900	750,000 Ohms
Transconductance	5800	4600 μmhos
Grid No. 1 Voltage for Ib = 10 μA (approx.)	-10	-10 Volts

TYPICAL OPERATION	Triode Section as 250 Mc Osc.	Pentode Section as Mixer[4]
Plate Voltage	150	150 Volts
Grid No. 2 Voltage		150 Volts
Mixer Grid No. 1 Supply Voltage		-3.5 Volts
Oscillator Voltage at Mixer Grid No. 1 (RMS)		2.6 Volts
Plate Current	13	6.2 Ma
Grid No. 2 Current		1.8 Ma
Grid No. 1 Current	3.6	Ma
Grid No. 1 Current		2 μa
Mixer Grid No. 1 Circuit Resistance		120,000 Ohms
Oscillator Grid Resistor	2700	Ohms
Conversion Transconductance		2100 μmhos
Oscillator Power Output (approx.)	0.5	Watt

NOTES:

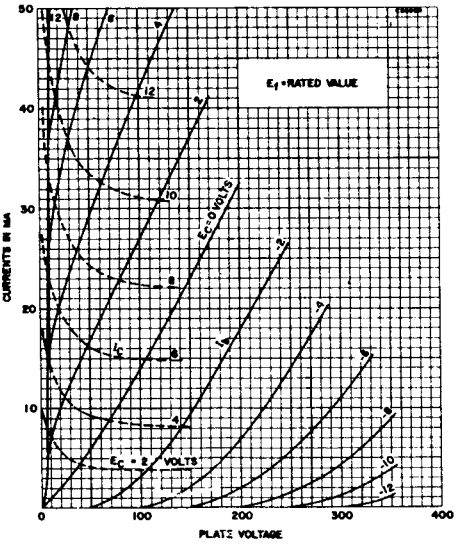
1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
2. Shield No. 315 connected to cathode.
3. Shield No. 315 connected to ground.
4. With separate excitation and triode section grounded.

APPLICATION

The Sylvania Types 6CG8, 6CG8A and 5CG8 have medium mu triode and sharp cutoff pentode contained in a T-6½ envelope. They are designed primarily for service as a VHF oscillator and mixer in TV receivers utilizing an IF in the order of 40 mc. Types 5CG8 and 6CG8A have controlled heater warm-up time for series string operation.

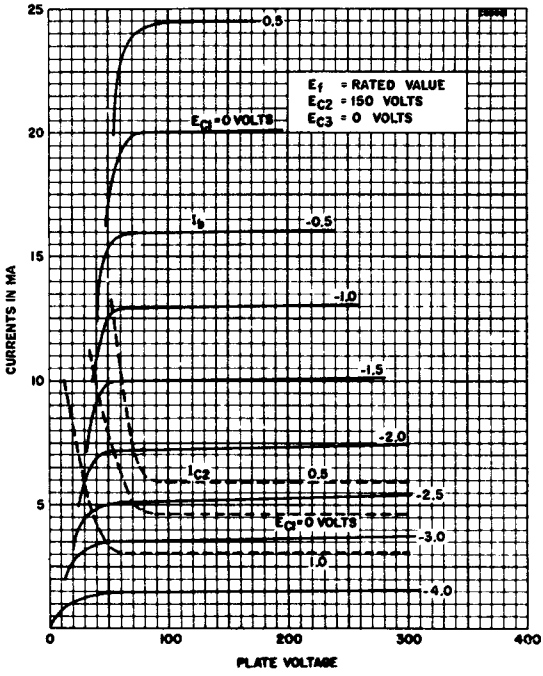
AVERAGE PLATE CHARACTERISTICS

(TRIODE SECTION)



6CG8, 6CG8A (Cont'd)

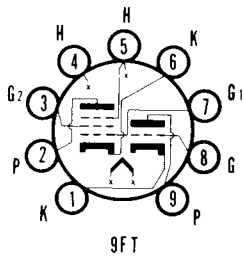
AVERAGE PLATE CHARACTERISTICS
(PENTODE SECTION)





SYLVANIA TYPE 6CH8

MEDIUM MU TRIODE
SHARP CUTOFF PENTODE



9FT

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9FT
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	450 Ma
Heater-Cathode Voltage (Design Center Values)	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
D C	100 Volts Max.
Total D C and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section	
Grid to Plate	1.6 μμf
Grid to (k+h+g3+I.S.)	1.9 μμf
Plate to (k+h+g3+I.S.)	1.6 μμf
Pentode Section	
Grid No. 1 to Plate	.025 μμf Max.
Grid No. 1 to (k+h+g3+g2+I.S.)	7.0 μμf
Plate to (k+h+g3+g2+I.S.)	2.25 μμf
Coupling	
Triode Grid to Pentode Plate	0.005 μμf
Pentode Grid No. 1 to Triode Plate	0.02 μμf
Pentode Plate to Triode Plate	0.04 μμf

6CH8 (Cont'd)

MAXIMUM RATINGS (Design Center Values)

	Triode Section	Pentode Section
Plate Voltage	300	300 Volts
Grid No. 3 Voltage		0 Volts
Grid No. 2 Supply Voltage		300 Volts
Grid No. 2 Voltage		See 6AM8 Rating Chart
Positive Grid No. 1 Voltage	0	0 Volts
Plate Dissipation	2.6	2.0 Watts
Grid No. 2 Input:		
For Grid No. 2 Voltages up to 150 Volts	0.5	0.5 Watt
For Grid No. 2 Voltages Between 150 and 300 Volts		See 6AM8 Rating Chart
Grid No. 1 Circuit Resistance[1]		
Fixed Bias	0.5	0.25 Megohm
Cathode Bias	1.0	1.0 Megohm

CHARACTERISTICS AND TYPICAL OPERATION

	Triode Section	Pentode Section
Plate Supply Voltage	200	200 Volts
Grid No. 3 Voltage		0 Volt
Grid No. 2 Supply Voltage		150 Volts
Grid No. 1 Voltage	−6	Volts
Cathode Bias Resistor		180 Ohms
Plate Current	13	9.5 Ma
Grid No. 2 Current		2.8 Ma
Transconductance	3300	6200 μmhos
Amplification Factor	19	
Plate Resistance (approx.)	5750	300,000 Ohms
Grid No. 1 Voltage for Ib = 10 μa (approx.)	−19	−8 Volts

NOTE:

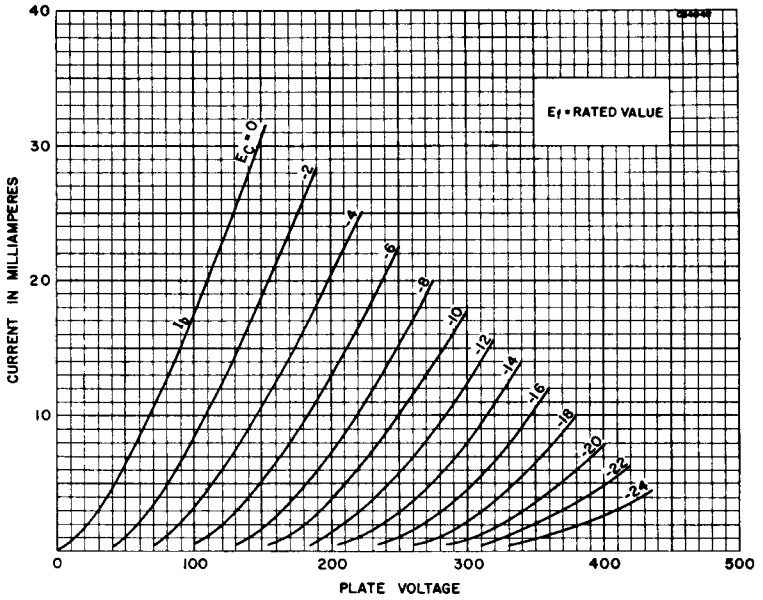
1. If either section is operating at maximum rated conditions, the Grid No. 1 circuit resistance for both sections should not exceed the stated values.

APPLICATION

The Sylvania Type 6CH8 has a medium mu triode and sharp cutoff pentode contained in one envelope. The pentode section may be used as a reactance tube, IF, video or AGC amplifier. The triode section may be used as a low frequency oscillator, sync clipper, sync separator or phase splitter.

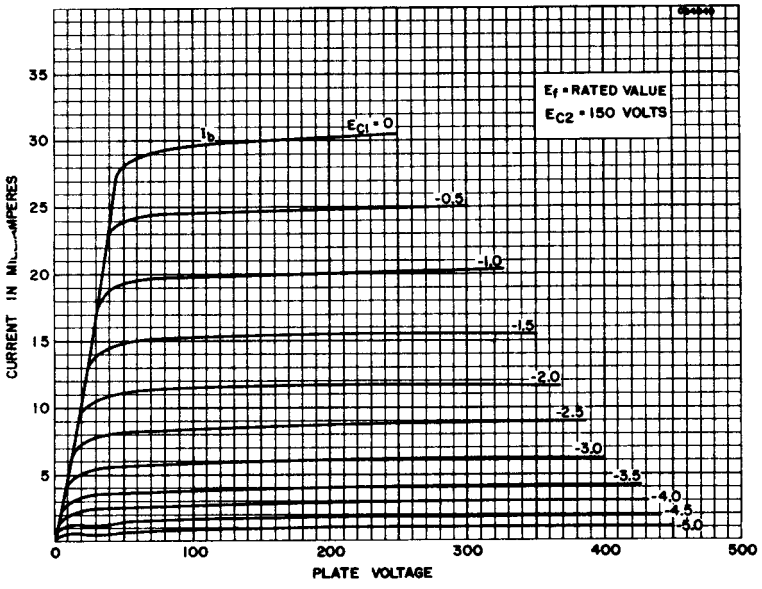
AVERAGE PLATE CHARACTERISTICS

(TRIODE SECTION)



AVERAGE PLATE CHARACTERISTICS

(PENTODE SECTION)



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-3
Basing	9CK
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6CM6	12CM6	
Heater Voltage	6.3	12.6	Volts
Heater Current	450	225	Ma
Heater-Cathode Voltage (Design Center Values)			
Heater Negative with Respect to Cathode			
Total DC and Peak	200	200	Volts Max.
Heater Positive with Respect to Cathode			
DC	100	100	Volts Max.
Total DC and Peak	200	200	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate: (g1 to p)	0.7 μμf
Input: g1 to (h+k+g2+g3)	8.0 μμf
Output: p to (h+k+g2+g3)	8.5 μμf

RATINGS (Design Center Values — Except as Noted)

Class A_1 Amplifier

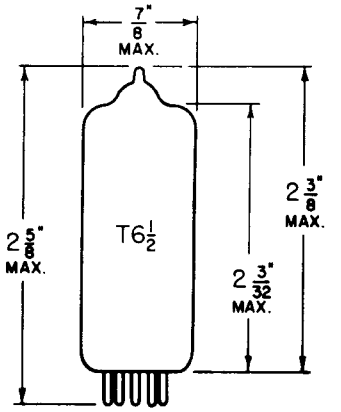
Plate Voltage	315 Volts Max.
Plate Dissipation	12 Watts Max.
Grid No. 2 Voltage	285 Volts Max.
Grid No. 2 Dissipation	2 Watts Max.
Grid No. 1 Circuit Resistance	
Fixed Bias	0.1 Megohm Max.
Cathode Bias	0.5 Megohm Max.

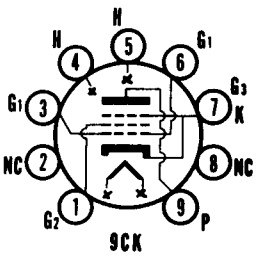
Vertical Deflection Amplifier[1]

	Pentode Connected	Triode Connected	
Plate Voltage	315	315	Volts Max.
Peak Positive Plate Voltage	2000	2000	Volts Abs. Max.
Plate Dissipation[2]	8	8	Watts Max.
Grid No. 2 Voltage	285		Volts
Grid No. 2 Dissipation[2]	1.75		Watts
Peak Negative Grid Voltage	250	250	Volts Max.
Average Cathode Current	40	40	Ma Max.
Peak Cathode Current	120	120	Ma Max.
Grid No. 1 Circuit Resistance			
Cathode Bias	2.2	2.2	Megohms Max.

QUICK REFERENCE DATA

The Sylvania Types 6CM6 and 12CM6 are miniature beam power pentodes designed for service as general purpose audio power amplifiers or vertical deflection amplifiers in television receiver sweep circuits. Except for bulb size and/or heater characteristics they are identical to the 6V6GT.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JANUARY 1956

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier (Single Tube)

Conditions:

Plate Voltage	180	250	315	Volts
Grid No. 2 Voltage	180	250	225	Volts
Grid No. 1 Voltage	−8.5	−12.5	−13.0	Volts
Peak A F Grid No. 1 Voltage	8.5	12.5	13.0	Volts
Zero Signal Plate Current	29	45	34	Ma
Maximum Signal Plate Current	30	47	35	Ma
Zero Signal Grid No. 2 Current	3.0	4.5	2.2	Ma
Maximum Signal Grid No. 2 Current	4.0	7.0	6.0	Ma
Plate Resistance (approx.)	50,000	50,000	80,000	Ohms
Transconductance	3,700	4,100	3,750	μmhos
Load Resistance	5,500	5,000	8,500	Ohms
Maximum Signal Power Output	2.0	4.5	5.5	Watts
Total Harmonic Distortion	8	8	12	Percent

Class A_1 Push-Pull Amplifier (Values are for Two Tubes)

Conditions:

Plate Voltage	250	285	Volts
Grid No. 2 Voltage	250	285	Volts
Grid No. 1 Voltage	−15	−19	Volts
Peak A F Grid No. 1 to Grid No. 1 Voltage	30	38	Volts
Zero Signal Plate Current	70	70	Ma
Maximum Signal Plate Current	79	92	Ma
Zero Signal Grid No. 2 Current	5	4	Ma
Maximum Signal Grid No. 2 Current	13	13.5	Ma
Plate-to-Plate Load Resistance	10,000	8,000	Ohms
Maximum Signal Power Output	10	14	Watts
Total Harmonic Distortion	5	3.5	Percent

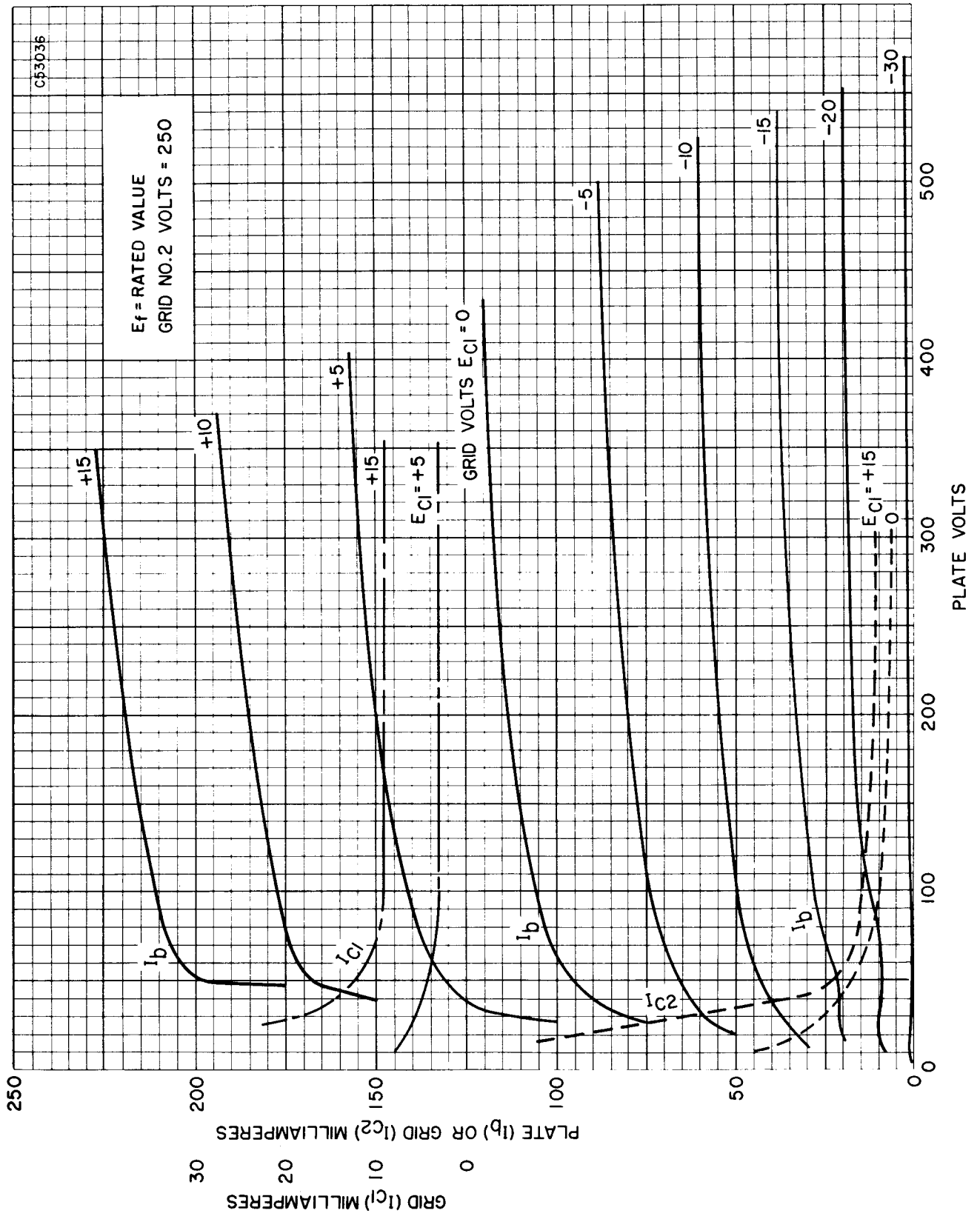
Vertical Deflection Amplifier

	Pentode Connected	Triode Connected	
Plate Voltage	250	250	Volts
Grid No. 2 Voltage	250		Volts
Grid No. 1 Voltage	−12.5	−12.5	Volts
Plate Current	45	49.5	Ma
Grid No. 2 Current	4.5		Ma
Transconductance	4,100	5,000	μmhos
Amplification Factor		9.8	
Plate Resistance (approx.)	50,000	1,960	Ohms
Grid No. 1 Voltage (approx.) for I_b = 0.5 Ma	−37	−37	Volts

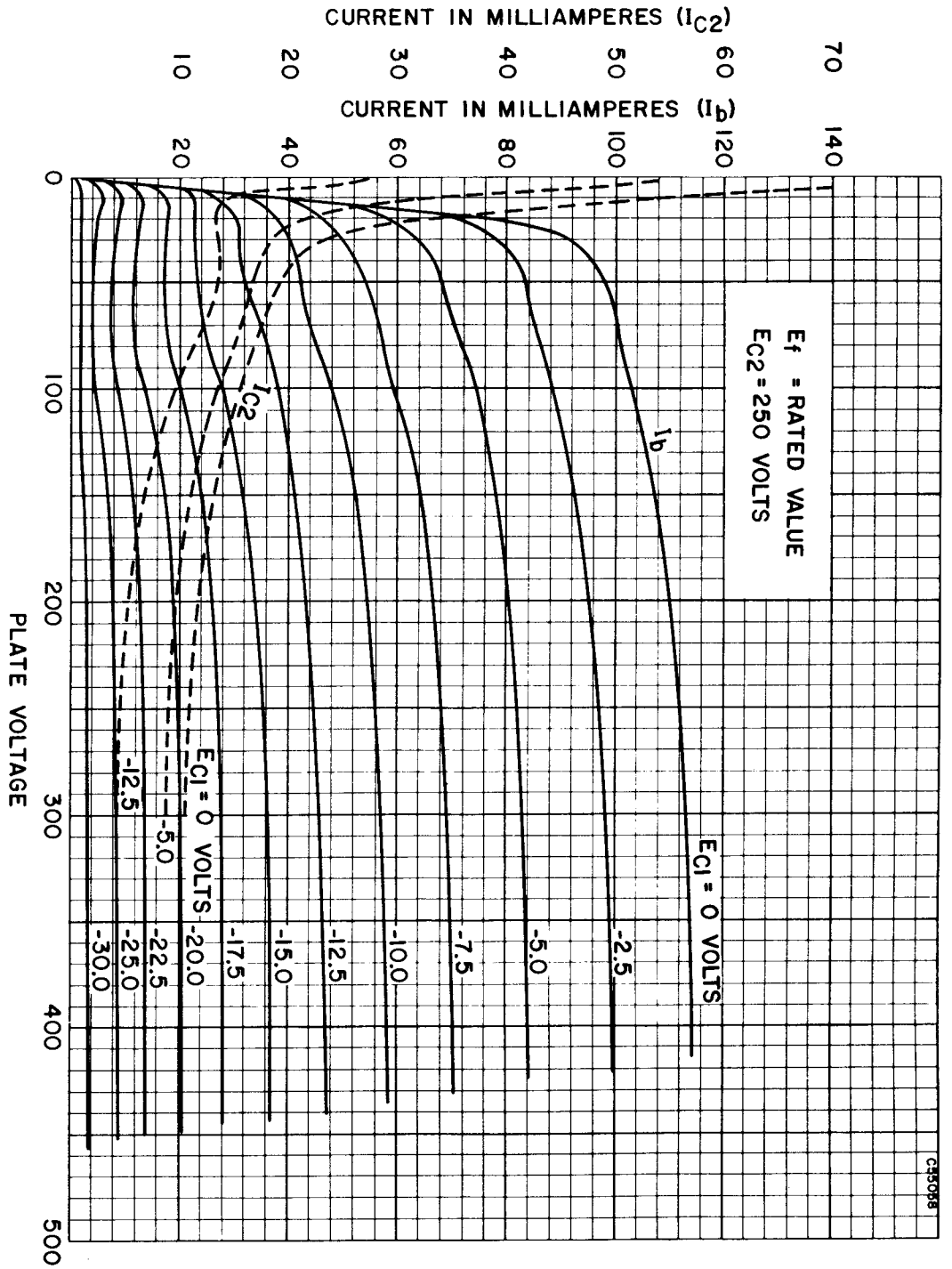
NOTES:

1. *For operating in 525 line, 30-frame system as described in "Standards of Good Engineering Practice for Television Broadcasting Stations, Federal Communications Commission". The duty cycle of the voltage pulse is not to exceed 15% of a scanning cycle.*
2. *In stages operating with a grid-leak bias, an adequate cathode bias resistor, or other suitable means, is required to protect the tube in the absence of excitation.*

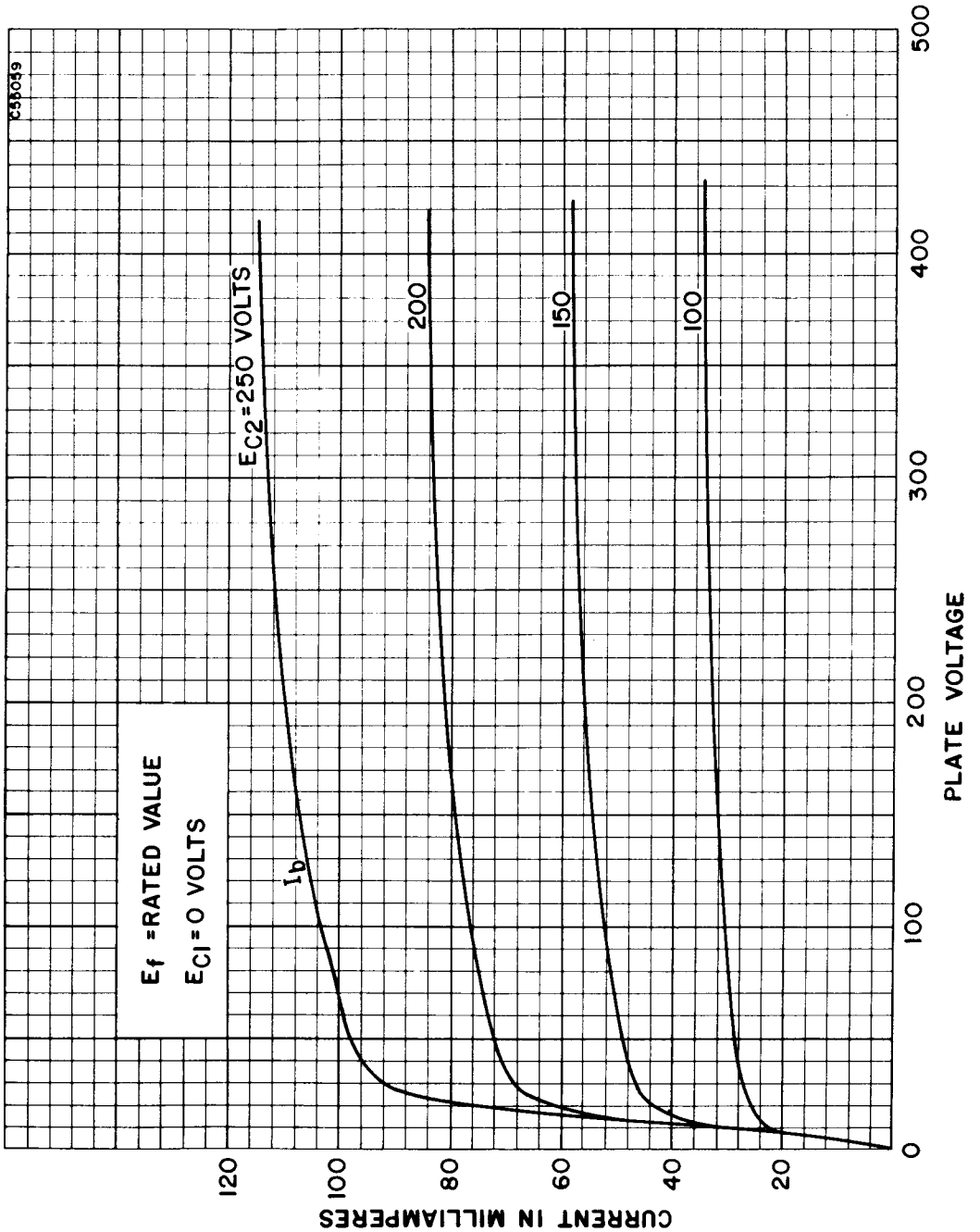
AVERAGE PLATE CHARACTERISTICS



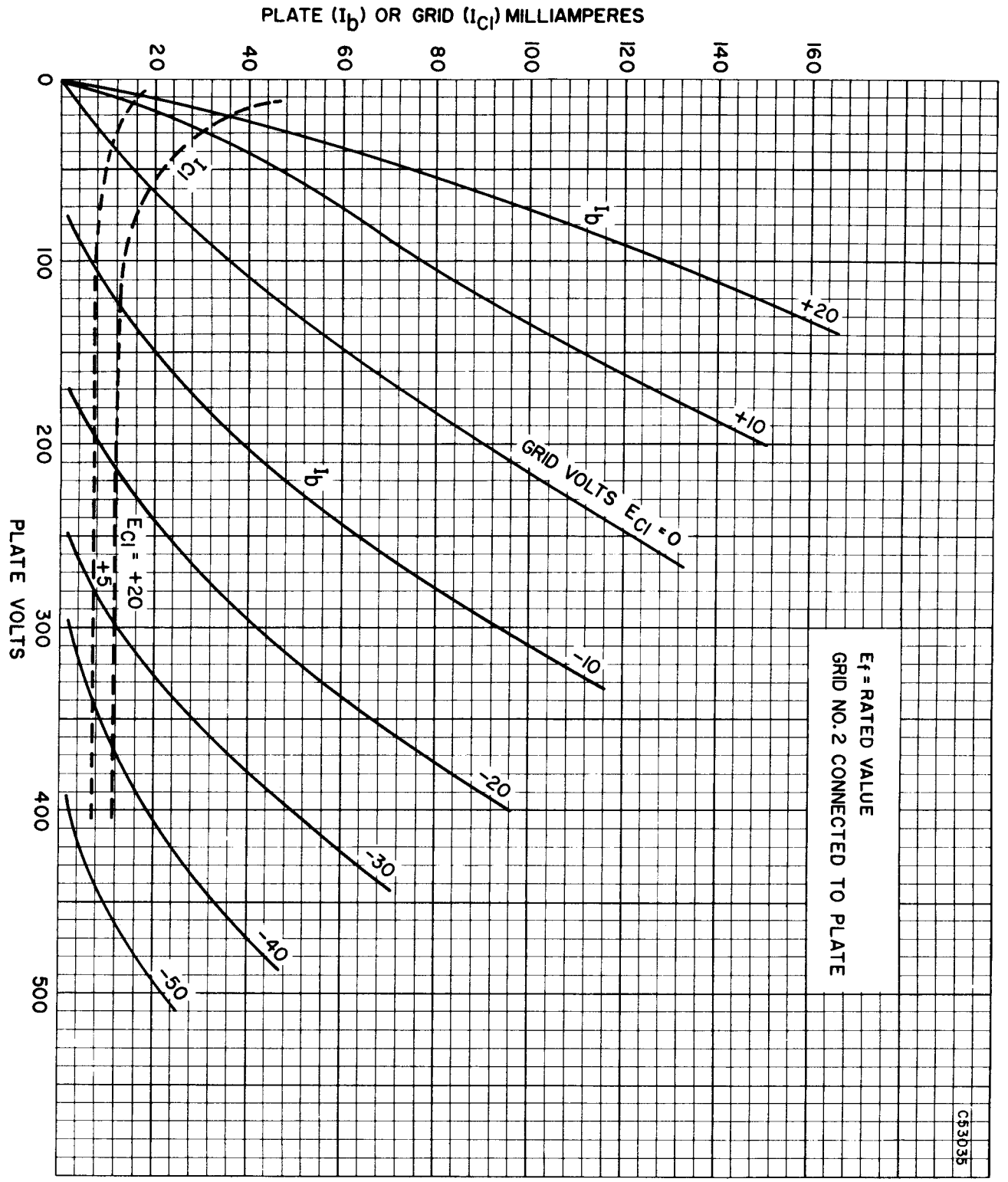
AVERAGE PLATE CHARACTERISTICS



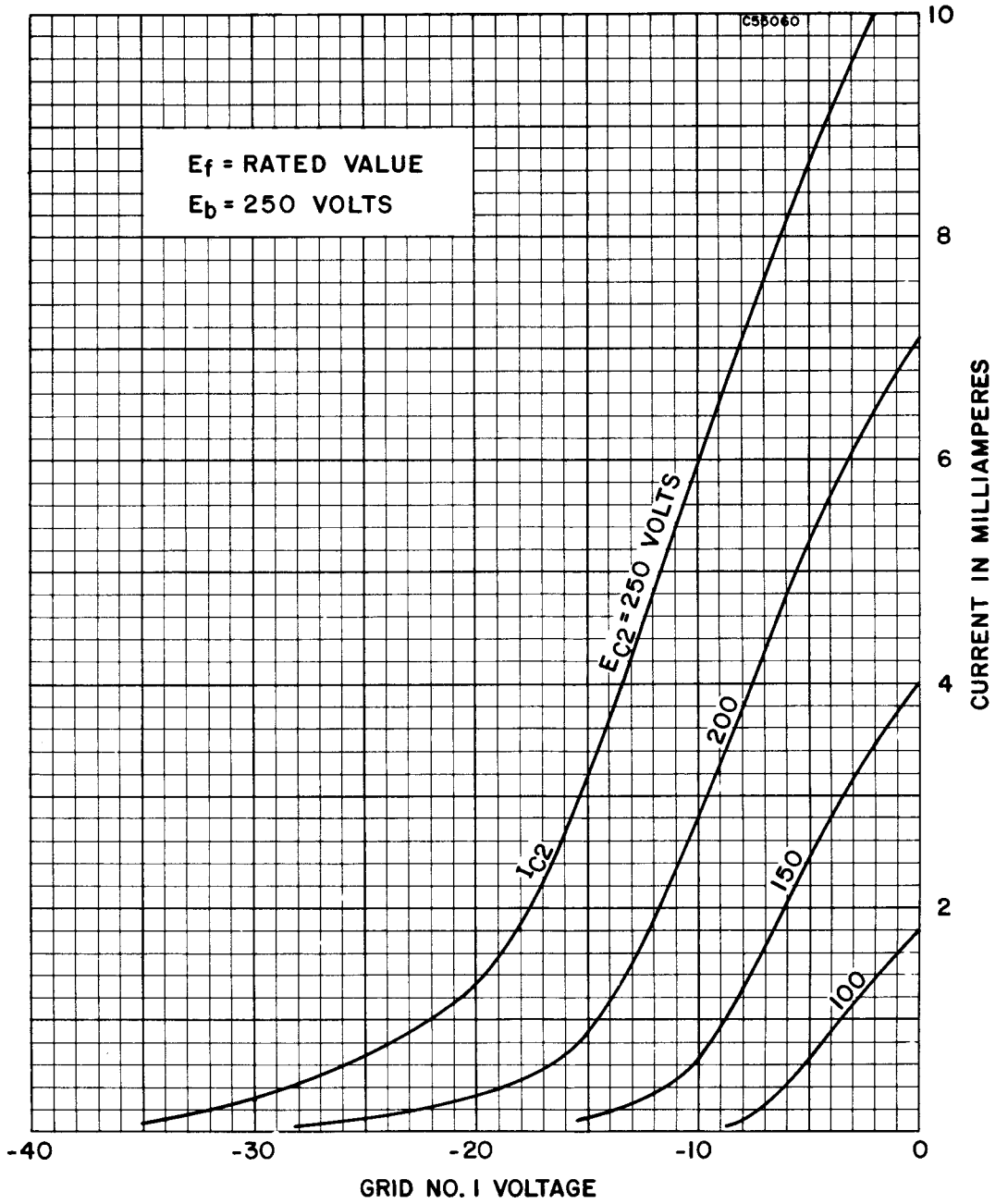
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS
(TRIODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS



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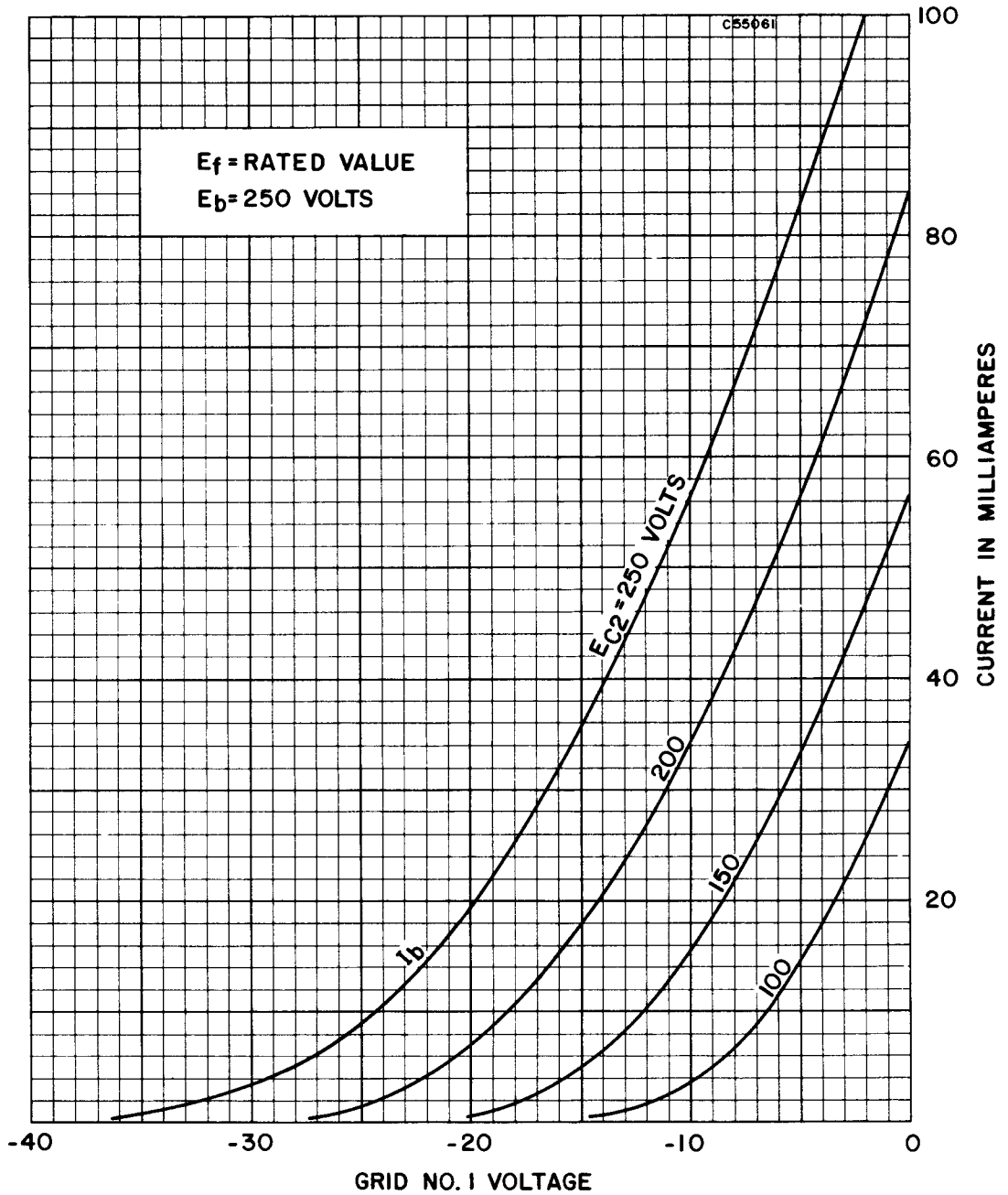
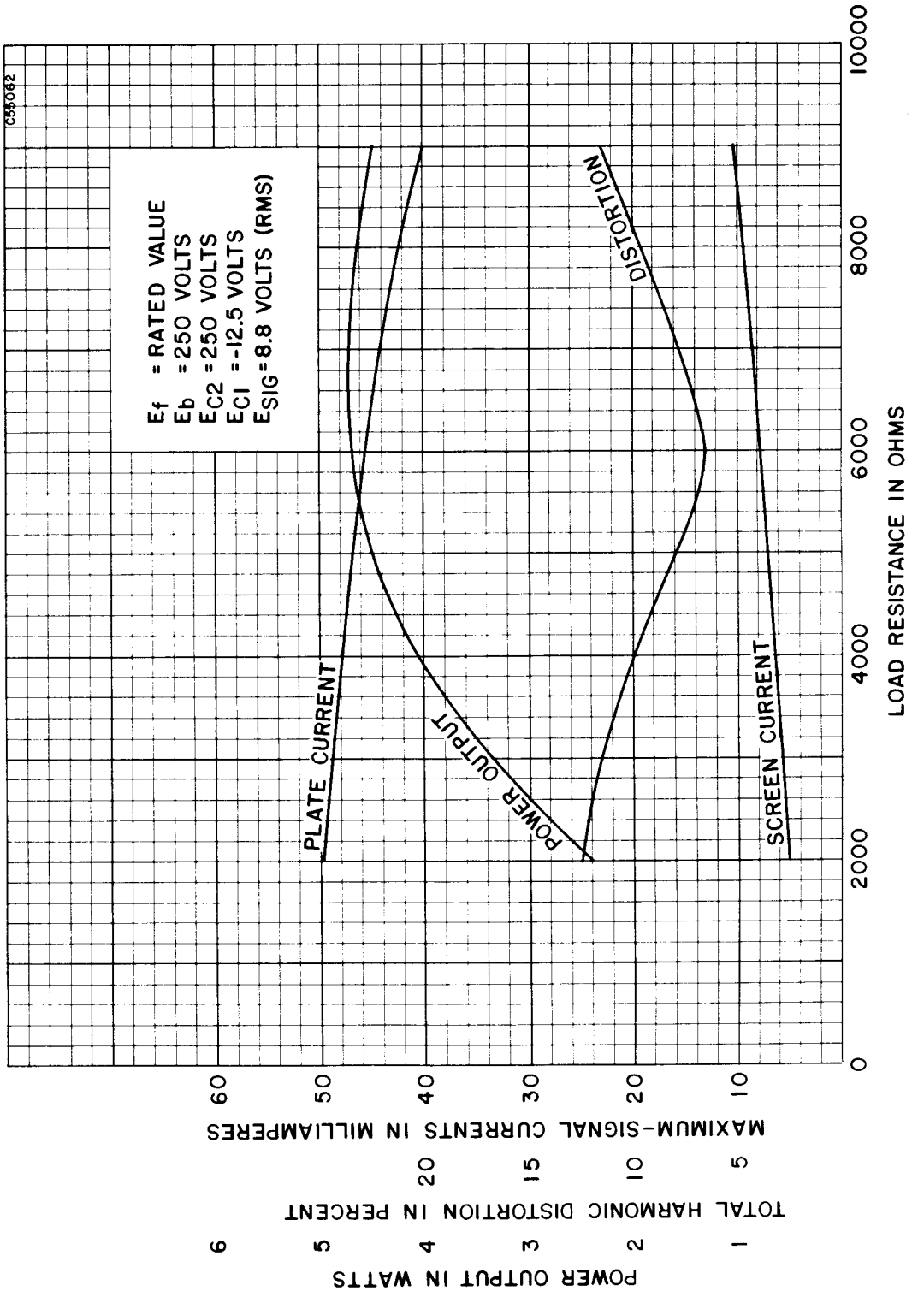


OPERATION CHARACTERISTICS



SYLVANIA engineering data service

MECHANICAL DATA

Bulb	T-6 ½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9FZ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	5CM8	6CM8	
Heater Voltage	4.7	6.3 Volts	
Heater Current	600	450 Ma	
Heater Warm-up Time[1]	11	11 Seconds	
Heater-Cathode Voltage (Design Center Values)			
Heater Negative with Respect to Cathode			
Total DC and Peak	200	200 Volts	Max.
Heater Positive with Respect to Cathode			
DC	100	100 Volts	Max.
Total DC and Peak	200	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Approx.)

Triode Section		
Grid to Plate: (g to p)	1.9 μμf	
Input: g to (h + k)	1.6 μμf	
Output: p to (h + k)	0.22 μμf	
Pentode Section		
Grid No. 1 to Plate: (g1 to p)	0.02 μμf	Max.
Input: g1 to (h+k+g2+g3+I.S.)	6.0 μμf	
Output: p to (h+k+g2+g3+I.S.)	2.6 μμf	
Coupling		
Pentode Plate to Triode Grid	0.01 μμf	Max.
Pentode Grid No. 1 to Triode Plate	0.15 μμf	Max.
Pentode Plate to Triode Plate	0.10 μμf	Max.

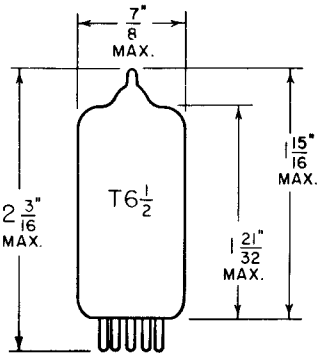
RATINGS (Design Center Values)

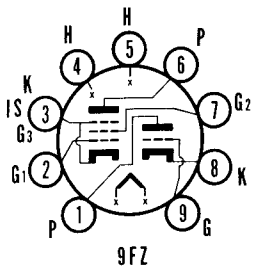
	Triode	Pentode	
Plate Voltage	300	300 Volts	Max.
Grid No. 2 Supply Voltage		300 Volts	Max.
Grid No. 2 Voltage	See Rating Chart		
Positive Grid No. 1 Voltage	0	0 Volts	Max.
Plate Dissipation	1.0	2.0 Watts	Max.
Grid No. 2 Dissipation		0.5 Watt	Max.
Grid No. 1 Circuit Resistance			
Self Bias		1.0 Megohm	Max.
Fixed Bias		0.25 Megohm	Max.

QUICK REFERENCE DATA

The Sylvania Type 6CM8 is a high-mu triode and sharp cut-off pentode. The pentode section may be used as an IF amplifier, video amplifier, AGC amplifier and reactance tube.

The 5CM8 is identical to the 6CM8 except for heater characteristics. Both types employ controlled heater warm-up time for services in series heater string television receivers.





SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION
EMPORIUM, PA.

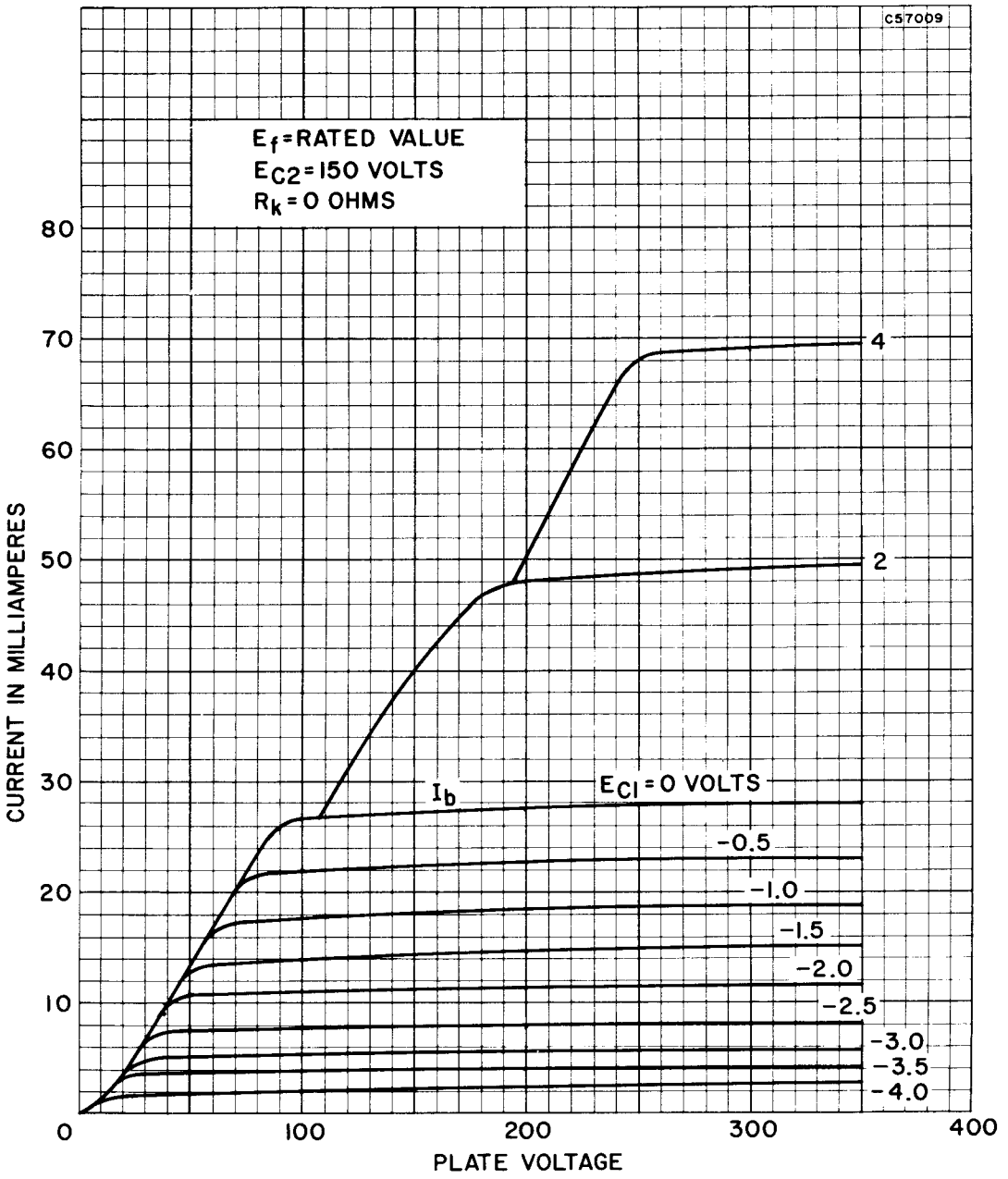
Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
APRIL, 1957

CHARACTERISTICS Class A_1 Amplifier	Triode	Pentode
Plate Supply Voltage	250	200 Volts
Grid No. 2 Voltage		150 Volts
Grid No. 1 Voltage	−2	0 Volts
Cathode Bias Resistor		180 Ohms
Plate Current	1.8	9.5 Ma
Grid No. 2 Current		2.8 Ma
Amplification Factor	100	
Plate Resistance (approx.)	50,000	600,000 Ohms
Transconductance	2000	6200 μmhos
Grid No. 1 Voltage for Ib = 10 μa (approx.)		−8 Volts

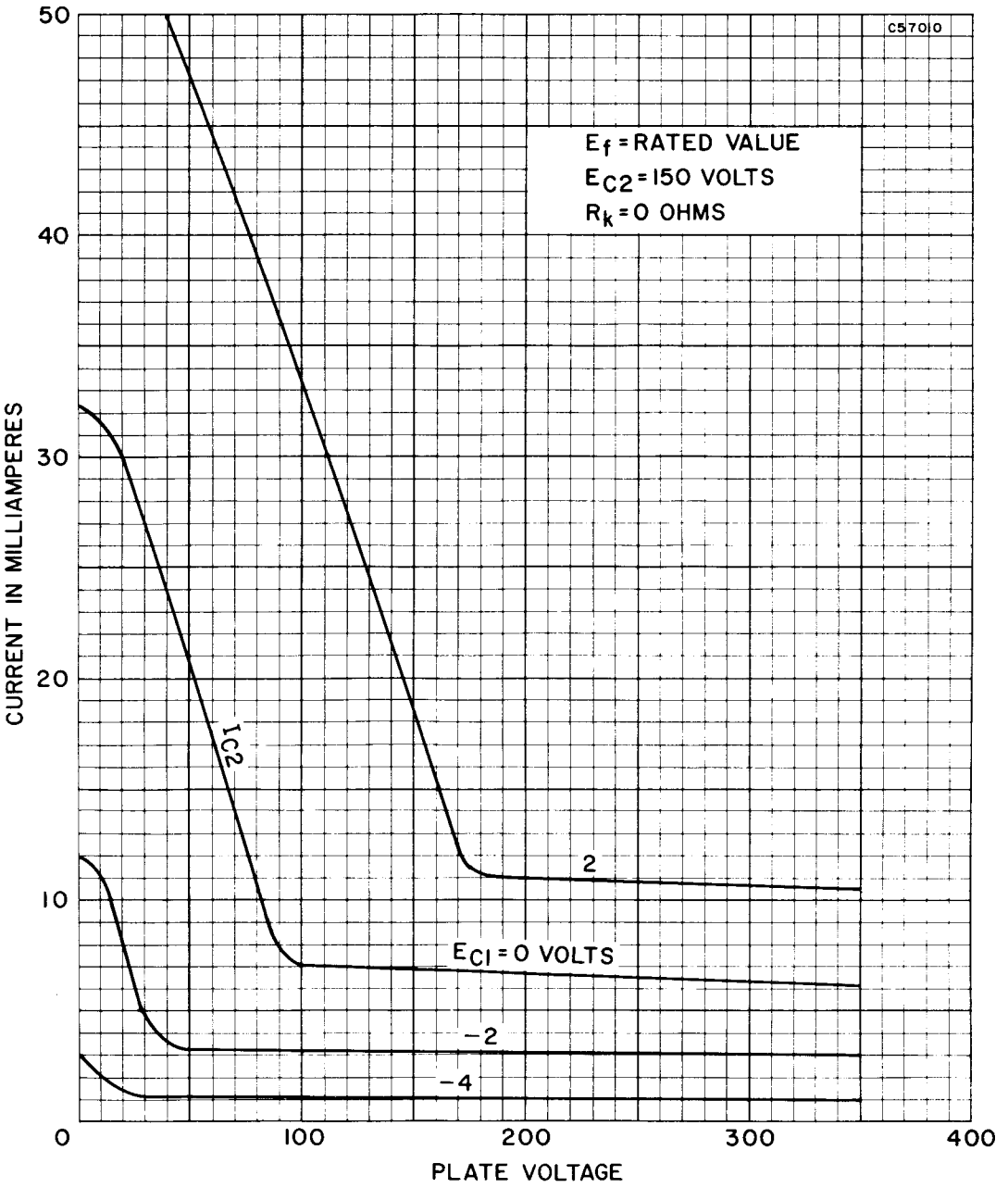
NOTE:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*

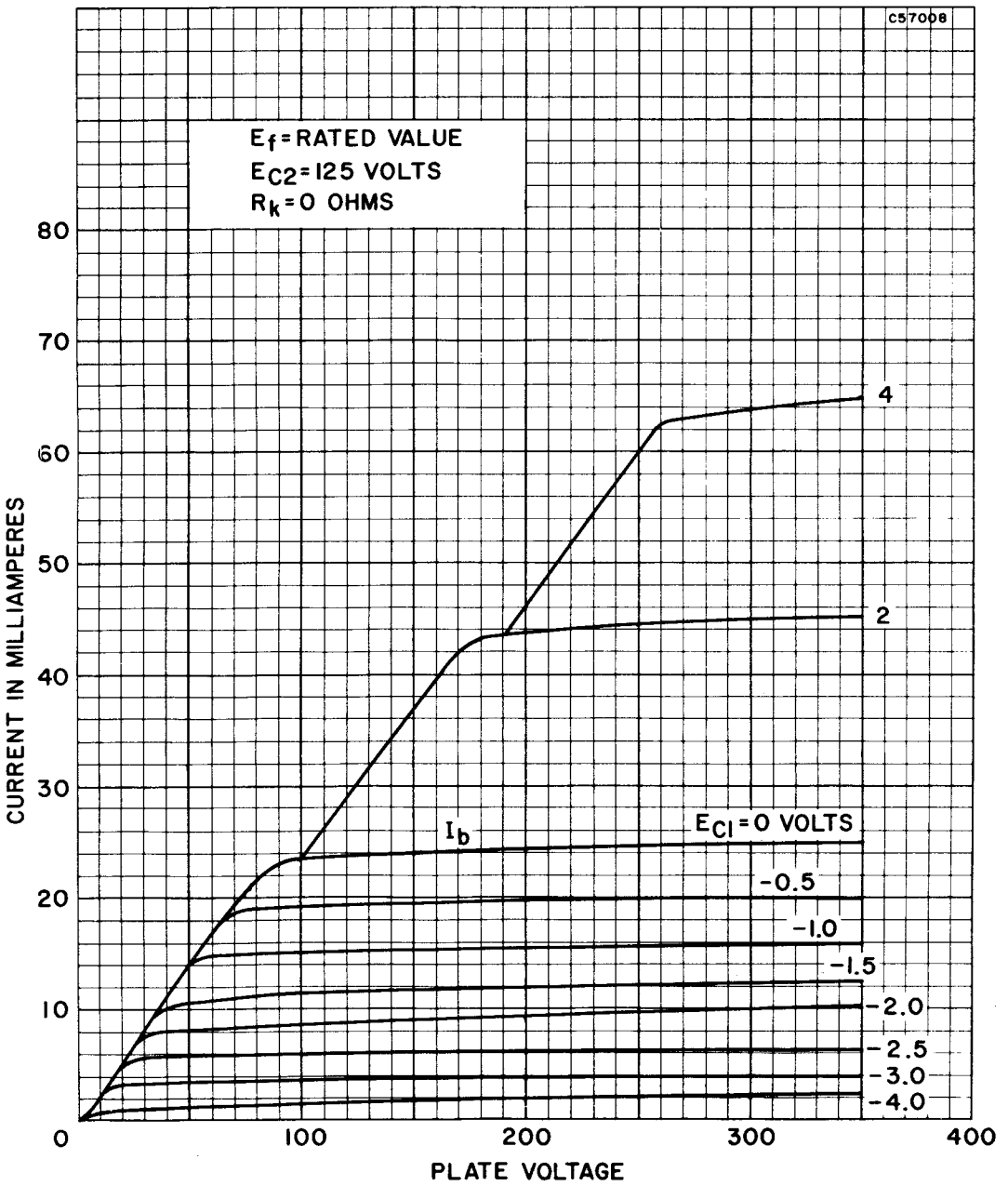
AVERAGE PLATE CHARACTERISTICS
(PENTODE SECTION)



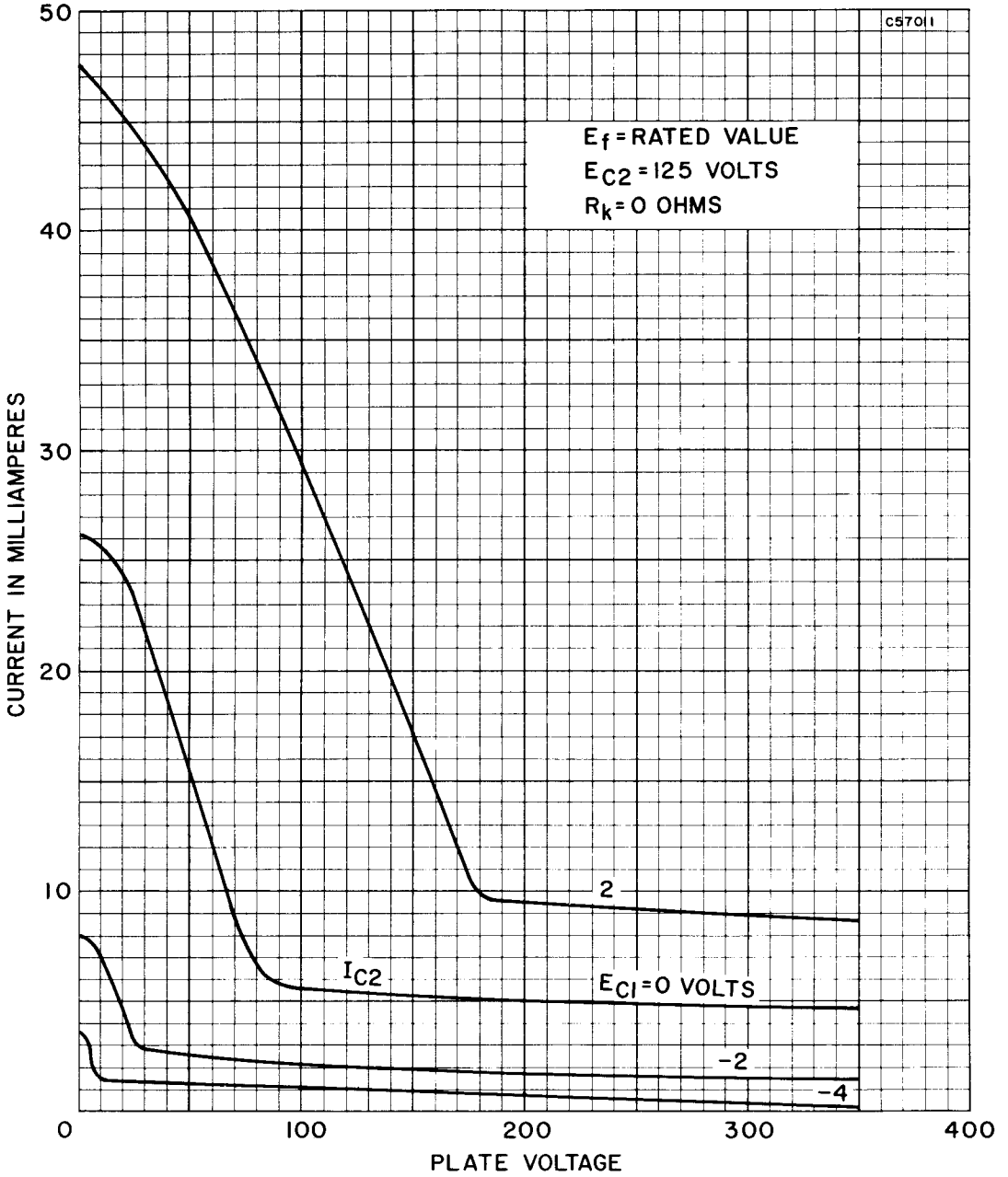
AVERAGE SCREEN CHARACTERISTICS
(PENTODE SECTION)



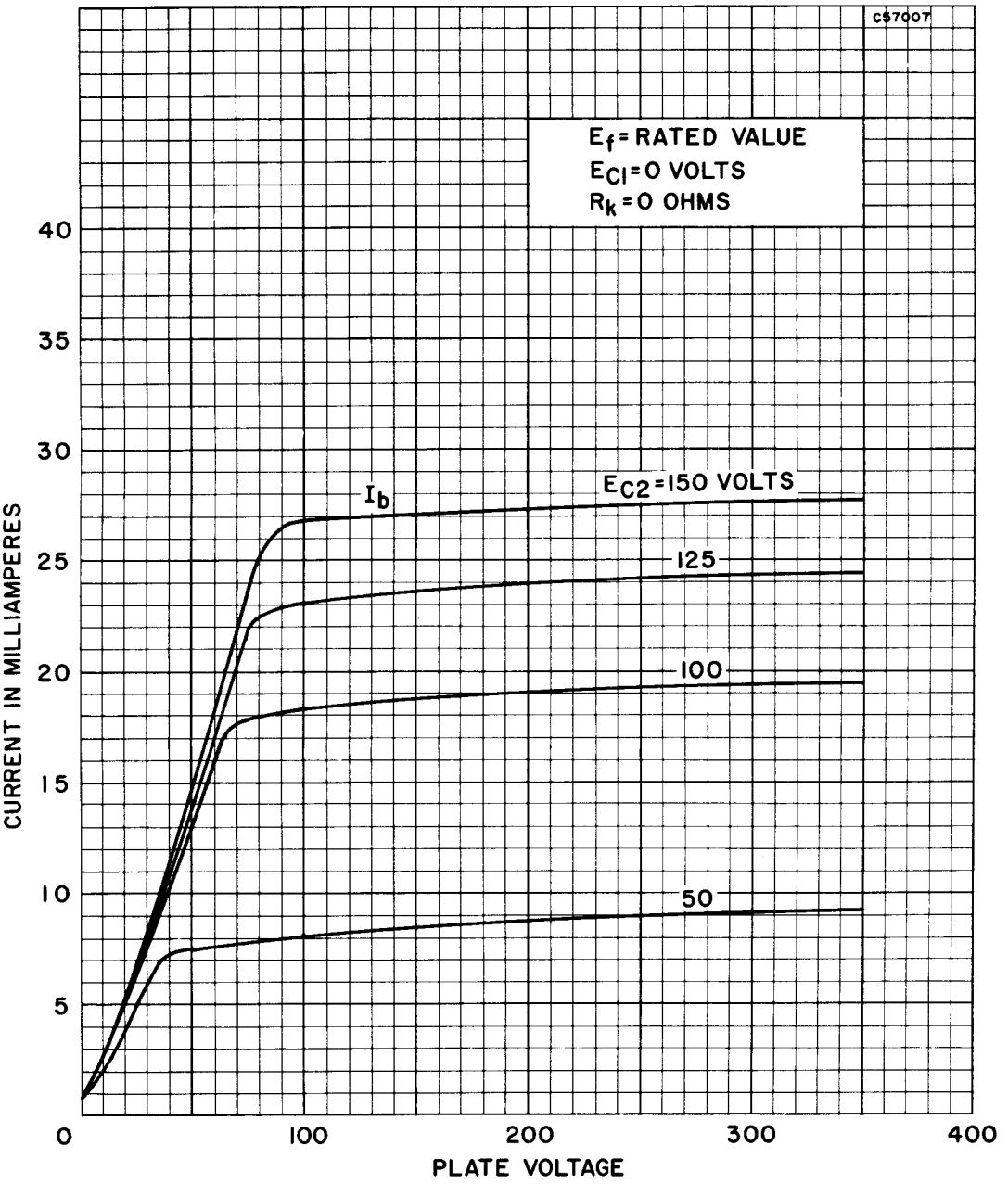
AVERAGE PLATE CHARACTERISTICS
(PENTODE SECTION)



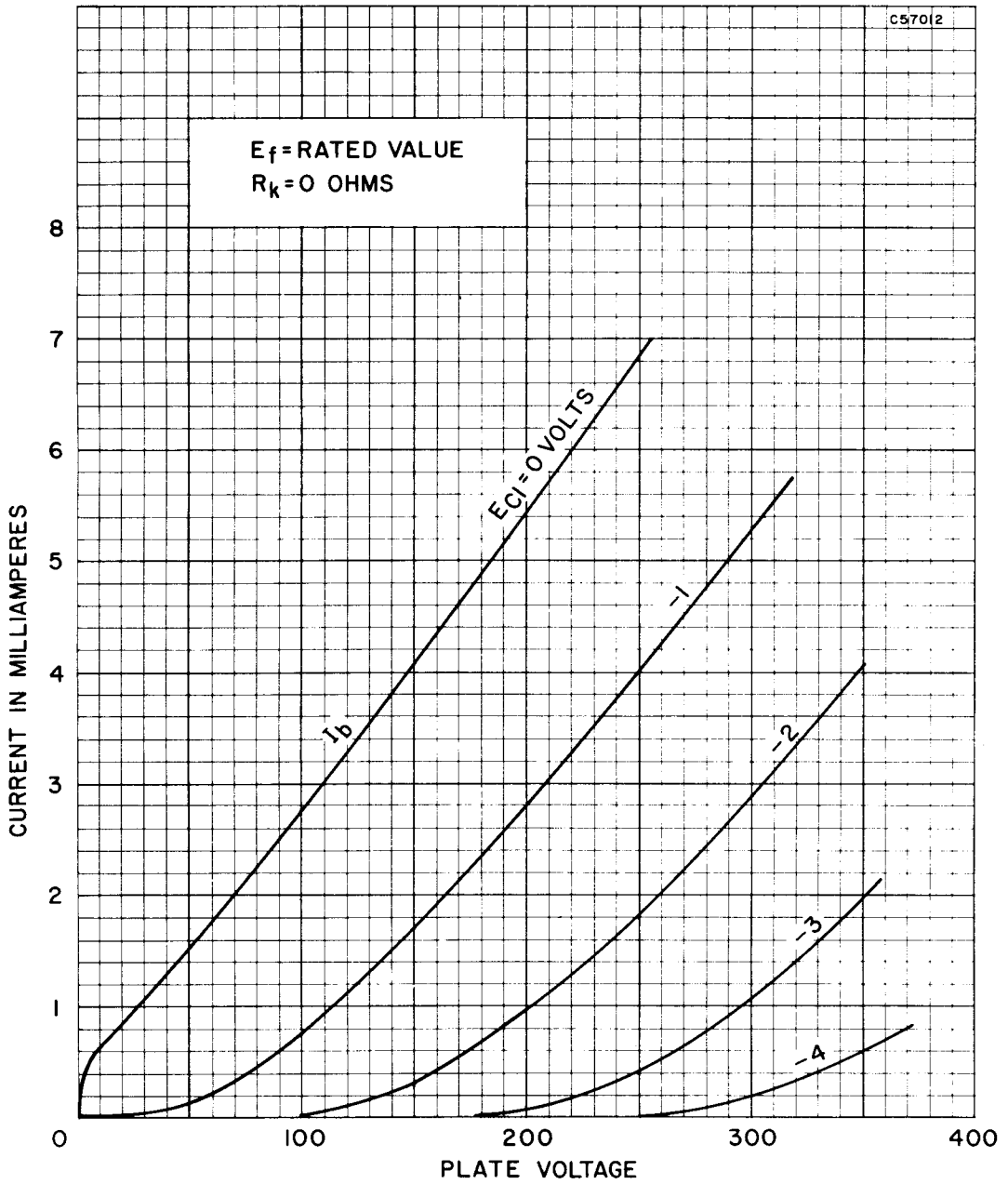
AVERAGE SCREEN CHARACTERISTICS
(PENTODE SECTION)



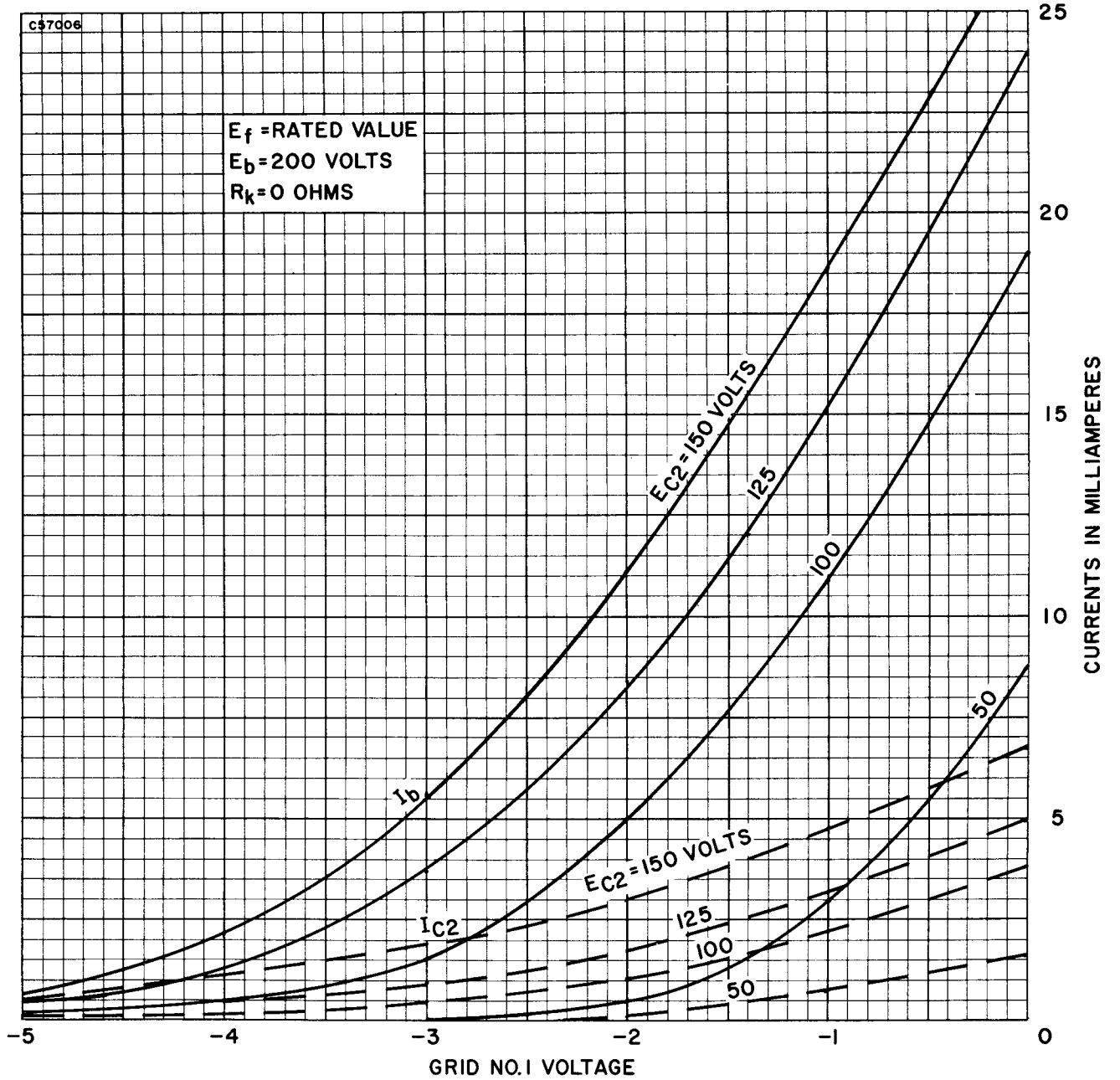
AVERAGE PLATE CHARACTERISTICS
(PENTODE SECTION)



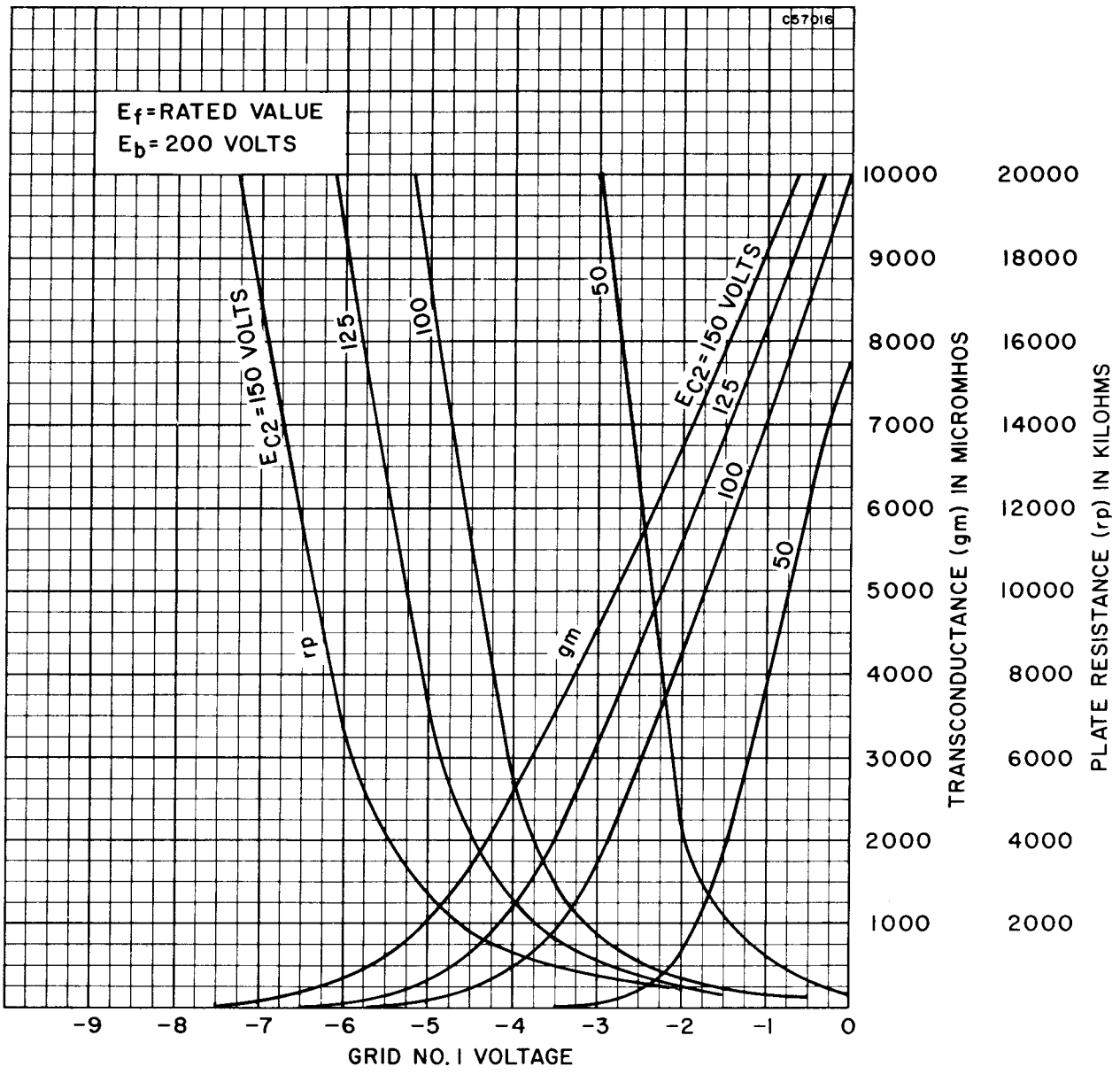
AVERAGE PLATE CHARACTERISTICS
(TRIODE SECTION)



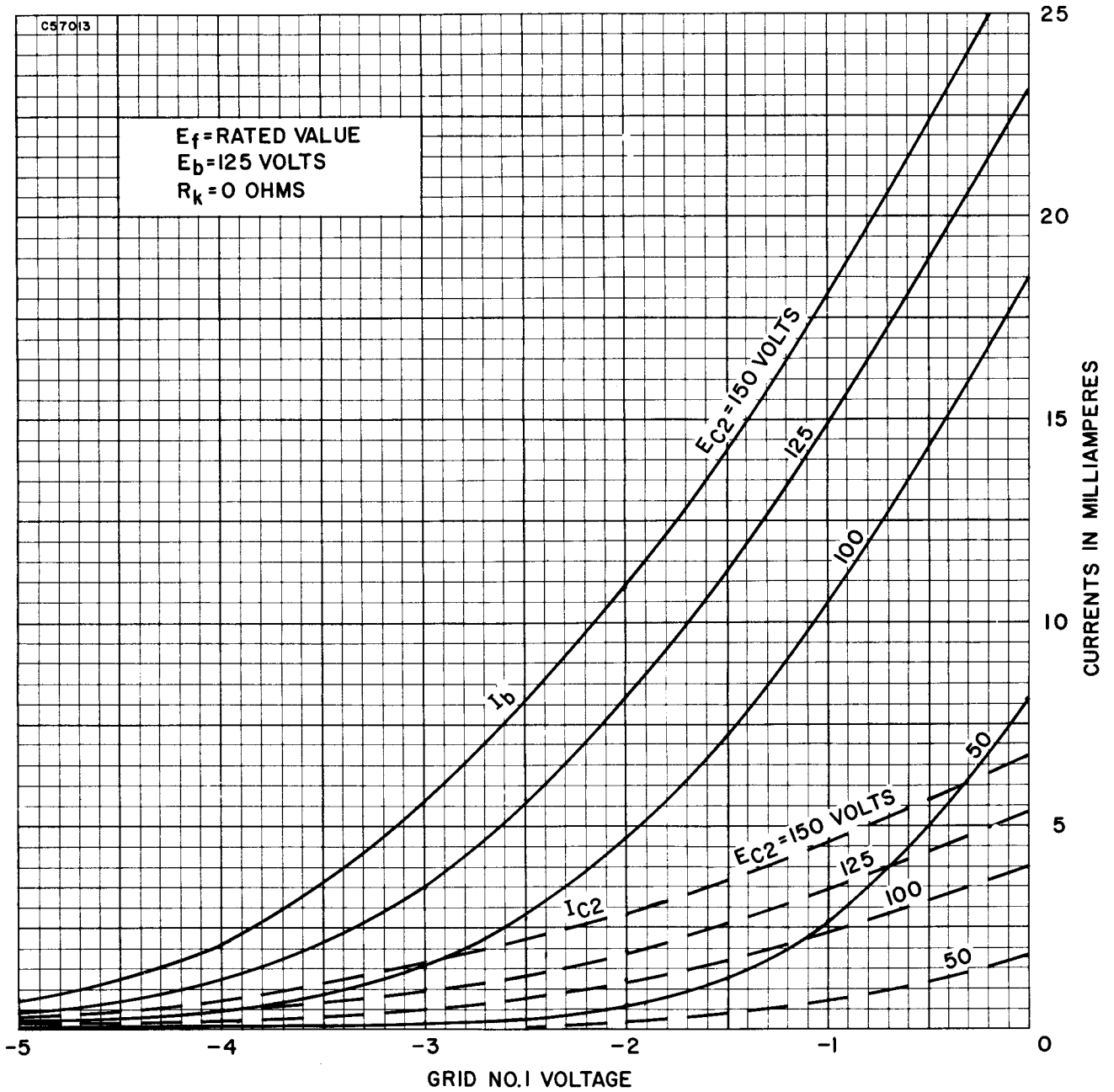
AVERAGE TRANSFER CHARACTERISTICS
(PENTODE SECTION)



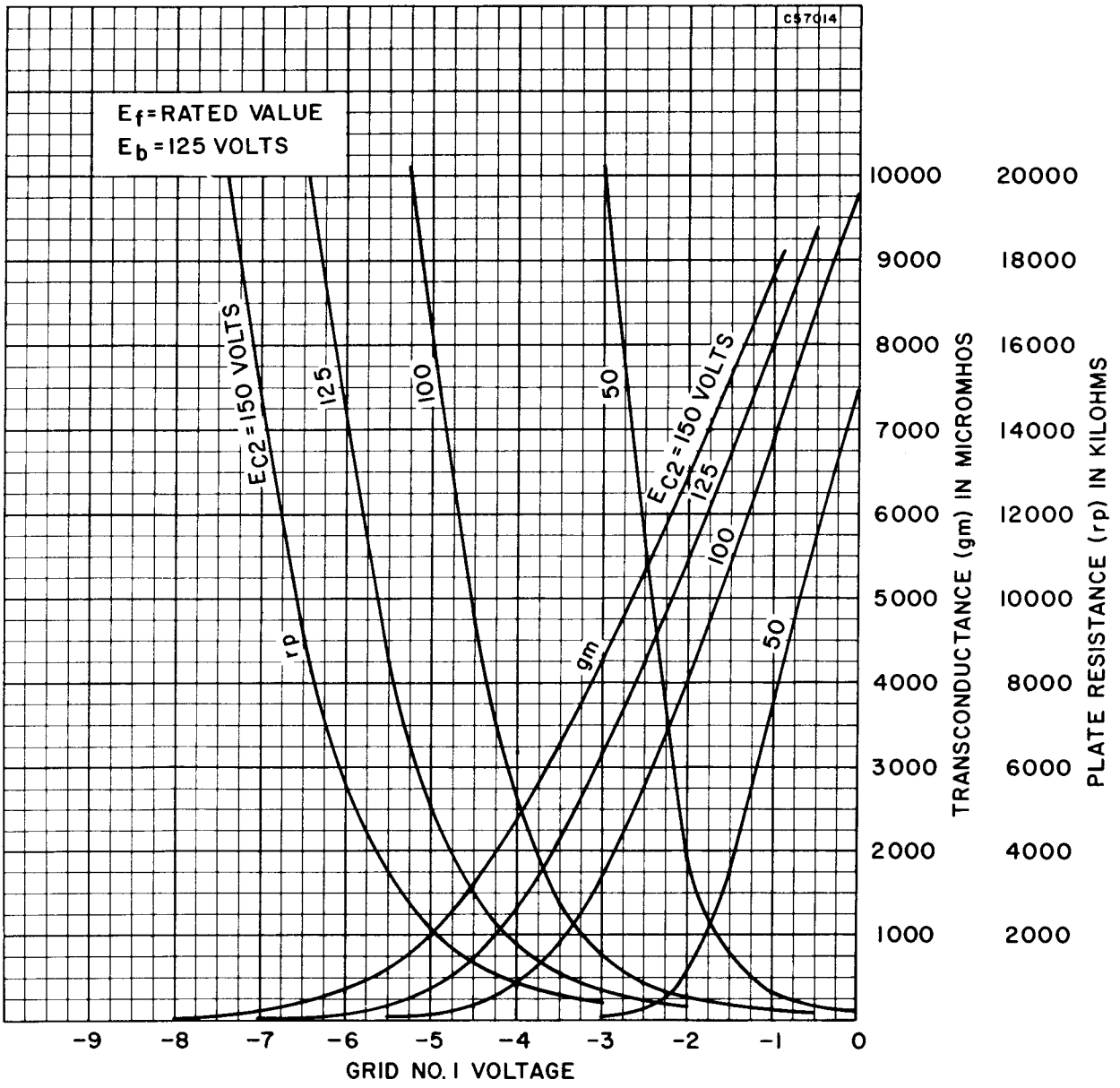
AVERAGE TRANSFER CHARACTERISTICS
(PENTODE SECTION)



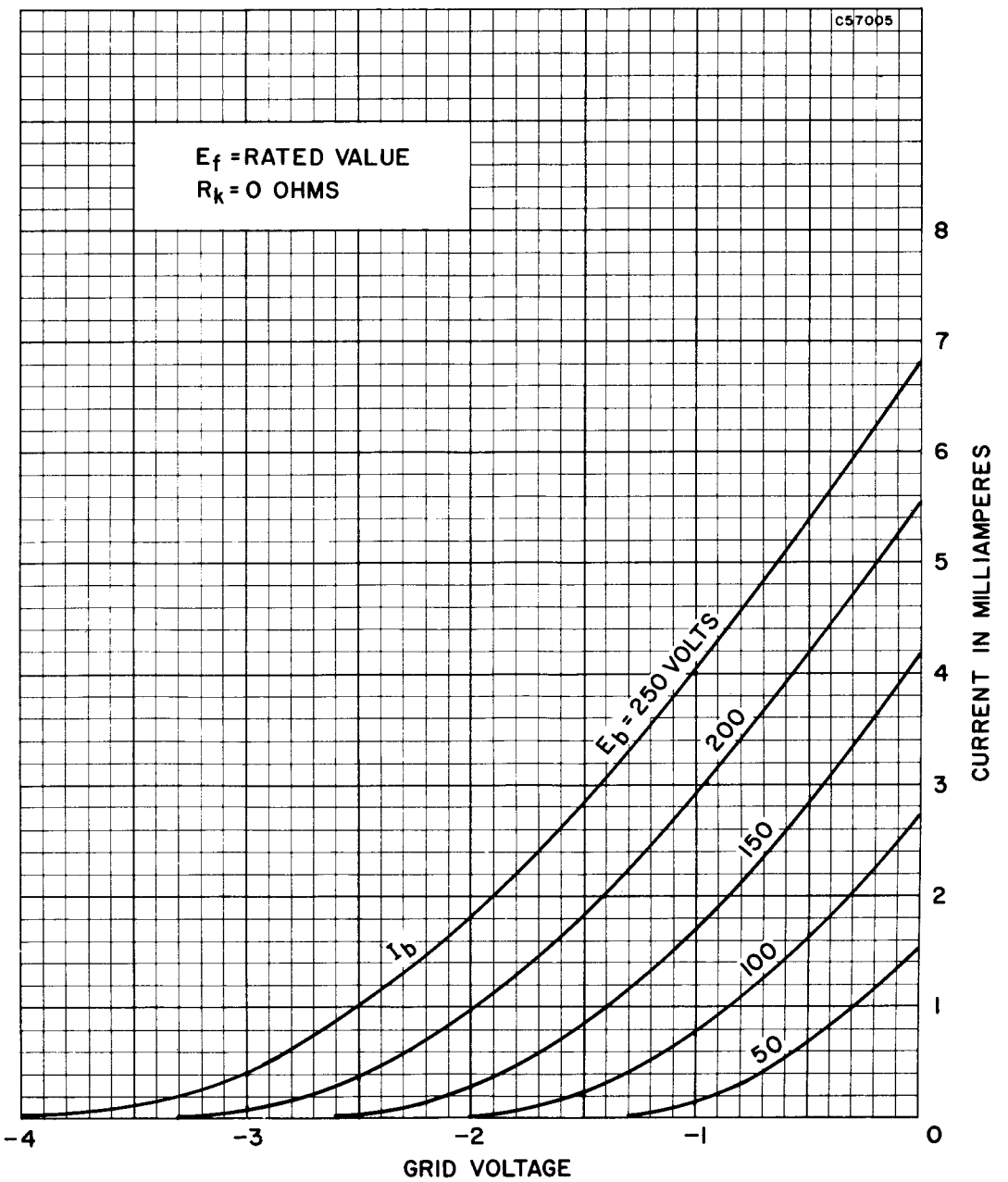
AVERAGE TRANSFER CHARACTERISTICS
(PENTODE SECTION)



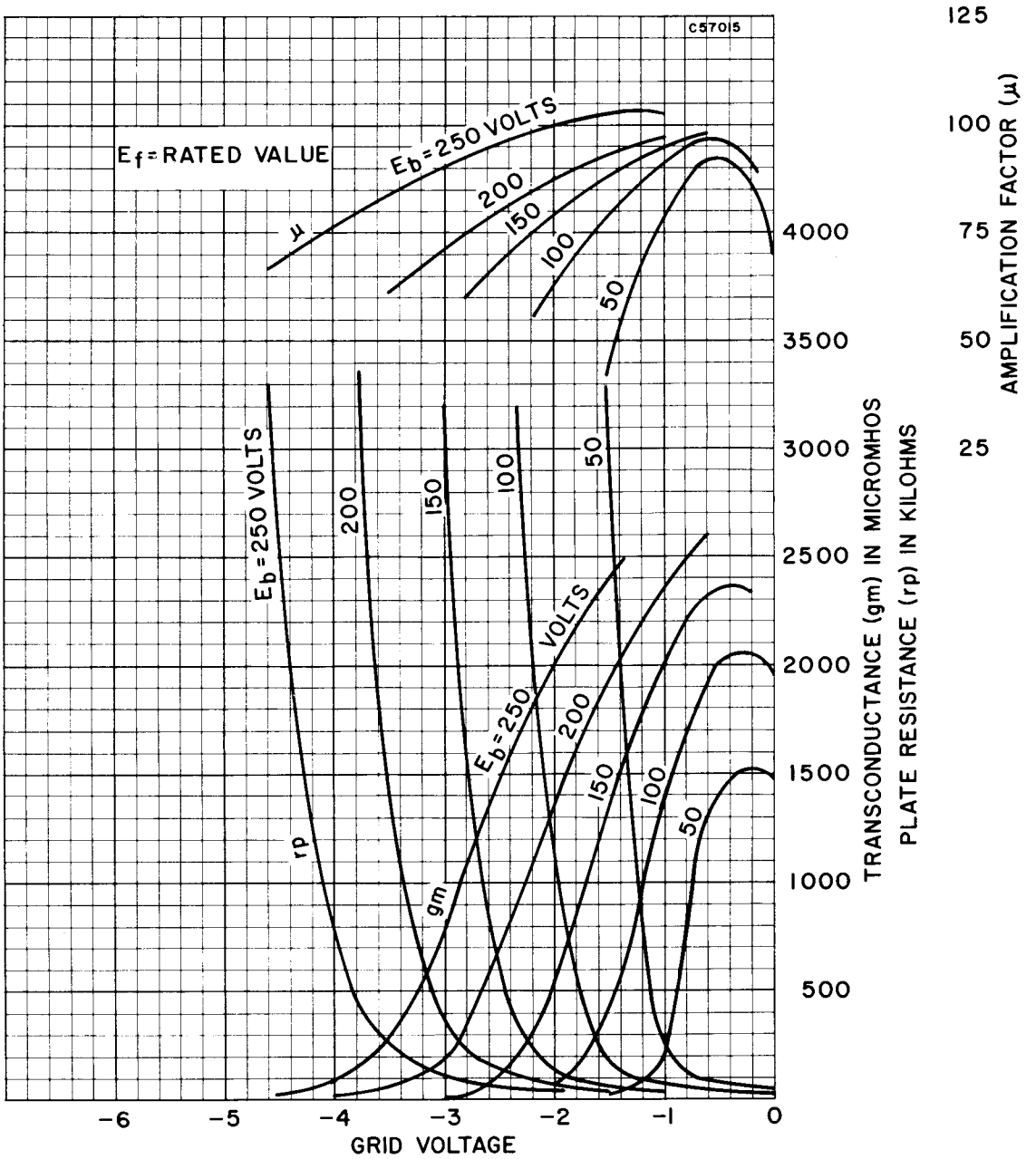
AVERAGE TRANSFER CHARACTERISTICS
(PENTODE SECTION)



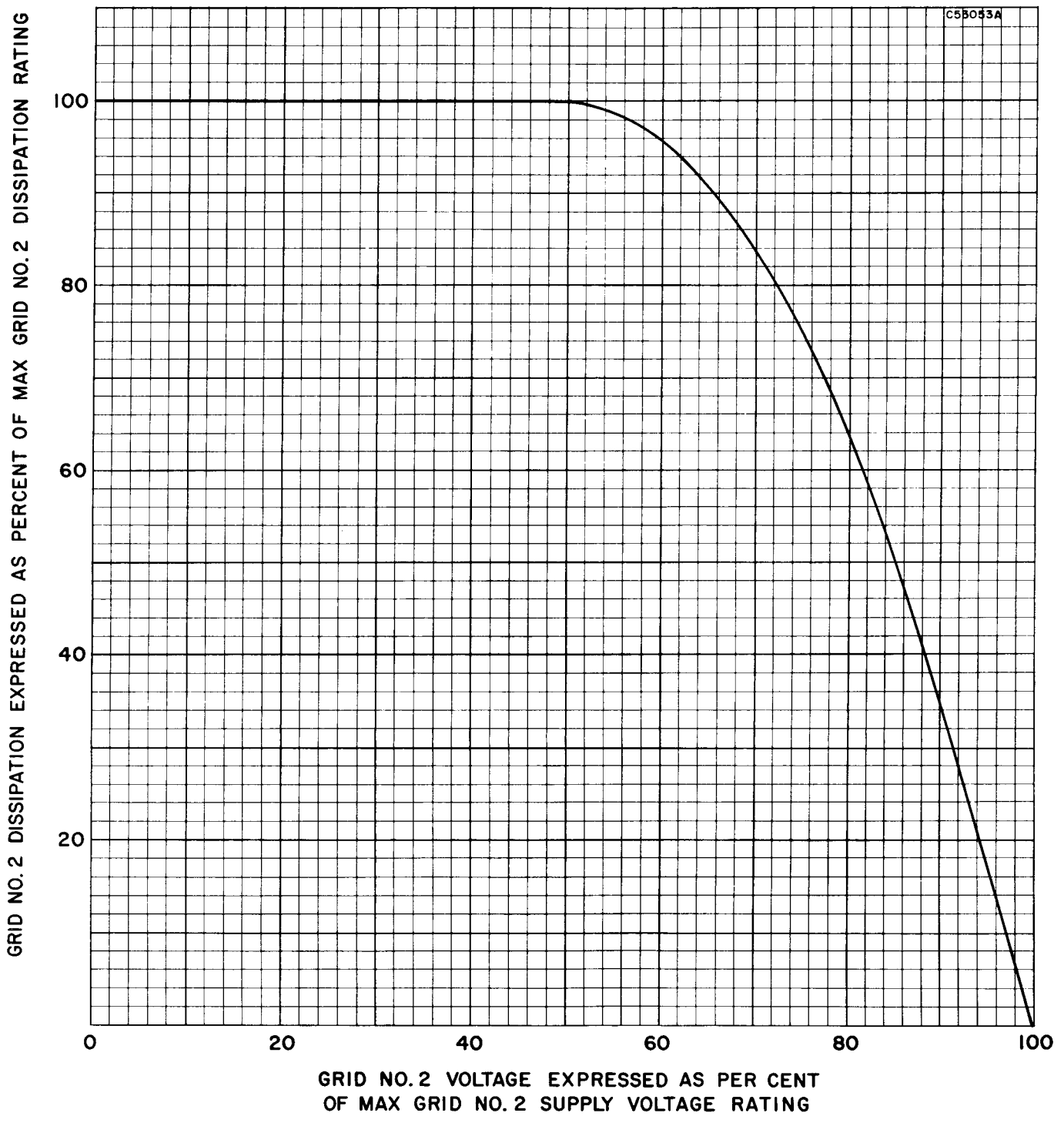
AVERAGE TRANSFER CHARACTERISTICS
(TRIODE SECTION)

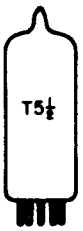


AVERAGE TRANSFER CHARACTERISTICS
(TRIODE SECTION)



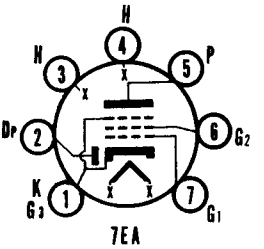
RATING CHART





SYLVANIA TYPE 6CR6 12CR6

DIODE DETECTOR
REMOTE CUTOFF PENTODE



MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7EA
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6CR6	12CR6
Heater Voltage	6.3	12.6 Volts
Heater Current	300	150 Ma
Heater-Cathode Voltage (Design Center Values)		
Heater Negative with Respect to Cathode		
Total D C and Peak		100 Volts Max.
Heater Positive with Respect to Cathode		
Total D C and Peak		100 Volts Max.

MAXIMUM RATINGS (Design Center Values)

Plate Voltage	300 Volts
Grid No. 2 Supply Voltage	300 Volts
Grid No. 2 Voltage	See 6AM8 Rating Chart
Plate Dissipation	2.5 Watts
Grid No. 2 Dissipation	0.3 Watt
Positive D C Grid No. 1 Voltage	0 Volts
Grid No. 1 Circuit Resistance	1.0 Megohm

CHARACTERISTICS AND TYPICAL OPERATION

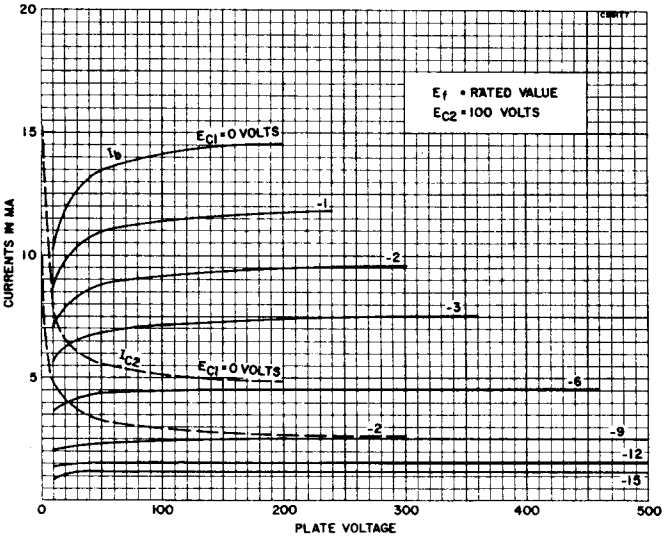
Class A_1 Amplifier

Plate Voltage	250 Volts
Grid No. 2 Voltage	100 Volts
Grid No. 1 Voltage	−2 Volts
Plate Current	9.6 Ma
Grid No. 2 Current	2.6 Ma
Transconductance	2200 μmhos
Plate Resistance (approx.)	0.8 Megohm
Grid No. 1 Voltage for Gm = μmhos (approx.)	−32 Volts
Minimum Diode Current with 10 Volts D C Applied	2 Ma

APPLICATION

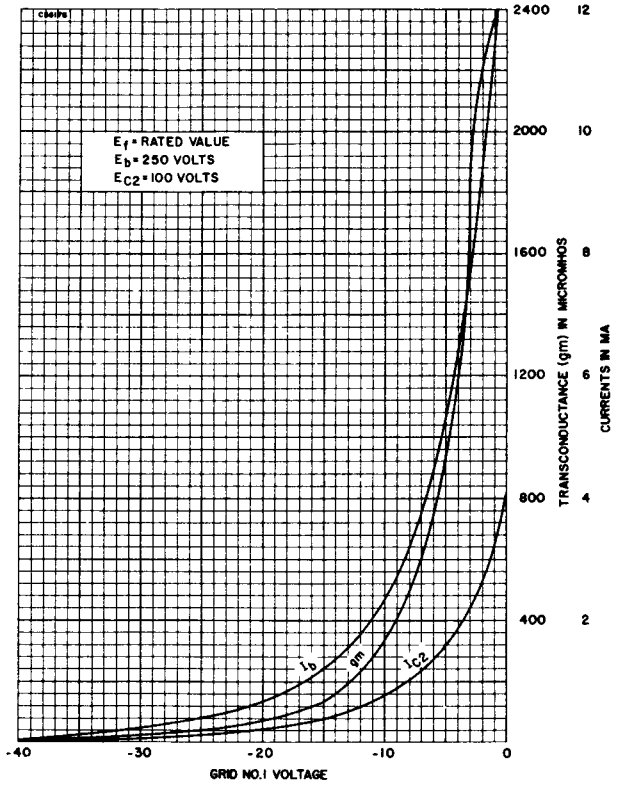
The Sylvania Types 6CR6 and 12CR6 have a diode detector and remote cutoff pentode contained in one envelope. The pentode section is intended for use as an audio amplifier in which AVC voltage is applied to the No. 1 Grid for improved AVC operation in receivers.

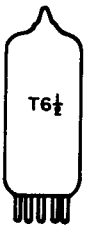
AVERAGE PLATE CHARACTERISTICS



6CR6, 12CR6 (Cont'd)

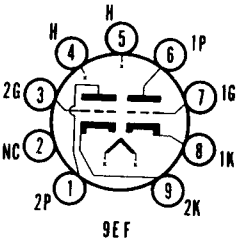
AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPE 6CS7
8CS7

DOUBLE TRIODE



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button, 9-Pin
Outline	6-3
Basing	9EF
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6CS7	8CS7	
Heater Voltage	6.3	8.4	Volts
Heater Current	600	450	Ma
Heater Warm-up Time (See Appendix)	11	11	Seconds
Heater-Cathode Voltage (Design Center Values)			
Heater Negative with Respect to Cathode			
Total D C and Peak		200	Volts Max
Heater Positive with Respect to Cathode			
D C		100	Volts Max
Total D C and Peak		200	Volts Max

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Triode No. 1[1]	Triode No. 2
Grid to Plate	2.6	2.6 μμf
Input: g to (k+h+e.s.)	1.8	3.0 μμf
Output: p to (k+h+e.s.)	0.5	0.5 μμf

RATINGS (Design Center Values—Except as Noted)
Vertical Deflection Oscillator and Amplifier[2]

	Triode No. 1[1] (Oscillator)	Triode No. 2 (Amplifier)	
D C Plate Voltage	500	500	Volts Max
Peak Positive Pulse Plate Voltage (Abs. Max.)		2200	Volts
Peak Negative Pulse Grid Voltage	400	250	Volts Max
Plate Dissipation[3]	1.25	6.5	Watts Max
Average Cathode Current	20	30	Ma Max
Peak Cathode Current	70	105	Ma Max
Grid Circuit Resistance	2.2	2.2	Megohms Max

AVERAGE CHARACTERISTICS

	Triode No. 1[1]	Triode No. 2	
Plate Voltage	250	250	Volts
Grid Voltage	−8.5	−10.5	Volts
Plate Current	10.5	19.0	Ma
Transconductance	2200	4500	μmhos
Amplification Factor	17.0	15.5	
Plate Resistance	7700	3450	Ohms
Plate Currant at E_c = −16 Volts		3.0	Ma
Grid Voltage for I_b = 10 μa	−24		Volts
Grid Voltage for I_b = 50 μa		−22	Volts

NOTES:

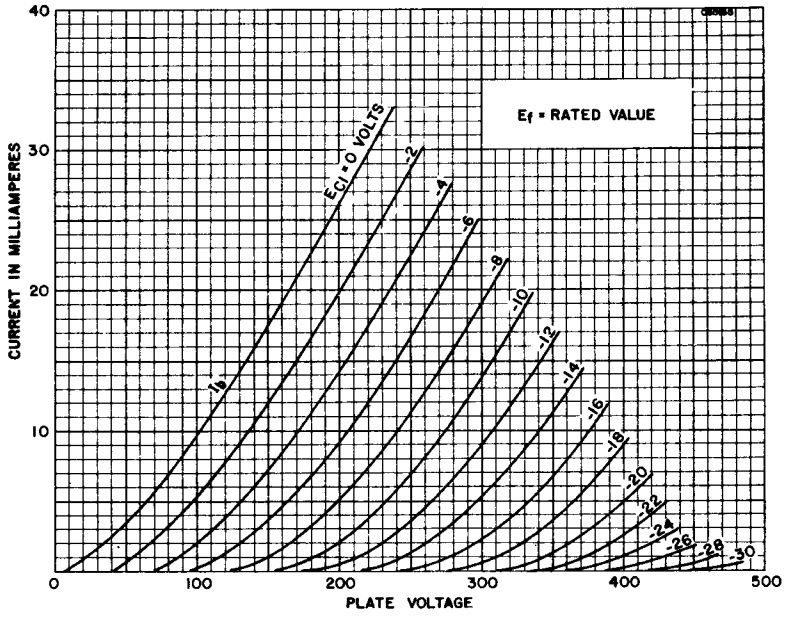
1. Triode No. 1 connects to pins 6, 7 and 8.
   Triode No. 2 connects to pins 1, 3 and 9.
2. For operation in a 525 line, 30-frame system as described in "Standards of Good Engineering Practice for Television Broadcasting Stations; Federal Communications Commission." The duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.
3. In stages operating with grid leak bias, an adequate cathode bias resistor or other suitable means is required to protect the tube in the absence of excitation.

APPLICATION

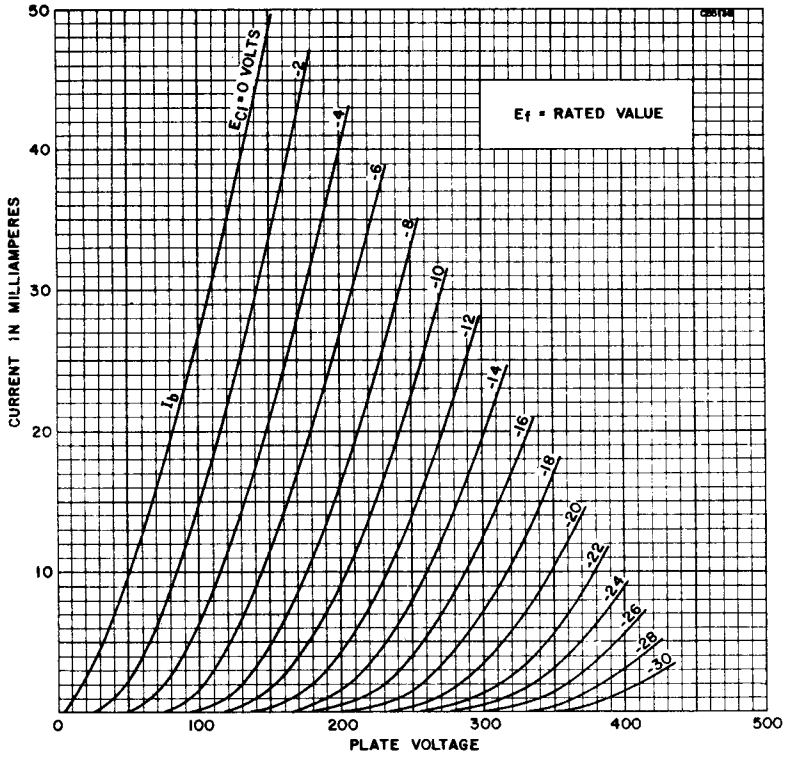
The Sylvania Types 6CS7 and 8CS7 are miniature, double triodes having dissimilar sections. Section No. 1 is intended for operation as a vertical deflection oscillator and Section No. 2 as a vertical deflection amplifier. The 6CS7 and 8CS7 incorporates controlled heater warm-up time to insure dependable operation in television receivers employing a series heater string.

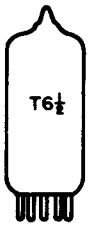
6CS7, 8CS7 (Cont'd)

AVERAGE PLATE CHARACTERISTICS
TRIODE NO. 1



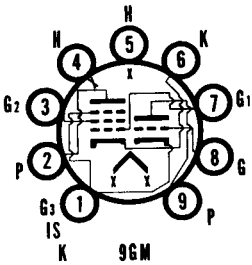
AVERAGE PLATE CHARACTERISTICS
TRIODE NO. 2





SYLVANIA TYPE 6CU8

MEDIUM MU TRIODE
SHARP CUTOFF PENTODE



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9GM
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	450 Ma
Heater Warm-up Time[1]	11 Seconds
Heater-Cathode Voltage (Design Center Values)	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
D C	100 Volts Max.
Total D C and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section

Grid to Plate	1.6 μμf
Grid to (k+h+g3+I.S.)	1.9 μμf
Plate to (k+h+g3+I.S.)	1.6 μμf

Pentode Section

Grid No. 1 to Plate	0.025 μμf Max.
Grid No. 1 to (k and g3+g2+h+Tk+I.S.)	7.0 μμf
Plate to (k and g3+g2+h+Tk+I.S.)	2.4 μμf

6CU8 (Cont'd)

DIRECT INTERELECTRODE CAPACITANCES (Cont'd)

Coupling

Pentode Grid No. 1 to Triode Plate	0.02 μμf
Pentode Plate to Triode Plate	0.04 μμf
Triode Grid to Pentode Plate	0.005 μμf

MAXIMUM RATINGS (Design Center Values)

	Triode Section	Pentode Section
Plate Voltage	300	300 Volts
Grid No. 2 Supply Voltage		300 Volts
Grid No. 2 Voltage		See 6AM8 Rating Chart
Plate Dissipation	2.6	2 Watts
Positive Grid No. 1 Voltage	0	0 Volt
Grid No. 2 Input:		
For Grid No. 2 Voltages up to 150 Volts		0.5 Watt
For Grid No. 2 Voltages Between 150 Volts and 300 Volts		See 6AM8 Rating Chart
Grid No. 1 Circuit Resistance		
Fixed Bias	0.5	0.25 Megohm
Self Bias	1.0	1.0 Megohm

AVERAGE CHARACTERISTICS

	Triode Section	Pentode Section
Plate Voltage	200	200 Volts
Grid No. 2 Voltage		150 Volts
Grid Voltage	−6	Volts
Cathode Bias Resistor		180 Ohms
Plate Current	13	9.5 Ma
Grid No. 2 Current		2.0 Ma
Transconductance	3300	6200 μmhos
Amplification Factor	19	
Plate Resistance	5750	300,000 Ohms
Ec1 for Ib = .10 μa (approx.)	−19	−8 Volts

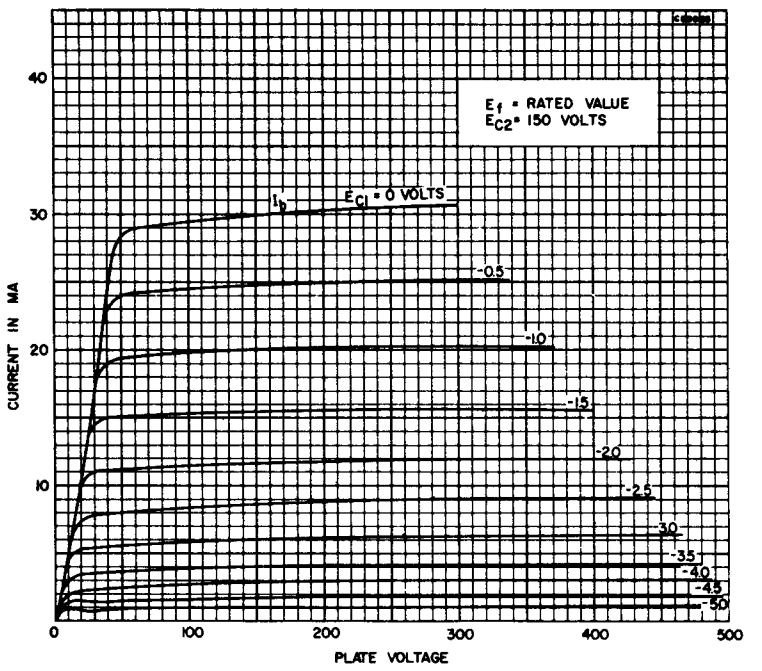
NOTE:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.

APPLICATION

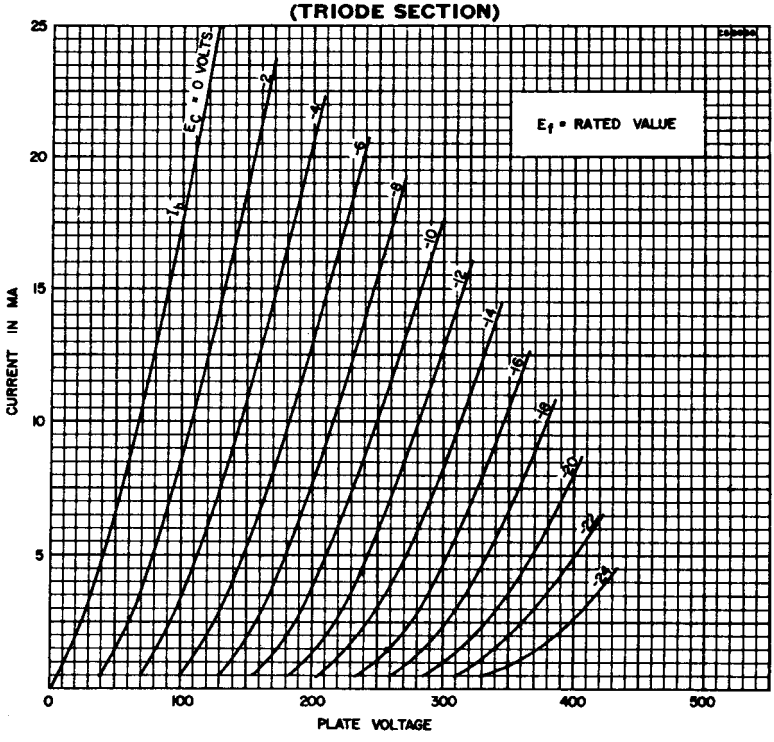
The Sylvania Type 6CU8 is a medium mu triode and sharp cutoff pentode contained in a T-6½ envelope. The pentode section is suitable for use as an IF, video or agc amplifier. The triode section is well suited for use in low frequency oscillator, sync-separator, sync-clipper and phase-splitter circuits.
Type 6CU8 has controlled heater warm-up time for series string operation.

AVERAGE PLATE CHARACTERISTICS
(PENTODE SECTION)



6CU8 (Cont'd)

AVERAGE PLATE CHARACTERISTICS
(TRIODE SECTION)



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9FC
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	4CX7	6CX7	
Heater Voltage	4.2	6.3	Volts
Heater Current	600	400	Ma
Heater Warm-up Time[1]	11		Seconds
Heater-Cathode Voltage (Design Center Values)			
Heater Negative with Respect to Cathode			
Total DC and Peak[2]	200	200	Volts Max.
Heater Positive with Respect to Cathode			
DC	100	100	Volts Max.
Total DC and Peak	200	200	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[3]

	Section No. 1	Section No. 2	
Grid to Plate: (g to p)	1.2		μμf
Input: g to (h+k+e.s.)	2.4		μμf
Output: p to (h+k+e.s.)	1.3		μμf
Heater to Cathode: (h to k)[4]	2.4	2.2	μμf
Plate to Cathode: (p to k)	0.17	0.17	μμf Max.
No. 2 Plate to No. 1 Plate and No. 1 Grid:			
No. 2 p to (No. 1 p+No. 1 g)	0.027		μμf Max.
Plate to Plate: (No. 1 p to No. 2 p)	0.017		μμf Max.
Grounded Grid Operation:			
Input: k to (g+i.s.+h+e.s.)		4.2	μμf
Output: p to (g+i.s.+h+e.s.)		1.7	μμf

RATINGS (Design Center Values — Each Section)

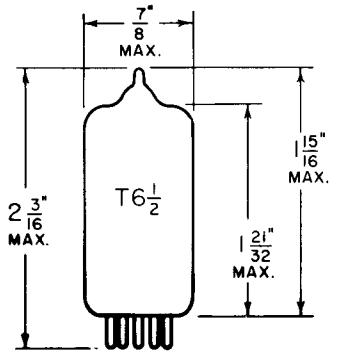
Plate Voltage[2]	250 Volts Max.
Plate Dissipation	2 Watts Max.
Cathode Current	20 Ma Max.
Grid Circuit Resistance	0.5 Megohm Max.

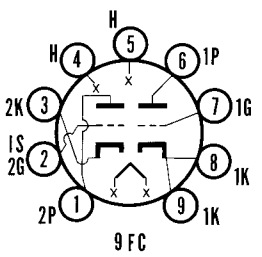
CHARACTERISTICS — Class A_1 Amplifier (Each Section)

Plate Voltage	150 Volts
Grid Voltage	0 Volts
Cathode Bias Resistor	220 Ohms
Plate Current	9.0 Ma
Transconductance	6400 μmhos
Amplification Factor	39
Grid Voltage for I_b = 10 μa (approx.)	−10 Volts

QUICK REFERENCE DATA

The Sylvania Types 4CX7 and 6CX7 are miniature medium mu twin triodes designed for operation as cascode (vhf) amplifiers. The 4CX7 features a 600 ma heater and controlled heater warm-up time for service in television receivers employing a series heater string.





SYLVANIA ELECTRIC PRODUCTS INC.

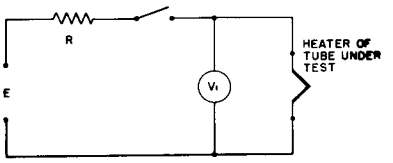
RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JANUARY 1956

NOTES:

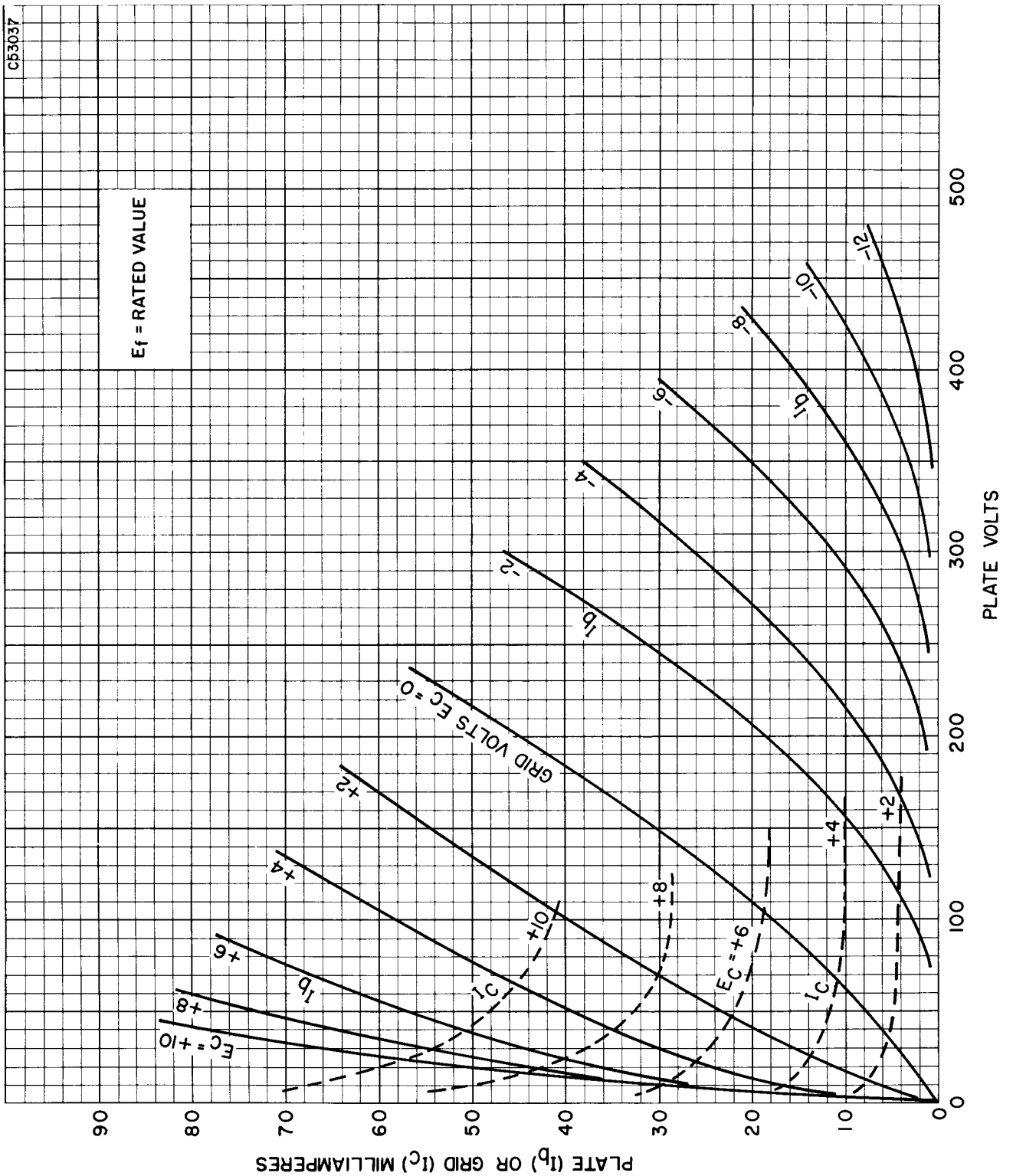
1. *Heater Warm-up Time is defined as the time required in the circuit shown below for the voltage across the heater terminals to increase from zero to the heater test voltage (V1). The conditions used in conjunction with the test circuit depend upon the rated heater voltage and current of the tube under test. For this type: E = 16.8 Volts, R = 21.0 Ohms, V1 = 3.33 Volts.*



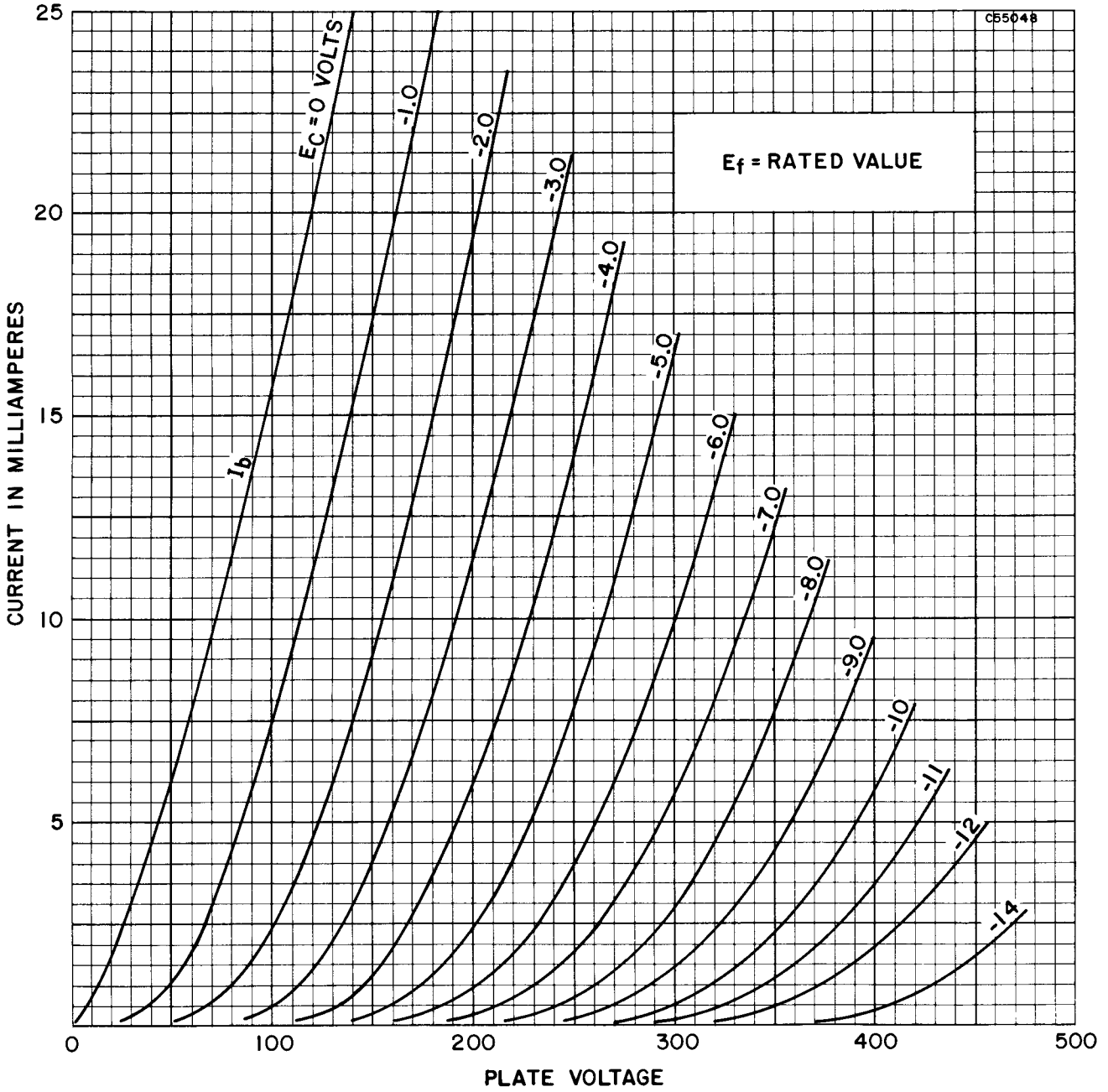
E — Applied Voltage, RMS or DC
R — Total Series Resistance
V1 — Heater Test Voltage, RMS or DC (80% Rated Heater Voltage)

2. *Under cutoff conditions when the tube is used as a cascode amplifier, this rating may be as high as 300 volts maximum.*
3. *Shield No. 315 connected to heater unless specified differently.*
4. *Shield No. 315 connected to ground.*

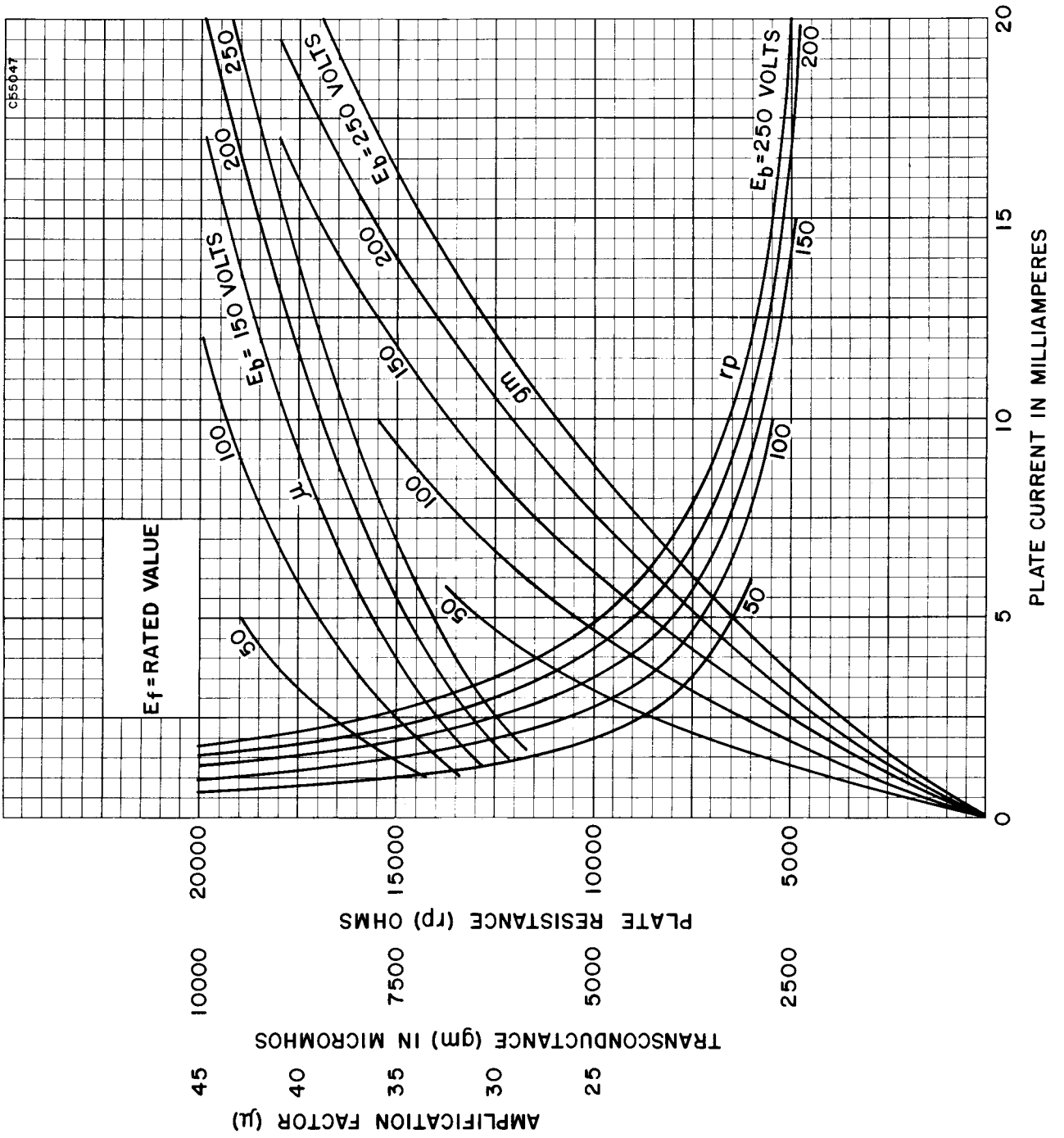
AVERAGE PLATE CHARACTERISTICS



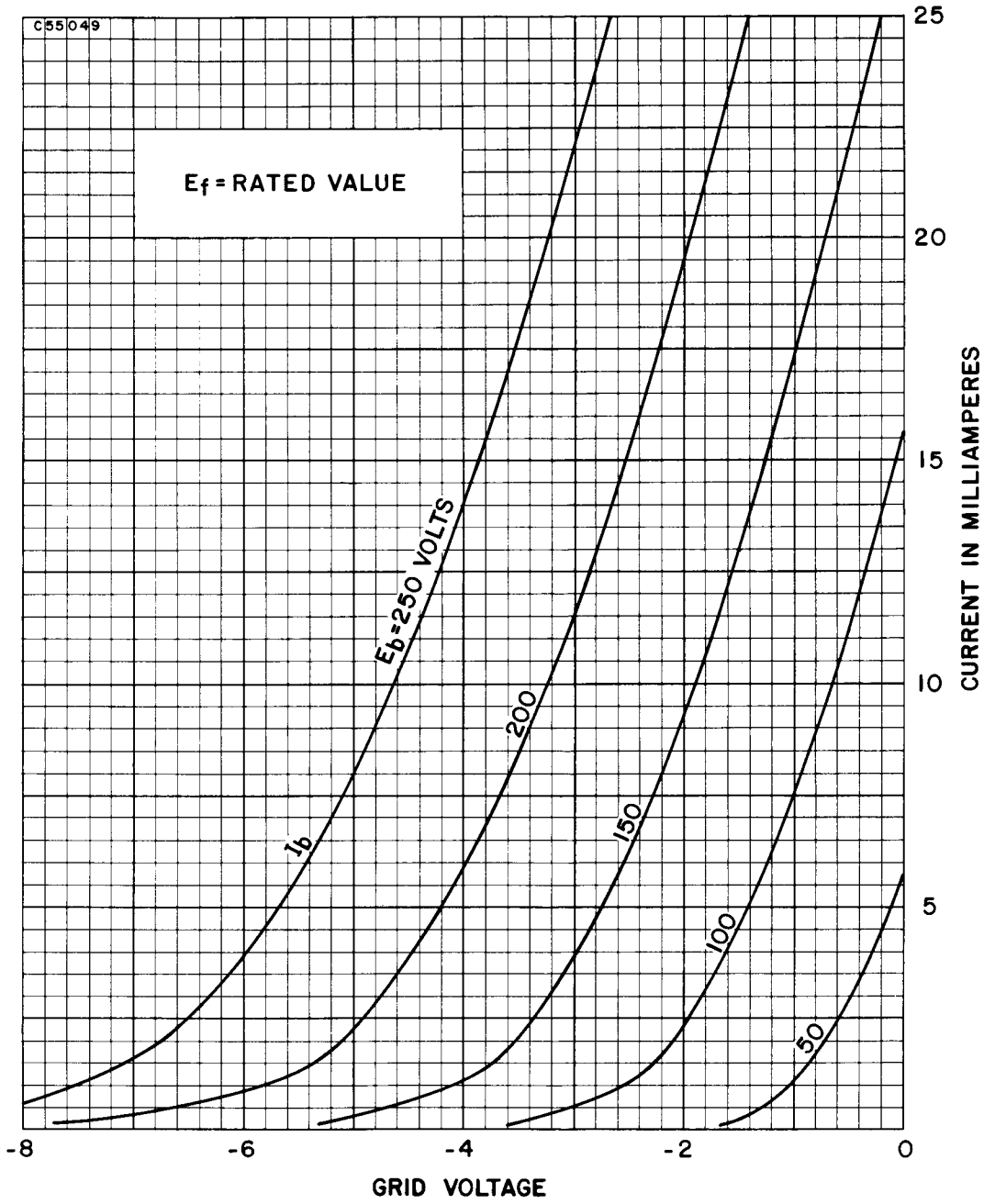
AVERAGE PLATE CHARACTERISTICS

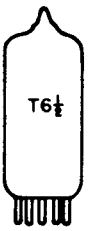


AVERAGE TRANSFER CHARACTERISTICS



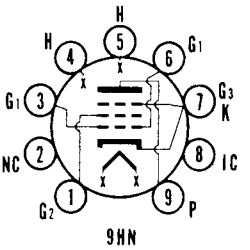
AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPE 6CZ5
5CZ5

BEAM PENTODE AMPLIFIER



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button, 9-Pin
Outline	6-4
Basing	9HN
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	5CZ5	6CZ5
Heater Voltage	4.7	6.3 Volts
Heater Current	600	450 Ma
Heater Warm-up Time[1]	11	11 Seconds
Heater-Cathode Voltage (Design Center Values)		
Heater Negative with Respect to Cathode		
Total D C and Peak		200 Volts Max.
Heater Positive with Respect to Cathode		
D C		100 Volts Max.
Total D C and Peak		200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

Grid No. 1 to Plate	0.4 $\mu\mu$f Max.
Input: g1 to (k+h+g3+g2)	6.0 $\mu\mu$f
Output: p to (k+h+g3+g2)	6.0 $\mu\mu$f

MAXIMUM RATINGS (Design Center Values—Except as Noted)[2]

	Vertical Deflection Amp.	Class A_1 Power Amp.
D C Plate Voltage	315	350 Volts
Peak Postive Plate Voltage (Abs. Max.)	2200[3]	Volts
D C Grid No. 2 Voltage	285	285 Volts
Peak Negative Grid No. 1 Voltage	250	Volts
Plate Dissipation	10	12 Watts
Grid No. 2 Input	2	2 Watts
Average Cathode Current	40	Ma
Peak Cathode Current	140	Ma
Grid No. 1 Circuit Resistance		
Fixed Bias	0.5	0.1 Megohm
Cathode Bias	1	1 Megohm
Bulb Temperature (At Hottest Point)	250	250 Degrees C

6CZ5, 5CZ5 (Cont'd)

CHARACTERISTICS

Plate Voltage	250 Volts
Grid No. 2 Voltage	250 Volts
Grid No. 1 Voltage	−14 Volts
Plate Current	46 Ma
Grid No. 2 Current	4.6 Ma
Transconductance	4800 μmhos
Plate Resistance (approx.)	73,000 Ohms
Grid No. 1 Voltage for Ib = 100 μa (approx.)	−35 Volts

Instantaneous Plate Knee Values
Eb = 70 Volts, Ec2 = 250 Volts, Ec1 = 0 Volts
Ib = 130 Ma, Ic2 = 16 Ma

TYPICAL OPERATION

AF Power Amplifier	Single Tube Class A_1	Push Pull Class AB_1
Plate Voltage	250	350 Volts
Grid No. 2 Voltage	250	280 Volts
Grid No. 1 Voltage	−14	−23.5 Volts
Peak AF Grid No. 1 Voltage	13	Volts
Peak AF Grid to Grid Voltage[4,5]		47 Volts
Zero Signal Plate Current	46	46 Ma
Maximum Signal Plate Current	48	103 Ma
Zero Signal Grid No. 2 Current	4.6	3 Ma
Maximum Signal Grid No. 2 Current	8	13 Ma
Transconductance	4800	μmhos
Load Resistance	5000	Ohms
Load Resistance (Plate to Plate)		7500 Ohms
Power Output	5.4	21.5 Watts
Total Harmonic Distortion	10	1 Percent

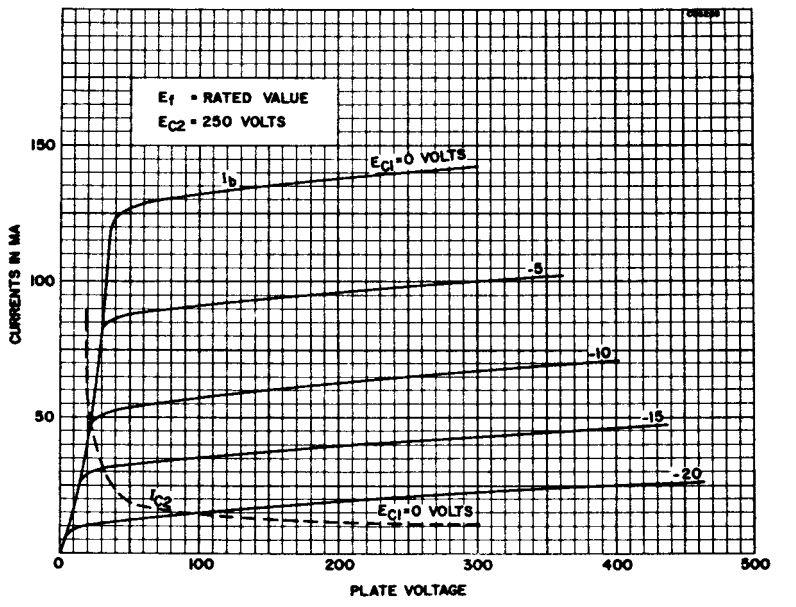
NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.
2. For operation in a 525-line, 30-frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations; Federal Communications Commission," the duty cycle of the pulse must not exceed 15% of one scanning cycle.
3. Under no circumstances should this absolute value be exceeded.
4. No Grid No. 1 Current should flow during any part of the input cycle.
5. Low resistance is required by the Grid No. 1 circuit such as transformer or impedance coupling devices.

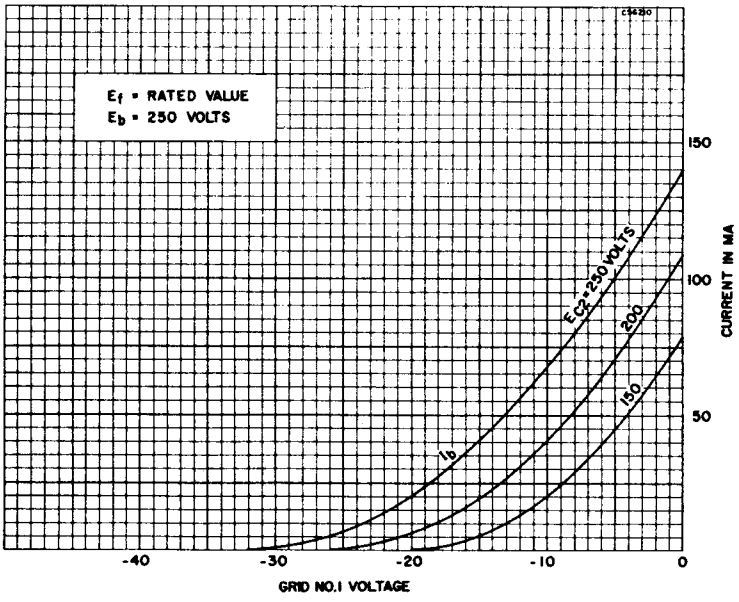
APPLICATION

The Sylvania Type 6CZ5 is a miniature, beam pentode intended primarily for use as a vertical deflection amplifier or audio amplifier. Types 6CZ5 and 5CZ5 have controlled heater warm-up time for series string operation.

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS

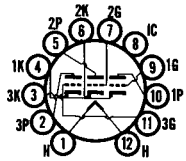


OSCILLATOR, MIXER AMPLIFIER or AFC

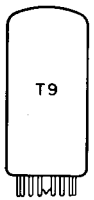
6D10

High Mu Triple Triode

Construction.....Compactron T-9
Base .....Button 12 Pin, E12-70
Basing 12BQ
Outline 9-56
Maximum Diameter .....1.188 In.
Maximum Seated Height .....1.500 In.
Maximum Overall Height .....1.875 In.



12BQ



ELECTRICAL DATA

HEATER OPERATION

Heater Voltage	6.3 Volts
Heater Current	450 Ma
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded) (Each Section)

Grid to Plate	1.5 Pf
Input	2.2 Pf
Output	0.5 Pf

RATINGS (Design Maximum Rating System) (Each Section)

Plate Voltage (Max.)	330 Volts
Plate Dissipation (Each Plate) (Max.)	2.0 Watts
Plate Dissipation (Plates 1, 2, and 3) (Max.)	6.0 Watts
Positive Grid Voltage (Max.)	0 Volt
Negative Grid Voltage (Max.)	50 Volts

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier—Each Section

Plate Voltage	125 Volts
Grid Voltage	−1.0 Volt
Plate Current	4.2 Ma
Plate Resistance	13,600 Ohms
Transconductance	4200 μmhos
Amplification Factor	57
Ec for Ib = 20 μa	−4 Volts

SYLVANIA

engineering data service 6D4

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	5AY
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts	
Heater Current	250 Ma	
Heater-Cathode Voltage (Absolute Maximum Values)		
Heater Positive with Respect to Cathode	110 Volts	Max.
Heater Negative with Respect to Cathode	110 Volts	Max.

RATINGS (Absolute Maximum Values)

Plate Supply Voltage	250 Volts	
Peak Plate Inverse Voltage	350 Volts	
Peak Plate Forward Voltage	350 Volts	
Negative Grid No. 1 Voltage	110 Volts	
Peak Plate Current	110 Ma	
Average Plate Current	25 Ma	
Cathode Heating Time[1]	30 Seconds	Min.
Duty Cycle	0.75 Percent	

CHARACTERISTICS AND TYPICAL OPERATION

Thyratron Operation

Plate Supply Voltage	50	125	300 Volts	
Series Plate Resistor	650	650	650 Ohms	
Cathode Resistor	4000	4000	4000 Ohms	
Grid Resistor	0.5	0.5	0.5 Megohm	
Heater Cathode Resistor	1.0	1.0	1.0 Megohm	
Grid Voltage to Start Conduction (approx.)	-6	-12.5	-26 Volts	
Tube Voltage Drop @ Ib = 100 Ma			18 Volts	Max.

Noise Generator Operation

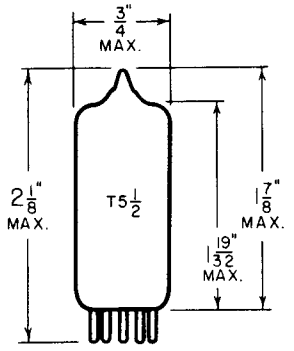
Plate Supply Voltage	250 Volts	
Grid Voltage	0 Volts	
Cathode Resistor	0 Ohms	
Plate Resistor	33,000 Ohms	
Noise Output (Peak to Peak)[2]	10 Volts	Min.

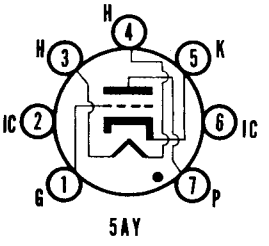
NOTES:

1. *Heater voltage must be applied before application of anode voltage so that the cathode reaches operating temperature.*
2. *The tube shall be placed in the circuit shown (Figure 1) in a constant magnetic field of 375 ± 20% gausses which is perpendicular to the normal electron path. The direction of the magnetic field shall be such as to deflect the electron beam toward the top of the tube. The noise voltage measured at the plate of the tube and across the output of the circuit shall not be less than the specified limit in peak-to-peak volts. The oscilloscope used for noise amplitude measurement shall have a 3 db video bandwidth extending to at least 4 megacycles.*

QUICK REFERENCE DATA

The Sylvania Type 6D4 is a miniature triode thyratron intended for use as a relay tube or wide band noise generator.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JUNE, 1957

APPLICATION

The Sylvania Type 6D4 thyratron is an excellent source of wide band noise. In this application, the tube is placed in a steady magnetic field which is directed through the tube at right angles to the conducting arc. Proper magnetic field alignment will be obtained if the field is directed parallel to a center-line through the tube base. This center-line passes half-way between pins numbered 3 and 4. Preferably, the north pole of the magnet should be adjacent to pin 7. A magnetic field strength of approximately 375 ± 20% gauss should be used.

In Figure 1, the tube is employed as a diode with the grid connected to the cathode. The plate series resistance (R_p) should be selected to limit the plate current (Ib) to about 6 to 7 ma with a plate supply (Ebb) of approximately 300 volts (with the specified magnet in place the plate supply voltage may be as high as 300 volts). Supply voltages lower than 250 volts may cause uncertain firing.

The Noise Generator Circuit should be immediately followed by a buffer amplifier to prevent reactive loading of the noise generator. This facilitates the use of filter and compensating amplifier circuits.

The Sylvania Type 6D4 alone does not produce uniform noise output over its useful range of frequencies (see Figure 2). The low frequency noise output is reasonably uniform, rising to a peak in the vicinity of one megacycle then dropping off quite rapidly at frequencies above two megacycles, consequently a compensated amplifier is required to obtain a uniform high level noise output. If the full spectrum is not required, filters may be used to obtain the desired high frequency cutoff.

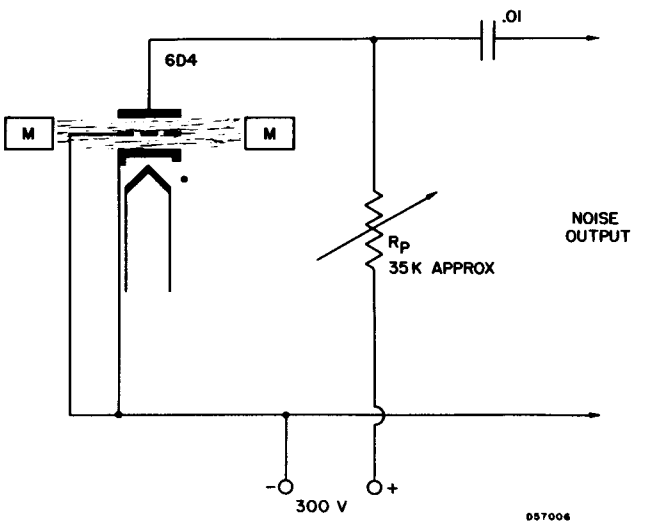


FIGURE 1. BASIC CIRCUIT OF NOISE GENERATOR

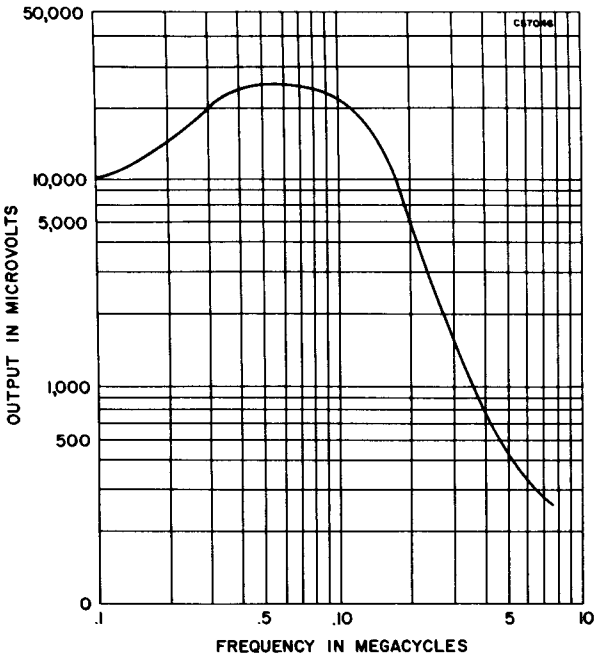
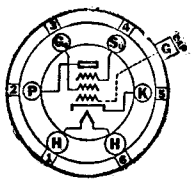


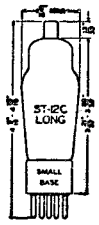
FIGURE 2. APPROXIMATE NOISE OUTPUT VS FREQUENCY



Sylvania

TYPE 6D6

PENTODE H. F.



CARACTERISTIQUES

Tension de chauffage (CA ou ou CC) ... ... 6,3 volts
Courant de chauffage ... ... 0,3 ampère
Ampoule ... ... ST-12C longue
Culot — Petit modèle 6 broches 6-F
Position de montage ... ... Toutes

Capacités directes interélectrodes :

Grille à plaque (avec blindage) ... ... 0,007 $\mu\mu f$
Entrée ... ... 4,7 $\mu\mu f$
Sortie ... ... 6,5 $\mu\mu f$
(Pour les conditions limites de fonctionnement, voir type 6U7G.)

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A

Tension de chauffage	6,3	6,3 volts
Tension de plaque	100	250 volts max.
Tension grille	—3	—3 volts min.
Tension grille écran	100	100 volts max.
Grille de suppression	Reliée à la cathode	
Courant plaque	8	8,2 ma.
Courant grille écran	2,2	2 ma.
Résistance interne	0,25	0,8 mégohm
Conductance mutuelle	1,500	1,600 μmhos

Condition de fonctionnement avec polarisation variable :

PREMIER DETECTEUR
DANS LE RECEPTEUR SUPERHETERODYNE

Tension de chauffage	6,3	6,3 volts
Tension plaque	100	250 volts max.
Tension grille* (approx.)	—10	—10 volts min.
Tension grille écran	100	100 volts max.
Grille de suppression	Reliée à la cathode.	

* La polarisation grille est minimum pour une tension de pointe d'oscillateur de 7 volts.

APPLICATION.

Le tube Sylvania 6D6 est un amplificateur pentode H.F. dans lequel la grille de suppression est connectée à une broche séparée. Ce tube, à grand recul de grille convient comme amplificateur ou premier détecteur dans des récepteurs CA, CC, universels ou automobiles.

AMPLIFICATEUR H.F. :

Le tube 6D6 est spécialement applicable aux circuits récepteurs de radio, à cause de son aptitude à réduire les effets de transmodulation, grâce à sa caractéristique à pente variable.

L'usage d'une résistance série, pour obtenir la tension de grille écran à partir de la tension anodique, est permis, pourvu que cette dernière tension n'excède pas 250 volts.

L'impédance du circuit de plaque doit être la plus grande possible. Une impédance accordée convient parfaitement pour des amplificateurs de moyenne fréquence fonctionnant à fréquence constante. Le gain d'amplification peut atteindre 200 ou plus, par étage.

Lorsqu'il est nécessaire d'obtenir une sensibilité uniforme dans une large bande de fréquence, un système de couplage spécial devra être employé. Dans le cas d'un couplage par résistance, la résistance de grille ne peut pas dépasser 1 mégohm.

PREMIER DETECTEUR OU MODULATEUR :

Le tube 6D6 peut avantageusement être utilisé comme premier détecteur dans un récepteur superhétérodyne. Pour des valeurs convenables de tension incidente et de tension d'oscillation locale, il peut donner un gain égal au tiers de celui qui serait obtenu en amplificateur de moyenne fréquence. De plus, ce gain peut être contrôlé par application d'une polarisation variable provenant d'une source séparée ou d'une résistance insérée dans la cathode. Cette dernière propriété est très intéressante pour les récepteurs à contrôle automatique de volume, car elle rend possible la réception des signaux faibles sans perte d'amplification et des signaux forts avec amoindrissement de l'action du contrôle de volume.

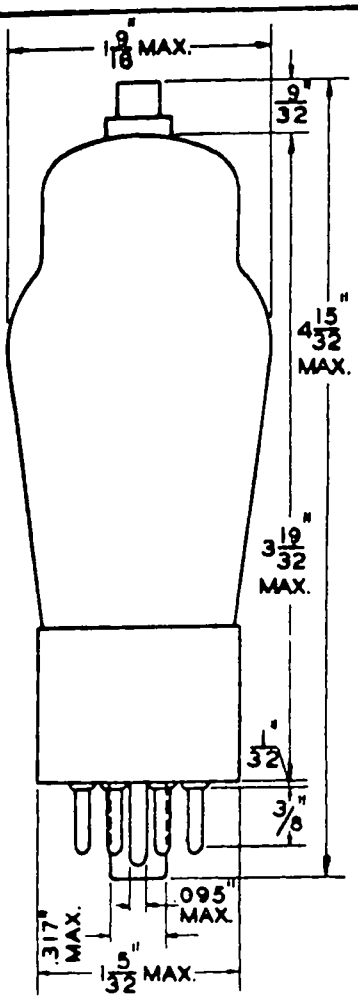
Hygrade Sylvania CORPORATION

TECHNICAL DATA

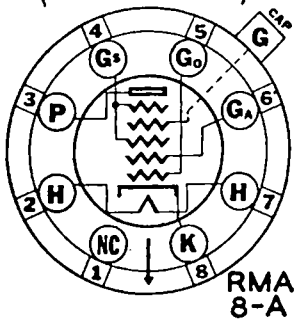
SYLVANIA TYPE 6D8G

Pentagrid Converter

SYLVANIA
6D8G



TUBE AND BASE DIAGRAM
(BOTTOM VIEW)



RMA 8-A

TENTATIVE RATINGS AND CHARACTERISTICS

Heater Voltage AC or DC	6.3	Volts
Heater Current	0.150	Ampere
Direct Interelectrode Capacitances:		
Grid G to plate (with tube shield)	0.30	μμF.
Grid G to Grid G_s (with tube shield)	0.20	μμF.
Grid G to Grid G_o (with tube shield)	0.15	μμF.
Grid G_o to Grid G_s	1.0	μμF.
Grid G to all other electrodes (r-f input)	7.0	μμF.
Grid G_s to all other electrodes (Osc.Output)	6.0	μμF.
Grid G_o to all other electrodes (Osc. Input)	7.0	μμF.
Plate to all other electrodes(Mixer Output)	9.0	μμF.

OPERATING CONDITIONS AND CHARACTERISTICS

Heater Voltage	6.3	6.3	Volts
Plate Voltage	100	250°	Volts
Control Grid Voltage (G)	-1.5	-3.0	Volts Min.
Screen Voltage (G_s)	50	100	Volts Max.
Anode Grid Voltage (G_s)	100*	250*	Volts
Oscillator Grid Resistor (G_o)	50000	50000	Ohms
Plate Current	1.0	3.0	Ma.
Screen Grid Current	1.7	3.5	Ma.
Anode Grid Current	1.8	4.5	Ma.
Oscillator Grid Current	0.25	0.7	Ma.
Cathode Resistor	300	300	Ohms
Plate Resistance	0.55	0.32	Megohm
Conversion Conductance	300	500	μmhos
Control Grid Voltage for 2 μmhos Conversion Conductance	-20	-40	Volts (Approx)

° Maximum

* Anode grid supply voltage with 20,000 ohms in series with G_s.

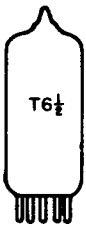
CIRCUIT APPLICATION

Sylvania 6D8G is a new pentagrid converter tube with characteristics very similar to those for Types 6A7 and 6A8G. The principal difference in ratings appears in the heater current which for Type 6D8G is only 0.150 ampere.

The uses for this tube parallel those for the other 6.3 volt tubes having this construction. The circuit applications are well known and do not require repetition in this bulletin.

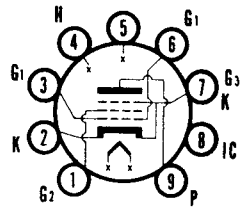
9-29-36

from RMA registration #76, June 12, 1936



SYLVANIA TYPE 6DB5
12DB5

BEAM PENTODE AMPLIFIER



9GR

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button, 9-Pin
Outline	6-3
Basing	9GR
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6DB5	12DB5
Heater Voltage	6.3	12.6 Volts
Heater Current	1.200	0.600 Ampere
Heater Warm-up Time[1]		11 Seconds
Heater-Cathode Voltage (Design Center Values)		
Heater Negative with Respect to Cathode		
Total D C and Peak		200 Volts Max.
Heater Positive with Respect to Cathode		
D C		100 Volts Max.
Total D C and Peak		200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.2 μμf Max.
Input: g1 to (k+h+B.P. +g2)	13 μμf
Output: p to (k+h+B.P. +g2)	8 μμf

MAXIMUM RATINGS (Design Center Values—Except as Noted)[2]

Vertical Deflection Amplifier Service

D C Plate Voltage	300 Volts
Peak Positive Plate Voltage (Abs. Max.)	2000[3] Volts
D C Grid No. 2 Voltage	150 Volts
Peak Negative Grid No. 1 Voltage	250 Volts
Plate Dissipation	10 Watts
Grid No. 2 Dissipation	1.25 Watts
Average Cathode Current	55 Ma
Peak Cathode Current	200 Ma
Grid No. 1 Circuit Resistance	
Fixed Bias	0.1 Megohm
Cathode Bias (Rk = 100 Ohms, Min.)	2.2 Megohms
Bulb Temperature (At Hottest Point)	250 Degrees C

TYPICAL OPERATION

AF Power Amplifier

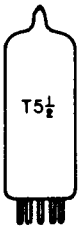
	Triode Connected	Class A_1 Amplifier	
Plate Voltage	225	110	200 Volts
Grid No. 2 Voltage		110	125 Volts
Grid No. 1 Voltage	-30	-7.5	Volts
Cathode Bias Resistor			180 Ohms
Peak AF Grid No. 1 Voltage		7.5	8.5 Volts
Zero Signal Plate Current		49	46 Ma
Max. Signal Plate Current		50	47 Ma
Zero Signal Grid No. 2 Current		4	2.2 Ma
Max. Signal Grid No. 2 Current		10	8.5 Ma
Plate Resistance	1500	13,000	28,000 Ohms
Transconductance	3800	8000	8000 μmhos
Load Resistance		2000	4000 Ohms
Power Output		2.1	3.8 Watts
Total Harmonic Distortion		10	10 Percent

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.
2. For operation in a 525-line, 30-frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations; Federal Communications Commission," the duty cycle of the pulse must not exceed 15% of one scanning cycle.
3. Under no circumstances should this absolute value be exceeded.
4. No Grid No. 1 Current should flow during any part of the input cycle.

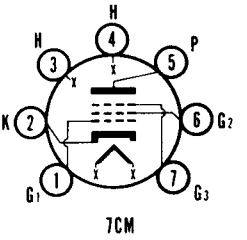
APPLICATION

The Sylvania Types 6DB5 and 12DB5 are miniature, beam pentodes intended primarily for use as a vertical deflection amplifier or audio amplifier. The 12DB5 has controlled heater warm-up time for series string operation.



SYLVANIA TYPE 6DC6

SEMI-REMOTE PENTODE



MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7CM
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	300 Ma
Heater-Cathode Voltage (Design Center Values)	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
D C	100 Volts Max.
Total D C and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.02 $\mu\mu$f Max.
Input	6.5 $\mu\mu$f
Output	2.0 $\mu\mu$f

RATINGS (Design Center Values)

Plate Voltage	300 Volts Max.
Grid No. 2 Supply Voltage	300 Volts Max.
Grid No. 2 Voltage	See 6AM8 Rating Chart
Grid No. 3 Voltage	0 Volts Max.
Grid No. 1 Voltage	0 Volts Max.
Plate Dissipation	2 Watts Max.
Grid No. 2 Input	0.5 Watt Max.
Grid No. 1 Circuit Resistance	
Fixed Bias	0.25 Megohm Max.
Self Bias	1.0 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

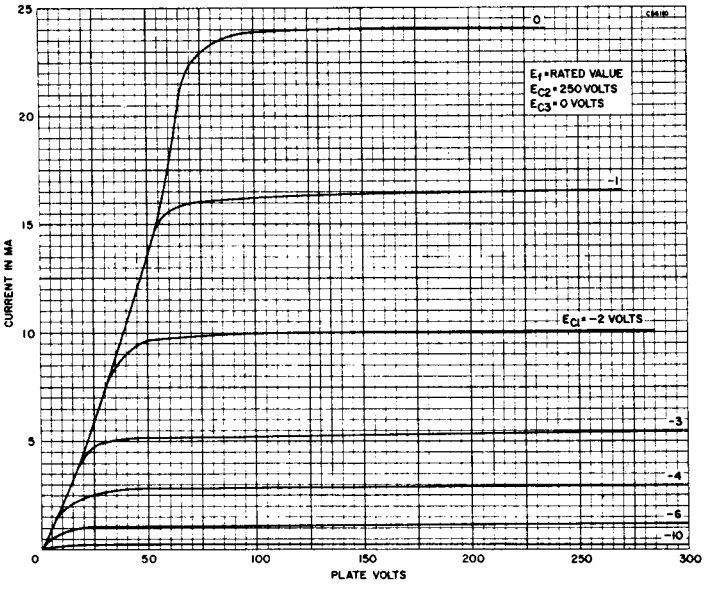
Plate Voltage	200 Volts
Grid No. 3	Connected to Cathode at Socket
Grid No. 2 Voltage	150 Volts
Cathode Bias Resistor	180 Ohms
Plate Current	9 Ma
Grid No. 2 Current	3 Ma
Plate Resistance (approx.)	0.5 Megohm
Transconductance	5500 μmhos
Grid No. 1 Bias (approx.) for gm = 50 μmhos	−12.5 Volts

APPLICATION

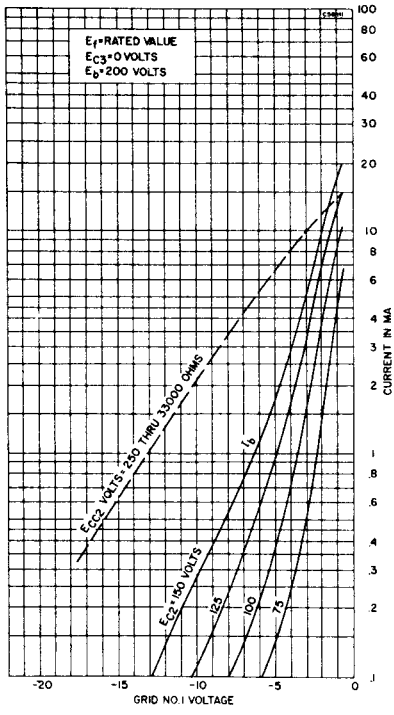
The Sylvania Type 6DC6 is a semi-remote cutoff pentode contained in a T-5½ bulb. It is designed for service in the IF stages of color and monochrome television receivers and may be used in the tuners of such sets as R-F amplifiers.

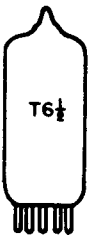
6DC6 (Cont'd)

AVERAGE PLATE CHARACTERISTICS

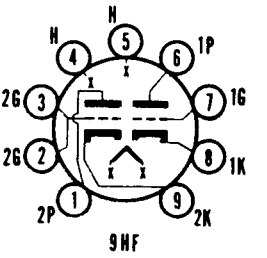


AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPE 6DE7 10DE7 13DE7



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-3
Basing	9HF
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6DE7	10DE7	13DE7
Heater Voltage	6.3	9.7	13.0 Volts
Heater Current	900	600	450 Ma
Heater Warm-up Time[1]	—	11	11 Seconds
Heater-Cathode Voltage (Design Maximum Values)[2]			
Heater Negative with Respect to Cathode			
Total DC and Peak			200 Volts Max.
Heater Positive with Respect to Cathode			
DC			100 Volts Max.
Total DC and Peak			200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Triode No. 1	Triode No. 2
Grid to Plate	4.0	8.5 μμf
Input: g to (h + k)	2.2	5.5 μμf
Output: p to (h + k)	0.52	1.0 μμf

RATINGS[2] (Design Maximum Values—Except as Noted)

Vertical Deflection Oscillator and Amplifier[3]

	Triode No. 1 Oscillator	Triode No. 2 Amplifier
DC Plate Voltage	330	275 Volts Max.
Peak Positive Pulse Plate Voltage (Abs. Max.)	—	1500 Volts
Peak Negative Pulse Grid Voltage	400	250 Volts Max.
Plate Dissipation[4]	1.5	7.0 Watts Max.
Average Cathode Current	22	50 Ma Max.
Peak Cathode Current	77	175 Ma Max.
Grid Circuit Resistance Self Bias	2.2	2.2 Megohms

AVERAGE CHARACTERISTICS

	Triode No. 1	Triode No. 2
Plate Voltage	250	150 Volts
Grid No. 1 Voltage	−11	−17.5 Volts
Plate Current	5.5	35 Ma
Transconductance	2000	6500 μmhos
Amplification Factor	17.5	6.0
Plate Resistance (approx.)	8750	925 Ohms
Grid Voltage for Ib = 10 μa	−20	— Ohms
Grid Voltage for Ib = 50 μa	—	−44 Volts
Plate Current at Ec = −24 Vdc	—	10 Ma
Plate Knee Characteristics Eb = 60 V; Ec = 0 (Instantaneous Values)	—	80 Ma

NOTES:

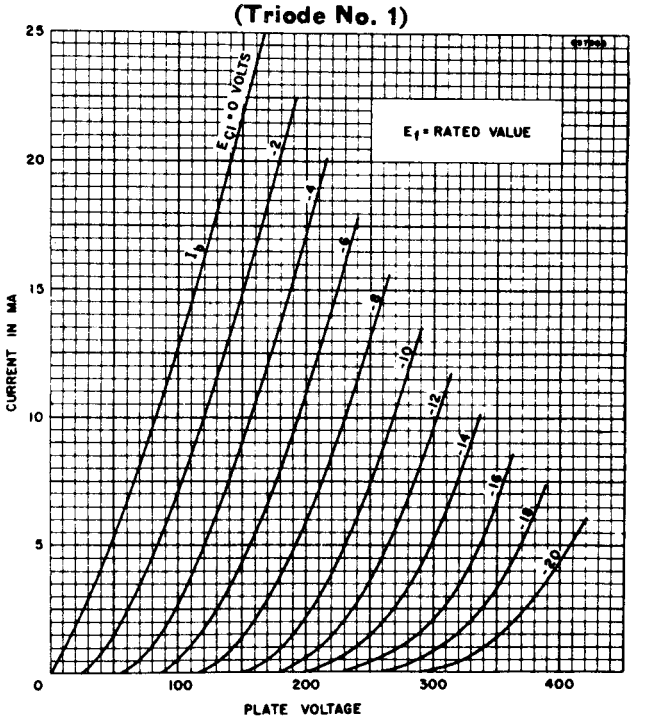
1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
2. Design Maximum Ratings are the limiting values expressed with respect to bogey tubes at which satisfactory tube life can be expected to occur. To obtain satisfactory circuit performance, therefore, the equipment designed must establish the circuit design so that no design-maximum value is exceeded with a bogey tube under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, and environmental conditions.
3. For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Stations; Federal Communications Commission." The duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.
4. In stages operating with grid leak bias, an adequate bias resistor or other suitable means is required to protect the tube in the absence of excitation.

APPLICATION NOTES

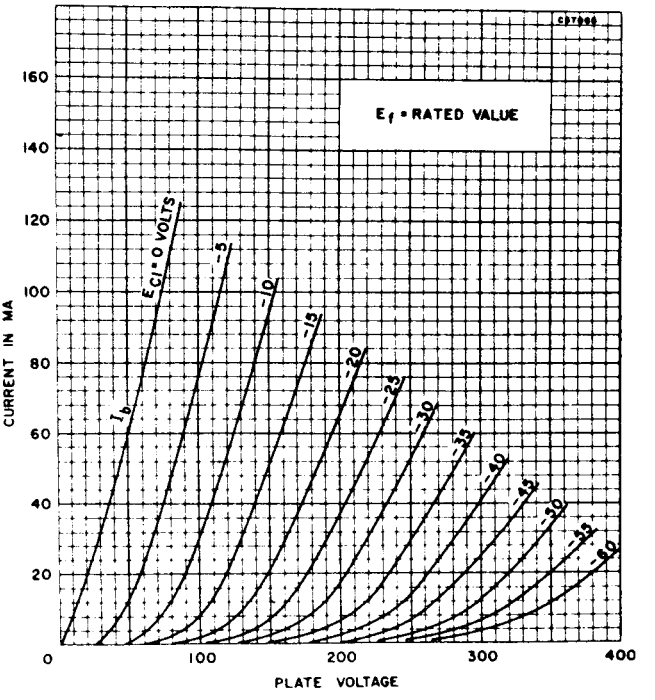
The Sylvania Types 6DE7, 10DE7, and 13DE7 have dissimilar double triodes contained in a miniature envelope. Triode No. 1 is intended for use as a Vertical Deflection Oscillator and Triode No. 2 is intended for use as a Vertical Deflection Amplifier.

Types 10DE7 and 13DE7 have controlled heater warm-up time for series string operation.

AVERAGE PLATE CHARACTERISTICS
(Triode No. 1)



AVERAGE PLATE CHARACTERISTICS
(Triode No. 2)



SYLVANIA

engineering data service

6DG6GT

MECHANICAL DATA

Bulb	T-9
Base[1]	B6-81 or B7-7 Intermediate Shell Octal or B6-84 or B7-59 Short Intermediate Shell Octal
Outline	9-11 or 9-41
Basing	7S
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts	
Heater Current	1.2 Amperes	
Heater-Cathode Voltage (Design Center Values)		
Heater Negative with Respect to Cathode		
Total DC and Peak	200 Volts	Max.
Heater Positive with Respect to Cathode		
DC	100 Volts	Max.
Total DC and Peak	200 Volts	Max.

RATINGS (Design Center Values)

Class A_1 Amplifier

Plate Voltage	200 Volts	Max.
Grid No. 2 Voltage	125 Volts	Max.
Plate Dissipation	10 Watts	Max.
Grid No. 2 Dissipation	1.25 Watts	Max.
Grid No. 1 Circuit Resistance		
Fixed Bias	0.1 Megohm	Max.
Cathode Bias	0.5 Megohm	Max.

CHARACTERISTICS AND TYPICAL OPERATION (Single Tube)

Class A_1 Amplifier

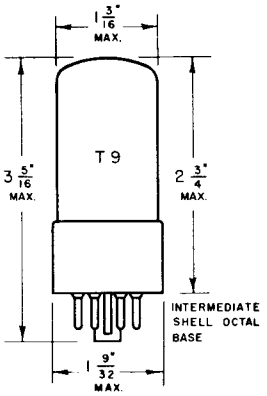
Plate Voltage	110	200 Volts
Grid No. 2 Voltage	110	125 Volts
Grid No. 1 Voltage	−7.5	Volts
Cathode Bias Resistor	180	Ohms
Peak AF Grid No. 1 Voltage	7.5	8.5 Volts
Zero-Signal Plate Current	49	46 Ma
Maximum-Signal Plate Current	50	47 Ma
Zero-Signal Grid No. 2 Current	4.0	2.2 Ma
Maximum-Signal Grid No. 2 Current	10	8.5 Ma
Plate Resistance (approx.)	13,000	28,000 Ohms
Transconductance	8,000	8,000 μmhos
Load Resistance	2,000	4,000 Ohms
Maximum-Signal Power Output	2.1	3.8 Watts
Total Harmonic Distortion (approx.)	10	10 Percent

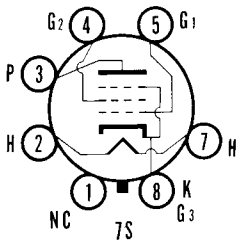
NOTE:

1. *Pin No. 1 omitted on bases B6-81 and B6-84.*

QUICK REFERENCE DATA

The Sylvania Type 6DG6GT is a beam power pentode intended for service as an audio power amplifier. Electrical characteristics of the 6DG6GT are identical to those of the 6W6GT.

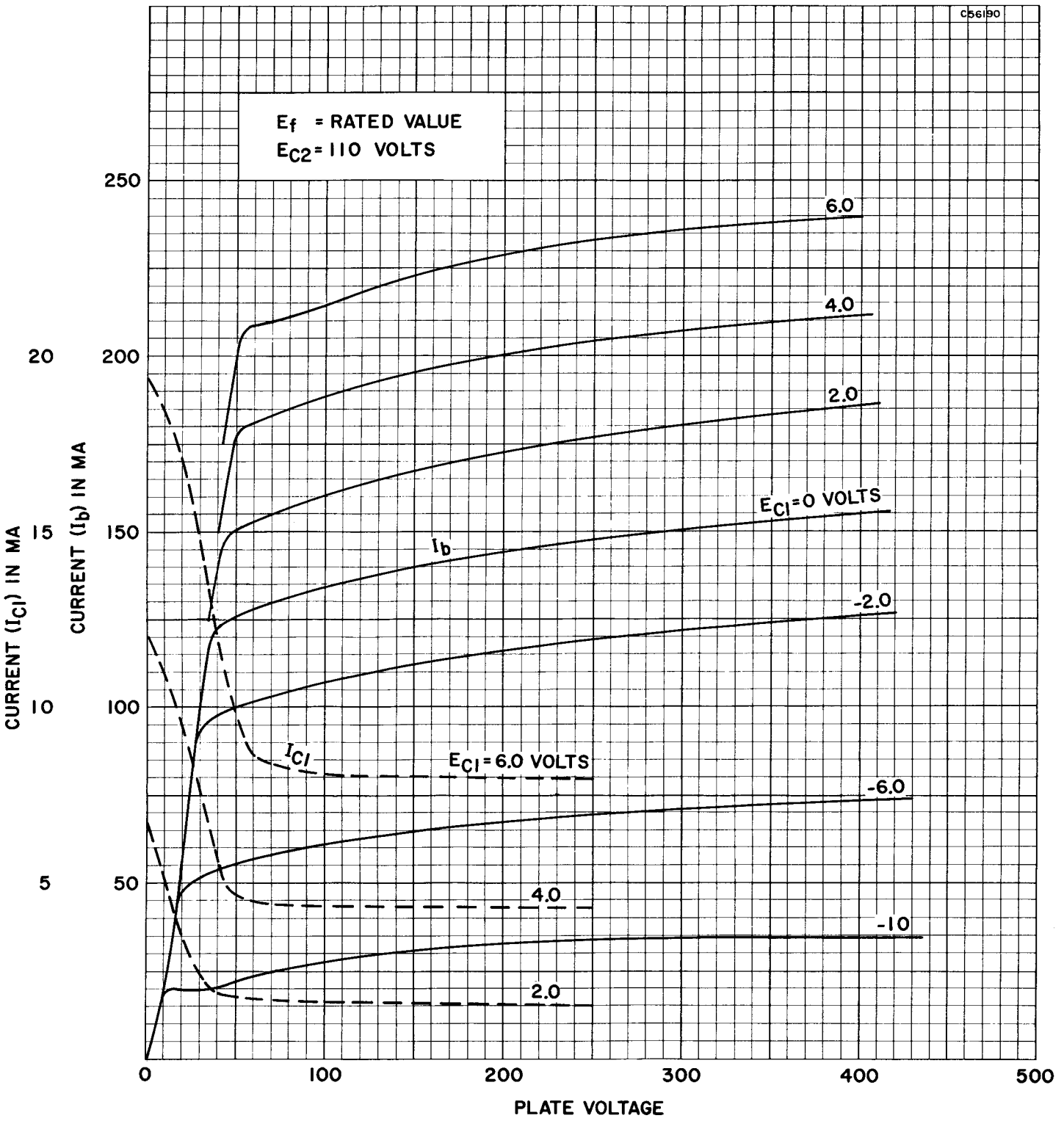




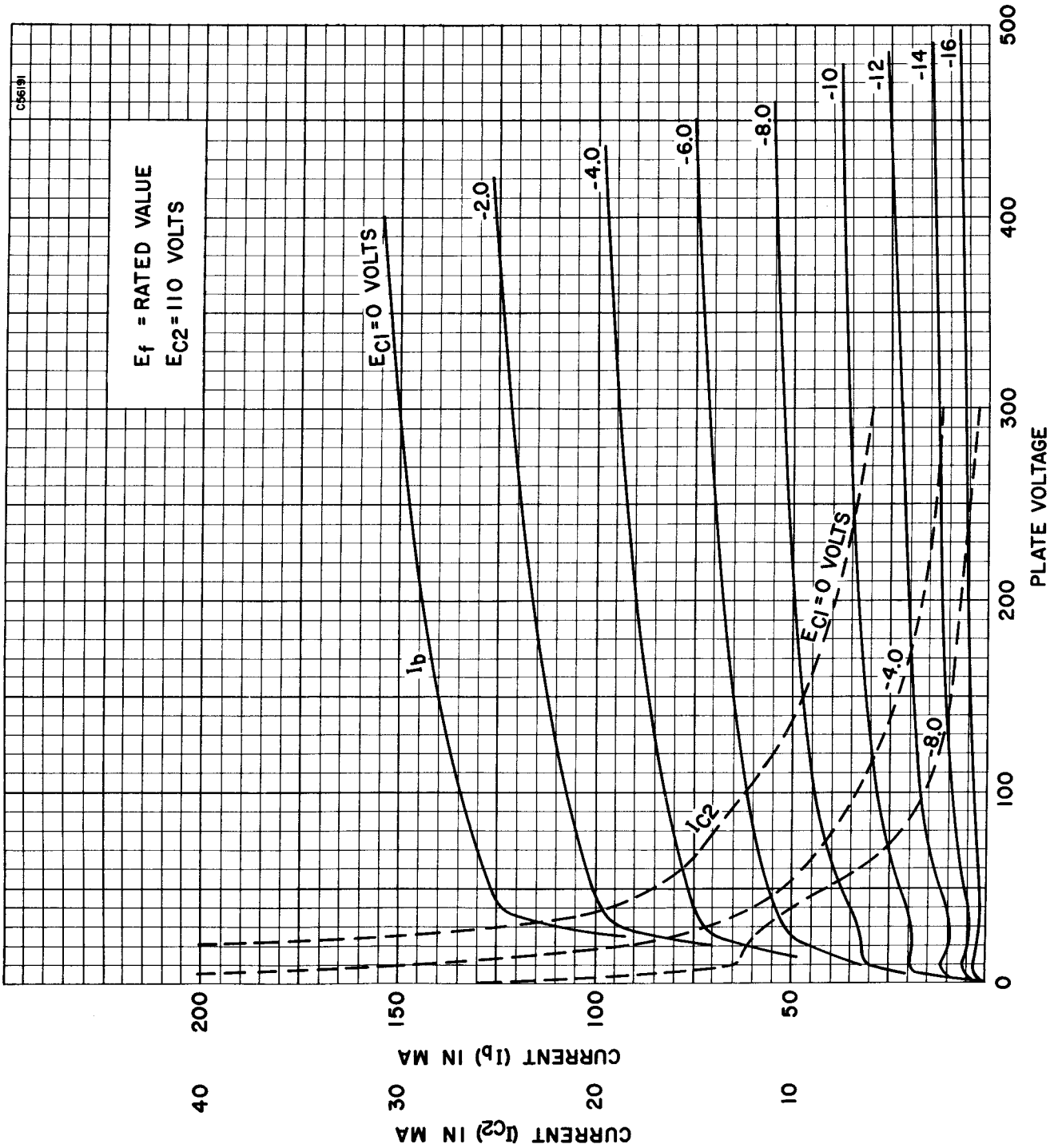
SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
APRIL, 1957

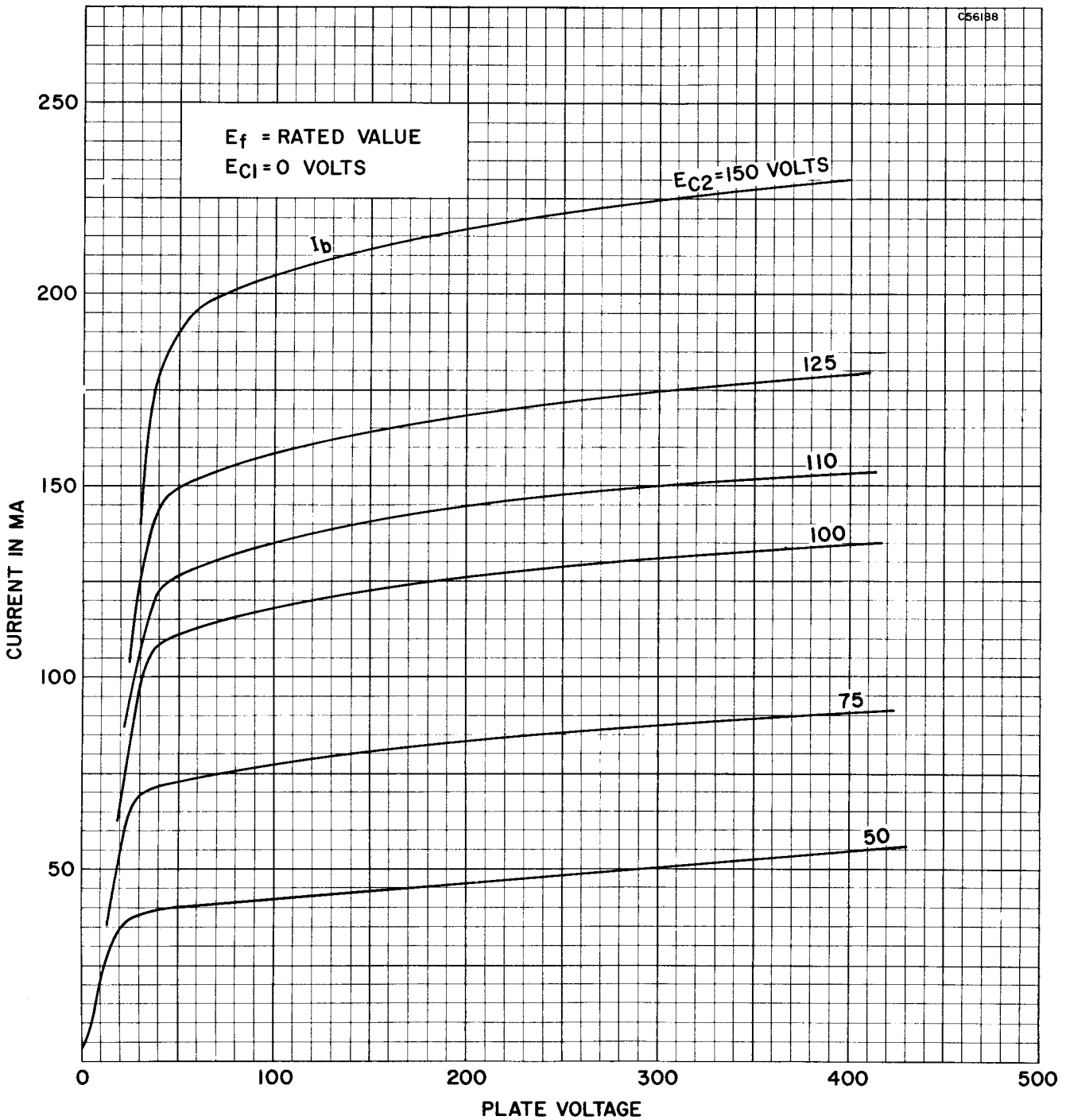
AVERAGE PLATE CHARACTERISTICS



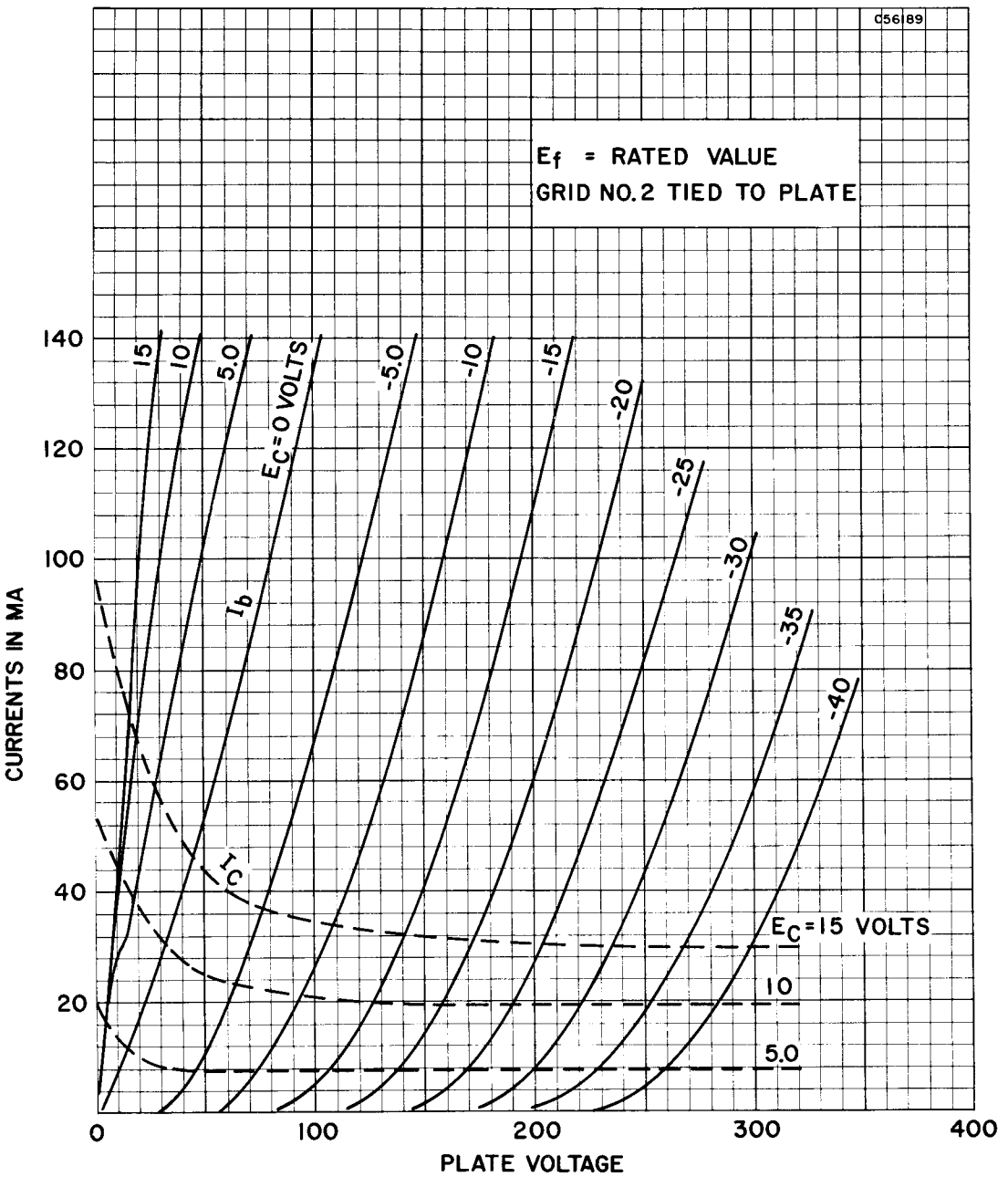
AVERAGE PLATE CHARACTERISTICS



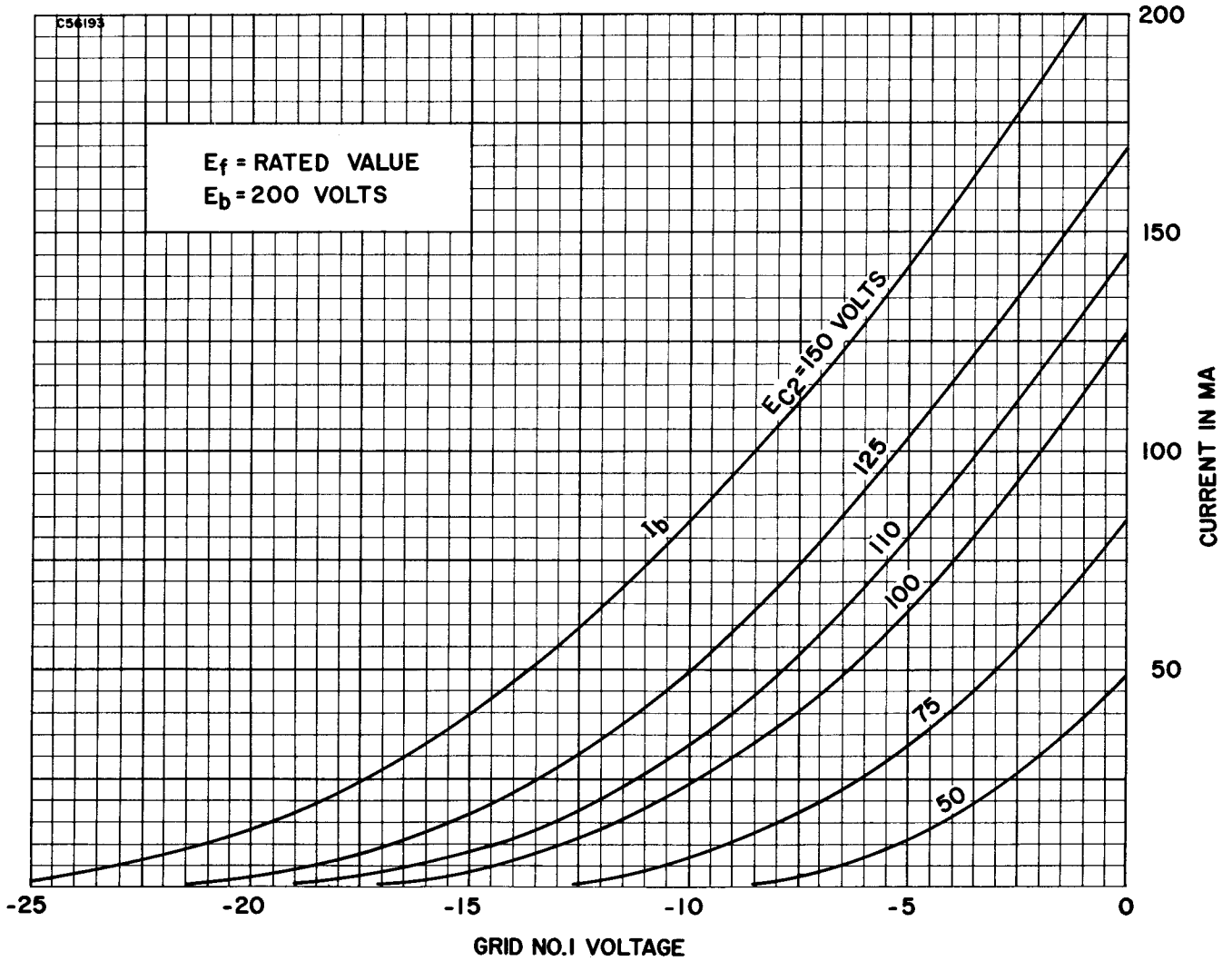
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS
(TRIODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS



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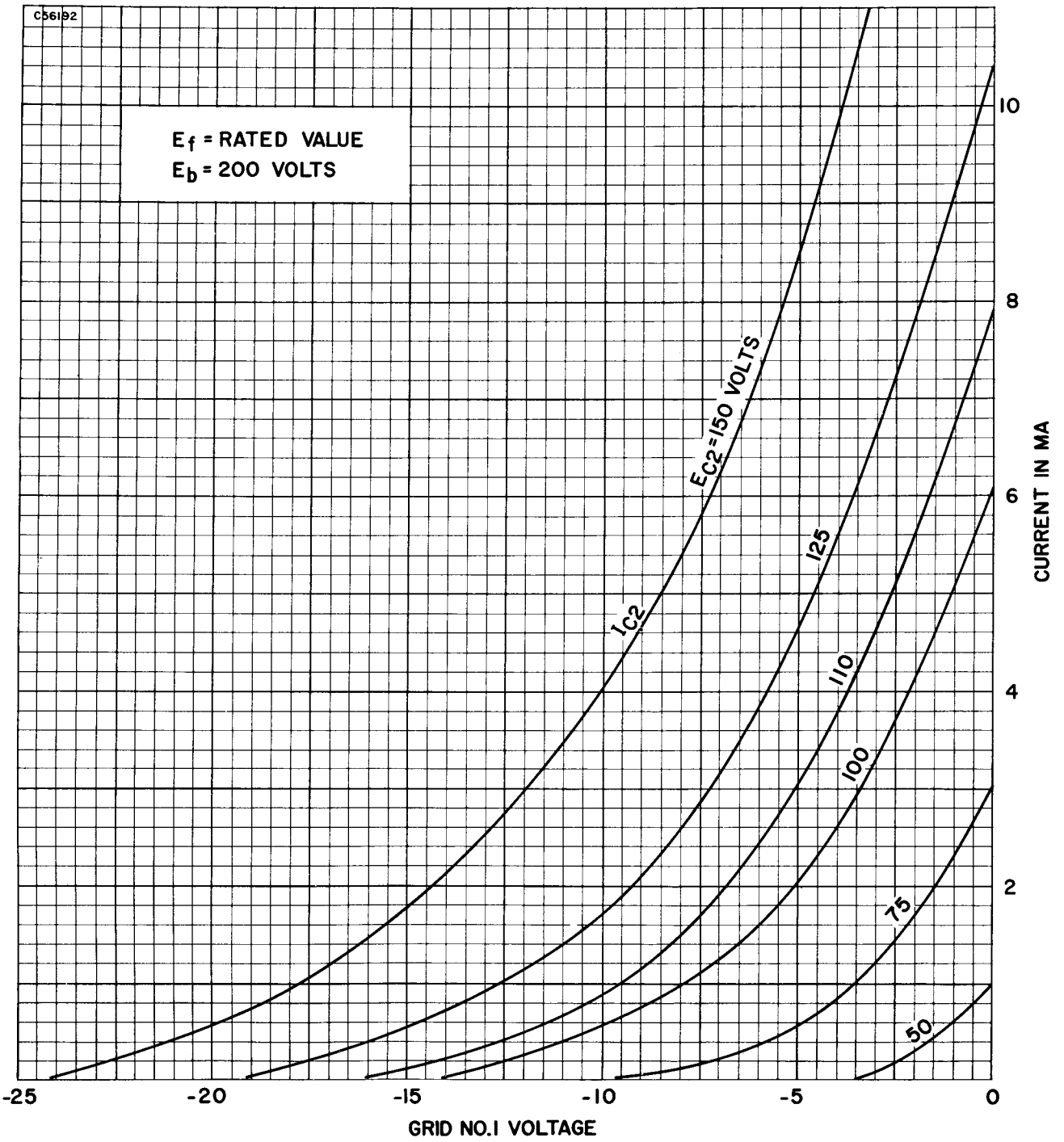
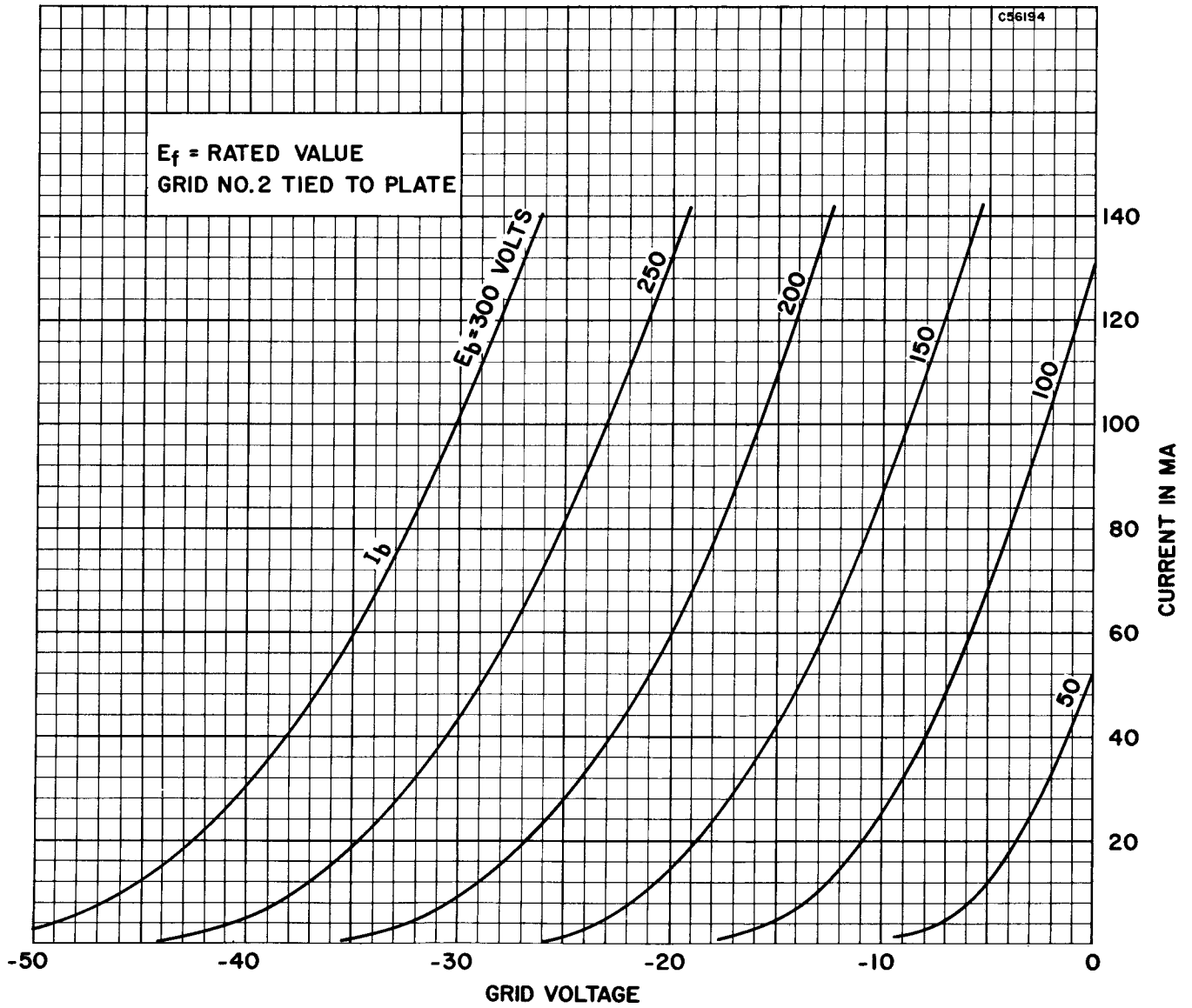
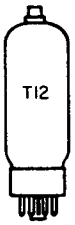


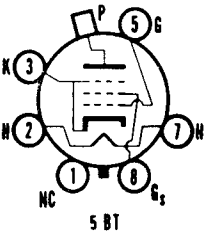
AVERAGE TRANSFER CHARACTERISTICS
(TRIODE CONNECTED)





SYLVANIA TYPE 6DN6
25DN6

BEAM POWER AMPLIFIER



MECHANICAL DATA

Bulb	T-12
Base	B8-118, Short Medium Shell Octal, 8-Pin
Outline	12-21
Basing	5BT
Top Cap	C1-1 Small
Cathode	Coated Unipotential
Mounting Position	Vertical[1]

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6DN6	25DN6	
Heater Voltage	6.3	25.0	Volts
Heater Current	2.5	0.60	Amperes
Heater Warm-up Time (See Appendix)		11	Seconds
Heater-Cathode Voltage (Design Center Values)			
Heater Negative with Respect to Cathode			
Total D C and Peak	200	200	Volts Max.
Heater Positive with Respect to Cathode			
D C	100	100	Volts Max.
Total D C and Peak	200	200	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Approx.)

Grid No. 1 to Plate	0.8 $\mu\mu$f
Input	22 $\mu\mu$f
Output	11.5 $\mu\mu$f

RATINGS (Design Center Values—Except as Noted)

Horizontal Deflection Amplifier[2]

D C Plate Supply Voltage (Boost + D C Power Supply)	700 Volts Max.
Peak Positive Pulse Plate Voltage (Abs. Max.)	6600 Volts
Peak Negative Pulse Plate Voltage	1500 Volts Max.
Plate Dissipation[3]	15 Watts Max.
Peak Negative Grid No. 1 Voltage	200 Volts Max.
D C Grid No. 2 Voltage	175 Volts Max.
Grid No. 2 Dissipation	3.0 Watts Max.
Average Cathode Current	200 Ma Max.
Peak Cathode Current	700 Ma Max.
Grid No. 1 Circuit Resistance	0.47 Megohm Max.
Bulb Temperature (At Hottest Point)	225° C Max

AVERAGE CHARACTERISTICS

Pentode Operation:

With E_b = 125 V, E_{c2} = 125 V and E_{c1} = −18 V

Plate Current	70 Ma
Grid No. 2 Current	6.3 Ma
Transconductance	9000 μmhos
Plate Resistance (approx.)	4000 Ohms

Zero Bias:

With E_b = 50 V, E_{c2} = 100 V and E_{c1} = 0 V (Instantaneous Values)

Plate Current	240 Ma
Grid No. 2 Current	30 Ma

Cutoff:

For I_b = 0.5 Ma with E_b = 125 V and E_{c2} = 125 V

Grid No. 1 Voltage (approx.)	−36 Volts

Triode Amplification Factor:

With E_b = E_{c2} = 125 V and E_{c3} = −18 V 4.35

NOTES:

1. Horizontal operation permitted if plane of Pins 1 and 3 is vertical.
2. For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcasting Stations; Federal Communications Commission." The duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.
3. In stages operating with grid leak bias, an adequate cathode bias resistor or other suitable means is required to protect the tube in the absence of excitation.

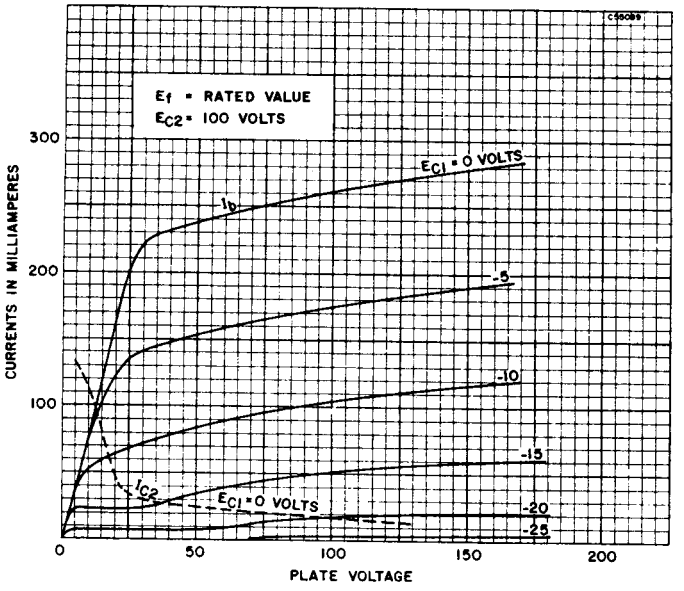
6DN6, 25DN6 (Cont'd)

APPLICATION

The Sylvania Types 6DN6 and 25DN6 are beam power amplifiers designed for use as horizontal deflection amplifiers in television receivers having low B supply voltages. These types exhibit extremely low plate knee characteristics at zero bias.

The 25DN6 features a 25.0 volt, 600 Ma heater and controlled heater warm-up time for series string operation. Except for heater characteristics, the 25ND6 is identical to the 6DN6.

AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS

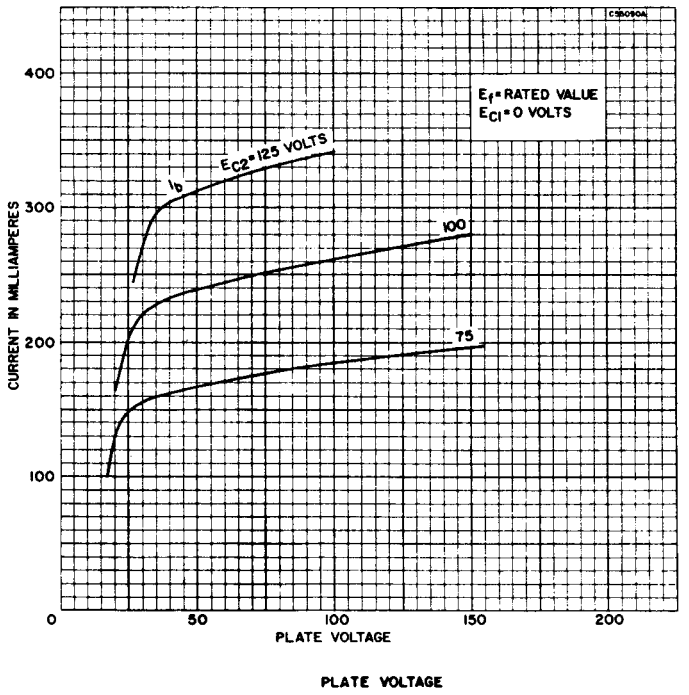


PLATE VOLTAGE

CHARACTERISTICS

GENERAL DATA[1]

Focusing Method	Electrostatic
Deflection Method	Electrostatic

Types*	Fluorescence	Phosphorescence	Persistence
6DP1	Green	.....	Medium
6DP2	Blue-Green	Green	Long
6DP7	Blue	Yellow	Long
6DP11	Blue	.....	Short
6DP14	Purple	Orange	Medium-Long
6DP19	Orange	Orange	Long
6DP25	Orange	Orange	Very Long
Faceplate			Clear

**In addition to the types shown, the 6DP- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

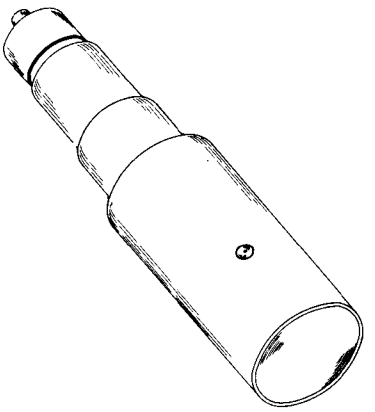
Heater Voltage	6.3 Volts
Heater Current (all Sections)	1.50 to 1.98 Amperes
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	6.0 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6.5 $\mu\mu$f
D1 to D2	3.0 $\mu\mu$f
D3 to D4	2.0 $\mu\mu$f
D1 to All Other Electrodes	11.0 $\mu\mu$f
D2 to All Other Electrodes	11.0 $\mu\mu$f
D3 to All Other Electrodes	9.0 $\mu\mu$f
D4 to All Other Electrodes	9.0 $\mu\mu$f

MECHANICAL DATA

Overall Length	20-1/16 ± 3/8 Inches
Minimum Useful Screen Diameter	5-3/16 Inches
Bulb Contact (Recessed Small Ball)	J1-22
Base 25 Pin	B25-139
Basing	See Diagram
Base Alignment	
Base Key Aligns with Bulb Contact	± 10 Degrees
Positive Voltage on D1 Deflects the Beam Approx. Toward Base Key.	
Positive Voltage on D3 Deflects the Beam Approx. Toward Vacant Pin No. 23.	
Bulb Contact Alignment	
Post-accelerator Contact Aligns with D1-D2 trace of Gun "B"	± 3 Degrees
Bulb Contact on same side as Base Key	
Trace Alignment	
D1-D2 Trace Aligns with D3-D4 Trace	90 ± 2 Degrees
Corresponding Traces of each Gun align within ±2 Degrees	

QUICK REFERENCE DATA

Oscilloscope Tube
6" Direct Viewed
Flat Faceplate
Round Glass Type
Three Independent Guns
Electrostatic Deflection
Electrostatic Focus
Post Deflection Acceleration
High Deflection Sensitivity
High Deflection Accuracy
Aluminized Screen
25 Pin Base



SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

SEPTEMBER, 1958

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 3 Voltage	15,000 Volts	dc
Anode No. 2 Voltage	4,500 Volts	dc
Ratio Anode No. 3 Voltage to Anode No. 2 Voltage[2]	3.3:1 Maximum	
Anode No. 1 Voltage for Focus	1,540 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	220 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater to Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	
Peak Voltage between Anode No. 2 and Any Deflection Plate	600 Volts	

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage	12,000 Volts	dc
Anode No. 2 Voltage	4,000 Volts	dc
Anode No. 1 Voltage for Focus[3]	950 to 1225 Volts	dc
Grid No. 1 Voltage[4]	−75 to −124 Volts	dc
Modulation[5]	35 Volts	dc Max.
Line Width "A"[6]	.015 Max.	Inches
Deflection Factors		
D1-D2	112 to 138 Volts	dc/Inch
D3-D4	105 to 130 Volts	dc/Inch
Deflection Factor Uniformity[7]	5% Maximum	
Undeflected Spot Position[8]	Within 15 MM Square	
Useful Scan[9]		
D1-D2	4 Inches	
D3-D4	4 Inches	
Interaction Factor[10]	6×10^{-5} Max.	In./Volt
Pattern Distortion[11 & 12]		
Anode No. 1 Focus Current		
with Ib3 = 50 μadc	−10 to +5 μa	dc
with Ec1 = 0 Volts	−50 to +5 μa	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Meg.	Max.
Deflection Circuit Resistance	1.0 Meg.	Max.

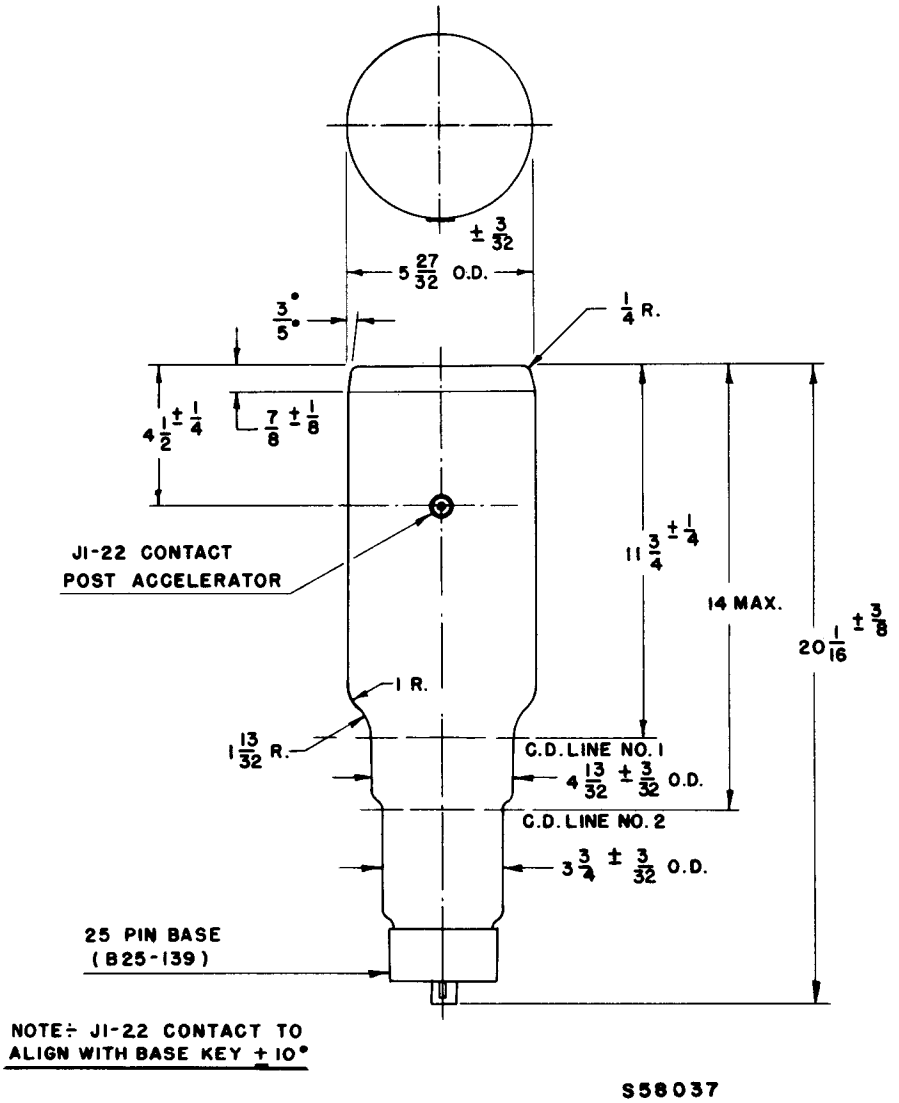
(It is recommended that the deflecting electrode circuit resistances be approximately equal. For low beam current conditions the resistance may be up to 5 megs.)

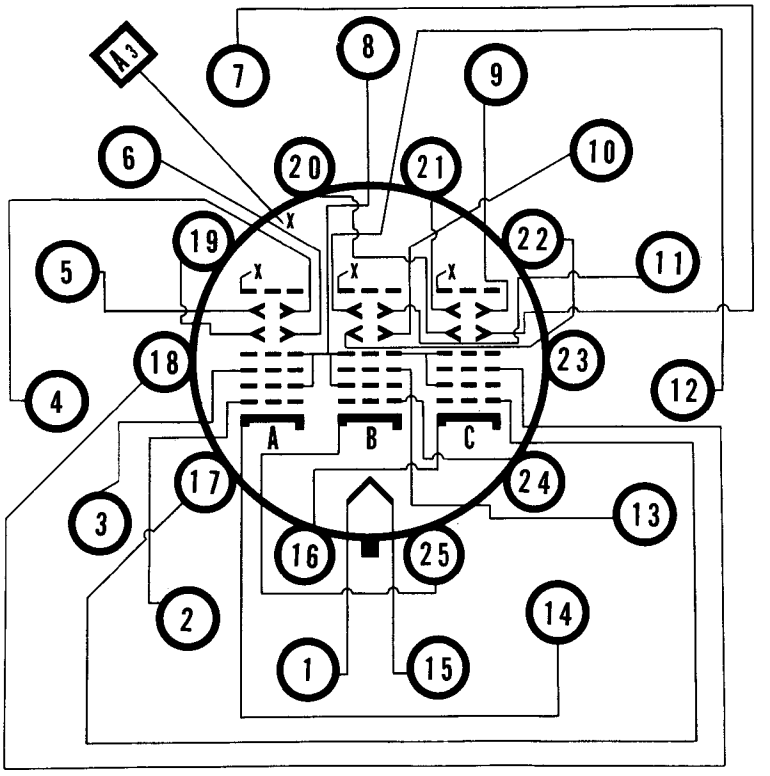
NOTES:

1. *Values are for each section unless otherwise specified.*
2. *This tube is designed for optimum performance when operating at an Eb3/Eb2 ratio of 3.0. Operation at other ratios may result in changes in deflection uniformity and pattern distortion.*
3. *At the specified operating condition, the focus voltage at Ib3 = 25 μadc shall be between 1000 and 1225 Volts dc and at Ib3 = 50 μadc shall be between 975 and 1225 volts dc. Scanning pattern and focus as per reference 4.12.6.1 of MIL-E-1C.*
4. *Visual extinction of undeflected focused spot.*
5. *For an Ib3 = 25 μadc. The modulation factor at Ib3 = 50 μadc shall be 50 V. Max.*

NOTES: (Cont.)

6. *For an Ib3 = 25 μadc measured in accordance with MIL-E-1C.*
7. *The deflection factor (for both D1-D2 and D3-D4 plate pairs separately) for a deflection of 75% of the minimum useful scan will not differ from the deflection factor at 25% of the minimum useful scan by more than the indicated value.*
8. *Centered with respect to the tube face and with the tube shielded.*
9. *Useful scan shall be ±2 Inches Min. from tube face center.*
10. *The deflection of one beam when balanced dc voltages are applied to the deflection electrodes of another beam will not be greater than the specified value.*
11. *The total horizontal movement on the left or right ends of a 3" horizontal trace (centered with respect to the tube face) deflected vertically 1.5" above and below the center of the tube face shall not exceed 0.075". The D1-D2 trace shall be considered horizontal.*
12. *The total vertical movement of the upper or lower ends of a 3" vertical trace centered on the tube face, deflected horizontally 1.5" to the left and right of the center of the tube face shall not exceed 0.075". The D3-D4 trace shall be considered vertical.*





ELEMENTS COMMON TO ALL THREE GUNS

J1-22 (A3) Post Accelerator

Pin No. 8 Accelerator

Pins No. 1 & 15 Heater

GUN A

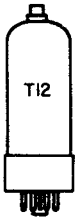
Pin No.	Element
2	Grid No. 1
3	Focusing Electrode
4	Deflector D2
5	Deflector D1
6	Deflector D3
14	Cathode
19	Deflector D4

GUN B

Pin No.	Element
10	Deflector D3
11	Deflector D2
12	Deflector D1
13	Focusing Electrode
22	Deflector D4
24	Grid No. 1
25	Cathode

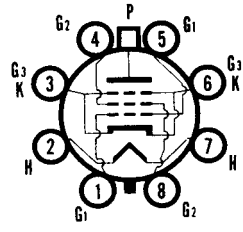
GUN C

Pin No.	Element
7	Deflector D3
9	Deflector D2
16	Cathode
17	Grid No. 1
18	Focusing Electrode
20	Deflector D4
21	Deflector D1



SYLVANIA TYPE 6DQ5

HORIZONTAL DEFLECTION AMPLIFIER



8JC

MECHANICAL DATA

Bulb	T-12
Base	B8-118, Short Medium Shell Octal, 8-Pin
Outline	12-21
Basing	8JC
Top Cap	C1-1 Small
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	2.5 Amperes
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts
Heater Positive with Respect to Cathode	
D C	100 Volts
Total D C and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.5 $\mu\mu$f
Input	23 $\mu\mu$f
Output	11 $\mu\mu$f

MAXIMUM RATINGS (Design Center Values—Except as Noted)

Horizontal Deflection Amplifier[1]

D C Plate Supply Voltage (Boost + D C Power Supply)	900 Volts
Peak Positive Pulse Plate Voltage (Abs. Max.)	7000 Volts
Peak Negative Pulse Plate Voltage	1500 Volts
Plate Dissipation[2]	24 Watts
Grid No. 2 Input	3.2 Watts
Peak Negative Grid No. 1 Voltage	200 Volts
D C Grid No. 2 Voltage	175 Volts
Average Cathode Current	285 Ma
Peak Cathode Current	1000 Ma
Grid No. 1 Circuit Resistance	0.47 Megohm
Bulb Temperature (At Hottest Point)	240 Degrees C

AVERAGE CHARACTERISTICS

Plate Voltage	175 Volts
Grid No. 2 Voltage	125 Volts
Grid No. 1 Voltage	−25 Volts
Plate Current	110 Ma
Grid No. 2 Current	5.0 Ma
Transconductance	10,500 μmhos
Amplification Factor[3]	3.3
Plate Resistance (Approx.)	5500 Ohms
Ec1 for Ib = 1.0 Ma (Approx.)	−55 Volts
Instantaneous Plate Knee Values	
Eb = 70 V, Ec2 = 125 V, and Ec1 = O V	
Ib = 550 Ma and Ic2 = 42 Ma	

NOTES:

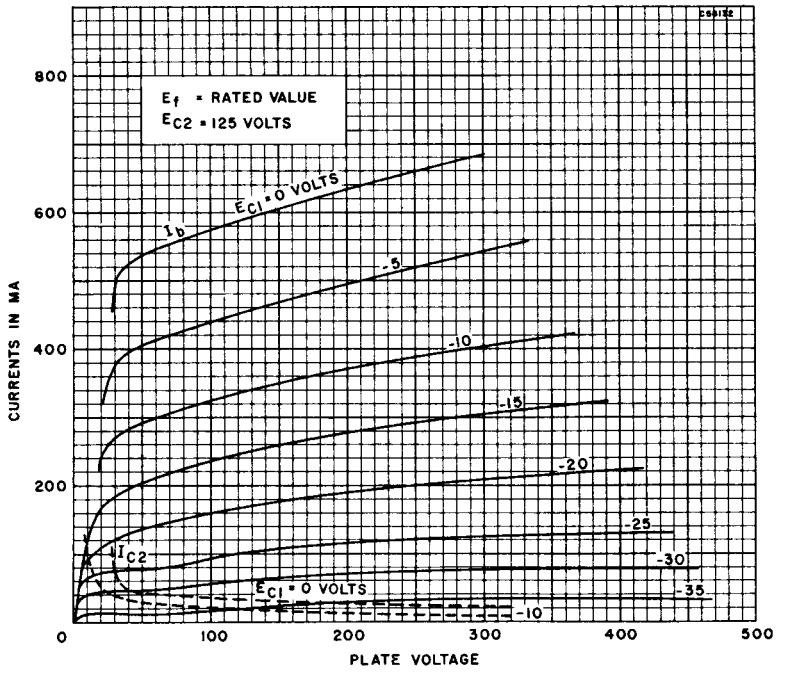
1. For operation in a 525-line, 30-frame system as described in "Standards of Good Engineering Practice for Television Broadcasting Stations; Federal Communications Commission". The duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.
2. In stages operating with grid-leak bias, an adequate cathode bias resistor or other suitable means is required to protect the tube in the absence of excitation.
3. Amplication factor obtained with Grid No. 2 tied to plate and operating as a triode connected amplifier. Eb = 125 V and Ec1 = −25 V.

APPLICATION

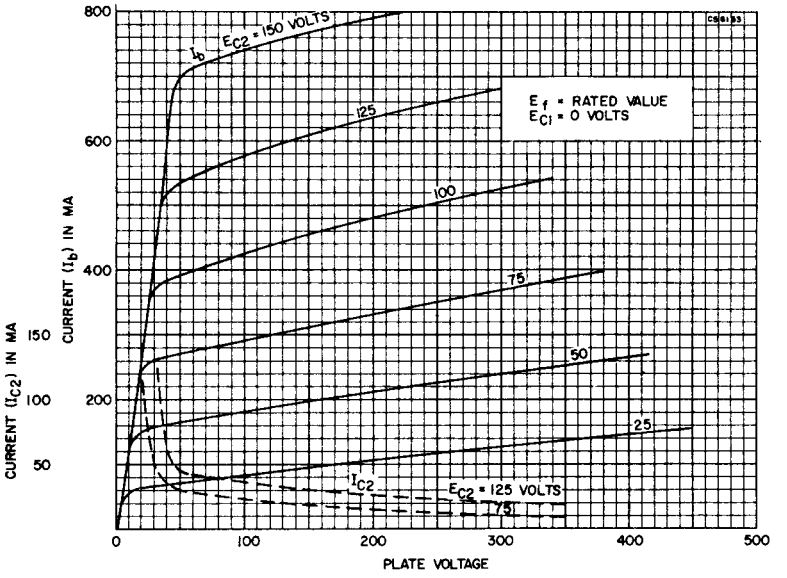
The Sylvania Type 6DQ5 is a beam power amplifier designed for use as a horizontal deflection amplifier in color television receivers.

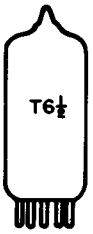
6DQ5 (Cont'd)

AVERAGE PLATE CHARACTERISTICS

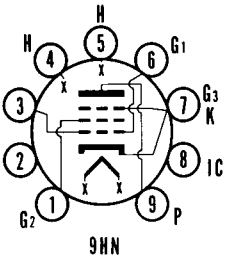


AVERAGE PLATE CHARACTERISTICS





SYLVANIA TYPES 6DT5 12DT5 25DT5



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-3
Basing	9HN
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6DT5	12DT5	25DT5
Heater Voltage	6.3	12.6	25 Volts
Heater Current	1200	600	300 Ma
Heater Warm-up Time[1]		11	11 Seconds
Heater-Cathode Voltage (Design Maximum Values)			
Heater Negative with Respect to Cathode			
Total D C and Peak			200 Volts Max.
Heater Positive with Respect to Cathode			
D C			100 Volts Max.
Total D C and Peak			200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.57 μμf
Input	12.5 μμf
Output	4.9 μμf

MAXIMUM RATINGS[2] (Design Maximum Values)

Vertical Deflection Amplifier[3]

Plate Voltage	315 Volts
Grid No. 2 Voltage	285 Volts
Peak Positive Pulse Plate Voltage (Abs. Max.)	2200 Volts
Peak Negative Pulse Grid Voltage	250 Volts
Plate Dissipation[4]	9.0 Watts
Grid No. 2 Dissipation[4]	2.0 Watts
Average Cathode Current	55 Ma
Peak Cathode Current	190 Ma
Grid Circuit Resistance	
Fixed Bias	0.5 Megohms
Cathode Bias	1.0 Megohms

CHARACTERISTICS

Plate Voltage	250 Volts
Grid No. 2 Voltage	250 Volts
Grid No. 1 Voltage	−16.5 Volts
Plate Current	44 Ma
Grid No. 2 Current	1.5 Ma
Transconductance	6200 μmhos
Ec1 for Ib = 100 μa (approx.)	−35 Volts

INSTANTANEOUS PLATE KNEE VALUES

Eb = 60 V, Ec2 = 150 V, and Ec1 = 0 V
Ib = 95 Ma and Ic2 = 8.5 Ma

NOTES:

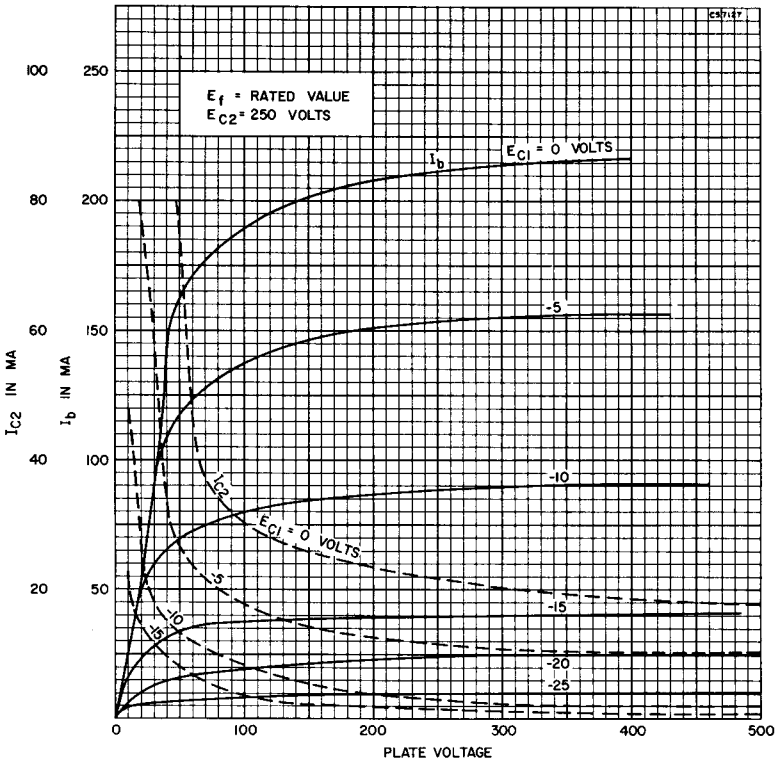
1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
2. Design-Maximum Ratings are the limiting values expressed with respect to bogey tubes at which satisfactory tube life can be expected to occur. To obtain satisfactory circuit performance, therefore, the equipment designer must establish the circuit design so that no design-maximum value is exceeded with a bogey tube under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, and environmental conditions.
3. For operating in a 525-line, 30-frame system as described in "Standards of Good Engineering Practice for Television Stations; Federal Communications Commission."
4. In stages operating with grid-leak bias, an adequate bias resistor or other suitable means is required to protect the tube in the absence of excitation.

APPLICATION

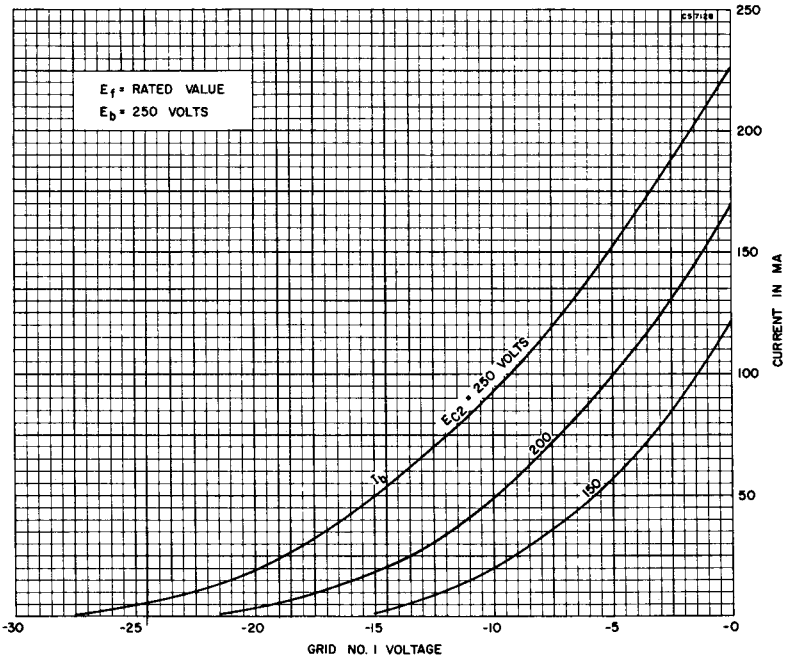
The Sylvania Types 6DT5, 12DT5 and 25DT5 are miniature beam power tubes designed primarily for vertical deflection amplifier service in television receivers employing 110° deflection systems. Both types feature high zero-bias plate current and are designed to operate at relatively low B supply voltages.
The 12DT5 and 25DT5 features controlled heater warm-up time for operation in receivers employing a series heater string.

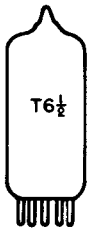
SYLVANIA TYPES 6DT5, 12DT5, 25DT5 (Cont'd)

AVERAGE PLATE CHARACTERISTICS

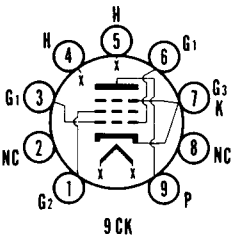


AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPE 6DW5 12DW5



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-4
Basing	9CK
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6DW5	12DW5
Heater Voltage	6.3	12.6 Volts
Heater Current	1200	600 Ma
Heater Warm-up Time[1]		11 Seconds
Heater-Cathode Voltage (Design Maximum Values)		
Total D C and Peak		200 Volts
Heater Positive with Respect to Cathode		
D C		100 Volts
Total D C and Peak		200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	0.5 μμf
Input: g1 to (h + k)	14 μμf
Output: p to (h + k)	9 μμf

MAXIMUM RATINGS[2] (Design Maximum Values)

Vertical Deflection Amplifier[3] (Pentode Connected)

D C Plate Voltage	330 Volts
D C Grid No. 2 Voltage	220 Volts
Peak Positive Pulse Plate Voltage ((Abs. Max.)	2200 Volts
Peak Negative Pulse Grid Voltage	250 Volts
Plate Dissipation[4]	11 Watts
Grid No. 2 Dissipation[4]	2.5 Watts
Average Cathode Current	65 Ma
Peak Cathode Current	225 Ma
Grid Circuit Resistance	
Self Bias	2.2 Megohms

CHARACTERISTICS AND TYPICAL OPERATION

Vertical-Deflection Amplifier (Pentode Connected)

Plate Voltage	200 Volts
Grid No. 2 Voltage	150 Volts
Grid No. 1 Voltage	-22.5 Volts
Plate Current	55 Ma
Grid No. 2 Current	2.0Ma
Transconductance	5500 μmhos
Amplification Factor[3]	4.3
Plate Resistance (approx.)	15,000 Ohms
Grid Voltage for Ib = 0.1 Ma	-55 Volts
Instantaneous Plate Knee Values	
Eb = 60 V, Ec2 = 150 V, and Ec1 = 0 V	
Ib = 260 Ma and Ic2 = 20 Ma	

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
2. Design-maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.
   These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.
3. For operation in a 525-line, 30-frame system as described in "Standards of Good Engineering Practice for Television Stations; Federal Communications Commission."

SYLVANIA TYPE 6DW5, 12DW5 (Cont'd)

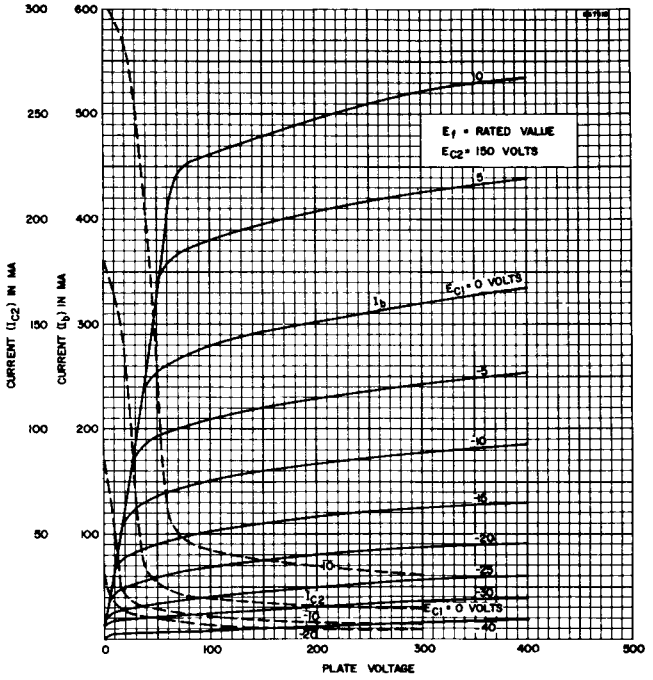
Notes: (cont'd)

4. In stages operating with grid-leak bias, an adequate bias resistor or other suitable means is required to protect the tube in the absence of excitation.

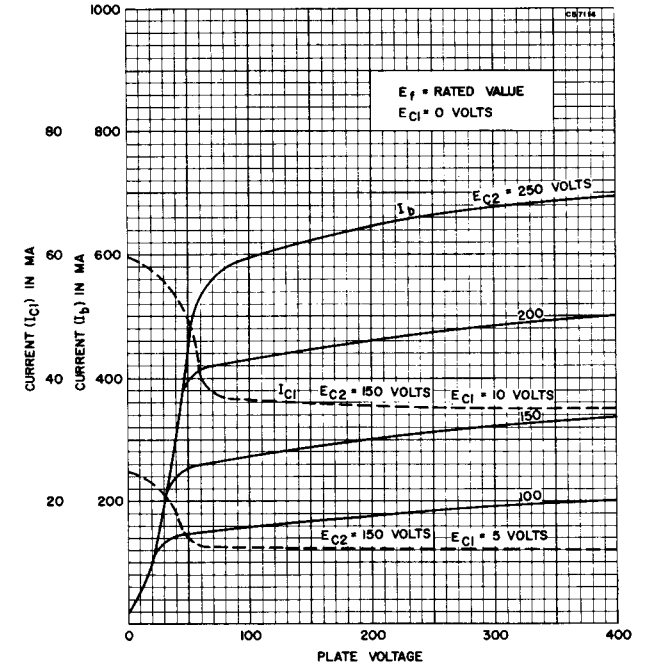
APPLICATION

The Sylvania Types 6DW5 and 12DW5 are miniature beam power tubes designed primarily for vertical-deflection amplifier service in television receivers employing 110° deflection systems. They are designed to operate at relatively low B supply voltages and feature high zero-bias plate current.
The 12DW5 has controlled heater warm-up time for series-string operation.

AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



ADVANCE DATA

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7DK
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

Heater Operation	1DY4 Series	2DY4 Series	3DY4 Series	6DY4 Parallel	
Heater Voltage	1.6	2.05	2.9	6.3[1]	Volts
Heater Current	600[1]	450[1]	300[1]	125	Ma
Heater Warm-up Time[2]	11	11	11	-	Seconds

Ratings (Design Maximum Values)

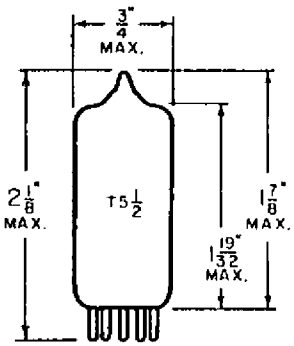
	Min-Max	Min-Max	Min-Max	Min-Max	
Heater Voltage[3]	- -	- -	- -	5.7-6.9	Volts
Heater Current[3]	560-640	420-480	280-320	- -	Ma
Maximum Heater-Cathode Voltage					
Heater Negative with Respect to Cathode					
Total DC & Peak	180	180	180	50	Volts
Heater Positive with Respect to Cathode					
DC	100	100	100	25	Volts
Total DC & Peak	180	180	180	50	Volts

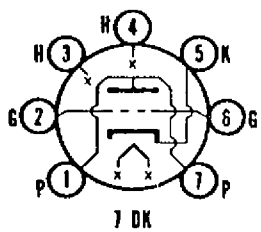
DIRECT INTERELECTRODE CAPACITANCES (Shielded)

Grid to Plate	2.0 pf
Input: g to (h + k + E.S.)	3.5 pf
Output: p to (h + k + E.S.)	1.15 pf
Heater to Cathode	2.3 pf

QUICK REFERENCE DATA

The Sylvania Types 6DY4, 3, 2, 1 are high efficiency, high Gm, medium mu, strap frame grid, triodes, intended for UHF oscillator service. The high figure of merit of the tubes (Gm x mu) permits oscillation at low plate power; additionally, the low heater power insures low temperature operation resulting in long life and high stability.





7 DK

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

June 10, 1963

146 (10-58)

from JEDEC release #4319, July 1, 1963

RATINGS (Design Maximum Ratings)

UHF Oscillator Service

Plate Voltage	135 Volts Max.
Plate Dissipation	1.5 Watts Max.
Negative Grid Voltage	50 Volts Max.
Grid Current	2 Ma Max.
Cathode Current	20 Ma Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

Plate Supply Voltage	90 Volts
Cathode Resistor	180 Ohms
Plate Current	10.4 Ma
Transconductance	11,000 μmhos
Amplification Factor	28
Ec for Ib = 100 μa (Approx.)	-4.25 Volts

Oscillator at 960 Mc

Plate Supply Voltage	135 Volts
Plate Resistor	4700 Ohms
Grid Resistor	4700 Ohms
Plate Current	11.5 Ma
Grid Current (Approx.)	650 μa

NOTES:

1. For series/parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current/voltage.

2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

3. Heater voltage supply variations shall be restricted to maintain heater voltage/current within the specified values.

6DY4
3DY4
2DY4
1DY4

ADDENDUM

Note: Control grid to cathode spacing on this type is of such low order of magnitude as to preclude the use of voltage between these elements of more than 30 volts dc or peak ac in commercial tube checkers and shorts indicating devices, particularly where mechanical excitation of the tube is employed.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-1
Basing	7DK
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

Heater Operation	1DY4A Series	2DY4A Series	3DY4A Series	6DY4A Parallel	
Heater Voltage	1.6	2.05[1]	2.9	6.3[1]	Volts
Heater Current	600	450[1]	300	125	Ma
Heater Warm-up Time[2]	11	11	11	-	Seconds

Ratings (Design Maximum Values)

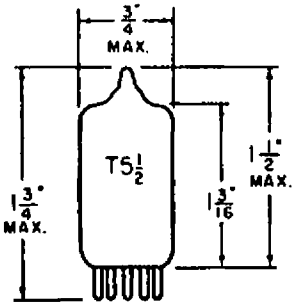
	Min-Max	Min-Max	Min-Max	Min-Max	
Heater Voltage[3]	- -	- -	- -	5.7-6.9	Volts
Heater Current[3]	560-640	420-480	280-320	- -	Ma
Maximum Heater-Cathode Voltage					
Heater Negative with Respect to Cathode					
Total DC & Peak	180	180	180	50	Volts
Heater Positive with Respect to Cathode					
DC	100	100	100	25	Volts
Total DC & Peak	180	180	180	50	Volts

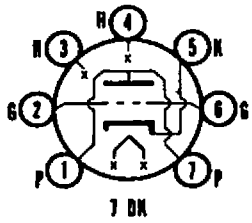
DIRECT INTERELECTRODE CAPACITANCES (Shielded)

Grid to Plate	2.0 pf
Input: g to (h + k + E.S.)	3.5 pf
Output: p to (h + K + E.S.)	1.15 pf
Heater to Cathode	2.3 pf

QUICK REFERENCE DATA

The Sylvania Types 6DY4A, 3, 2, 1 are high efficiency, high Gm. medium mu, strap frame grid, triodes, intended for UHF oscillator service. The high figure of merit of the tubes (Gm x mu) permits oscillation at low plate power; additionally, the low heater power insures low temperature operation resulting in long life and high stability. The 6DY4A, 3, 2, 1 are identical to the 6DY4, 3, 2, 1 except for bulb size.





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

August 8, 1963

from JEDEC release #4395, Sept. 2, 1963

RATINGS (Design Maximum Ratings)

UHF Oscillator Service

Plate Voltage	135 Volts Max.
Plate Dissipation	1.5 Watts Max.
Negative Grid Voltage	50 Volts Max.
Grid Current	2 Ma Max.
Cathode Current	20 Ma Max.

Note: Control grid to cathode spacing on this type is of such low order of magnitude as to preclude the use of voltage between these elements of more than 30 volts dc or peak ac in commercial tube checkers and shorts indicating devices, particularly where mechanical excitation of the tube is employed.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier	90 Volts
Cathode Resistor	180 Ohms
Plate Current	10.4 Ma
Transconductance	11,000 μmhos
Amplification Factor	28
Ec for Ib = 100 μa (Approx.)	-4.25 Volts

Oscillator at 960 Mc

Plate Supply Voltage	135 Volts
Plate Resistor	4700 Ohms
Grid Resistor	4700 Ohms
Plate Current	11.5 Ma
Grid Current (Approx.)	650 μa

NOTES

1. For series/parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current/voltage.

2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

3. Heater voltage supply variations shall be restricted to maintain heater voltage/current within the specified values.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-12
Base	B8-110, Short Medium Shell Octal 8-Pin
Outline	12-14
Basing	8JP
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (ac or dc)	6.3	Volts
Heater Current	1.2	Ampere
Heater-Cathode Voltage (Design Maximum System)[1]		
Heater Positive with Respect to Cathode		
Total DC and Peak	200	Volts Max.
Heater Negative with Respect to Cathode		
DC	100	Volts Max.
Total DC and Peak	200	Volts Max.

RATINGS (Design Maximum System)[1] - Each Section

Plate Voltage	400	Volts Max.
Grid No. 2 Voltage	300	Volts Max.
Plate Dissipation	15	Watts Max.
Grid No. 2 Dissipation	2.0	Watts Max.
Grid No. 1 Circuit Resistance		
Fixed Bias	0.1	Megohm Max.
Self Bias	0.47	Megohm Max.

AVERAGE CHARACTERISTICS - Each Section

Plate Voltage	250	Volts
Grid No. 2 Voltage	250	Volts
Grid No. 1 Voltage	-12.5	Volts
Plate Current	50	Ma
Grid No. 2 Current	3.0	Ma
Transconductance	6000	µmhos
Plate Resistance (Approx.)	28,000	Ohms

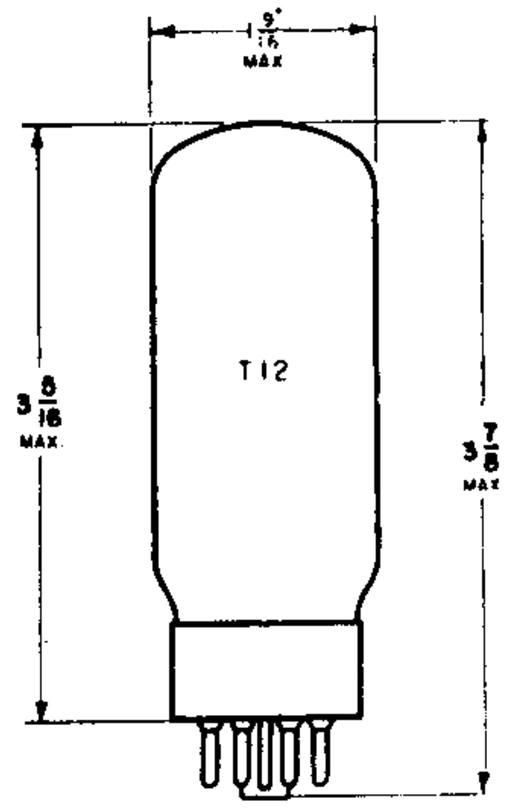
CHARACTERISTICS AND TYPICAL OPERATION

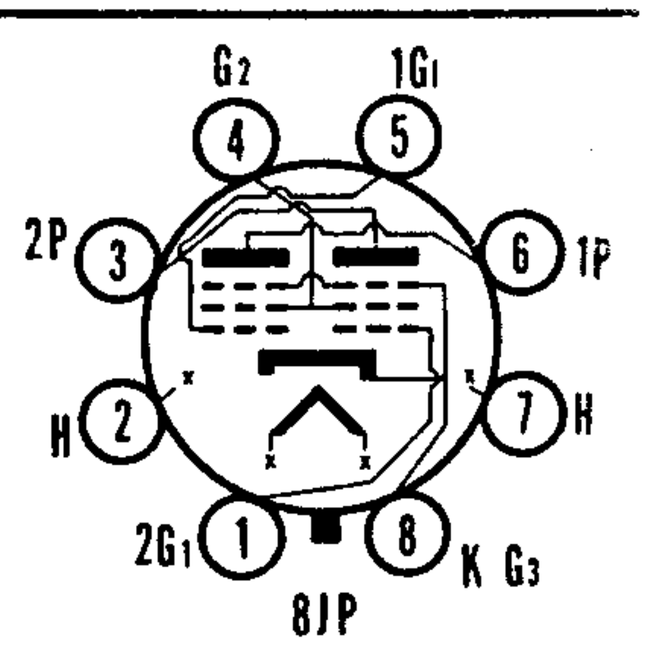
Class AB1 Amplifier (two sections in push-pull)

Plate Voltage	250	400	Volts
Grid No. 2 Voltage	250	250	Volts
Grid No. 1 Voltage	-16	-20	Volts
Peak AF Grid to Grid Voltage	32	40	Volts
Zero Signal Plate Current	77	58	Ma
Maximum Signal Plate Current	74	74	Ma
Zero Signal Grid No. 2 Current	3.5	1.7	Ma

QUICK REFERENCE DATA

The Sylvania Type 6DY7 is a Dual Beam Power Pentode designed for application in stereophonic sound systems, and features Framelok construction.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

October 8, 1958

CHARACTERISTICS AND TYPICAL OPERATION (Cont'd)

Maximum Signal Grid No. 2 Current	15.5	14.0	Ma
Load Resistance (Plate to Plate)	9000	14,000	Ohms
Maximum Signal Power Output	11	20	Watts
Total Harmonic Distortion	2.5	2.0	Percent

Class A1 Operating Conditions and Characteristics[2] (Single Section)

Plate Voltage	250	Volts
Grid No. 2 Voltage	250	Volts
Grid No. 1 Voltage	-12.5	Volts
Peak AF Signal Voltage	12.5	Volts
Zero Signal Plate Current	50	Ma
Maximum Signal Plate Current	45	Ma
Zero Signal Grid No. 2 Current	3.0	Ma
Maximum Signal Grid No. 2 Current	9.0	Ma
Load Resistance	5000	Ohms
Maximum Signal Power Output	5.0	Watts
Total Harmonic Distortion	9.0	Percent

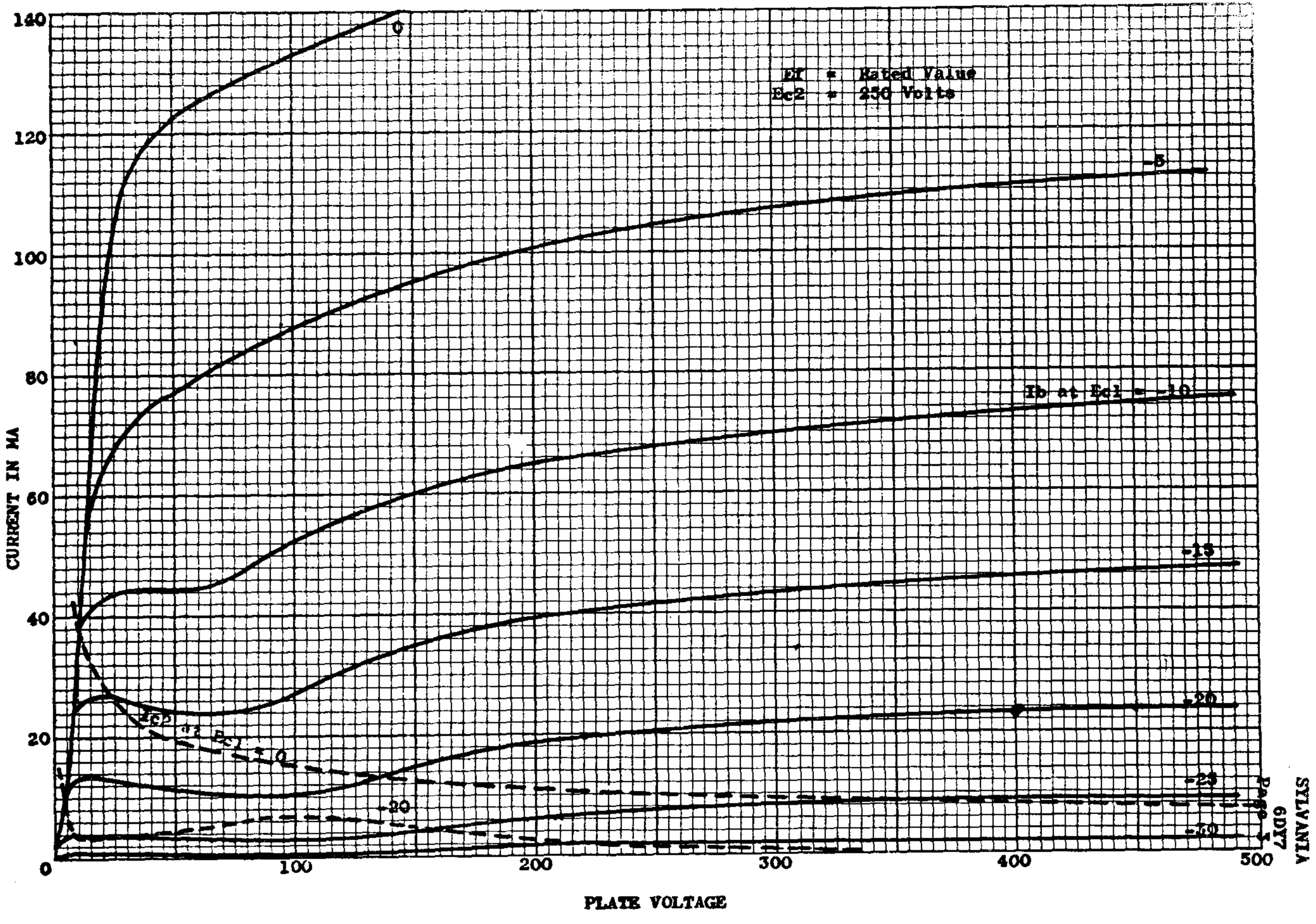
NOTES:

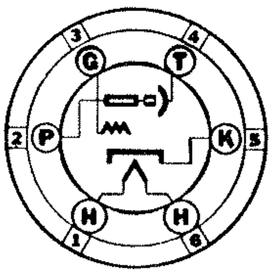
1. Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

   The device manufacturer chooses these values to provide acceptable serviceability of the device taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.

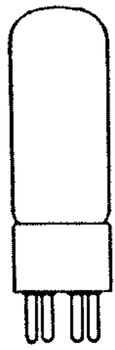
   The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.

2. The effects of cross-coupling between sections, with both sections operating simultaneously as single channel Class A1 Amplifiers, is 50 db down.


Ef = Rated Value
Ec2 = 250 Volts
Ib at Ec1 = -10
-5
-15
-20
-25
-30
Ec1 = 0
-20
140
120
100
80
60
40
20
0
100
200
300
400
500
CURRENT IN MA
PLATE VOLTAGE
SYLVANIA
6DX7
Page 1



6R-0-0



Sylvania Type 6E5

ELECTRON RAY INDICATOR TUBE

PHYSICAL SPECIFICATIONS

Base	Small 6 Pin
Bulb	T9
Maximum Overall Length	4 3/16"
Maximum Seated Height	3 9/16"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC	6.3 Volts
Heater Current	0.3 Ampere
Maximum Plate Supply Voltage	250 Volts
Maximum Target Voltage	250 Volts
Minimum Target Voltage	100 Volts
Maximum Heater-Cathode Voltage	90 Volts

TYPICAL OPERATION

Heater Voltage	6.3	6.3	6.3 Volts
Plate Supply Voltage	100	200	250 Volts
Target Supply Voltage	100	200	250 Volts
Plate Current (Triode Unit)*	0.19	0.19	0.24 Ma.
Target Current (Approximate)*	1.0	3.0	4.0 Ma.
Grid Voltage (Triode Unit) † Approximate.	0.0	0.0	0.0 Volt
Grid Voltage (Triode Unit) ‡ Approximate.	−3.3	−6.5	−8.0 Volts
Triode Plate Resistor	0.5	1.0	1.0 Megohm

*With triode grid voltage of zero volts.
†For shadow angle of 90 degrees.
‡For shadow angle of zero degrees.

APPLICATION

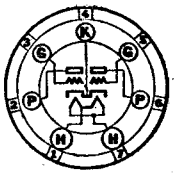
Sylvania Type 6E5 consists of a triode, which functions as a d-c amplifier, and an electron ray device. This latter consists of a portion of the heated cathode as a source of the electrons which are attracted to the target by the positive potential on it. The shaded or unlighted sector is produced by the shadow of a control electrode which is attached to the plate of the triode.

This tube is designed primarily for use as a visible tuning indicator of the electron ray type. It contains a round conical plate or "Target" which fluoresces during operation, and is viewed through the top of the bulb. The visible indication is in the form of a fluorescent lighted sector covering about three-quarters of the area of the target when no voltage is applied to the control grid of the tube. When a negative voltage is applied to the control grid, the edges of the lighted portion close in over the previously unlighted or shaded 90° sector with a fan-like movement until the voltage is increased to a value such that the shaded portion is eliminated and the entire top surface of the target becomes uniformly illuminated.

If the control grid is made negative, the plate and therefore the electron ray-control electrode become more positive with respect to the cathode due to decreasing the voltage drop in the resistor which is connected externally between the target and the plate. As this control element becomes more positive its shadow on the target is reduced and the edges of the lighted portion close in as mentioned above.

In actual circuit use the varying negative voltage for controlling the shadow may be obtained from some point in the a-v-c circuit, thus giving an indication of resonance when the unlighted portion of the target is at minimum.

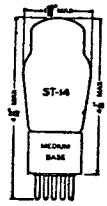
The principal difference between Type 6E5 and Type 6U5/6G5 is in the plate current cut-off characteristics, which are —8 volts and —22 volts respectively. Where difficulty is experienced due to complete closing of the shadow of the 6E5 it is recommended that the 6U5/6G5 be used. If no difficulty exists due to closing of the shadow from only a portion of the a-v-c voltage being used, increased indications on weak signals may be obtained by using a Type 6U5/6G5 and applying the total a-v-c voltage. Type 6U5/6G5 may be used to replace the 6E5 in nearly all present applications, and in general no circuit changes will be necessary.



Sylvania

TYPE 6E6

DOUBLE TRIODE AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,6 ampère
Ampoule	ST 14
Culot — Moyen 7 broches	7-B
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

Tension de chauffage...	6,3	6,3 volts
Tension plaque	180	250 volts
Tension grille	—20	—27,5 volts
Courant plaque*	11,5	18,0 ma.
Conductance mutuelle*	1,400	1,700 μmhos
Coefficient d'amplification	6	6
Résistance interne*	4,300	3,500 ohms
Impédance de charge**	15,000	14,000 ohms
Puissance modulée***	0,75	1,6 watts

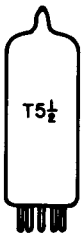
* Pour chaque plaque. ** De plaque à plaque. *** Totale pour les deux sections.

APPLICATION.

Le tube Sylvania 6E6 est un amplificateur de puissance comportant deux triodes à faible coefficient d'amplification dans la même ampoule. A part les cathodes et le filament, les électrodes de chaque triode ont des sorties séparées, ce qui permet le montage en parallèle ou en push-pull.

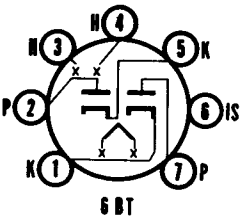
Le type 6E6 est destiné à l'amplification classe A dans des récepteurs pour automobiles utilisant des hauts-parleurs installés au plafond. Cette méthode d'installation ne demande pas une puissance aussi grande que lorsque le poste est installé sous l'auvent.

Ce tube peut également trouver une application dans les petits récepteurs CA dont la puissance ne doit pas être grande.



SYLVANIA TYPE 6EB5

DUO DIODE



MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-3
Basing	6BT
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	300 Ma
Heater-Cathode Voltage (Design Center Values)	
Heater Negative with Respect to Cathode	
Total D C and Peak	330 Volts Max.
Heater Positive with Respect to Cathode	
Total D C and Peak	330 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[1]
Plate Input (Each Section)	2.3 μμf
Plate to Plate	.014 μμf
Cathode Input (Each Section)	2.9 μμf

RATINGS (Design Center Values)

Peak Inverse Plate Voltage	550 Volts Max.
AC Plate Supply Voltage Per Plate, RMS	200 Volts Max.
Peak Plate Current Per Plate	40 Ma Max.

CHARACTERISTICS

Voltage Drop at Ib = 11 Ma Per Plate	10 Volts

TYPICAL OPERATION (Full-wave Rectifier)

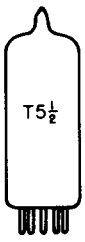
A C Plate Voltage Per Plate	200 Volts
Input Filter Capacitance	8.0 μf
D C Output Voltage	255 Volts
D C Output Current	12.0 Ma

NOTE:

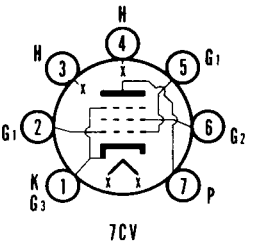
1. Shield No. 316 connected to Pin 6.

APPLICATION

The Sylvania Type 6EB5 is a miniature, double diode well suited for a wide variety of low current applications.



SYLVANIA TYPE 6EH5 12EH5 25EH5 50EH5



MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-3
Basing	7CV
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6EH5	12EH5	25EH5	50EH5	
Heater Voltage	6.3	12.6	25	50	Volts
Heater Current	1200	600	300	150	Ma
Heater Warm-up Time[1]	...	11	...	...	Seconds
Heater-Cathode Voltage (Design Center Values)					
Heater Negative with Respect Respect to Cathode					
Total D C and Peak	200	300	200	200	Volts Max.
Heater Positive with Respect to Cathode					
D C	100	100	100	100	Volts Max.
Total D C and Peak	200	200	200	200	Volts Max.

DIRECT INTERELECTRODES CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.65 μμf
Input	17 μμf
Output	9 μμf

MAXIMUM RATINGS (Design Center Values)

Class A_1 Amplifier

Plate Voltage	135 Volts
Grid No. 2 Voltage	117 Volts
Grid No. 1 Voltage	0 Volts
Plate Dissipation	5 Watts
Grid No. 2 Dissipation	1.75 Watts
Grid No. 1 Circuit Resistance	
Fixed Bias	0.1 Megohm
Cathode Bias	0.5 Megohm

CHARACTERISTICS AND TYPICAL OPERATION

Plate Voltage	110 Volts
Grid No. 2 Voltage	115 Volts
Cathode Resistor	62 Ohms
Peak AF Grid No. 1 Voltage	3 Volts
Zero-Signal Plate Current	42 Ma
Maximum Signal Plate Current	42 Ma
Zero Signal Grid No. 2 Current	11.5 Ma
Maximum Signal Grid No. 2 Current	14.5 Ma
Transconductance	14,600 μmhos
Plate Resistance (approx.)	11,000 Ohms
Load Resistance	3000 Ohms
Maximum Signal Power Output	1.4 Watts
Total Harmonic Distortion	7 Percent

NOTE:

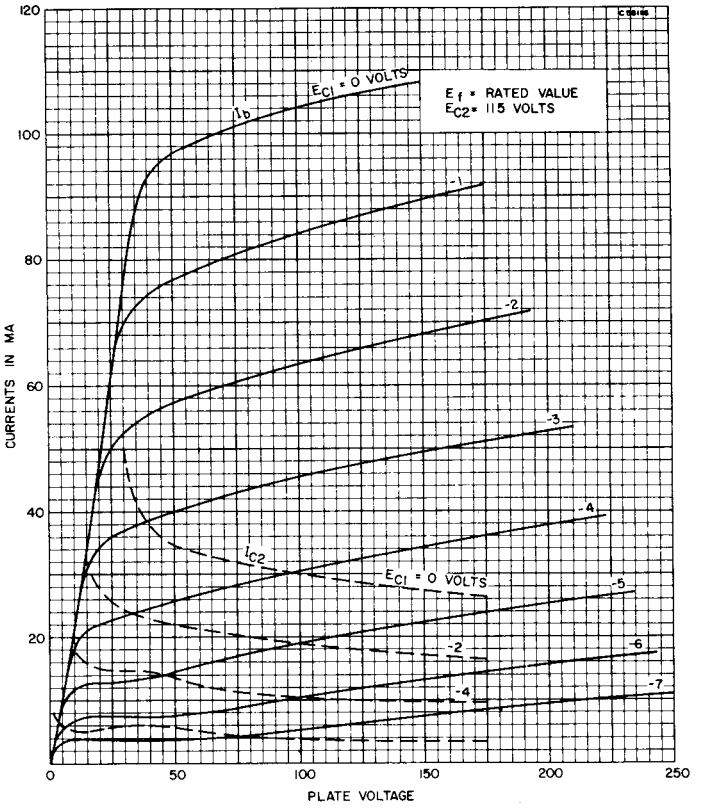
1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

APPLICATION

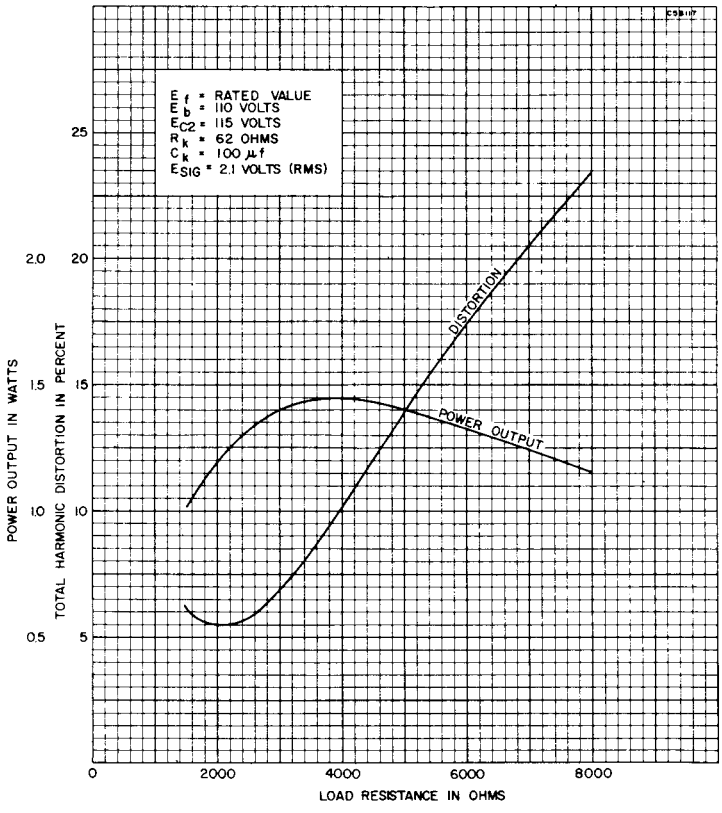
The Sylvania Types 6EH5, 12EH5, 25EH5 and 50EH5 are miniature power pentodes designed for service as audio power amplifiers. Type 12EH5 differs from the others in that it is controlled for heater warm-up time and has a higher heater-cathode voltage rating.

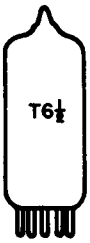
6EH5, 12EH5, 25EH5, 50EH5 (Cont'd)

AVERAGE PLATE CHARACTERISTICS

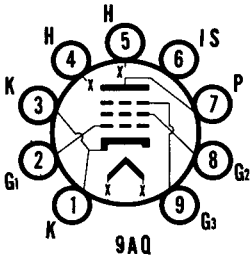


OPERATION CHARACTERISTICS





SYLVANIA TYPES 6EH7 4EH7 3EH7



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	
Max. Seated Height	2 5/32 Inches
Basing	9AQ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Operation	3EH7 Series	4EH7 Series	6EH7 Parallel
Heater Voltage	3.4	4.4	6.3 Volts
Heater Current	600	450	300 Ma
Heater Warm-up Time[2]	11	11	— Seconds
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
Total D C and Peak			150 Volts
Heater Positive with Respect to Cathode			
Total D C and Peak			150 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	.005 μμf Max.
Input: g1 to (h+k+g2+g3+I.S.)	9 μμf
Output: p to (h+k+g2+g3+I.S.)	3 μμf

RATINGS (Design Center Values)

Plate Voltage with Ib = 0 Ma	550 Volts Max.
Plate Voltage	250 Volts Max.
Grid No. 2 Voltage with Ic2 = 0 Ma	550 Volts Max.
Grid No. 2 Voltage	250 Volts Max.
Plate Dissipation	2.5 Watts Max.
Grid No. 2 Dissipation	0.65 Watts Max.
Cathode Current	20 Ma Max.
Grid No. 1 Circuit Resistance	1.0 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

Characteristics	
Plate Voltage	200 Volts
Grid No. 3 Voltage	0 Volts
Grid No. 2 Voltage	90 Volts
Grid No. 1 Voltage	−2 Volts
Plate Current	12 Ma
Grid No. 2 Current	4.5 Ma
Transconductance	12,500 μmhos
Plate Resistance (approx.)	0.5 Megohm
Grid No. 1 Impedance at 40 MC/S	30,000 Ohms[1]

CHARACTERISTICS AND TYPICAL OPERATION (Continued)

Typical Operation				
Plate Voltage				200 Volts
Grid No. 3 Voltage				0 Volts
Grid No. 2 Supply Voltage				200 Volts
Grid No. 2 Series Resistor				22,000 Ohms
Grid No. 1 Voltage	−19.5	−9.5	−6.5	−2 Volts
Transconductance	125	625	1250	12,500 μmhos
Ec1 for a Cross Mod. Factor of 1%	450	160	100	— MV (RMS)

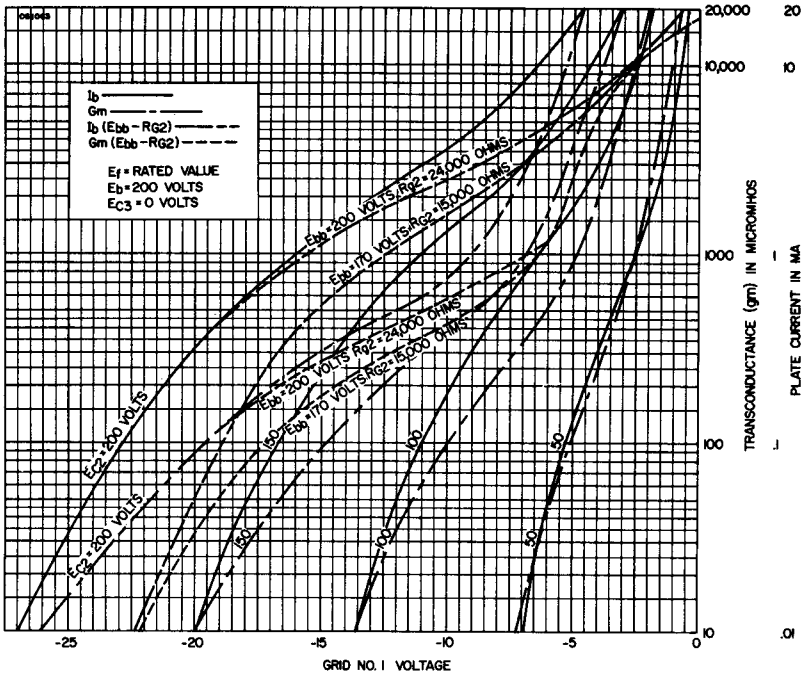
NOTE:

1. Input damping of tube and typical ceramic socket with both cathode leads returned directly to ground is about 11,000 ohms.

APPLICATION

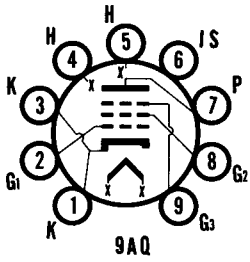
The Sylvania Types 3EH7, 4EH7 and 6EH7 are T-6½ high transconductance semi-remote cutoff pentodes designed for service as VHF IF amplifiers. Types 3EH7 and 4EH7 have controlled heater warm-up time for series string operation.

AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPES 6EJ7 4EJ7 3EJ7



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline: Max. Seated Height	2 5/32 Inches
Basing	9AQ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Operation	3EJ7 Series	4EJ7 Series	6EJ7 Parallel
Heater Voltage	3.4	4.4	6.3 Volts
Heater Current	600	450	300 Ma
Heater Warm-up Time	11	11	— Seconds
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
Total D C and Peak			150 Volts
Heater Positive with Respect to Cathode			
Total D C and Peak			150 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	.005 μμf Max.
Input: g1 to (h+k+g2+g3+I.S.)	10 μμf
Output: p to (h+k+g2+g3+I.S.)	3 μμf

RATINGS (Design Center Values)

Plate Voltage with Ib = 0 Ma	550 Volts Max.
Plate Voltage	250 Max.
Grid No. 2 Voltage with Ic2 = 0 Ma	550 Volts Max.
Grid No. 2 Voltage	250 Volts Max.
Plate Dissipation	2.5 Watts Max.
Grid No. 2 Dissipation	0.9 Watts Max.
Cathode Current	25 Ma Max.
Grid No. 1 Circuit Resistance	1.0 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

Plate Voltage	200 Volts
Grid No. 3 Voltage	0 Volts
Grid No. 2 Voltage	200 Volts
Grid No. 1 Voltage	−2.5 Volts
Plate Current	10 Ma
Grid No. 2 Current	4.1 Ma
Transconductance	15,000 μmhos
Amplification Factor (G2 to G1)	60
Plate Resistance (approx.)	0.35 Megohm
Grid No. 1 Impedance at 40 MC	30,000 Ohms[1]

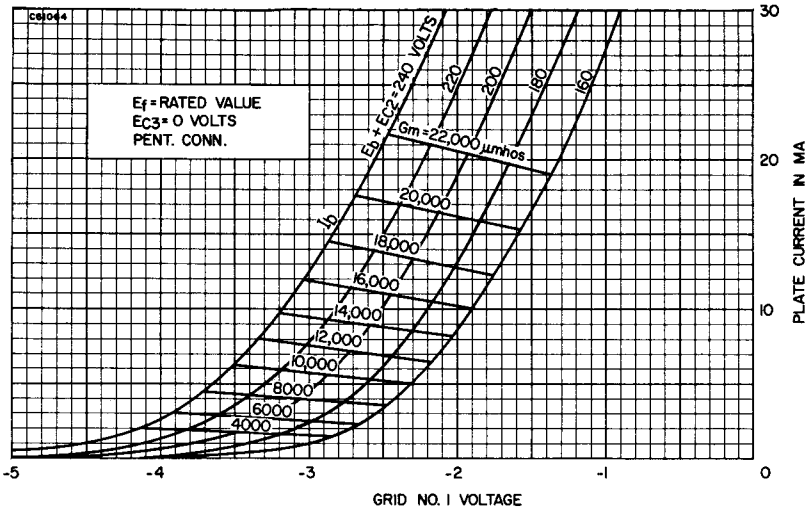
NOTE:

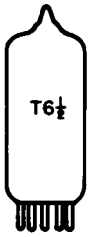
1. Input damping of tube and typical ceramic socket with both cathode leads tied directly to ground is about 10,000 ohms.

APPLICATION

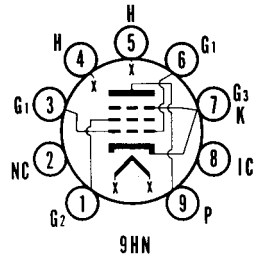
The Sylvania Types 3EJ7, 4EJ7 and 6EJ7 are T-6½ high transconductance sharp-cutoff pentodes designed for service as IF amplifiers.
Types 3EJ7 and 4EJ7 are designed for series string operation.

AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPES 6EM5 8EM5



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-4
Basing	9HN
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6EM8	8EM5	
Heater Voltage	6.3	8.4	Volts
Heater Current	800	600	Ma
Heater Warm-up Time[1]		11	Seconds
Heater-Cathode Voltage (Design Center Values)			
Heater Negative with Respect to Cathode			
Total D C and Peak		200	Volts Max.
Heater Positive with Respect to Cathode			
D C		100	Volts Max.
Total D C and Peak		200	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.7 μμf Max.
Input: g1 to (h+k+g2+g3)	10 μμf
Output: p to (h+k+g2+g3)	5.1 μμf

MAXIMUM RATINGS (Design Center Values)

Vertical Deflection Amplifier[2]

Plate Voltage	315 Volts
Grid No. 2 Voltage	285 Volts
Peak Positive Pulse Plate Voltage (Abs. Max.)	2200 Volts
Peak Negative Pulse Grid Voltage	250 Volts
Plate Dissipation[3]	10.0 Watts
Grid No. 2 Dissipation[3]	1.5 Watts
Average Cathode Current	60 Ma
Peak Cathode Current	210 Ma
Bulb Temperature	250 Degrees C
Grid Circuit Resistance	
Fixed Bias	2.2 Megohms
Cathode Bias	2.2 Megohms

CHARACTERISTICS

Plate Voltage	250 Volts
Grid No. 2 Voltage	250 Volts
Grid No. 1 Voltage	−18.0 Volts
Plate Current	35 Ma
Grid No. 2 Current	3.0 Ma
Transconductance	5100 μmhos
Amplification Factor	8.7
Ec1 for Ib = 0.2 Ma	−37 Volts
Instantaneous Plate Knee Values	
Eb = 60 V, Ec2 = 250 V, and Ec1 = 0 V	
Ib = 180 Ma and Ic2 = 30 Ma	

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
2. For operation in a 525-line, 30-frame system as described in "Standards of Good Engineering Practice for Television Stations; Federal Communications Commission."
3. In stages operating with grid-leak bias, an adequate bias resistor or other suitable means is required to protect the tube in the absence of excitation.

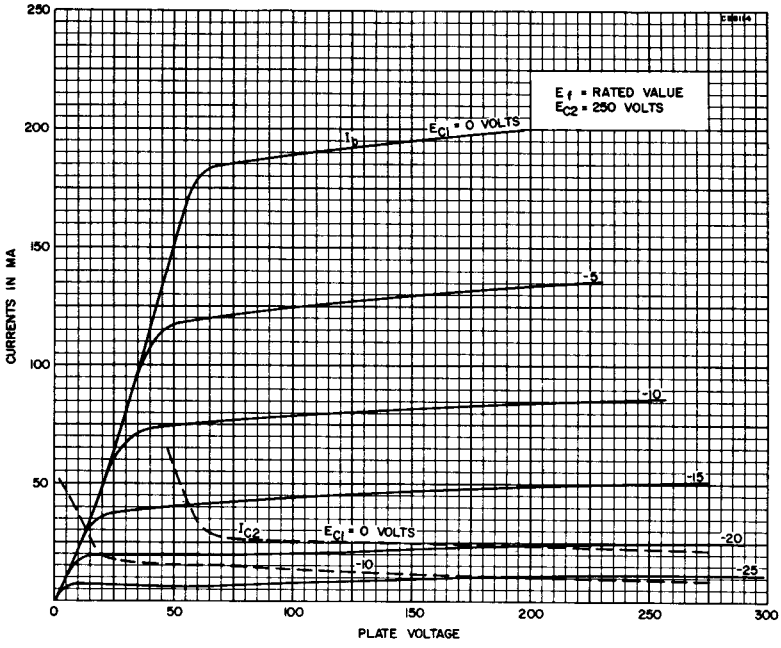
APPLICATION

The Sylvania Types 6EM5 and 8EM5 are miniature beam power tubes designed primarily for vertical deflection amplifier service in television receivers employing 110° deflection systems.

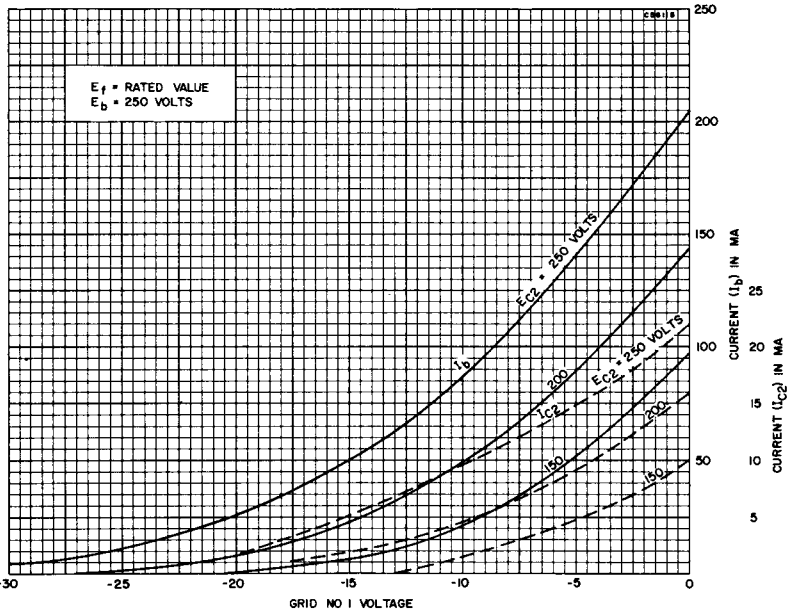
The 8EM5 features controlled heater warm-up time for operation in receivers employing a series heater string.

SYLVANIA TYPES 6EM5, 8EM5 (Cont'd)

AVERAGE PLATE CHARACTERISTICS

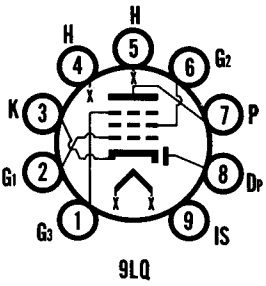


AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPES 6EQ7 12EQ7 20EQ7



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-3
Basing	9LQ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	20EQ7	12EQ7	6EQ7	
Heater Voltage (±10%)	20	12.6	6.3	Volts
Heater Current	100	150	300	Ma
Maximum Heater-Cathode Voltage				
Heater Negative with Respect to Cathode				
Total D C and Peak			200	Volts Max.
Heater Positive with Respect to Cathode				
D C			100	Volts Max.
Total D C and Peak			200	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Pentode Section	
Grid No. 1 to Plate	.002 μμf Max.
Input: g1 to (h+Pk,g3,I.S.+g2)	5.5 μμf
Output: p to (h+Pk,g3,I.S.+g2)	5.0 μμf
Coupling	
Pentode Grid No. 1 to Diode Plate	.0015 μμf Max.
Pentode Plate to Diode Plate	.095 μμf Max.

RATINGS (Design Maximum Values)

Plate Voltage	300 Volts Max.
Grid No. 3 Voltage (Positive or Negative)	300 Volts Max.
Grid No. 2 Supply Voltage	300 Volts Max.
Grid No. 2 Voltage	See 6AM8 Rating Chart
Positive Grid No. 1 Voltage	0 Volts Max.
Negative Grid No. 1 Voltage	50 Volts Max.
Plate Dissipation	3.0 Watts Max.
Grid No. 3 Input	0.2 Watts Max.
Grid No. 2 Input	0.6 Watts Max.
Diode Plate Current	3.0 Ma Max.

CHARACTERISTICS AND TYPICAL OPERATION

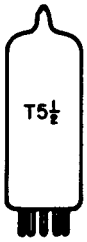
Pentode—Class A1 Amplifier	
Plate Voltage	100 Volts
Grid No. 3 and Internal Shield	Tied to Cathode
Grid No. 2 Voltage	100 Volts
Grid No. 1 Voltage[1]	
Grid No. 1 Resistor	2.2 Megohms
Plate Current	9.0 Ma
Grid No. 2 Current	3.5 Ma
Transconductance	3800 μmhos
Plate Resistance (approx.)	250,000 Ohms
Ec1 for gm = 40 μmhos (approx.)	−20 Volts
Average Diode Current with 10 Volts D C applied (Test Condition ONLY)	2.0 Ma

NOTE:

1. Average contact potential bias developed across specified grid resistor.

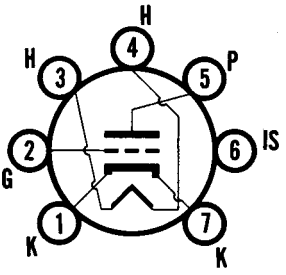
APPLICATION

The Types 6EQ7, 12EQ7, and 20EQ7 are diode sharp-cutoff pentodes. The diode and pentode units are provided with separate cathodes. The pentode unit is intended for use as an AM/FM IF amplifier. The diode is intended for use in detector and AVC applications.



SYLVANIA TYPES 6ER5 3ER5 2ER5

VHF TRIODE



7FP

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7FP
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	2ER5	3ER5	6ER5	
Heater Voltage	2.3	2.8	6.3	Volts
Heater Current	600	450	180	Ma
Heater-Cathode Voltage				
Heater Negative with Respect to Cathode				
Total D C and Peak	200	200	200	Volts Max.
Heater Positive with Respect to Cathode				
D C	100	100	100	Volts Max.
Total D C and Peak	200	200	200	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded	Unshielded
Grid to Plate	0.36	0.38 μμf
Input	4.4	4.4 μμf
Output	4.0	3.0 μμf
Heater to Cathode	2.8	2.8 μμf
Grid to Cathode	3.1	3.1 μμf
Plate to Cathode	0.2	0.24 μμf
Grid to Heater	0.28	0.28 μμf Max.

RATINGS (Design Center Values)

Supply Voltage	550 Volts Max.
Plate Voltage	250 Volts Max.
Plate Dissipation	2.2 Watts Max.
Cathode Current	20 Ma Max.
Negative Grid Voltage	50 Volts Max.
Grid Circuit Resistance	
Cathode Bias	1.0 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

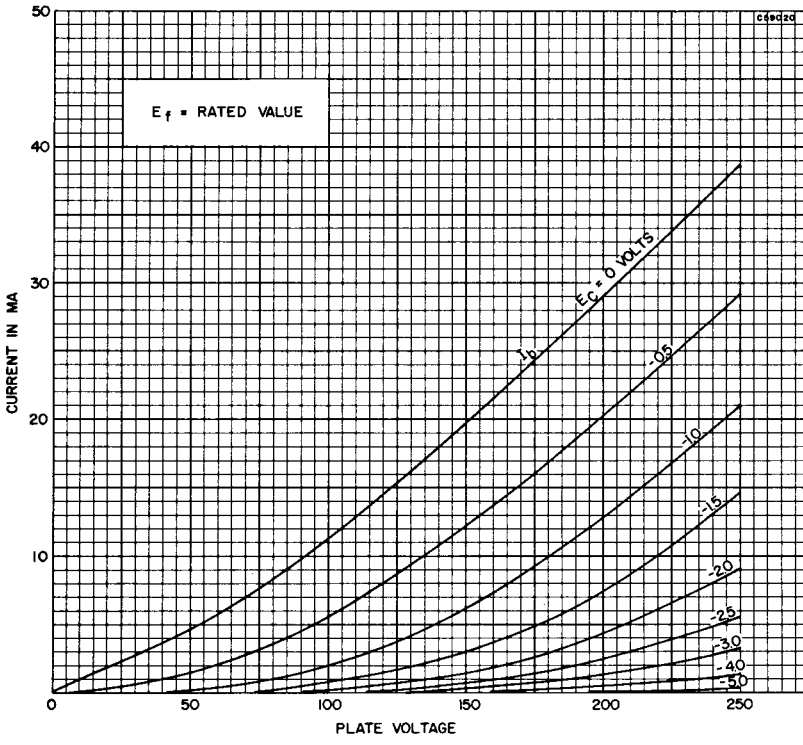
Plate Voltage	200 Volts
Grid Voltage	−1.2 Volts
Plate Current	10 Ma
Transconductance	10,500 μmhos
Amplification Factor	80
Plate Resistance	8000 Ohms
Ec1 for Gm = 500 μmhos	−3.8 Volts
Ec1 for Gm = 100 μmhos	−5.6 Volts

APPLICATION

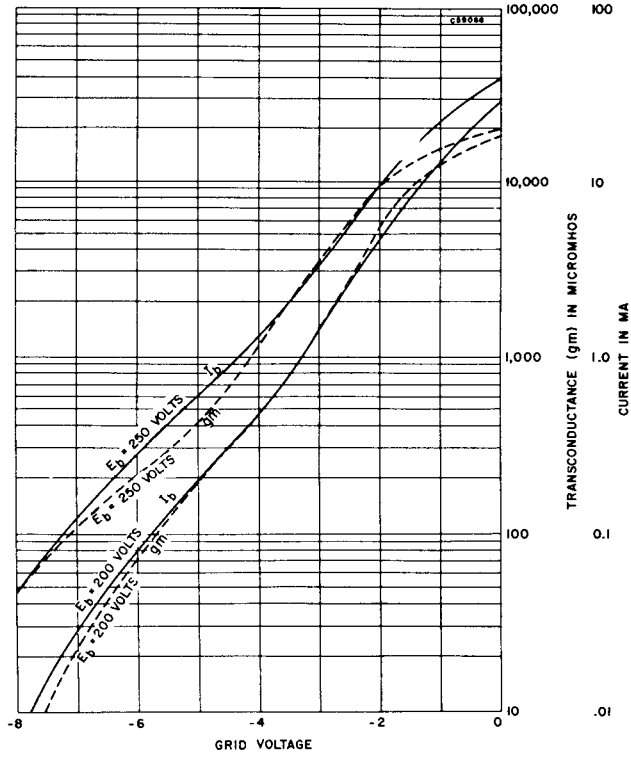
The Sylvania Types 2ER5, 3ER5 and 6ER5 are semi-remote cutoff, frame grid, triodes designed for use as VHF RF amplifiers. Features of the design include: A partial shield between the grid and plate which lowers the capacitance between these two elements and promotes ease of neutralization and higher input impedance by virtue of dual cathode leads.

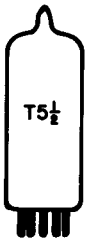
SYLVANIA TYPES 6ER5, 3ER5, 2ER5 (Cont'd)

AVERAGE PLATE CHARACTERISTICS

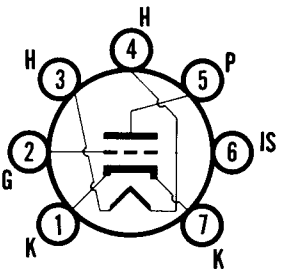


AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPES 6ES5 3ES5 2ES5



VHF TRIODE

7FP

MECHANICAL DATA

Bulb	T-5½
Base	E8-1, Miniature Button 7-Pin
Outline	5-2
Basing	7FP
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	2ES5	3ES5	6ES5	
Heater Voltage	2.35	3.0	6.3	Volts
Heater Current	600	450	200	Ma
Heater Warm-up Time[1]	11	11		Seconds
Heater-Cathode Voltage				
Heater Negative with Respect to Cathode				
Total D C and Peak	200	200	200	Volts
Heater Positive with Respect to Cathode				
D C	100	100	100	Volts
Total D C and Peak	200	200	200	Volts

DIRECT INTERELECTRODE CAPACITANCES (Shielded)

Grid to Plate	0.36 $\mu\mu$f
Input: g to (h+k+I.S.)	3.0 $\mu\mu$f
Output: p to (h+k+I.S.)	4.0 $\mu\mu$f

RATINGS (Design Center Values)

Plate Voltage	250 Volts Max.
Plate Dissipation	2.5 Watts Max.
D C Cathode Current	25 Ma Max.
Grid Circuit Resistance	0.5 Megohms Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

Plate Voltage	200 Volts
Grid Voltage	−1.0 Volts
Plate Current	15 Ma
Transconductance	9500 μmhos
Amplification Factor	70
Plate Resistance (approx.)	7400 Ohms
Ec for Ib = 100 μa (approx.)	−9 Volts

NOTE:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.

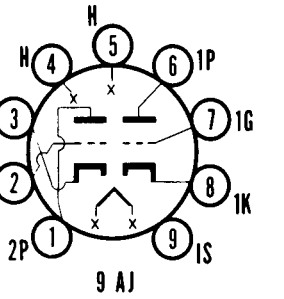
APPLICATION

The Sylvania Types 2ES5, 3ES5 and 6ES5 are semi-remote cutoff triodes designed for use as VHF RF amplifiers. Features of the design include: A partial shield between the grid and plate which lowers the capacitance between these two elements and promotes ease of neutralization; low input capacitance; and higher input impedance by virtue of dual cathode leads.



SYLVANIA TYPES 6ES8 4ES8

VHF DUO TRIODE



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9AJ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	4ES8	6ES8
Heater Voltage	4.0	6.3 Volts
Heater Current	600	365 Ma
Heater Cathode Voltage (Design Center Values)		
RMS, Voltage Between Cathode and Heater (Grounded Cathode Section)		50 Volts Max.
RMS, Voltage Between Cathode and Heater (Grounded Grid Section)		50 Volts Max.
Cathode Positive with Respect to Heater (Grounded Grid Section)		130 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Each Section)[1]

	Unshielded	Shielded
Grid to Plate	1.85	1.85 μμf
Plate to Cathode	0.18	0.17 μμf
Heater to Cathode	2.7	2.7 μμf
Plate Section No. 1 to Plate Section No. 2	.040	.015 μμf Max.
Plate Section No. 2 to Grid Section No. 1	.003	.003 μμf Max.
Grid Section No. 1 to Cathode Section No. 2	.002	.002 μμf Max.

RATINGS (Design Center Values—Each Section)

Plate Supply Voltage (Ib = 0 Ma)	550 Volts Max.
Plate Voltage	130 Volts Max.
Plate Dissipation	1.8 Watts Max.
Cathode Current	22 Ma Max.
Negative Grid Voltage	50 Volts Max.
Grid Circuit Resistance	1.0 Megohm Max.

CHARACTERISTICS

Class A1 Amplifier (Each Section)

Plate Voltage	90 Volts
Grid Voltage	−1.2 Volts
Plate Current	15 Ma
Transconductance	12,500 μmhos

CASCODE OPERATING CHARACTERISTICS[2]

Supply Voltage	180 Volts
Plate Current	15 Ma
Transconductance	12,500 μmhos
Noise Figure[3]	6.5 db
Ec for gm = 125 μa (approx.)	−9.0 Volts
Input Voltage for Cross Modulation Factor of 1% at gm = 125 μmhos	500 MV

NOTES:

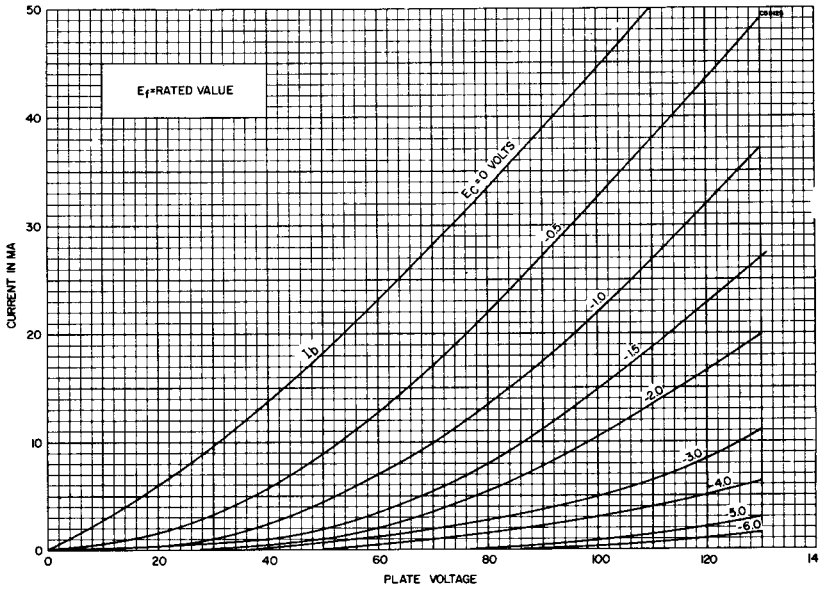
1. Section No. 1 (grounded cathode input section) connects to Pins 6, 7, and 8. Section No. 2 (grounded grid output section) connects to Pins 1, 2, and 3.
2. The grid of the output section, Section No. 2, is connected to a potentiometer.
3. Noise figure measurements taken with tube operating in a TV tuner.

APPLICATION

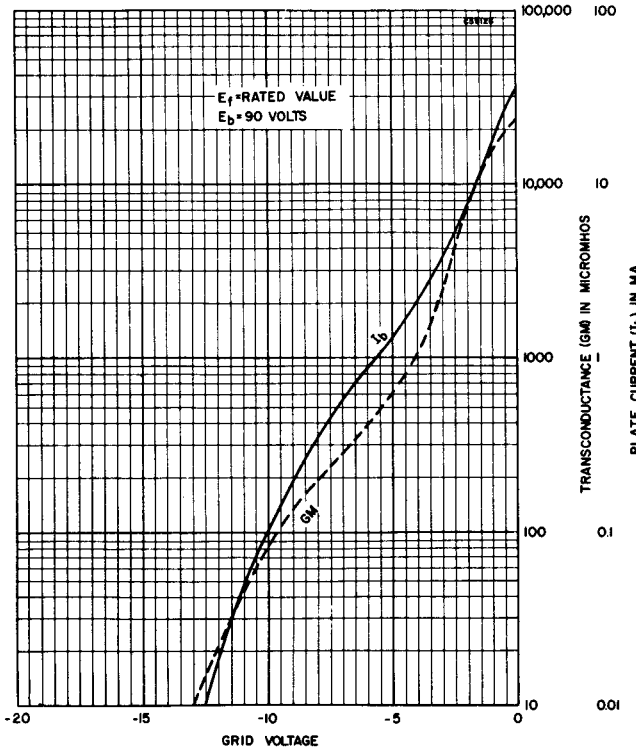
Sylvania Types 4ES8 and 6ES8 are semi-remote cutoff double triodes designed for use as cascode VHF amplifiers. Types 4ES8 and 6ES8 feature extremely high gm, low capacitances, and low noise.
Type 4ES8 is designed for series heater string applications.

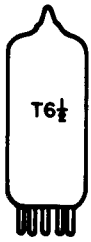
SYLVANIA TYPES 6ES8 (Cont'd)
4ES8

AVERAGE PLATE CHARACTERISTICS



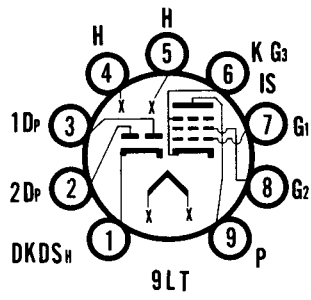
AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPES 6ET7 8ET7

DUO DIODE PENTODE



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-3
Basing	9LT
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6ET7	8ET7
Heater Voltage	6.3	8.0 Volts
Heater Current	750	600 Ma
Maximum Heater Current Range		560-640 Ma
Heater Warm-up Time[1]		11 Seconds
Heater-Cathode Voltage (Design Maximum Values)		
Heater Negative with Respect to Cathode		
Total D C and Peak		200 Volts Max.
Heater Positive with Respect to Cathode		
D C		100 Volts Max.
Total D C and Peak		200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Pentode Section	
Grid No. 1 to Plate	0.1 μμf Max.
Input: g1 to (h+Pk,g3,I.S.+g2+Dk,DSh)	10 μμf
Output: p to (h+Pk,g3,I.S.,g2+Dk,DSh)	4.2 μμf
Diode Section (Each Diode)	
Diode Plate to (h+Dk,Dsh+Pk,g3,I.S.)	1.5 μμf
Diode Cathode; Diode Shield to (h+Dp+Pk,g3,I.S.)	7.5 μμf
Coupling	
Pentode Grid No. 1 to Diode Plate (Each Diode)	.005 μμf Max.
Pentode Plate to Diode Plate (Each Diode)	.02 μμf Max.

RATINGS (Design Maximum Values)[2]

Plate Voltage	330 Volts Max.
Grid No. 2 Supply Voltage	330 Volts Max.
Grid No. 2 Voltage	See Rating Chart
Positive Grid No. 1 Voltage	0 Volts Max.
Plate Dissipation	5.0 Watts Max.
Grid No. 2 Dissipation	1.1 Watts Max.
Grid No. 1 Circuit Resistance	
Cathode Bias	0.25 Megohms Max.
Fixed Bias	0.1 Megohms Max.

CHARACTERISTICS AND TYPICAL OPERATION

Pentode—Class A1 Amplifier

Plate Voltage	200 Volts
Grid No. 2 Voltage	150 Volts
Cathode Bias Resistor	100 Ohms
Plate Current	25 Ma
Grid No. 2 Current	5.5 Ma
Transconductance	11,500 μmhos
Plate Resistance (approx.)	60,000 Ohms
Ec1 for Ib = 100 μa (approx.)	−10 Volts
Average Diode Current with 10 Volts D C Applied (Each Diode)	1.5 Ma

Instantaneous Plate Knee Values

Eb = 60 V, Ec2 = 150, and Ec1 = 0 V;
Ib = 55 Ma and Ic2 = 18 Ma

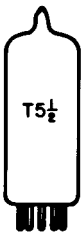
NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

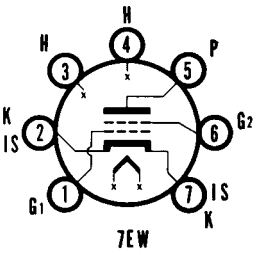
2. Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.
The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.
The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variations, and environmental conditions.

APPLICATION

The Type 8ET7 is a duo-diode sharp-cutoff pentode. The diode and pentode units are provided with separate cathodes. The pentode unit is intended for use as a video amplifier, while the diodes are essentially intended for use as a horizontal phase detector in television receivers.



SYLVANIA TYPES 6EV5 2EV5 3EV5



VHF TETRODE

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7EW
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	2EV5	3EV5	6EV5	
Heater Voltage	2.4	2.9	6.3	Volts
Heater Current	600	450	200	Ma
Heater Warm-up Time[1]	11	11		Seconds
Max. Heater Voltage Range[2]			5.7-6.9	Volts
Max. Heater Current Range	560-640	420-480	—	Ma
Heater-Cathode Voltage (Design Maximum Values)				
Heater Negative with Respect to Cathode				
Total D C and Peak	200	200	100	Volts Max.
Heater Positive with Respect to Cathode				
D C	100	100	50	Volts Max.
Total D C and Peak	200	200	100	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[3]

Grid No. 1 to Plate	.035 $\mu\mu$f Max.
Input	4.5 $\mu\mu$f
Output	2.9 $\mu\mu$f

RATINGS (Design Maximum Values)

Plate Voltage	275 Volts Max.
Grid No. 2 Supply Voltage	180 Volts Max.
Grid No. 2 Voltage	See 6AM8 Rating Chart
Plate Dissipation	3.25 Watts Max.
Grid No. 2 Dissipation	0.2 Watts Max.
Positive Grid No. 1 Voltage	0 Volts Max.
Cathode Current	20 Ma Max.
Grid Circuit Resistance	0.5 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

Plate Voltage	250 Volts
Grid No. 2 Voltage	80 Volts
Grid No. 1 Voltage	−1 Volt
Plate Current	11.5 Ma
Grid No. 2 Current	0.9 Ma
Transconductance	8800 μmhos
Plate Resistance	0.150 Megohm
Ec1 for Gm = 100 μmhos (approx.)	−4.5 Volts

NOTES:

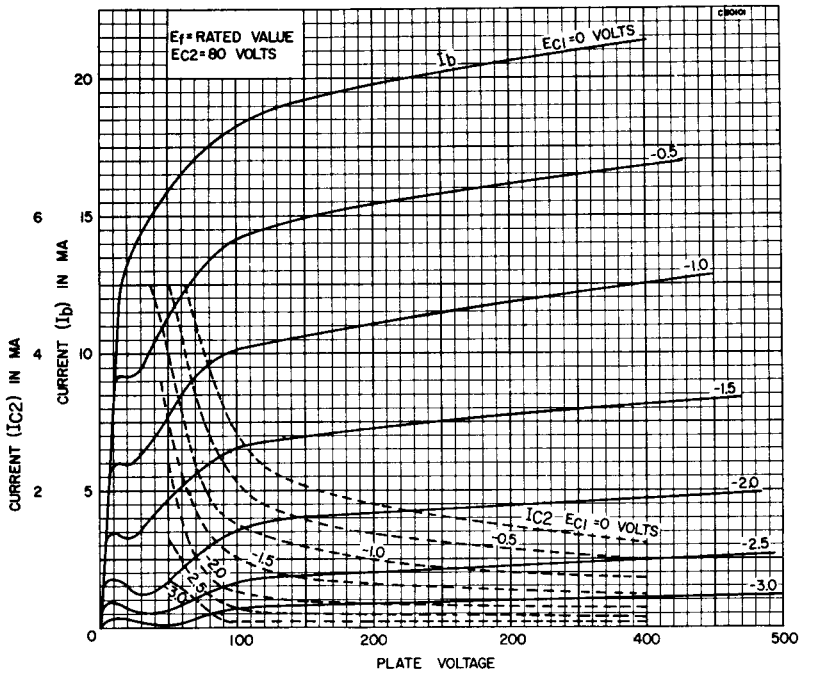
1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
2. Design Maximum Rating.
3. Shield No. 316 connected to cathode.

APPLICATION

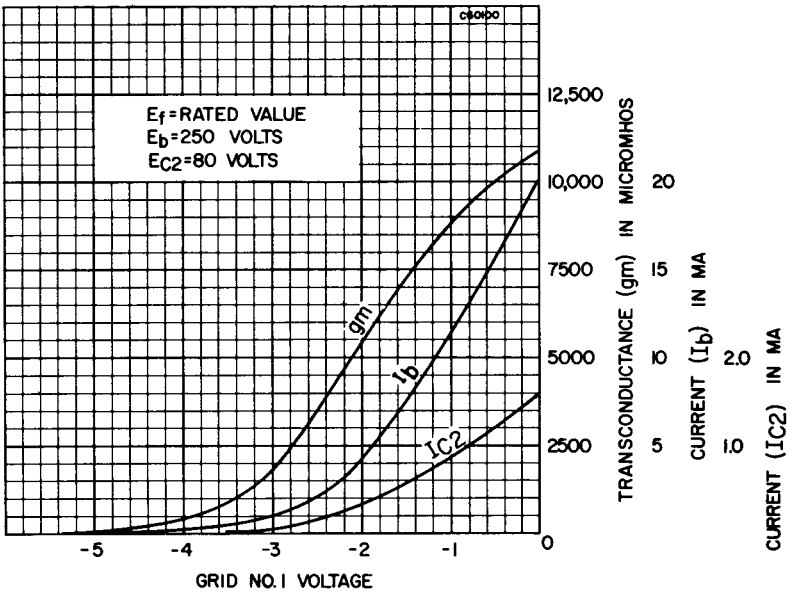
The 2EV5, 3EV5 and 6EV5 are miniature, sharp cutoff tetrodes designed particularly for service as VHF amplifiers in television receiver tuners. The 2EV5 and 3EV5 feature controlled heater warm-up time for use in series string television receivers.

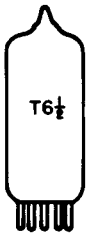
SYLVANIA TYPES 6EV5, 2EV5, 3EV5 (Cont'd)

AVERAGE PLATE CHARACTERISTICS



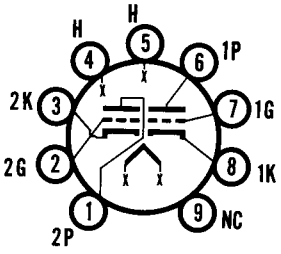
AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPE 6EV7

DUOTRIODE



9LP

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-3
Basing	9LP
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Characteristics

Heater Voltage[1]	6.3 Volts
Heater Current[2]	600 Ma
Ratings (Design Maximum Values)	
Heater Voltage[3]	6.3 ± 0.6 Volts
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
D C	100 Volts Max.
Total D C and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section 1[4]	Section 2[4]
Grid to Plate	3.4	3.4 μμf
Input: g to (h+k)	3.0	3.0 μμf
Output: p to (h+k)	0.33	0.23 μμf

Ratings (Design Maximum Values) Each Section

Relay Control Service

Plate Voltage	300 Volts Max.
Plate Dissipation[5]	2.5 Watts Max.
Plate Dissipation[1]	4.5 Watts Max.
Positive Grid Voltage	0 Volts Max.
Cathode Current	20 Ma Max.
Grid Circuit Resistance	3.9 Megohms Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier—Each Section

Plate Voltage	250 Volts
Grid Voltage	−2 Volts
Plate Current	9.2 Ma
Transconductance	5200 μmhos
Amplification Factor	60
Plate Resistance	11,500 Ohms
Ec for Ib = 100 μa	−9 Volts

RELAY CONTROL OPERATION (Each Section)

	"ON" Time More Than 30 Sec. in Any 2 Min. Interval	"ON" Time Less Than 30 Sec. in Any 2 Min. Interval
Plate Supply Voltage	150	250 Volts
Zero Bias Plate Current	10	18.5 Ma
Plate Lead (Relay)	2500	2500 Ohms
Ec for Ib = 100 μa (approx.)	−5	−9 Volts

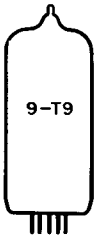
NOTES:

1. For parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater voltage.
2. The bogey value of current is obtained when operating the heater at the specified 6.3 volts.
3. Heater voltage supply variations shall be restricted to maintain heater voltage within the specified tolerance.
4. Section No. 1 connects to Pins 6, 7, and 8.
   Section No. 2 connects to Pins 1, 2 and 3.

5. Plate dissipation can be as high as 2.5 watts when the "ON" time exceeds 30 seconds in any 2 minute interval.
6. Plate dissipation can be as high as 4.5 watts when the "ON" time does not exceed 30 seconds in any 2 minute interval.

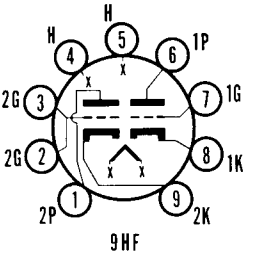
APPLICATION

The Sylvania Type 6EV7 is a miniature high-mu twin triode having separate cathodes. It is designed for service as a relay-control tube in remote tuning units of television receivers.



SYLVANIA TYPES 6EW7 10EW7

DISSIMILAR DUO TRIODE



The 9-T9 design utilized a T-9 (1⅛" Dia.) bulb based to fit a standard 9-pin miniature socket. Advantages of the 9-T9 include an increase in the heat dissipation safety margin, as compared to 9-pin miniature tubes employing T-6½ (¹³⁄₁₆" Dia.) bulbs.

MECHANICAL DATA

Bulb	Special, T-9
Base	9-Pin, same as E9-1, except bulb diameter
Outline	See Drawing
Basing	9HF
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6EW7	10EW7
Heater Voltage	6.3[1]	9.7 Volts
Heater Current	900	600[2] Ma
Heater Warm-up Time[3]		11 Seconds
Maximum Heater Voltage Range[4]	5.7-6.9	— Volts
Maximum Heater Current Range[4]	—	560-640 Ma
Heater-Cathode Voltage (Design Maximum Values)		
Heater Negative with Respect to Cathode		
Total D C and Peak	200	200 Volts Max.
Heater Positive with Respect to Cathode		
D C	100	100 Volts Max.
Total D C and Peak	200	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section No. 1	Section No. 2
Grid to Plate	4.2	9.0 μμf
Input: g (h+k)	2.2	7.0 μμf
Output: p to (h+k)	0.4	1.2 μμf

RATINGS (Design Maximum Values)

Vertical Deflection Oscillator and Amplifier[5]

	Section[7] No. 1 Oscillator	Section[7] No. 2 Amplifier
Plate Voltage	330	330 Volts Max.
Peak Positive Pulse Plate Voltage	—	1500 Volts Max.
Peak Negative Pulse Grid Voltage	400	250 Volts Max.
Plate Dissipation[6]	1.5	10 Watts Max.
Average Cathode Current	22	50 Ma Max.
Peak Cathode Current	77	175 Ma Max.
Grid Circuit Resistance		
Self Bias	2.2	2.2 Megohms

AVERAGE CHARACTERISTICS

	Section[7] No. 1	Section[7] No. 2
Plate Voltage	250	150 Volts
Grid No. 1 Voltage	-11	-17.5 Volts
Plate Current	5.5	45 Ma
Transconductance	2000	7500 μmhos
Amplification Factor	17.5	6.0
Plate Resistance (approx.)	8750	800 Ohms
Ec for Ib = 10 μa (approx.)	-20	— Volts
Ec for Ib = 100 μa (approx.)	—	-40 Volts
Ib at Ec = -25 Vdc	—	8 Ma
Ib with Eb = 60 V and Ec = 0 V (Instantaneous Values)	—	95 Ma

NOTES:

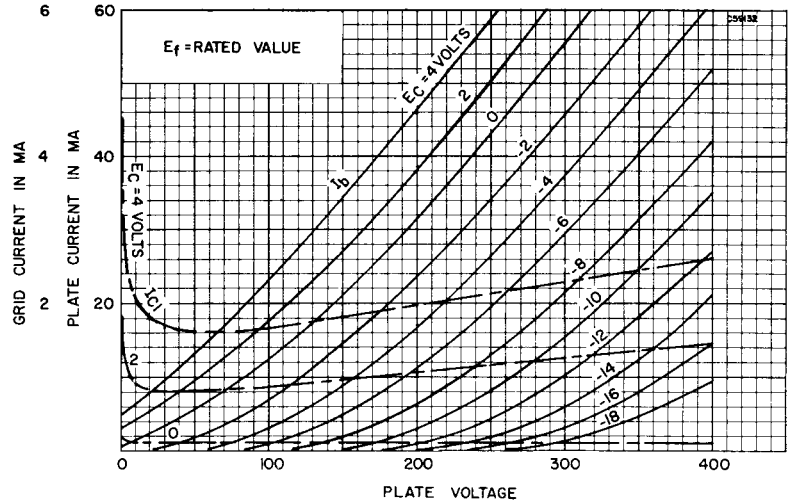
1. For parallel heater operation, equipment should be so designed so that at normal supply voltage bogey tubes will operate at this value of heater voltage.
2. For series heater operation, equipment should be so designed so that at normal supply voltage bogey tubes will operate at this value of heater current.
3. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

4. Design-Maximum Ratings.
5. For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Stations; Federal Communications Commission." The duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.
6. In stages operating with grid leak bias, an adequate bias resistor or other suitable means is required to protect the tube in the absence of excitation.
7. Section No. 1 connects to Pins 6, 7 and 8. Section No. 2 connects to Pins 1, 2, 3 and 9.

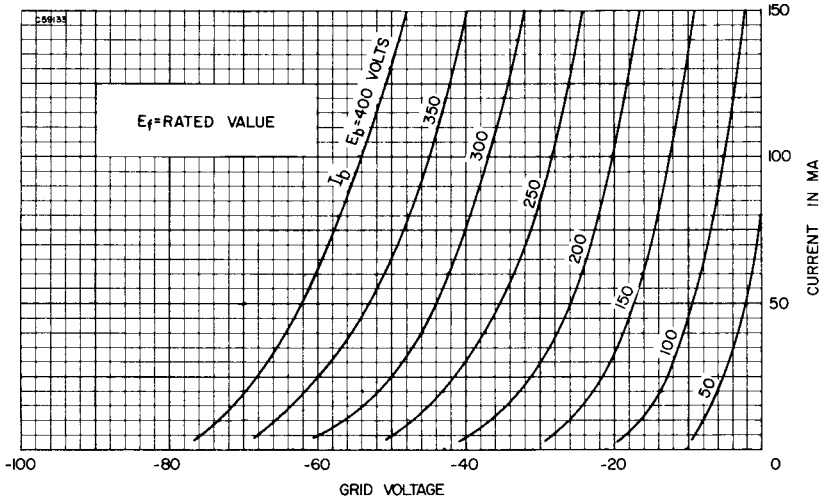
APPLICATION

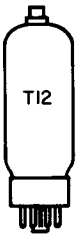
The Sylvania Types 6EW7 and 10EW7 are dissimilar-section double triodes featuring the 9-T9 bulb and pin configuration. The 6EW7 and 10EW7 are intended to serve the combined functions of vertical deflection oscillator and amplifier.

AVERAGE PLATE CHARACTERISTICS
(Section No.1)

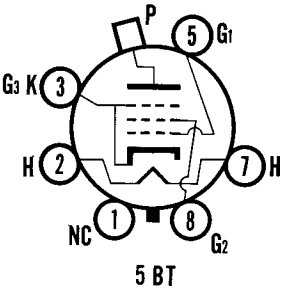


AVERAGE TRANSFER CHARACTERISTICS
(Section No.2)





SYLVANIA TYPES 6EX6 21EX6



5 BT

MECHANICAL DATA

Bulb	T-12
Base	Short Medium Shell Octal 5-Pin, B5-123
Outline	12-21
Top Cap	C1-1
Basing	5BT
Cathode	Coated Unipotential
Mounting Position	Vertical[1]

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6EX6	21EX6
Heater Voltage	6.3	21.5 Volts
Heater Current	2.25	0.6 Amperes
Heater Warm-up Time[2]		11 Seconds
Heater-Cathode Voltage (Design Max. Values)		
Heater Negative with Respect to Cathode		
Total D C and Peak	200	200 Volts Max.
Heater Positive with Respect to Cathode		
D C	100	100 Volts Max.
Total D C and Peak	200	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	1.1 $\mu\mu$f
Input: g1 to (h+k+g2+B.p)	22 $\mu\mu$f
Output: p to (h+k+g2+B.p)	8.5 $\mu\mu$f

RATINGS (Design Maximum Values)

Horizontal Deflection Amplifier[3]

D C Plate Supply Voltage (Boost + D C Power Supply)	770 Volts Max.
Peak Positive Plate Voltage (Abs. Max.)	7000 Volts
Peak Negative Plate Voltage (Abs. Max.)	1500 Volts
Grid No. 2 Voltage	195 Volts Max.
Peak Negative Grid No. 1 Voltage	220 Volts Max.
Plate Dissipation[4]	22 Watts Max.
Grid No. 2 Dissipation	3.5 Watts Max.
Average Cathode Current	220 Ma Max.
Peak Cathode Current	770 Ma Max.
Grid No. 1 Circuit Resistance	0.47 Megohm Max.
Bulb Temperature (At Hottest Point)	225 Degrees C Max.

AVERAGE CHARACTERISTICS

Plate Voltage	175 Volts
Grid No. 2 Voltage	175 Volts
Grid No. 1 Voltage	−30 Volts
Plate Current	67 Ma
Grid No. 2 Current	3.3 Ma
Transconductance	7700 μmhos
Amplification Factor[5]	4.2
Plate Resistance	8500 Ohms
EC1 for Ib = 1 ma (approx.)	−50 Volts
Ec1 with Eb = 5000 Volts for Ib = 1.0 ma	−101 Volts

Instantaneous Plate Knee Values

Eb = 60 V, Ec2 = 150 V and Ec1 = 0 V;
Ib = 460 Ma; and Ic2 = 45 Ma;
Eb = 60 V, Ec2 = 125 V and Ec1 = 0 V;
Ib = 360 Ma, and Ic2 = 30 Ma.

NOTES:

1. Horizontal operation is permitted if Pins 2 and 7 are in a horizontal plane.
2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

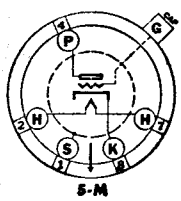
NOTES: (cont'd)

3. For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcasting Stations; Federal Communications Commission." The duty cycle of the voltage pulse not to exceed 15% of a scanning cycle.
4. In stages operating with grid leak bias, an adequate cathode bias resistor or other suitable means is required to protect the tube in the absence of excitation.
5. Amplification factor with tube operating as a triode with 175 volts on the plate and Grid No. 2 and −30 volts on Grid No. 1.

APPLICATION

The Sylvania Types 6EX6 and 21EX6 are beam power amplifiers designed for service as horizontal deflection amplifiers in television receivers. Features of the tubes are extremely high perveance and high plate current at low plate and grid No. 2 voltage, plus a high ratio of plate to Grid No. 2 current.

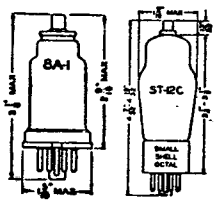
The 21EX6 employs a 600 ma heater and controlled heater warm-up time for service in series string television receivers.



Sylvania

TYPE 6F5
TYPE 6F5G

TRIODES
A MU ELEVE



CARACTERISTIQUES

	6F5	6F5G
Tension de chauffage CA ou CC	6,3	6,3 volts
Courant de chauffage	0,3	0,3 ampère
Ampoule	8A-1	ST12-C
Capuchon	Miniature	Miniature
Culot — Petit octal 5 broches	5-M	5-M
Position de montage	Toutes	Toutes

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A

Tension de chauffage	6,3 volts
Tension plaque	250 volts max.
Tension grille*	—2 volts
Courant plaque*	0,9 ma.
Résistance interne	66,000 ohms
Conductance mutuelle	1,500 μmhos
Coefficient d'amplification	100

*Valeurs normales et non pas de fonctionnement avec couplage par résistance.

APPLICATION.

Les tubes Sylvania 6F5 et 6F5G sont des amplificateurs triode B. F. à grand mu assez semblable à la section triode du tube 75, mais ayant des caractéristiques meilleures. Le tableau de caractéristiques montre une plus faible résistance interne et une plus grande conductance mutuelle que pour le type 75. Les deux tubes ont le même coefficient d'amplification.

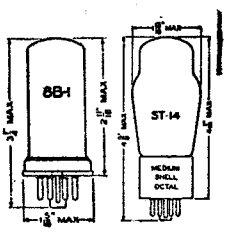
Lorsqu'un tube 6F5 est utilisé en conjonction avec le type 6H6 ou 6H6G, cette combinaison devient équivalente à un type 75. On peut donc, dans ce cas, se référer aux renseignements donnés sous le titre Type 75.



Sylvania

TYPE 6F6
TYPE 6F6G

AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

	6F6	6F6G
Tension chauffage CA ou CC	6,3	6,3 volts
Courant chauffage	0,7	0,7 ampère
Ampoule	8B-1	ST-14
Culot : Moyen octal 7 broches	7-S	7-S
Position de montage	Toutes	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

	Pentode	Triode
Tension chauffage CA ou CC	6,3	6,3 volts
Courant chauffage	0,7	0,7 ampère
Tension plaque	375	350 volts max.
Tension écran	285	— volts max.
Dissipation plaque	11	10 watts max.
Dissipation écran	3,75	— watts max.

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A* (Un seul tube)

	Pentode		Triode
Tension chauffage	6,3	6,3	6,3 volts
Tension plaque	250	285	285 volts
Tension écran	250	285	... volts
Tension grille	—16,5	—20	—20 volts
Courant plaque (signal zéro))	34	38	31 ma.
Courant écran (signal zéro) ...	6,5	7	... ma.
Résistance interne	80,000*	78,000*	2,600 ohms
Conductance mutuelle	2,500	2,550	2,600 μmhos
Coefficient d'amplification ...	—	—	6.8
Impédance de charge	7,000	7,000	4,000 ohms
Puissance modulée	3,2	4,8	0,85 watts
Distorsion harm. totale	8	9	6,5 pour cent

* Valeurs approximatives.

AMPLIFICATEUR PUSH-PULL

	CLASSE A1	CLASSE AB2	
	Pentode	Pentode	Triode*
Tension chauffage	6,3	6,3	6,3 volts
Tension plaque	315	375	350 volts
Tension écran	285	250	— volts
Tension grille	—24	—26	—38 volts
Tension pointe B.F. (G à G) ...	48	82	123 volts
Courant plaque (signal zéro) ...	62	34	48 ma.
Courant plaque (signal max.) ...	80	82	92 ma.
Courant écran (signal Zéro) ...	12	5	— ma.
Courant écran (signal max.) ...	19,5	19,5	— ma.
Impédance de charge (P à P) ...	10,000	10,000	6,000 ohms
Puissance modulée	11	18,5	13 watts
Distortion harmonique totale ...	4	3,5	2 pour cent

*Avec grille reliée à cathode.

APPLICATION

Les tubes 6F6 et 6F6G sont des amplificateurs de puissance pentode, à chauffage indirect sous 6,3 volts. Les caractéristiques électriques sont presque identiques à celles du type 42. Il peut être employé seul ou en montage push-pull. Quoique le tube soit pentode, il peut fonctionner comme triode en raccordant la grille écran à la plaque. Comme tel, il convient bien pour piloter un étage push-pull classe AB de deux 6F6 ou 6F6G, puisqu'il fournit un maximum de 0,85 watt modulé environ.

Pour un seul tube fonctionnant en classe A, la liaison par transformateur ou par impédance est recommandée. Le tube 6F6 ou 6F6G peut également être couplé par résistance avec le tube détecteur ou le premier étage basse fréquence. Dans le cas du couplage par résistance, la résistance de grille ne peut pas dépasser 500.000 ohms. Cette valeur ne peut être utilisée qu'en cas de polarisation automatique. Lorsque le tube fonctionne avec une polarisation fixe, ou partiellement fixe, la résistance ne peut dépasser 250.000 ohms.

La conductance mutuelle, la résistance interne et le coefficient d'amplification du tube 6F6 ou 6F6G en font un amplificateur idéal pour fonctionnement en classe AB, un tube en amplificateur triode servant de pilote à deux tubes 6F6 ou 6F6G montés en push-pull.

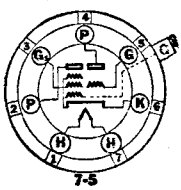
Pour le montage en push-pull classe AB, connexion triode ou pentode, fonctionnant avec les tensions maxima inscrites au tableau des caractéristiques, la liaison par transformateur ou impédance convient.

L'étage pilote doit être prévu pour fournir le maximum de puissance modulée avec le minimum de distorsion.

Dans chacun des quatre montages figurant aux tableaux, le tube pilote recommandé est un simple tube 6F6 ou 6F6G en connexion triode. Il fonctionnera dans les conditions suivantes:

Tension plaque	250 volts
Tension grille	—20 volts
Impédance minimum de plaque	10,000 ohms

Les sources de tension plaque, écran et grille devront avoir une résistance négligeable. D'autres renseignements applicables aux types 6F6 ou 6F6G seront trouvés au type 42.

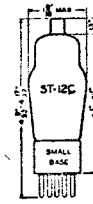


Sylvania

TYPE 6F7

PENTODE

TRIODE



CARACTERISTIQUES

Tension chauffage CA ou CC	6,3 volts
Courant chauffage	0,3 ampère
Ampoule	ST-12C
Capuchon	petit métal
Culot — Petit 7 broches	7-E
Position de montage	Toutes

Capacités directes interélectrodes :

Section triode :	Grille à plaque	2,0	$\mu\mu f$
	Grille à cathode	2,5	$\mu\mu f$
	Plaque à cathode	3,0	$\mu\mu f$
Section pentode :	Grille à plaque (avec blindage)	0,007	$\mu\mu f$ max.
	Entrée	3,2	$\mu\mu f$
	Sortie	12,5	$\mu\mu f$

Conditions de fonctionnement et caractéristiques :

	Section triode	Section pentode	
Tension de chauffage	6,3	6,3	6,3 volts
Tension plaque	100	100	250 volts max.
Tension grille	—3	—3	—3 volts
Tension grille écran	...	100	100 volts max.
Courant plaque	3,5	6,3	6,5 ma.
Courant écran	...	1,6	1,5 ma.
Résistance interne	16,200	290,000	850,000 ohms
Conductance mutuelle	525	1,050	1,100 μmhos
Coefficient d'amplification ...	8,5	300	900
Conductance mutuelle à —35 V. de polarisation	...	9	10 μmhos

UTILISATION EN CONVERTISSEUR DE FREQUENCE

	Sect. triode	Sect. pentode
Tension de chauffage	6,3	6,3 volts
Tension plaque	100	250 volts max.
Tension grille	...	—10 volts
Tension écran	...	100 volt max.
Courant plaque	2,4	2,8 ma.
Courant grille	0,15	0 ma.
Courant écran	...	0,6 ma.
Résistance interne	...	2 mégohms
Tension de pointe d'oscillation	...	7 volts
Conductance de conversion	...	300 μmhos

APPLICATION.

Le tube Sylvania 6F7 est un tube à chauffage indirect constitué par une section triode et une section pentode enfermées dans la même ampoule. A l'exception de la cathode qui est commune, les électrodes de chaque section ont des sorties indépendantes, ce qui permet l'adaptation à des circuits variés.

La section pentode peut fonctionner en H.F. (ou M.F.) et la section triode comme détecteur polarisé. Si l'A. V. C. est à employer, ou si la polarisation de grille de la pentode doit varier, la polarisation de grille de la triode doit être obtenue d'une source séparée. Ceci est nécessaire pour éviter que la variation du courant cathodique de la section pentode n'influe sur la polarisation de la section triode. Le couplage de la triode avec le tube suivant se fait généralement par résistance. Avec une tension d'alimentation anodique de 250 volts, une polarisation de 24 volts convient, ainsi qu'une résistance de charge de 250,000 ohms.

Le tube 6F7 peut encore fonctionner en convertisseur de fréquence, la section triode comme oscillatrice, la section pentode comme première détectrice.

Dans ce cas, la résistance de fuite de grille oscillatrice doit être connectée à la cathode. *Le courant plaque de la section triode ne peut pas dépasser 4 millampères sans réduire considérablement la vie du tube.* La polarisation de la détectrice sera réglée de telle sorte que sa valeur minimum dépasse la tension de pointe d'oscillation d'au moins 3 volts. Il est préférable d'utiliser un tube 6A7 pour la conversion de fréquence.

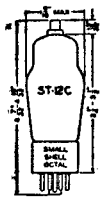
La section triode peut être utilisée comme détecteur par la grille. Mais la détection par la courbure de la caractéristique de plaque doit lui être préférée. Grille et plaque peuvent être raccordées, la triode fonctionnant alors comme diode; cependant, un meilleur isolement est obtenu avec un tube tel que le 6B7.



Sylvania

TYPE 6F8G

TRIODE
JUMELLE



CARACTERISTIQUES

Tension chauffage CA ou CC	6,3 volts
Courant chauffage	0,6 ampères
Ampoule	ST-12C
Capuchon	Miniature
Socket : petit octal 8 broches	8-G
Position de montage	Toutes

Capacités interélectrodes :

Grille à plaque	4,0*	3,6°	$\mu\mu f$
Grille à cathode	3,2*	3,0°	$\mu\mu f$
Plaque à cathode	3,2*	3,8°	$\mu\mu f$
Grille à grille		0,2	$\mu\mu f$
Plaque à plaque		0,4	$\mu\mu f$
Grille reliée au sommet à plaque de l'autre triode		0,1	$\mu\mu f$

*Section triode dont la grille est connectée au sommet.
° Section triode dont la grille est connectée à une broche.

Conditions limites de fonctionnement. (Voir page 9) :

Tension chauffage CA ou CC	6,3 volts
Courant chauffage	0,6 ampère
Tension plaque	300 volts max.
Dissipation plaque (par plaque)	2,5 watts max.
Tension grille	0 volt min.

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A1		
Tension de chauffage	6,3	6,3 volts
Tension plaque	9,0	250 volts
Tension grille	0	—8 volts
Courant plaque	10,0	9 ma.
Résistance interne	6,700	7,700 ohms
Conductance mutuelle	3,000	2,600 μmhos
Coefficient d'amplification	20	20

Fonctionnement type en inverseur de phase :

Tension d'alimentation de plaque	100	250 volts
Tension grille	—2,25	—5,5 volts
Courant plaque par section	1,5	2,4 ma.
Résistance de charge par plaque	30,000	50,000 ohms
Résistance de polarisation automatique	750	1,150 ohms
Amplification de tension (approx.)	26	29
Tension efficace utile maximum	20	65 volts ap.

APPLICATION.

Le type Sylvania 6F8G est un amplificateur à triodes jumelles qui consiste essentiellement en deux types 6J5G montés dans la même ampoule. Les caractéristiques électriques d'une section sont très voisines de celles du 6J5G, de sorte que les notes sur l'application de ce dernier type sont applicables au 6F8G. Les plaque, grille et cathode de chaque section, sont raccordées séparément aux broches du culot permettant ainsi l'adaptation à des circuits spéciaux. La tension entre cathode et filament doit être maintenue aussi faible que possible lorsque la connexion directe entre ces électrodes n'est pas possible.

Pour le fonctionnement en inversion de phase, la tension de plaque est égale à la tension d'alimentation, moins la chute de tension dans la résistance de charge. La résistance de polarisation automatique ne nécessite pas de condensateur by-pass lorsque le tube 6F8G est utilisé en inverseur de phase. Les valeurs fournies pour l'amplification de tension sont les tensions mesurées entre plaques, pour un signal de 1 volt appliqué à la grille de la section d'entrée. La valeur de la résistance de retour de grille du tube suivant sera déterminée par le type de ce tube, mais ne sera jamais inférieur à deux fois la résistance interne du 6F8G, afin d'éviter une distorsion sérieuse.

En fonctionnement, la température du tube 6F8G est plus élevée que celle des autres tubes ayant la même ampoule. Pour cette raison, il est recommandé de loger le 6F8G dans un endroit ventilé. Si un échauffement excessif est rencontré à cause du manque de ventilation, une attention spéciale doit être donnée aux valeurs de la polarisation grille et de la résistance grille, pour éviter toute possibilité d'émission de grille.

Pour l'utilisation en amplificateur en cascade, il est recommandé que la section triode dont la grille est raccordée au sommeil de l'ampoule soit utilisée comme 1er étage en vue de réduire le bourdonnement.

6FM7

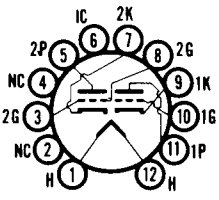
13FM7, 15FM7

Color Television Type

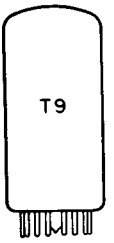
VERTICAL DEFLECTION OSCILLATOR and AMPLIFIER

Double Dissimilar Triode

Construction.....Compactron T-9
Base .....Button 12 Pin, E12-70
Basing 12EJ
Outline 9-58
Maximum Diameter .....1.188 In.
Maximum Seated Height .....2.000 In.
Maximum Overall Height .....2.375 In.



12EJ



ELECTRICAL DATA

HEATER OPERATION

	15FM7	13FM7	6FM7
Heater Voltage	14.8	13.0	6.3 Volts
Heater Current	450	450	1005 Ma
Heater Warm-up Time	11	11	— Seconds
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
Total DC and Peak			200 Volts
Heater Positive with Respect to Cathode			
DC			100 Volts
Total DC and Peak			200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

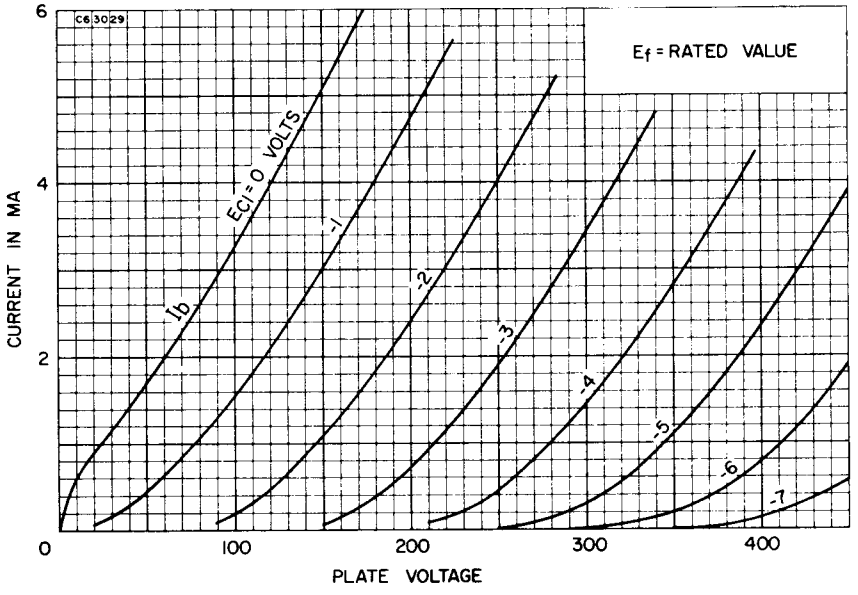
	Section No. 1	Section No. 2
Grid to Plate	4.0	7.0 Pf
Input: g to (h + k)	2.4	7.0 Pf
Output: p to (h + k)	0.40	1.1 Pf

RATINGS (Design Maximum Rating System)

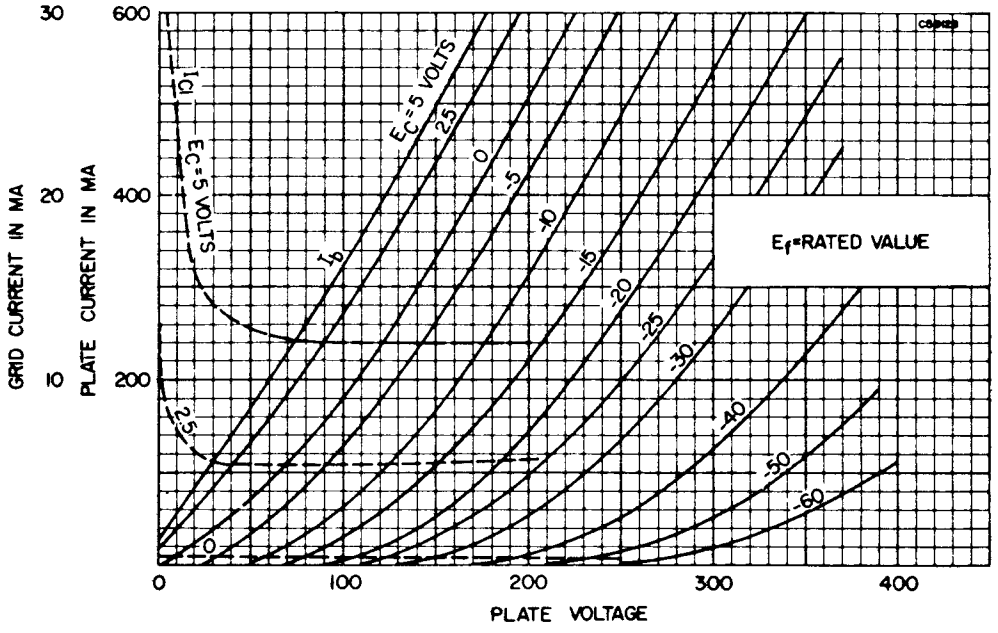
Vertical Deflection Oscillator and Amplifier[1]

	Section[2] No. 1 Oscillator	Section[2] No. 2 Amplifier
Plate Voltage (Max.)	350	550 Volts
Peak Positive Pulse Plate Voltage (Max.)	—	1500 Volts
Peak Negative Pulse Grid Voltage (Max.)	400	250 Volts
Plate Dissipation (Max.)[3]	1.0	10 Watts
Average Cathode Current (Max.)	—	50 Ma
Peak Cathode Current (Max.)	—	175 Ma
Grid Circuit Resistance, Self Bias (Max.)	2.2	2.2 Megohms

AVERAGE PLATE CHARACTERISTICS
(Section No. 1)



AVERAGE PLATE CHARACTERISTICS
(Section No. 2)



CHARACTERISTICS AND TYPICAL OPERATION

	Section No. 1	Section No. 2
Plate Voltage	250	175 Volts
Grid No. 1 Voltage	−3	−25 Volts
Plate Current	2.0	40 Ma
Transconductance	2200	6000 μmhos
Amplification Factor	66	5.5
Plate Resistance (Approx.)	30,000	920 Ohms
Ec for Ib = 20 μa (Approx.)	−5.3	— Volts
Ec for Ib = 200 μa (Approx.)	—	−45 Volts

NOTES:

(1) For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations; Federal Communications Commission," the duty cycle of the voltage pulse not to exceed 15% of one horizontal scanning cycle.

(2) Section No. 1 connects to Pins 6, 7 and 8. Section No. 2 connects to Pins 1, 2, 3, and 9.

(3) In stages operating with grid leak bias, an adequate bias resistor or other suitable means is required to protect the tube in the absence of excitation.

ADVANCE DATA

The 9T9 design utilizes a T-9 (1 1/8" Dia.) bulb based to fit a standard 9-pin miniature socket. Advantages of the 9T9 include an increase in the heat dissipation safety margin, as compared to 9-pin miniature tubes employing T-6½ (13/16" Dia.) bulbs.

MECHANICAL DATA

Bulb	Special, T-9
Base	9-Pin, E9-68
Outline	9-70
Basing	9HF
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

Heater Operation	Series	Series	Parallel	
Heater Voltage	9.7	13.0	6.3[1]	Volts
Heater Current	600[1]	450[1]	925	Ma
Heater Warm-up Time[2]	11	11	-	Seconds

Ratings (Design Maximum Values)

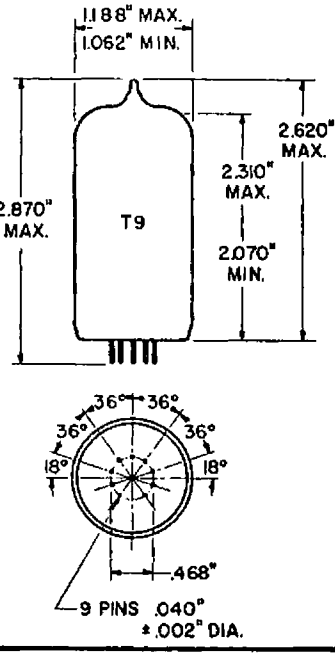
	Min-Max	Min-Max	Min-Max	
Heater Voltage[3]	- -	- -	5.7-6.9	Volts
Heater Current[3]	560-640	420-480	- -	Ma
Maximum Heater-Cathode Voltage				
Heater Negative with Respect to Cathode				
Total DC and Peak	200	200	200	Volts
Heater Positive with Respect to Cathode				
DC	100	100	100	Volts
Total DC and Peak	200	200	200	Volts

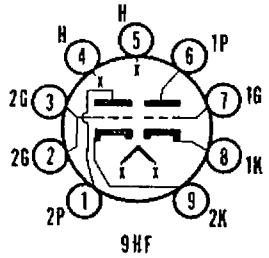
DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section No. 1	Section No. 2	
Grid to Plate	4.6	8.0	µµf
Input: g to (h+k)	2.4	7.5	µµf
Output: p to (h+k)	0.30	1.2	µµf

QUICK REFERENCE DATA

The Sylvania Types 6FR7, 10FR7 and 13FR7 are dissimilar-section double triodes featuring the 9T9 bulb and pin configuration. They are designed to serve the combined functions of vertical deflection oscillator and amplifier.





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RATINGS (Design Maximum Values)

Vertical Deflection Oscillator and Amplifier[4]

	Section[5] No. 1 Oscillator	Section[5] No. 2 Amplifier		
Plate Voltage	330	330	Volts	Max.
Peak Positive Pulse Plate Voltage	-	1500	Volts	Max.
Peak Negative Pulse Grid Voltage	400	250	Volts	Max.
Plate Dissipation[6]	1.5	10	Watts	Max.
Average Cathode Current	22	50	Ma	Max.
Peak Cathode Current	77	175	Ma	Max.
Grid Circuit Resistance				
Self Bias	2.2	2.2	Megohms	

AVERAGE CHARACTERISTICS

	Section No. 1	Section No. 2	
Plate Voltage	250	150	Volts
Grid No. 1 Voltage	-3	-20	Volts
Plate Current	1.4	50	Ma
Transconductance	1600	7200	µmhos
Amplification Factor	68	5.4	
Plate Resistance (Approx.)	40,000	750	Ohms
Ec for Ib = 10 µa (Approx.)	-5.5	-	Volts
Ec for Ib = 100 µa (Approx.)	-	-45	Volts
Ib at Ec = -28 Vdc (Approx.)	-	10	Ma
Ib with Eb = 60 V and Ec = 0 V (Instantaneous Values)	-	95	Ma

NOTES:

1. For series/parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current/voltage.

2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

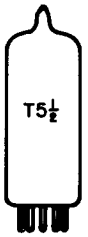
3. Heater voltage supply variations shall be restricted to maintain heater voltage/current within the specified values.

NOTES: (Cont'd)

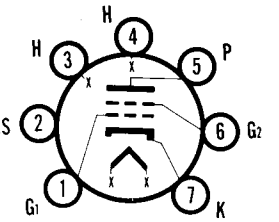
4. For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Stations; Federal Communications Commission". The duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.

5. Section No. 1 connects to Pins 6, 7 and 8. Section No. 2 connects to Pins 1, 2, 3 and 9.

6. In stages operating with grid leak bias, an adequate bias resistor or other suitable means is required to protect the tube in the absence of excitation.



SYLVANIA TYPE 6FV6



7FQ

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7FQ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	200 Ma
Peak Heater-Cathode Voltage (Design Maximum Values)[2]	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
D C	100 Volts Max.
Total D C and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[3]

Grid No. 1 to Plate	0.03 $\mu\mu$f Max.
Input	4.5 $\mu\mu$f
Output	3.0 $\mu\mu$f

MAXIMUM RATINGS (Design Maximum Values)

Plate Voltage	275 Volts
Grid No. 2 Supply Voltage	180 Volts
Grid No. 2 Voltage	See 6AM8 Rating Chart
Positive Grid No. 1 Voltage	0 Volts
Plate Dissipation	2.0 Watts
Grid No. 2 Input	0.5 Watts
Cathode Current	20 Ma
Grid No. 1 Circuit Resistance (Self Bias)	0.5 Megohms

CHARACTERISTICS AND TYPICAL OPERATION

Plate Voltage	125 Volts
Grid No. 2 Voltage	80 Volts
Grid No. 1 Voltage	−1 Volt
Plate Current	10 Ma
Grid No. 2 Current	1.5 Ma
Transconductance	8000 μmhos
Plate Resistance	0.1 Megohm
Ec1 for Ib = 20 μa (approx.)	−6 Volts

NOTES:

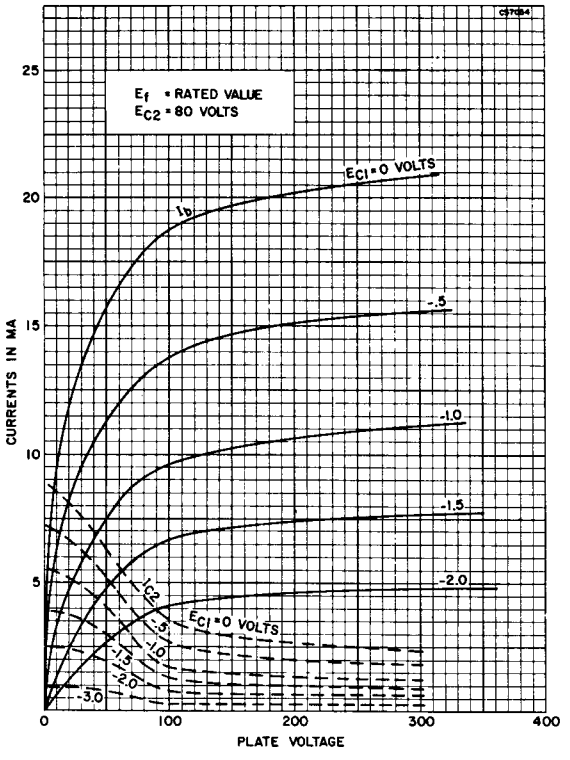
1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
2. Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.
3. Shield No. 316 connected to cathode.

APPLICATION

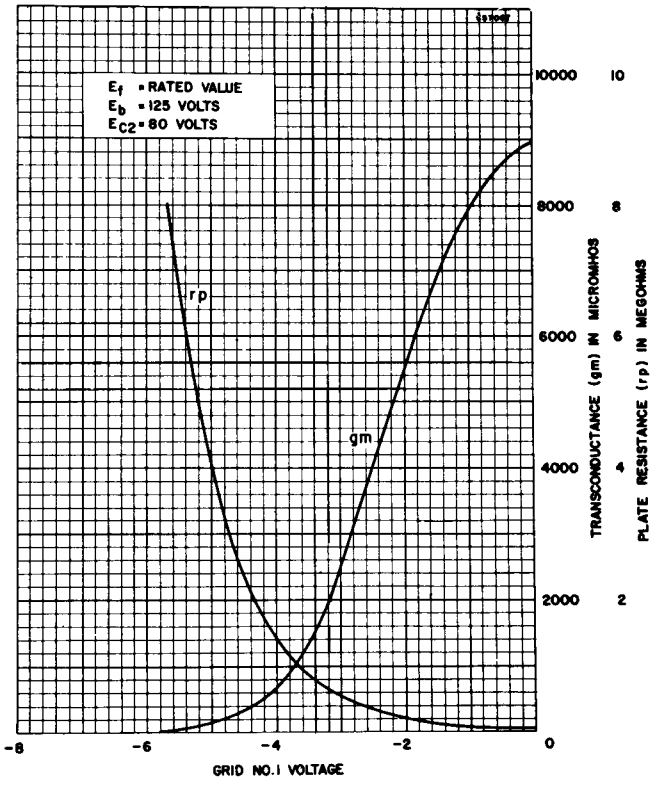
The Sylvania Type 6FV6 is a miniature, sharp cutoff tetrode designed particularly for service as a vhf amplifier in television tuners.

SYLVANIA TYPE 6FV6 (Cont'd)

AVERAGE PLATE CHARACTERISTICS

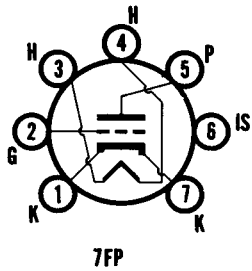


AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPE 6FY5
3FY5
2FY5



7FP

VHF TRIODE

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7FP
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	2FY5	3FY5	6FY5	
Heater Voltage	2.4	3.1	6.3	Volts
Heater Current	600	450	200	
Heater Warm-up Time[1]	11	11		Seconds
Heater-Cathode Voltage				
Heater Neg. with Respect to Cathode				
Total D C and Peak	100	100	100	Volts Max.
Heater Pos. with Respect to Cathode				
Total D C and Peak	100	100	100	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded	Unshielded
Grid to Plate	0.48	0.5 μμf Max.
Input	4.75	4.75 μμf
Output	4.3	3.3 μμf
Grid to Heater	0.28	0.28 μμf Max.
Plate to Cathode	0.21	0.25 μμf
Grid to Heater	3.2	3.2 μμf
Cathode to Heater	2.5	2.5 μμf

RATINGS (Absolute Maximum Values)

Plate Voltage	200 Volts Max.
Plate Dissipation	2.2 Watts Max.
Cathode Current	20 Ma Max.
Negative Grid Voltage	50 Volts Max.
Grid Circuit Resistance	1.0 Megohms Max.
Cathode Heater Circuit Resistance	20,000 Ohms Max.

CHARACTERISTICS AND TYPICAL OPERATIONS
Class A1 Amplifier

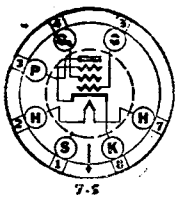
Plate Voltage	135	135	135	135 Volts
Grid Voltage	-4.5	-5	-3.1	-1.0 Volts
Plate Current	0.1	—	—	11 Ma
Transconductance	—	125	625	13,000 μmhos
Amplification Factor	—	—	—	70

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.

APPLICATION

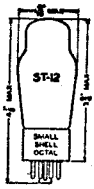
The Sylvania Types 6FY5, 3FY5, and 2FY5 are remote cutoff triodes designed for use as VHF RF amplifiers. Features of the design include: A partial shield between the grid and plate which lowers the capacitance between these two elements and promotes ease of neutralization; low input capacitance; and higher input impedance by virtue of dual cathode leads.



Sylvania

TYPE 6G6G

AMPLIFICATEUR
PENTODE DE PUISSANCE



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,15 ampères
Ampoule	ST-12
Culot — Petit octal 7 broches	T-S.
Position de montage	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension chauffage CA ou CC	6,3 volts
Courant chauffage	0,150 ampère
Tension plaque	180 volts max,
Tension grille écran	180 volts max.
Dissipation plaque	2,75 watts max.
Dissipation écran	0,75 watts max.

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A1

	Triode**	Pentode	
Tension de chauffage	6,3	6,3	6,3 volts
Tension plaque	180	135	180 volts
Tension grille écran	—	135	180 volts
Tension grille*	—12	—6,0	—9,0 volt
Courant plaque	11	11,5	15,0 ma.
Courant grille écran	—	2,0	2,5 ma.
Résistance interne	4,750	170,000	175,000 ohms
Conductance mutuelle	2,000	2,100	2,300 μmhos
Cœfficient d'amplification ...	9,5	360	400
Résistance de charge	12,000	12,000	10,000 ohms
Puissance utile	0,25	0,6	1,1 watt
Distorsion harmonique totale ...	5	7,5	10 pour cent

* Voir application.

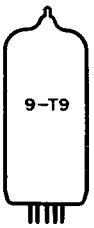
** Avec grille-écran reliée à la plaque.

APPLICATION

Le type 6G6G est un amplificateur pentode de puissance dont le filament absorbe un courant de 150 ma. seulement. Il est destiné à être utilisé dans des étages de sortie où le rendement maximum est désirable et où une puissance modulée élevée n'est pas requise. Ce tube n'est pas recommandé pour service automobile.

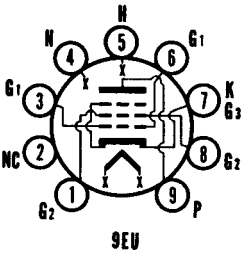
Le couplage par transformateur ou impédance est recommandé. Si on utilise le couplage par résistance, la résistance de grille cc doit être limitée à 0,5 mégohm, que la polarisation soit automatique ou fixe, pourvu que la tension plaque soit de 135 volts. Si la tension plaque est 180 volts, la résistance de grille ne peut pas dépasser 0,5 mégohm en polarisation automatique et 0,005 mégohm en polarisation fixe.

La tension de chauffage ne pourra pas dépasser de plus de ... la tension normale, et la différence de potentiel entre ... et cathode doit être maintenue aussi faible que pos... dans le cas où la connexion directe entre ces électrodes ... pas réalisée.



SYLVANIA TYPE 6GC5

BEAM POWER PENTODE



The 9T9 design utilizes a T-9 (1⅛" Dia.) bulb based to fit a standard 9-pin miniature socket. Advantages of the 9T9 include an increase in the heat dissipation safety margin, as compared to 9-pin miniature tubes employing T-6½ (⅝" Dia.) bulbs.

MECHANICAL DATA

Bulb	Special, T-9
Base	9-Pin, Same as E9-1, except Bulb Dia. (E9-68)
Outline	9-71
Basing	9EU
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Characteristics

Heater Voltage[1]	6.3 Volts
Heater Current[2]	1.2 Ma
Ratings (Design Maximum Values)	
Heater Voltage[3]	6.3 ± 0.6 Volts
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
D C	100 Volts Max.
Total D C and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Approx.)

Grid No. 1 to Plate	0.9 μμf
Input: g1 to (h + k, g3 + g2)	18 μμf
Output: p to (h + k, g3 + g2)	7 μμf

RATINGS (Design Maximum Values)

Plate Voltage	220 Volts Max.
Grid No. 2 Voltage	140 Volts Max.
Plate Dissipation	12 Watts Max.
Grid No. 2 Dissipation	1.4 Watts Max.
Grid No. 1 Circuit Resistance	
Fixed Bias	0.1 Megohm Max.
Cathode Bias	0.5 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATIONS

Class A1 Amplifier (Single Tube)

Plate Voltage	110	200 Volts
Grid No. 2 Voltage	110	125 Volts
Grid No. 1 Voltage	−7.5	— Volts
Cathode Resistor	—	180 Ohms
Peak AF Grid No. 1 Voltage	7.5	8.5 Volts
Zero Signal Plate Current	49	46 Ma
Max. Signal Plate Current	50	47 Ma
Zero Signal Grid No. 2 Current	4	2.2 Ma
Max. Signal Grid No. 2 Current	10	8.5 Ma
Transconductance	8000	8000 μmhos
Plate Resistance (approx.)	13,000	28,000 Ohms
Load Resistance	2000	4000 Ohms
Max. Signal Power Output	2.1	3.8 Watts
Total Harmonic Distortion (approx.)	10	10 Percent

NOTES:

1. For parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater voltage.
2. The bogey value of current is obtained when operating the heater at the specified 6.3 volts.
3. Heater voltage supply variations shall be restricted to maintain heater voltage within the specified tolerance.

APPLICATION

The Sylvania Type 6GC5, beam power pentode, features high power sensitivity as an audio power amplifier. In Class A1 operation, it can deliver 2.1 watts of power with a B+ voltage of only 110 volts.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9GF
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

	Parallel Operation
Heater Voltage[1]	6.3 Volts
Heater Current	380 Ma

Ratings (Design Maximum Values)

	Min.-Max.	
Heater Voltage[2]	5.7-6.9	Volts
Maximum Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
Total DC and Peak	100	Volts
Heater Positive with Respect to Cathode		
Total DC and Peak	100	Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section

Grid to Plate	2.3	µµf
Input: g to (h+k,Pk,g3,I.S.)	3.0	µµf
Output: p to (h+k,Pk,g3,I.S.)	1.2	µµf

Pentode Section

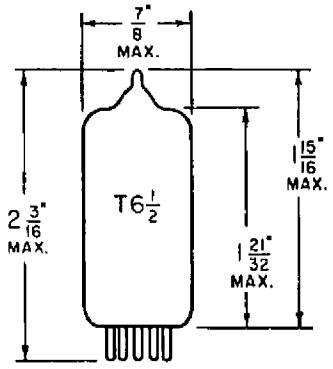
Grid No. 1 to Grid No. 2	1.7	µµf
Grid No. 1 to Plate	.025	µµf Max.
Input: g1 to (h+Tk,K,g3,g2+I.S.)	6.0	µµf
Output: p to (h+Tk,K,g3,g2+I.S.)	3.5	µµf

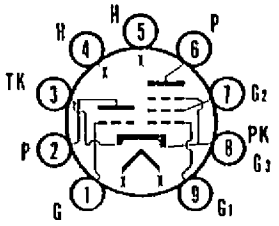
Coupling

Pentode Grid No. 1 to Triode Plate	.05	µµf Max.
Pentode Plate to Triode Plate	.03	µµf Max.

QUICK REFERENCE DATA

The Sylvania Type 6GD7 has a medium mu triode and a sharp cutoff pentode contained in a miniature envelope. It is designed primarily for service as a VHF oscillator and mixer. The oscillator section features a Gm of 10,000 µmhos and the pentode section features a Gm of 12,000 µmhos.





9GF

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

June 29, 1962

146 (10-58)

from JEDEC release #3823, July 23, 1962

RATINGS (Design Maximum Values)

	Triode Section	Pentode Section		
Plate Voltage	125	250	Volts	Max.
Grid No. 2 Supply Voltage		250	Volts	Max.
Grid No. 2 Voltage		See J5/C4-2		
Plate Dissipation	2.2	2.2	Watts	Max.
Grid No. 2 Dissipation				
For Grid No. 2 Voltages up to 150 Volts		0.55	Watt	Max.
For Grid No. 2 Voltages between 150 and 250 Volts		See J5/C4-2		
Cathode Current	16.5	20	Ma	Max.
Grid No. 1 Circuit Resistance	0.5		Megohm	Max.
Fixed Bias		0.25	Megohm	Max.
Self Bias		0.5	Megohm	Max.

Control grid to cathode spacings on this type are of such low order of magnitude as to preclude the use of voltage between these elements of more than 30 volts dc or peak ac in commercial tube checkers and shorts indicating devices, particularly where mechanical excitation of the tube is employed.

AVERAGE CHARACTERISTICS

	Triode Section	Pentode Section	
Plate Voltage	125	170	Volts
Grid No. 2 Voltage		150	Volts
Grid No. 1 Voltage	-1.0	0	Volts
Cathode Bias Resistor		82	Ohms
Plate Current	15	10	Ma
Grid No. 2 Current		3.3	Ma
Transconductance	10,000	12,000	µmhos
Amplification Factor	47	70	(G1 to G2)
Plate Resistance (Approx.)	4,700	350,000	Ohms
Ec1 for Ib = 20 µa (Approx.)	-	-5	Volts

NOTES:

1. For parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater voltage.

2. Heater voltage supply variations shall be restricted to maintain heater voltage within the specified values.

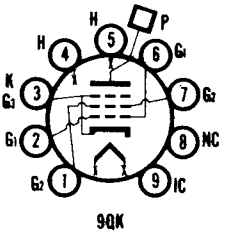
6GJ5

12GJ5, 17GJ5

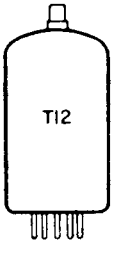
HORIZONTAL DEFLECTION AMPLIFIER

Beam Power Pentode

Construction .....Novar T-12
Base .....Novar Button 9 Pin, E9-76
Top Cap .....C1-2, C1-3 or C1-33
Basing 9QK
Outline 12-70
Maximum Diameter .....1.562 In.
Maximum Seated Height .....3.170 In.
Maximum Overall Height .....3.550 In.



9QK



ELECTRICAL DATA

HEATER OPERATION

	17GJ5	12GJ5	6GJ5
Heater Voltage	16.8	12.6	6.3 Volts
Heater Current	450	600	1200 Ma
Heater Warm-up Time	11	11	— Seconds

Maximum Heater-Cathode Voltage
- Heater Negative with Respect to Cathode
  - Total DC and Peak ..... 200 Volts
- Heater Positive with Respect to Cathode
  - DC ..... 100 Volts
  - Total DC and Peak ..... 200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	0.26 Pf
Input: g1 to (k + g3 + g2 + h)	15 Pf
Output: p to (k + g3 + g2 + h)	6.5 Pf

RATINGS (Design Maximum Rating System)

Horizontal Deflection Amplifier[1]

DC Plate Supply Voltage (Boost + DC Power Supply) (Max.)	770 Volts
Peak Positive Plate Voltage (Max.)	6500 Volts
Peak Negative Plate Voltage (Max.)	1500 Volts
Grid No. 2 Voltage (Max.)	220 Volts
Negative Grid No. 1 Voltage (Max.)	-55 Volts
Peak Negative Grid No. 1 Voltage (Max.)	330 Volts
Plate Dissipation (Max.)[2]	17.5 Watts
Grid No. 2 Input (Max.)	3.5 Watts
Average Cathode Current (Max.)	175 Ma
Peak Cathode Current (Max.)	550 Ma
Grid No. 1 Circuit Resistance (Max.)	1.0 Megohm
Bulb Temperature (At Hottest Point) (Max.)	240 °C

CHARACTERISTICS AND TYPICAL OPERATION

Plate Voltage	250 Volts
Grid No. 2 Voltage	150 Volts
Grid No. 1 Voltage	−22.5 Volts
Plate Current	70 Ma
Grid No. 2 Current	2.1 Ma
Transconductance	7100 μmhos
Amplification Factor(3)	4.4
Plate Resistance	15,000 Ohms
Ec1 for Ib = 1 Ma (Approx.)	−42 Volts

INSTANTANEOUS PLATE KNEE VALUES

Eb = 60 V, Ec2 = 150 V and Ec1 = 0 V;
Ib = 390 Ma; and Ic2 = 32 Ma

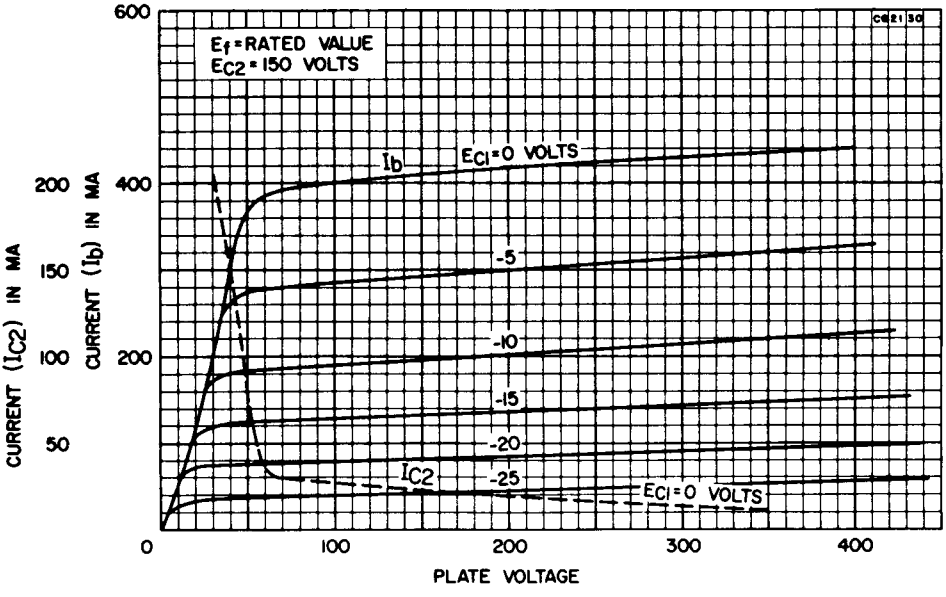
NOTES:

(1) For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations; Federal Communications Commission," the duty cycle of the voltage pulse must not exceed 15% of one horizontal scanning cycle.

(2) In stages operating with grid leak bias, an adequate cathode bias resistor or other suitable means is required to protect the tube in the absence of excitation.

(3) Amplification factor with tube operating as a triode with 150 volts on the plate and Grid No. 2 and −22.5 volts on Grid No. 1.

AVERAGE PLATE CHARACTERISTICS



HORIZONTAL DEFLECTION AMPLIFIER

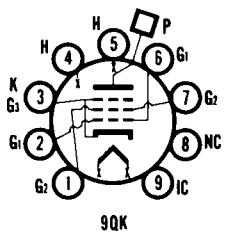
6GJ5A

12GJ5A, 17GJ5A

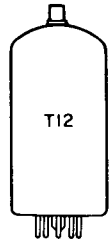
Beam Power Pentode

Construction	Novar T-12
Base	Novar Button 9 Pin, E9-88 (Exhaust Tip on Base)
Top Cap	C1-2, C1-3 or C1-33
Basing	9QK
Outline	
Maximum Diameter	1.562 In.
Maximum Seated Height	3.125 In.
Maximum Overall Height	3.505 In.

The 6GJ5A, 12GJ5A, and 17GJ5A are identical to the 6GJ5, 12GJ5, and 17GJ5 except for base with exhaust tip at bottom and shorter bulb.



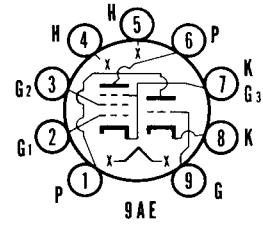
9QK





SYLVANIA TYPE 6GJ8

TRIODE-PENTODE



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9AE
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	6.3 Volts
Heater Current[4]	600 Ma
Heater Warm-up Time[1]	11 Seconds
Max. Heater Voltage Range (Parallel Supply)[2]	5.7-6.9 Volts
Max. Heater Current Range (Series String Supply)[2]	560-640 Ma
Heater-Cathode Voltage (Design Maximum System)	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
D C	100 Volts Max.
Total D C and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[5]	Unshielded
Triode Section		
Grid to Plate	2.6	2.6 μμf
Input: g to (h+k+Pk, g3, I.S.)	3.6	3.4 μμf
Output: p to (h+k+Pk, g3, I.S.)	2.4	1.6 μμf
Pentode Section		
Grid No. 1 to Plate	0.025	0.036 μμf Max.
Input: g1 to (h+k, g3, I.S. + g2)	8.0	8.0 μμf
Output: p to (h+k, g3, I.S. + g2)	3.2	2.4 μμf

RATINGS (Design Maximum System)

	Triode Section	Pentode Section
Plate Voltage	330	330 Volts Max.
Grid No. 2 Voltage	See 6AM8 Rating Chart	
Grid No. 2 Supply Voltage	—	330 Volts Max.
Positive Grid Voltage	0	0 Volts Max.
Plate Dissipation	2.5	2.5 Volts Max.
Grid No. 2 Dissipation	—	0.55 Watt Max.
Grid No. 1 Circuit Resistance		
Fixed Bias	1.0	— Megohm Max.
Self Bias	2.2	— Megohms Max.

CHARACTERISTICS AND TYPICAL OPERATION

	Triode Section	Pentode Section
Class A1 Amplifier		
Plate Voltage	125	125 Volts
Grid No. 2 Voltage	—	125 Volts
Grid No. 1 Voltage	-1.0	-1.0 Volts
Plate Current	13.5	12 Ma
Grid No. 2 Current	—	4.5 Ma
Transconductance	8500	7500 μmhos
Amplification Factor	40	—
Plate Resistance (approx.)	5000	150,000 Ohms
Ec1 for Ib = 20 μa (approx.)	-9	-6.5 Volts

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.
2. Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined

by its published data, and should not be exceeded under the worst probable conditions.
The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.
The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.

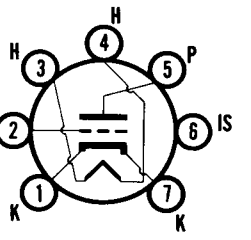
3. For parallel heater operation, equipment should be designed so that at normal supply voltage bogey tubes will operate at this value of heater voltage.
4. For series heater operation, equipment should be designed so that at normal supply voltage bogey tubes will operate at this value of heater current.
5. With external JEDEC No. 315 shield connected to cathode of section under test.

APPLICATION

The Sylvania Type 6GJ8 is a miniature tube which contains a sharp cutoff pentode and a medium mu triode in one envelope.
The pentode section is intended primarily for service as an oscillator in the horizontal deflection system of television receivers.
Type 6GJ8 has controlled heater warm-up time for series string operation.



SYLVANIA TYPES 6GK5 3GK5 2GK5



7FP

VHF HI GM TRIODE

The Sylvania Types 2GK5, 3GK5 and 6GK5 measured under grounded plate conditions yield an Input Resistance of 275 Ohms and an Input Capacitance of 11.2 $\mu\mu$f at 200 Mc. Noise measurements yield a Noise Figure of 4.7 db at 200 Mc in an optimized triode RF amplifier stage, noise matched.

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7FP
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics Heater Operation	2GK5 Series	3GK5 Series	6GK5 Parallel	
Heater Voltage	2.3	2.8	6.3[1]	Volts
Heater Current	600[1]	450[1]	180	Ma
Heater Warm-up Time[2]	11	11	...	Seconds
Ratings (Design Maximum Values)	**Min-Max**	**Min-Max**	**Min-Max**	
Heater Voltage[3]	.....	.....	5.7 - 6.9	Volts
Heater Current[3]	560-640	420-480	.. ..	Ma
Maximum Heater-Cathode Voltage				
Heater Negative with Respect to Cathode				
Total D C and Peak	100	100	100	Volts
Heater Positive with Respect to Cathode				
Total D C and Peak	100	100	100	Volts

DIRECT INTERELECTRODE CAPACITANCES (Shielded)

Grid to Plate	0.52 $\mu\mu$f
Input: g to (h+k+I.S.+E.S.)	5.0 $\mu\mu$f
Output: p to (h+k+I.S.+E.S.)	3.5 $\mu\mu$f
Heater to Cathode	2.5 $\mu\mu$f

RATINGS (Design Maximum Values)

Plate Voltage	200 Volts Max.
Plate Dissipation	2.5 Watts Max.
D C Cathode Current	22 Ma Max.
Negative Grid Voltage	50 Volts Max.
Grid Circuit Resistance (Self Bias)	1.0 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

Plate Voltage	135 Volts
Grid Voltage	−1.0 Volts
Plate Current	11.5 Ma
Transconductance	15,000 μmhos
Amplification Factor	78
Plate Resistance (approx.)	5400 Ohms
Ec for Gm = 150 μmhos (approx.)	−4.2 Volts
Ec for Gm = 1500 μmhos (approx.)	−2.5 Volts
Hot Input Resistance (200 Mc)[4]	275 Ohms
Hot Input Capacitance (200 Mc)[4]	11.2 $\mu\mu$f
Noise Figure (200 Mc)[5]	4.7 db

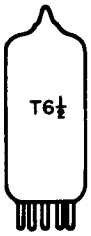
NOTES:

1. For series/parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current/voltage.
2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
3. Heater voltage supply variations shall be restricted to maintain heater voltage/current within the specified values.
4. Measured under grounded plate conditions.
5. Optimized neutralized triode RF amplifier stage, noise matched.

SYLVANIA TYPES 6GK5 (Cont'd)
3GK5
2GK5

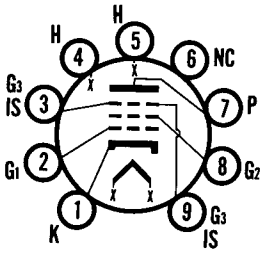
APPLICATION

The Sylvania Types 2GK5, 3GK5 and 6GK5 are frame grid gain controlled triodes designed for use as VHF RF amplifiers at a B+ of 135 volts. Features of the design include: A partial shield between the grid and plate which lowers the capacitance between these two elements and promotes ease of neutralization; low input capacitance; and higher input impedance by virtue of dual cathode leads.



SYLVANIA TYPE 6GK6

BEAM POWER PENTODE



9GK

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-4
Basing	9GK
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Characteristics

Heater Voltage[1]	6.3 Volts
Heater Current[2]	760 Ma

Ratings (Design Maximum Values)

Heater Voltage[3]	6.3 ± 0.6 Volts
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total D C and Peak	100 Volts Max.
Heater Positive with Respect to Cathode	
Total D C and Peak	100 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

Grid No. 1 to Plate	0.14 μμf Max.
Input	10 μμf
Output	7 μμf

RATINGS (Design Maximum Values)

Plate Voltage[4]	330 Volts Max.
Grid No. 2 Voltage[4]	330 Volts Max.
Negative Grid No. 1 Voltage	100 Volts Max.
Plate Dissipation	13.2 Watts Max.
Grid No. 2 Dissipation (Average)	2 Watts Max.
Grid No. 2 Dissipation (Peak)	4 Watts Max.
Cathode Current	65 Ma Max.
Grid No. 1 Circuit Resistance	
Fixed Bias	0.3 Megohm Max.
Cathode Bias	1.0 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

	Pentode Operation		
	Single Tube Class A1	Class AB1 Push-Pull	
Plate Voltage	250	250	300 Volts
Grid No. 2 Voltage	250	250	300 Volts
Grid No. 1 Voltage	-7.3	—	— Volts
Cathode Resistor	135	130	130 Ohms
Grid Voltage (RMS) Per Grid	4.3	8	10 Volts
Plate Current (Zero Signal)	48	62	72 Ma
Plate Current (Max. Signal)	49.5	75	92 Ma
Grid No. 2 Current (Zero Signal)	5.5	7.0	8 Ma
Grid No. 2 Current (Max. Signal)	10.8	15	22 Ma
Transconductance	11.3K	—	— μmhos
Amplification Factor[5]	19	—	—
Plate Resistance	38K	—	— Ohms
Load Resistance	5.2K	—	— Ohms
Load Resistance (Plate to Plate)	—	8K	8K Ohms
Maximum-Signal Power Output	5.7	11	17 Watts
Total Harmonic Distortion	10	3.0	4.0 Percent

NOTES:

1. For parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater voltage.
2. The bogey value of current is obtained when operating the heater at the specified 6.3 volts.
3. Heater voltage supply variations shall be restricted to maintain heater voltage within the specified tolerance.

4. When the heater and positive voltages are obtained from a storage battery by means of a vibrator, the maximum values of the plate and Grid No. 2 Voltages are 275 volts and that of the plate dissipation 9.9 watts.
5. Measured from Grid No. 2 to Plate.

APPLICATION

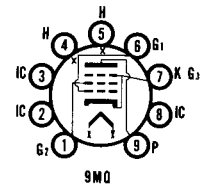
The Sylvania Type 6GK6 is a beam power pentode audio Amplifier designed for service in the output stage of high quality audio amplifiers or other equipment requiring high power output at relative low distortion.

AUDIO POWER AMPLIFIER

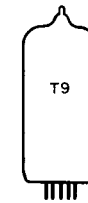
6GM5

Beam Power Pentode

Construction 9-T9
Base .....Button 9 Pin, E9-68
Basing 9MQ
Outline 9-71
Maximum Diameter .....1.188 In.
Maximum Seated Height .....2.920 In.
Maximum Overall Height .....3.230 In.



9MQ



ELECTRICAL DATA

HEATER OPERATION

Heater Voltage	6.3 Volts
Heater Current	800 Ma
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.13 Pf
Input	9.0 Pf
Output	4.0 Pf

RATINGS (Design Maximum Rating System)

Plate Voltage (Max.)	550 Volts
Grid No. 2 Voltage (Max.)	440 Volts
Plate Dissipation (Max.)	19 Watts
Grid No. 2 Dissipation (Max.)(1)	3.3 Watts
Cathode Current (Max.)	85 Ma
Grid No. 1 Circuit Resistance	
Fixed Bias (Max.)	0.3 Megohm
Self Bias (Max.)	1.0 Megohm

CHARACTERISTICS AND TYPICAL OPERATION

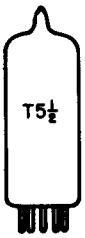
	Pentode Operation S.T.—Class A1 Amp.	Ultra-Linear Operation(2) Class AB1—Push-Pull	
Plate Voltage	300	400	425 Volts
Grid No. 2 Voltage	300	Note 2	Note 2 Volts
Grid No. 1 Voltage	−10	−20.5	— Volts
Cathode Resistor	—	—	185 Ohms
Peak A-F Grid Voltage	10	41	42 Volts
Zero-Signal Plate Current	60	80	88 Ma
Maximum-Signal Plate Current	75	138	104 Ma
Zero-Signal Grid No. 2 Current	8	11.5	13 Ma
Maximum Signal Grid No. 2 Current	15	26.4	17.5 Ma
Transconductance	10.2K	—	— μmhos
Plate Resistance (Approx.)	29K	—	— Ohms
Load Resistance	3K	—	— Ohms
Load Resistance (PL to PL)	—	6600	6600 Ohms
Power Output	11	32	26 Watts
Total Harmonic Distortion	13	1.0	2 Percent

Pentode Operation (Class AB1 Push-Pull Amp)

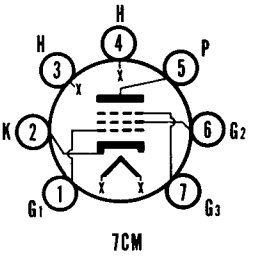
Plate Voltage	300	350	400	450	450	450 Volts
Grid No. 2 Voltage	300	350	350	350	400	400 Volts
Grid No. 1 Voltage	−12.5	−15.5	−16	−16.5	−21	— Volts
Cathode Resistor	—	—	—	—	—	200 Ohms
Peak A-F Grid Voltage	25	31	32	33	42	28 Volts
Zero-Signal Plate Current	86	92	85	77	66	82 Ma
Maximum-Signal Plate Current	116	130	143	153	144	94 Ma
Zero-Signal Grid No. 2 Current	12.6	13	11	9.6	9.4	11.5 Ma
Maximum-Signal Grid No. 2 Current	26	28.6	27	27	30	22 Ma
Load Resistance (PL to PL)	6600	6600	6600	6600	6600	9000 Ohms
Power Output	23	30	37	43	45	28 Watts
Total Harmonic Distortion	2.5	2	1.5	1.5	1.5	2 Percent

NOTES:

(1) Grid No. 2 dissipation may be permitted to reach 6 watts during the periods of maximum input of speech and music signals.
(2) Grid No. 2 tapped at 40% of the primary winding.



SYLVANIA TYPES 6GM6 4GM6 5GM6



MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7CM
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	4GM6	5GM6	6GM6
Heater Voltage	4.2	5.6	6.3 Volts
Heater Current	600	450	400 Ma
Heater Warm-up Time	11	11	— Seconds
Heater-Cathode Voltage (Design Maximum Values)			
Heater Negative with Respect to Cathode			
Total D C and Peak			200 Volts Max.
Heater Positive with Respect to Cathode			
D C			100 Volts Max.
Total D C and Peak			200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

	Unshielded
Grid No. 1 to Plate	.036 μμf Max.
Input: g1 to (h+k+g2+g3+I.S.)	10.0 μμf
Output: p to (h+k+g2+g3+I.S.)	2.4 μμf

RATINGS (Design Maximum Values)

Plate Voltage	330 Volts Max.
Grid No. 2 Supply Voltage	330 Volts Max.
Grid No. 2 Voltage	See 6AM8 Rating Chart
Positive Grid No. 1 Voltage	0 Volts Max.
Plate Dissipation	3.1 Watts Max.
Grid No. 2 Input	0.65 Watts Max.

CHARACTERISTICS AND TYPICAL OPERATION

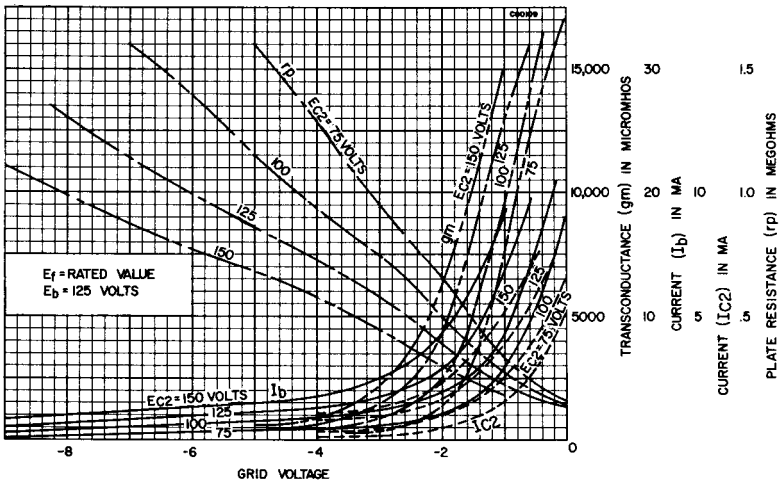
Class A1 Amplifier

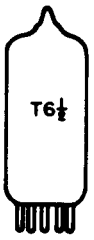
Plate Voltage	125 Volts
Grid No. 3	Tied to Cathode
Grid No. 2 Voltage	125 Volts
Cathode Bias Resistor	56 Ohms
Plate Current	14 Ma
Grid No. 2 Current	3.4 Ma
Transconductance	13,000 μmhos
Plate Resistance (approx.)	0.2 Megohm
Ec1 for Gm = 60 μmhos (approx.)	−15 Volts

APPLICATION

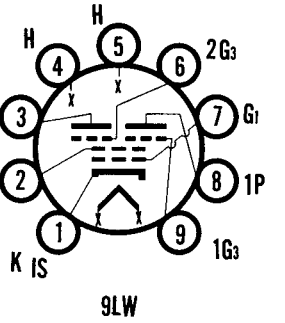
The Sylvania Type 6GM6, 4GM6 and 5GM6 are miniature high transconductance semi-remote pentodes designed for service as IF amplifiers. Types 4GM6 and 5GM6 are designed for series string operation.

AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPES 6GS8 / 4GS8 / 3GS8



DUAL CONTROL PENTODE

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-3
Basing	9LW
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	3GS8	4GS8	6GS8	
Heater Voltage	3.15	4.2	6.3	Volts
Heater Current	600	450	300	Ma
Heater Warm-up Time[1]	11	11	...	Seconds
Maximum Heater Current Range[2]	560-640	420-480	...	Ma
Maximum Heater Voltage Range[2]	...	...	5.7-6.3	Volts
Heater-Cathode Voltage (Design Max. Values)[2]				
Heater Negative with Respect to Cathode				
Total D C and Peak	200	200	200	Volts Max.
Heater Positive with Respect to Cathode				
D C	100	100	100	Volts Max.
Total D C and Peak	200	200	200	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 3 to Plate (Each Section)	2.0 $\mu\mu$f
Grid No. 1 to All	6.0 $\mu\mu$f
Grid No. 3 (Each Section) to All	3.8 $\mu\mu$f
Plate (Each Section) to All	3.2 $\mu\mu$f
Grid No. 3 (Section 1) to Grid No. 3 (Section 2)	0.015 $\mu\mu$f Max.

RATINGS (Design Maximum Values)[2]

Plate Voltage (Each Section)	300 Volts Max.
Grid No. 2 Voltage	150 Volts Max.
Positive D C Grid No. 3 Voltage (Each Section)	3.0 Volts Max.
Negative D C Grid No. 3 Voltage (Each Section)	50 Volts Max.
Peak Positive Grid No. 3 Voltage (Each Section)	50 Volts Max.
Negative D C Grid No. 1 Voltage	50 Volts Max.
Plate Dissipation (Each Section)	1.1 Watts Max.
Grid No. 2 Dissipation	0.75 Watts Max.
D C Cathode Current	12 Ma Max.
Grid No. 1 Circuit Resistance	0.5 Megohm Max.
Grid No. 3 Circuit Resistance (Each Section)	0.5 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

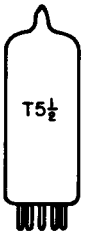
Both Sections Operating		
Plate Voltage (Each Section)	100	100 Volts
Grid No. 2 Voltage	67.5	67.5 Volts
Grid No. 3 Voltage (Each Section)	−10	0 Volts
Grid No. 1 Voltage	Note 3	Note 3
Plate Current (Each Section)		2.0 Ma
Grid No. 2 Current	6.0	3.6 Ma
Cathode Current	6.1	7.7 Ma
Each Section Operating Separately with Plate and Grid No. 3 of Opposite Section Grounded		
Plate Voltage	100	100 Volts
Grid No. 2 Voltage	67.5	67.5 Volts
Grid No. 3 Voltage	0	0 Volts
Grid No. 1 Voltage	0	Note 3
Plate Current		2.0 Ma
Grid No. 3 Transconductance		270 μmhos
Grid No. 1 Transconductance	1200	μmhos
Ec3 for Ib = 100 μa (approx.)		−3.7 Volts
Ec1 for Ib = 100 μa (approx.)		−2.0 Volts

NOTES:

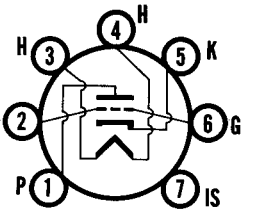
1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
2. Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.
3. Grid Current adjusted for 100 μa d c.

APPLICATION

The Sylvania Types 3GS8, 4GS8 and 6GS8 have dual pentodes with separate plates and separate No. 3 Grids contained in one envelope. They are primarily intended for service as a combined sync separator-clipper and AGC tube in television receivers. The 3GS8 and 4GS8 are controlled for heater warm-up time for series string operation.



SYLVANIA TYPES 6GW5 4GW5 3GW5 2GW5



7GK

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7GK
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Operation	2GW5 Series	3GW5 Series	4GW5 Series	6GW5 Parallel
Heater Voltage	2.45	3.0	4.2	6.3 Volts
Heater Current	600	450	300	190 Ma
Heater Warm-up Time	11	11	11	— Sec.

Maximum Heater-Cathode Voltage

Heater Negative with Respect to Cathode	
Total D C and Peak	100 Volts
Heater Positive with Respect to Cathode	
Total D C and Peak	100 Volts

DIRECT INTERELECTRODE CAPACITANCES (Shielded)

Grid to Plate	0.60 $\mu\mu$f
Input: g to (h+k+I.S.+E.S.)	5.5 $\mu\mu$f
Output: p to (h+k+I.S.+E.S.)	4.0 $\mu\mu$f
Plate to Cathode	.055 $\mu\mu$f

RATINGS (Design Maximum Values)

Plate Voltage	200 Volts Max.
Plate Dissipation	2.5 Watts Max.
D C Cathode Current	25 Ma Max.
Negative Grid Voltage	50 Volts Max.
Grid Circuit Resistance (Self Bias)	1.0 Megohms Max.

Control grid to cathode spacing on this type is of such close magnitude as to preclude the use of voltage between these elements of more than 30 volts D C or peak A C in commercial tube checkers and shorts indicating devices particularly where mechanical excitation of the tube is utilized.

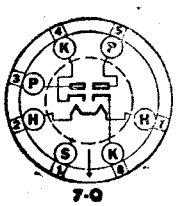
CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

Plate Voltage	135 Volts
Grid Voltage	−1.0 Volts
Plate Current	12.5 Ma
Transconductance	15,000 μmhos
Amplification Factor	70
Plate Resistance (approx.)	5800 Ohms
Ec for Gm = 150 μmhos (approx.)	−5.0 Volts
Ec for Gm = 1500 μmhos (approx.)	−2.6 Volts

APPLICATION

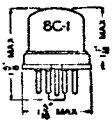
The Sylvania Types 2GW5, 3GW5, 4GW5, and 6GW5 are frame grid gain controlled triodes designed for use as VHF RF amplifiers at a B+ of 135 volts. Features of the design include: A partial shield between the grid and plate which lowers the capacitance between these two elements and promotes ease of neutralization and low input capacitance. Higher input impedance and reduced grid inductance is assured by virtue of dual grid leads.

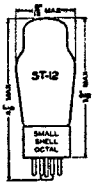


Sylvania

TYPE 6H6
TYPE 6H6G

DOUBLE DIODE





CARACTERISTIQUES

	6H6	6H6G
Tension chauffage CA ou CC	6,3	6,3 volts
Courant chauffage	0,3	0,3 ampère
Ampoule	8C-1	ST-12
Culot — Petit octal 7 broches	7-Q	7-Q
Position de montage	Toutes	Toutes

Capacités directes interélectrodes :

Plaque N° 1 à cathode	3,0	3,1 $\mu\mu$f.
Plaque N° 2 à cathode	3,4	4,0 $\mu\mu$f.
Couplage plaque 1 à plaque 2	0,05	0,1 $\mu\mu$f **max.**

Conditions de fonctionnement et caractéristiques :

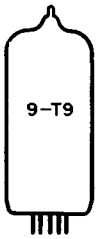
Tension efficace CA par plaque	117	117 volts max.
Courant sortie redressé	4	4 ma. max.

APPLICATION

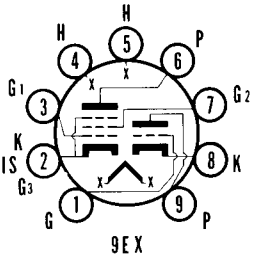
Le tube 6H6 ou 6H6G est constitué par deux plaques de diodes, chacune associée avec une cathode individuelle. Les cathodes ont des sorties indépendantes. Les deux diodes sont séparées électrostatiquement l'une de l'autre. Cette disposition offre des possibilités de connexion que ne permettent pas d'autres doubles diodes, tels que les types 75 ou 85, qui ont une cathode commune.

Il est possible d'assurer un A.V.C. différé en connectant la cathode d'une section à un point du système ayant un potentiel positif, tel qu'une prise intermédiaire sur la résistance de cathode dans l'étage H.F. du récepteur. Le retour de grille pour la diode est alors fait à la masse, donnant ainsi une polarisation négative à la plaque diode. La valeur de cette tension détermine l'importance du retard obtenu. Ce montage est fréquemment employé pour fournir la tension de régulation (A.V.C.) au récepteur.

La seconde diode peut être utilisée en détectrice, avec ou sans polarisation, d'après le résultat désiré. En tout cas, la polarisation appliquée à la diode détectrice ne peut pas être trop élevée, sinon une mauvaise qualité en résulterait à cause de l'annulation du courant plaque pour les pointes de tension négative du signal.



SYLVANIA TYPES 6HC8 17HC8



TRIODE-PENTODE

The 9-T9 design utilized a T-9 (1⅛" Dia.) bulb based to fit a standard 9-pin miniature socket. Advantages of the 9-T9 include an increase in the heat dissipation safety margin, as compared to 9-pin miniature tubes employing T-6½ (¹³⁄₁₆" Dia.) bulbs.

MECHANICAL DATA

Bulb	Special, T-9
Base	9-Pin, Same as E9-1, except Bulb Diameter
Outline	See Drawing
Basing	9EX
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6HC8	17HC8
Heater Voltage	6.3[1]	16.8 Volts
Heater Current	1200	450[2] Ma
Heater Warm-up Time[3]	—	11 Seconds
Maximum Heater Voltage Range[4]	5.7-6.9	— Volts
Maximum Heater Current Range[4]	—	420-480 Ma
Heater-Cathode Voltage (Design Maximum Values)[4]		
Heater Negative with Respect to Cathode		
Total D C and Peak	200	200 Volts Max.
Heater Positive with Respect to Cathode		
D C	100	100 Volts Max.
Total D C and Peak	200	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section	
Grid to Plate	4.4 μμf
Input: g to (h+Tk+Pk, g3, I.S.)	3.0 μμf
Output: p to (h+Tk+Pk, g3, I.S.)	2.6 μμf
Pentode Section	
Grid No. 1 to Plate	0.2 μμf Max.
Input: g1 to (h+Pk, g3, I.S., +g2)	10 μμf
Output: p to (h+Pk, g3, I.S., +g2)	8 μμf

RATINGS (Design Maximum Values)[4]

Vertical Deflection Oscillator and Amplifier[5]

	Tri. Osc.	Pent. Amp.
Plate Voltage	330	350 Volts Max.
Grid No. 2 Voltage	—	315 Volts Max.
Peak Positive Pulse Plate Voltage	—	2200 Volts Max.
Peak Negative Pulse Grid Voltage	400	275 Volts Max.
Plate Dissipation[6]	1.0	11 Watts Max.
Grid No. 2 Dissipation[6]	—	1.5 Watts Max.
Average Cathode Current	20	65 Ma Max.
Peak Cathode Current	70	230 Ma Max.
Grid Circuit Resistance		
Self Bias	2.2	2.2 Megohms Max.
Fixed Bias	2.2	2.2 Megohms Max.

AVERAGE CHARACTERISTICS

	Triode Section	Pentode Section
Plate Voltage	250	250 Volts
Grid No. 2 Voltage	—	250 Volts
Grid No. 1 Voltage	−3	−18 Volts
Plate Current	1.4	38 Ma
Grid No. 2 Current	—	3 Ma
Transconductance	2000	5100 μmhos
Amplification Factor	68	8.7
Plate Resistance (approx.)	34,000	55,000 Ohms
Ec for Ib = 20 μa (approx.)	−5	— Volts
Ec for Ib = 100 μa (approx.)	—	−39 Volts

Ib with Eb = 60 V, Ec2 = 250 V, and Ec = 0 V
(Instantaneous Values)[7]
Ib = 180 Ma and Ic2 = 30 Ma

NOTES:

1. For parallel heater operation, equipment should be so designed so that at normal supply voltage bogey tubes will operate at this value of heater voltage.
2. For series heater operation, equipment should be so designed so that at normal supply voltage bogey tubes will operate at this value of heater current.
3. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
4. Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.
5. For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Stations; Federal Communications Commission." The duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.
6. In stages operating with grid leak bias, an adequate bias resistor or other suitable means is required to protect the tube in the absence of excitation.
7. Measurements of this characteristic must be made by a method, such that the tube is not damaged by plate or grid No. 2 dissipations in excess of the maximum ratings.

APPLICATION

The Sylvania Types 6HC8 and 17HC8 are triode-pentodes featuring the 9-T9 bulb and pin configuration. The 6HC8 and 17HC8 are intended to serve the combined functions of vertical deflection oscillator and amplifier.

Color Television Type

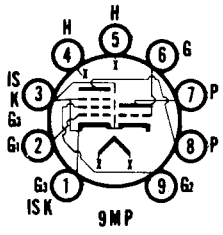
VHF OSCILLATOR and MIXER

6HG8/ECF86

4HG8, 5HG8/LCF86, 7HG8/PCF86, 8HG8

Medium Mu Triode and Sharp Cutoff Pentode

Construction .....Miniature T-6½
Base .....Button 9 Pin, E9-1
Basing 9MP
Outline 6-2
Maximum Diameter .....0.875 In.
Maximum Seated Height .....1.937 In.
Maximum Overall Height .....2.187 In.





ELECTRICAL DATA

HEATER OPERATION

	8HG8	7HG8/ PCF86	5HG8/LCF86	4HG8	6HG8/ ECF86
Heater Voltage	8.0	7.2	5.3	4.5	6.3 Volts
Heater Current	300	300	450	600	340 Ma
Heater Warm-up Time	—	—	11	11	— Seconds

Maximum Heater-Cathode Voltage
Heater Negative with Respect to Cathode
Total DC and Peak ..... 200 Volts
Heater Positive with Respect to Cathode
DC ..... 100 Volts
Total DC and Peak ..... 200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section

Grid to Plate ..... 2.0 Pf
Input: g to (h + k, Pk, Pg3, IS) ..... 2.4 Pf
Output: p to (h + k, Pk, Pg3, IS) ..... 1.1 Pf

Pentode Section

Grid No. 1 to Plate (Max.) ..... 0.020 Pf
Input: g1 to (h + k, Tk, g3, IS + g2) ..... 6.0 Pf
Output: p to (h + k, Pk, Pg3, IS + g2) ..... 3.5 Pf
Grid No. 1 to Grid No. 2 ..... 1.7 Pf

Coupling

Triode Grid to Pentode Plate (Max.) ..... 0.014 Pf
Pentode Grid No. 1 to Triode Plate (Max.) ..... 0.01 Pf
Pentode Plate to Triode Plate (Max.) ..... 0.14 Pf
Pentode Grid No. 1 to Triode Grid (Max.) ..... 0.01 Pf

RATINGS (Design Maximum Rating System)

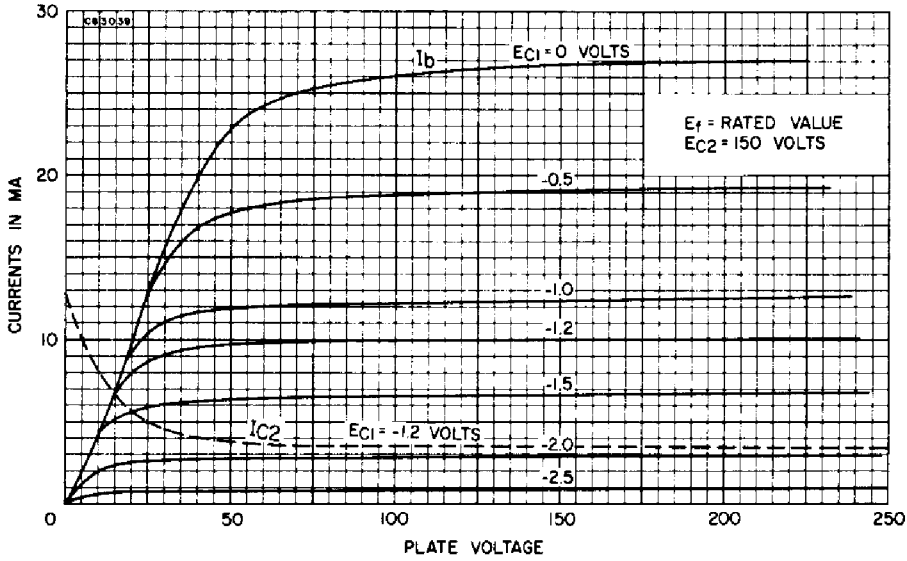
	Triode Section	Pentode Section
Plate Voltage (Max.)	125	250 Volts
Grid No. 2 Supply Voltage (Max.)	—	250 Volts
Grid No. 2 Voltage	See Rating Chart (Gen. Info. Sec.)	
Positive Grid No. 1 Voltage (Max.)	0	0 Volt
Plate Dissipation (Max.)	1.9	2.2 Watts
Grid No. 2 Dissipation (Max.)	—	0.55 Watts
Cathode Current (Max.)	16.5	20 Ma
Grid No. 1 Circuit Resistance (Max.)	0.5	— Megohm
Fixed Bias (Max.)	—	0.25 Megohm
Cathode Bias (Max.)	—	0.5 Megohm

The spacing between the control grids and cathodes are of such a low order of magnitude as to preclude the use of excessive voltages between these elements in commercial tube checkers and shorts indicating devices, particularly where the tube is mechanically excited. The DC or peak AC voltage applied between each sections control grid and cathode must not exceed 30 volts for the pentode or 50 volts for the triode.

CHARACTERISTICS AND TYPICAL OPERATION

	Triode Section	Pentode Section
Plate Voltage	100	170 Volts
Grid No. 2 Voltage	—	150 Volts
Grid No. 1 Voltage	−3	−1.2 Volts
Plate Current	14	10 Ma
Grid No. 2 Current	—	3.3 Ma
Transconductance	5500	12,000 μmhos
Amplification Factor (g1 to g2)	17	70
Plate Resistance	3100	350,000 Ohms

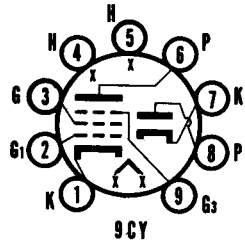
AVERAGE PLATE CHARACTERISTICS
(Pentode Section)





SYLVANIA TYPE 6HJ8

DIODE PENTODE



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9CY
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

Heater Operation	Series	Parallel
Heater Voltage	6.3	6.3[1] Volts
Heater Current	450[1]	450 Ma
Heater Warm-up Time	11	— Seconds

Ratings (Design Maximum Values)

	Min.-Max.	Min.-Max.
Heater Voltage[2]	— —	5.7 - 6.9 Volts
Heater Current[2]	420 - 480	— — Ma
Maximum Heater-Cathode Voltage		
Heater Neg. with Respect to Cathode		
Total D C and Peak	200	200 Volts
Heater Pos. with Respect to Cathode		
D C	100	100 Volts
Total D C and Peak	200	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Pentode Section	
Grid to Plate	.015 μμf Max.
Input: g1 to (h+k+g2+g3+I.S.)	7.0 μμf
Output: p to (h+k+g2+g3+I.S.)	3.2 μμf
Diode Section	
Plate to Heater, Cathode	2.4 μμf
Cathode to Heater, Plate	3.0 μμf
Coupling:	
Pentode Grid to Diode Plate	.005 μμf Max.
Pentode Plate to Diode Cathode	.015 μμf Max.
Pentode Plate to Diode Plate	.035 μμf Max.

RATINGS (Design Maximum Values)

Plate Voltage	330 Volts Max.
Grid No. 2 Voltage	See 6AM8 Rating Chart
Grid No. 2 Supply Voltage	330 Volts Max.
Plate Dissipation	3.2 Watts Max.
Grid No. 2 Dissipation	0.55 Watts Max.
Positive Grid No. 1 Voltage	0 Volts Max.
Diode Current for Continuous Operation	5 Ma Max.
Grid No. 1 Circuit Resistance	
Self Bias	1.0 Megohm Max.
Fixed Bias	0.25 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

Plate Supply Voltage	125 Volts
Grid No. 2 Supply Voltage	125 Volts
Grid No. 3 Voltage	Connected to Cathode at Socket
Cathode Resistor	56 Ohms
Plate Current	11.5 Ma
Grid No. 2 Current	3.6 Ma
Transconductance	9300 μmhos
Plate Resistance (approx.)	0.2 Megohm
Ec1 for Ib = 20 μa (approx.)	−6 Volts
Ib at EC1 = −3V; RK = 0	2 Ma
Diode Characteristics with Eb = 10 Volts, Ib = 50 Ma[4]	

NOTES:

1. For series/parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current/voltage.

NOTES: (Cont'd)

2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
3. Heater voltage supply variations shall be restricted to maintain heater voltage/current within the specified values.
4. Test condition only.

APPLICATION

The Sylvania Type 6HJ8 is a miniature diode pentode. The pentode section has sharp cutoff characteristics and may be used as an IF or AGC amplifier. The high perveance diode can be used as an RF detector, video detector or dc restorer.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7GM
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics / Heater Operation	2HK5 Series	3HK5 Series	4HK5 Series	6HK5 Parallel	
Heater Voltage	2.3	2.9	4.0	6.3[1]	Volts
Heater Current	600[1]	450[1]	300[1]	190	Ma
Heater Warmup Time[2]	11	11	-	-	Sec.

Ratings (Design Maximum Values)[4]

	Min-Max	Min-Max	Min-Max	Min-Max	
Heater Voltage[3]	- -	- -	- -	5.7-6.9	Volts
Heater Current[3]	560-640	420-480	280-320	- -	Ma
Maximum Heater-Cathode Voltage					
Heater Negative with Respect to Cathode					
Total DC and Peak	100	100	100	100	Volts
Heater Positive with Respect to Cathode					
Total DC and Peak	100	100	100	100	Volts

DIRECT INTERELECTRODE CAPACITANCES (Shield No. 316)

Grid to Plate	.29 μμf
Input: g to (h+k+I.S.+E.S.)	4.4 μμf
Output: p to (h+k+I.S.+E.S.)	2.6 μμf
Heater to Cathode	2.5 μμf

RATINGS (Design Maximum Values)[4]

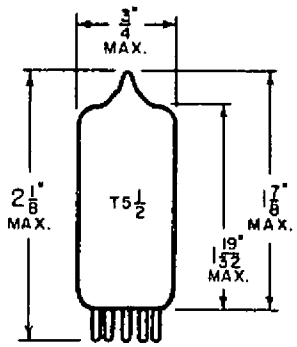
Plate Voltage	200 Volts	Max.
Plate Dissipation	2.3 Watts	Max.
DC Cathode Current	22 Ma	Max.
Negative Grid Voltage	50 Volts	Max.
Grid Circuit Resistance (Self Bias)	1.0 Megohms	Max.

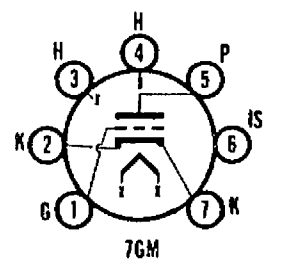
NOTE: Control grid to cathode spacing on this type is of such low order of magnitude as to preclude the use of voltage between

from JEDEC release #4066, Jan. 7, 1963

QUICK REFERENCE DATA

The Sylvania Types 2HK5, 3HK5, 4HK5 and 6HK5 are frame grid gain controlled triodes designed for use as VHF RF amplifiers at a B+ of 135 volts. Features of the design include: A partial shield between the grid and plate which minimizes the capacitance between these two elements and promotes ease of neutralization; low input capacitance; and higher input impedance by virtue of dual cathode leads.





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EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

December 21, 1962

these elements of more than 30 volts dc or peak ac in commercial tube checkers and shorts indicating devices, particularly where mechanical excitation of the tube is employed.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

Plate Voltage	135 Volts
Grid Voltage	-1.0 Volts
Plate Current	12.5 Ma
Transconductance	15,000 μmhos
Amplification Factor	75
Plate Resistance (approx.)	5,000 Ohms
Ec for Gm = 150 μmhos (approx.)	-5.0 Volts
Ec for Gm = 1500 μmhos (approx.)	-2.6 Volts
Input Resistance (200 mc)[5]	600 Ohms
Input Capacitance (200 mc)[5]	9.0 μμf
Noise Figure (200 mc)[6]	4.2 db

NOTES:

1. For series/parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current/voltage.

2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

3. Heater voltage supply variations shall be restricted to maintain heater voltage/current within the specified values.

4. Design Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron tube of a specified type as defined by its published data and should not be exceeded under the worst probable conditions.

   The tube manufacturer chooses these values to provide acceptable serviceability of the tube, making allowance for the effects of changes in operating conditions due to variations in the characteristics of the tube under consideration.

   The equipment manufacturer should design so that initially and throughout life no design maximum value for the intended service is exceeded with a bogey tube under the worst probable operation conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all other electron devices in the equipment.

5. Measured under grounded plate conditions.

6. Optimized neutralized triode RF amplifier stage, noise matched.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button, 9-Pin
Outline	6-2
Basing	9AE
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

Heater Operation	Series	Parallel	
Heater Voltage	6.3	6.3[1]	Volts
Heater Current	600[1]	600	Ma
Heater Warm-up Time[2]	11	-	Seconds

Ratings (Design Maximum Values)

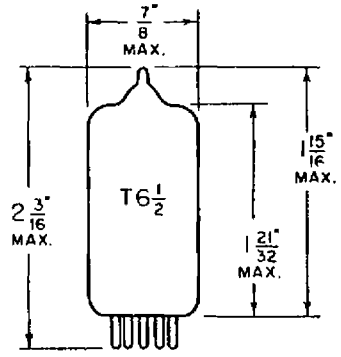
	Min.-Max.	Min.-Max.	
Heater Voltage[3]	-	5.7-6.9	Volts
Heater Current[3]	560-640	-	Ma
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
Total DC and Peak	200	200	Volts
Heater Positive with Respect to Cathode			
DC	100	100	Volts
Total DC and Peak	200	200	Volts

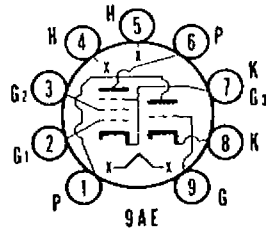
DIRECT INTERELECTRODE CAPACITANCES

	Shielded	Unshielded		
Triode Section				
Grid to Plate	2.8	2.8	μμf	
Input: g to (h+k+Pk,g3,I.S.)	3.0	2.8	μμf	
Output: p to (h+k+Pk,g3,I.S.)	2.4	1.6	μμf	
Pentode Section				
Grid No. 1 to Plate	.025	.03	μμf	Max.
Input: g1 to (h+k,g3,I.S.+g2)	7.5	7.5	μμf	
Output: p to (h+k,g3,I.S.+g2)	3.0	2.3	μμf	

QUICK REFERENCE DATA

The Sylvania Type 6HL8 contains a medium mu triode and high Gm pentode in a T-6½ bulb. The triode is designed for sync separator, voltage amplifier or general purpose use. The pentode can be used as a video IF amp., AGC amp. and reactance tube.





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March 29, 1962

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146 (10-58)

RATINGS (Design Maximum Values)

	Triode Section	Pentode Section	
Plate Voltage	330	330	Volts Max.
Grid No. 2 Supply Voltage		330	Volts Max.
Grid No. 2 Voltage	See Rating Chart		
Positive Grid No. 1 Voltage		0	Volts Max.
Plate Dissipation	2.5	2.5	Watts Max.
Grid No. 2 Dissipation		0.55	Watt Max.
Grid No. 1 Circuit Resistance			
Fixed Bias	1.0	-	Megohm
Self Bias	1.0	-	Megohms

AVERAGE CHARACTERISTICS

	Triode Section	Pentode Section	
Plate Voltage	125	125	Volts
Grid No. 2 Voltage		125	Volts
Grid No. 1 Voltage	-1.0	-1.0	Volts
Transconductance	7000	10,000	μmhos
Plate Current	12.5	12.0	Ma
Grid No. 2 Current		4.5	Ma
Plate Resistance (Approx.)	5000	150,000	Ohms
Amplification Factor	40		
Ec1 for Ib = 20 μa (approx.)	-	-7	Volts

NOTES:

1. For series/parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current/voltage.

2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

3. Heater voltage supply variations shall be restricted to maintain heater voltage/current within the specified values.

6HQ5

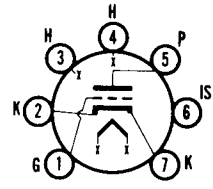
2HQ5, 3HQ5, 4HQ5

Color Television Type

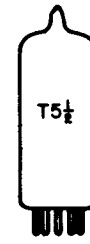
VHF AMPLIFIER

Sharp Cutoff Triode

Construction .....Miniature T-5½
Base .....Button 7 Pin, E7-1
Basing 7GM
Outline 5-2
Maximum Diameter .....0.750 In.
Maximum Seated Height .....1.875 In.
Maximum Overall Height .....2.125 In.



7GM



ELECTRICAL DATA

HEATER OPERATION

	2HQ5	3HQ5	4HQ5	6HQ5
Heater Voltage	2.4	3.0	4.2	6.3 Volts
Heater Current	600	450	300	200 Ma
Heater Warm-up Time	11	11	11	— Seconds
Maximum Heater-Cathode Voltage				
Heater Negative with Respect to Cathode				
Total DC and Peak				100 Volts
Heater Positive with Respect to Cathode				
Total DC and Peak				100 Volts

DIRECT INTERELECTRODE CAPACITANCES (Shielded)

Grid to Plate	0.52 Pf
Input: g to (h + k + IS + E.S.)	5.0 Pf
Output: p to (h + k + IS + E.S.)	3.5 Pf
Heater to Cathode	2.5 Pf

RATINGS (Design Maximum Rating System)

Plate Voltage (Max.)	200 Volts
Plate Dissipation (Max.)	2.5 Watts
DC Cathode Current (Max.)	22 Ma
Negative Grid Voltage (Max.)	50 Volts
Grid Circuit Resistance (Self Bias) (Max.)	1.0 Megohm

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

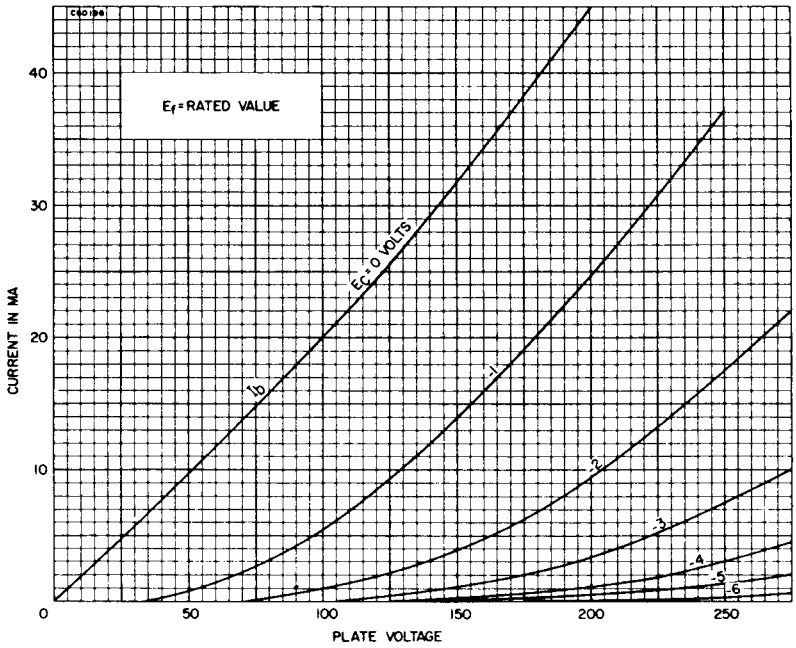
Plate Voltage	135 Volts
Grid Voltage	−1.0 Volt
Plate Current	11.5 Ma
Transconductance	15,000 μmhos
Amplification Factor	78
Plate Resistance (Approx.)	5400 Ohms
Ec for Gm = 150 μmhos (Approx.)	−4.2 Volts
Ec for Gm = 1500 μmhos (Approx.)	−2.5 Volts
Input Resistance (200 MHz)(1)	275 Ohms
Input Capacitance (200 MHz)(1)	11.2 Pf
Noise Figure (200 MHz)(2)	4.7 db

NOTES:

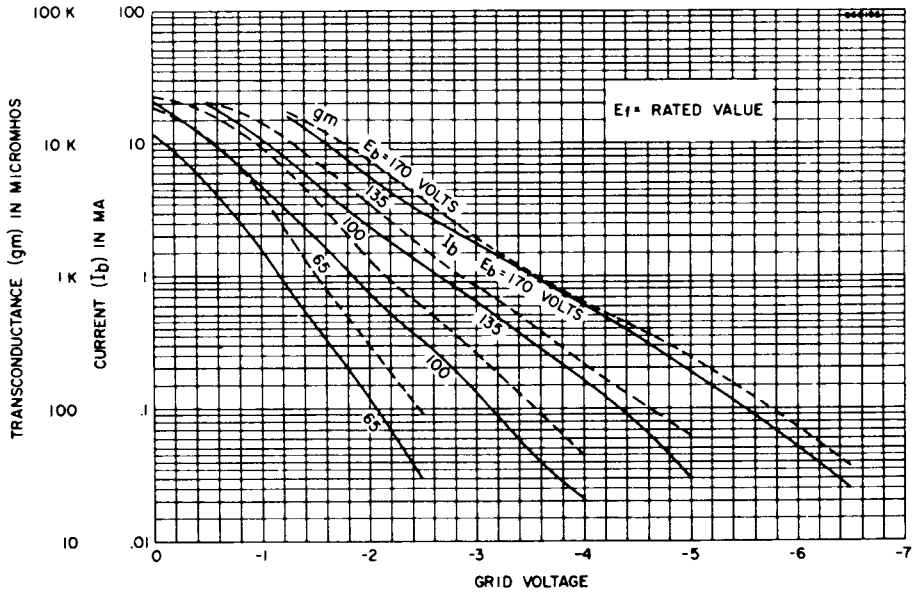
(1) Measured under grounded plate conditions.

(2) Optimized neutralized triode RF amplifier stage, noise matched.

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



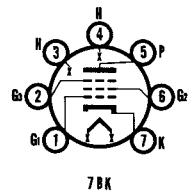
IF AMPLIFIER

6HR6

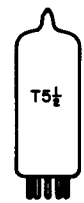
19HR6

Semi-Remote-Cutoff Pentode

Construction .....Miniature T-5½
Base .....Button 7 Pin, E7-1
Basing 7BK
Outline 5-2
Maximum Diameter .....0.750 In.
Maximum Seated Height .....1.875 In.
Maximum Overall Height .....2.125 In.



7BK



ELECTRICAL DATA

HEATER OPERATION

	19HR6	6HR6
Heater Voltage	18.9	6.3 Volts
Heater Current	150	450 Ma
Heater Warm-up Time	17	11 Seconds
Maximum Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
Total DC and Peak		200 Volts
Heater Positive with Respect to Cathode		
DC		100 Volts
Total DC and Peak		200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate (Max.)	0.006 Pf
Grid No. 1 to Cathode, Grid No. 3 and Internal Shield, Grid No. 2, and Heater	8.8 Pf
Plate to Cathode, Grid No. 3 and Internal Shield, Grid No. 2, and Heater	5.2 Pf

RATINGS (Design Maximum Rating System)

Class A1 Amplifier

Plate Supply Voltage (Max.)	300 Volts
Grid No. 3 (Suppressor-Grid)	Connect to Cathode at Socket
Grid No. 2 (Screen-Grid) Supply Voltage (Max.)	300 Volts
Grid No. 2 Voltage	See Rating Chart (Gen. Info. Sec.)
Grid No. 1 (Control-Grid) Voltage:	
Positive Bias Value (Max.)	0 Volt
Negative Bias Value (Max.)	50 Volts
Plate Dissipation (Max.)	3 Watts
Grid No. 2 Input:	
For Grid No. 2 Voltages up to 150 Volts (Max.)	1 Watt
For Grid No. 2 Voltages between 150 and 300 Volts	See Rating Chart (Gen. Info. Sec.)
Maximum Circuit Values:	
Grid No. 1 Circuit Resistance:	
For Fixed Bias Operation (Max.)	0.5 Megohm
For Cathode Bias Operation (Max.)	1 Megohm

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

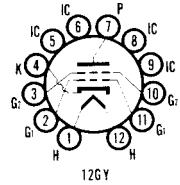
Plate Supply Voltage	200 Volts
Grid No. 3	Connected to Cathode at Socket
Grid No. 2 Supply Voltage	115 Volts
Grid No. 1 Supply Voltage	0 Volt
Cathode Resistor	68 Ohms
Plate Resistance (Approx.)	0.5 Megohm
Transconductance	8500 μmhos
Plate Current	13.2 Ma
Grid No. 2 Current	4.3 Ma
Grid No. 1 Voltage (Approx.) for Transconductance = 60 μmhos	−15 Volts

6HS5

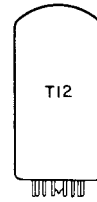
HIGH VOLTAGE REGULATOR

Beam Triode

Construction.....Compactron T-12
Base .....Button 12 Pin, E12-74
Basing 12GY
Outline 12-60
Maximum Diameter .....1.563 In.
Maximum Seated Height .....3.500 In.
Maximum Overall Height .....3.875 In.



12GY



ELECTRICAL DATA

HEATER OPERATION

Heater Voltage	6.3 Volts
Heater Current	1500 Ma
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total DC and Peak	450 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	1.6 Pf
Input: g to (h + k + bp)	24 Pf
Output: p to (h + k + bp)	6.5 Pf

RATINGS (Design Maximum Rating System)

High-Voltage Regulator Service(1)

Peak Plate Voltage	5500 Volts
Plate Dissipation	30 Watts
Peak Plate Current	325 Ma
Grid-Circuit Resistance(2)	0.1 Megohm
Bulb Temperature at Hottest Point	220 °C

CHARACTERISTICS AND TYPICAL OPERATION

Pulse Plate Voltage(3)	3500 Volts
Beam Plate Connected to Cathode at Socket	
Negative DC Grid Voltage	4.4 Volts
Peak Plate Current	300 Ma
Amplification Factor	300
Transconductance	65,000 μmhos
Plate Resistance, (Approx.)	4600 Ohms
Grid Voltage, (Approx.)	
Eb = 3500 Volts, Ib = 1.0 Ma	−13 Volts

NOTES:

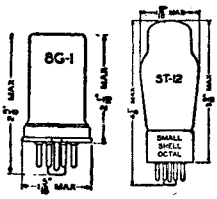
(1) For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations; Federal Communications Commission," the duty cycle of the voltage pulse must not exceed 15% of one horizontal scanning cycle.
(2) Larger values of grid-circuit resistance may be used if provisions are made to protect the tube.
(3) Duty cycle of the pulse must be less than 2.5%.



Sylvania

TYPE 6I5
TYPE 6I5G

SUPER TRIODE AMPLIFICATEUR-DETECTEURS



CARACTERISTIQUES

	6J5	6J5G
Tension chauffage CA ou CC	6,3	6,3 volts
Courant chauffage	0,3	0,3 ampère
Ampoule	8G1	ST-12
Culot : petit octal 6 broches	6-Q	6-Q
Position de montage	Toutes	Toutes

Capacités directes interélectrodes* :

Grille à plaque	3,4	4,0 $\mu\mu$f
Entrée	3,4	4,2 $\mu\mu$f
Sortie	3,6	5,0 $\mu\mu$f

Conditions limites de fonctionnement. (Voir page 9) :

Tension chauffage CA ou CC	6,3 volts
Courant chauffage	0,3 ampère
Tension plaque	300 volts max.
Tension grille	0 volts min.
Dissipation plaque	2,5 watts max.

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A

Tension de chauffage	6,3	6,3 volts
Tension plaque	90	250 volts
Tension grille	0	—8 volts
Courant plaque	10	9 ma.
Résistance interne	6,700	7,700 ohms approx.
Conductance mutuelle	3,000	2,600 μmhos appr.
Coefficient d'amplification	20	20

APPLICATION

Le type Sylvania 6J5 ou 6J5G est un amplificateur triode à usage général, qui peut être utilisé dans les circuits de conception classique comme amplificateur, détecteur ou oscillateur. En général, les applications et conditions de fonctionnement sont semblables à celles des tubes tels que 76, 37, 6C5 et 6C5G.

A part de légères différences dans les capacités et l'absence de la broche n° 4 dans le type 6J5, les types 6J5 et 6J5G sont très semblables.

Quoique le type 6J5 ou 6J5G ait le même coefficient d'amplification que les types 6C5 et 6C5G, la conductance mutuelle a été considérablement accrue avec, comme conséquence, la réduction de la résistance interne. La capacité de sortie est à peu près le tiers de celle du type 6C5 et la conception du tube est telle que le 6J5G est spécialement adapté au fonctionnement sur équipement à très haute fréquence.

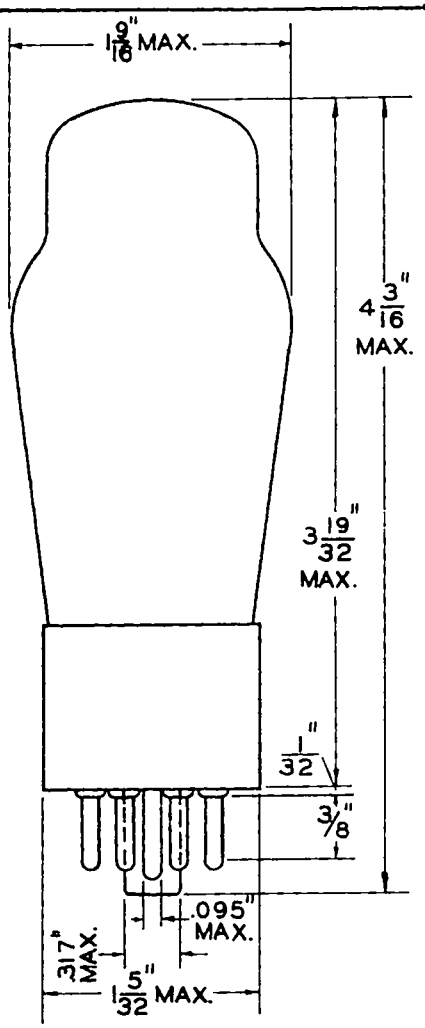
Hygrade Sylvania CORPORATION

TECHNICAL DATA

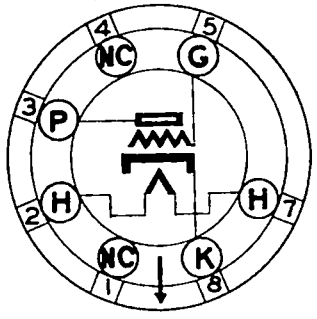
SYLVANIA TYPE 6J5G

General Purpose Amplifier

SYLVANIA
6J5G



TUBE AND BASE DIAGRAM
(BOTTOM VIEW)



TENTATIVE CHARACTERISTICS

Heater Voltage AC or DC	6.3	Volts
Heater Current	0.3	Ampere

Direct Interelectrode Capacitances:

Grid to Plate	3.4	μμF.
Input	3.8	μμF.
Output	3.3	μμF.

OPERATING CONDITIONS AND CHARACTERISTICS
CLASS A AMPLIFIER

Heater Voltage	6.3	Volts
Plate Voltage	250	Volts
Grid Voltage	-8	Volts
Plate Current	9.0	Ma.
Plate Resistance	7700	Ohms (Approx)
Mutual Conductance	2600	μmhos (Approx)
Amplification Factor	20	

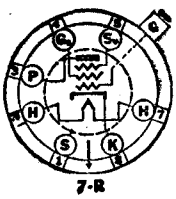
CIRCUIT APPLICATION

Sylvania 6J5G is a new glass tube equipped with an octal base. Although this tube has the same amplification factor as Types 6C5 and 6C5G the mutual conductance has been substantially increased with corresponding reduction in plate impedance. The output capacity is approximately one-third that of Type 6C5 and the tube design is such that the 6J5G should be especially applicable in ultra high frequency equipment.

Type 6J5G is a general purpose amplifier triode and may be used in circuits of conventional design as an amplifier, detector, or oscillator tube. In general, the applications and operating conditions will parallel those for such tubes as Types 76, 37, 6C5 and 6C5G.

5-25-36

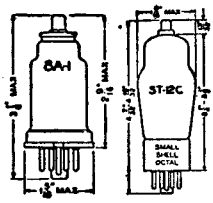
from RMA release #72, May 26, 1936



Sylvania

TYPE 6J7
TYPE 6J7G

TRIGRILLES AMPLIFICATEURS



CARACTERISTIQUES

	6J7	6J7G
Tension chauffage CA ou CC	6,3	6,3 volts
Courant chauffage	0,3	0,3 ampère
Ampoule	8A-1	ST-12C
Capuchon	Miniature	Miniature
Culot : petit octal 7 broches	7-R	7-R
Position de montage	Toutes	Toutes

Capacités directes interélectrodes. (Pentode) :

	6J7	6J7G
Grille à plaque	0,005	0,007 $\mu\mu$F
Entrée (G à toutes électrodes, sauf P.)	7,0	4,6 $\mu\mu$F
Sortie (P. à toutes électrodes, sauf G.)	12,0	12,0 $\mu\mu$F

Conditions limites de fonctionnement. (Voir page 9) :

AMPLIFICATEUR CLASSE A1

	Triode	Pentode.
Tension chauffage CA ou CC	6,3	6,3 volts
Courant chauffage	0,3	0,3 ampère
Tension plaque	250	300 volts max.
Source Tension écran	—	300 volts max.
Tension écran	—	125 volts max.
Dissipation plaque	1,75	0,75 watt max.
Dissipation écran	—	0,10 watt max.
Tension polarisation grille ext.	0	0 volt min.

Conditions de fonctionnement et caractéristiques :

	Triode		Pentode	
Tension de chauffage	6,3	6,3	6,3	6,3 volts
Tension de plaque	180	250	100	250 volts
Tension grille*	—5,3	—8	—3	—3 volts
Tension grille écran	relié plaque		100	100 volts
Grille de suppression	relié plaque		Connectée à la cathode	
Courant plaque	5,3	6,5	2,0	2,0 ma.
Courant écran	—	—	0,5	0,5 ma.
Résistance interne	0,011	0,01	1,0	1,5 mégohms
Conductance mutuelle	1,800	1,900	1,185	1,225 min.
Coefficient d'amplification ...	20	20	—	—
Tension grille pour coupure de courant cathodique	—	—	—7	—7 volts (appr.)

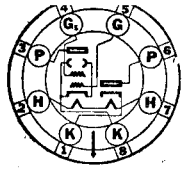
*Résistance dans circuit grille ne doit pas dépasser 1 mégohm.

APPLICATION

Sylvania 6J7 et 6J7G sont des amplificateurs ou détecteurs à trois grilles. La courbure de la caractéristique de la plaque est très rapide. A cause de cette propriété, ce tube est le détecteur idéal.

Les usages du type 6J7 ou 6J7G sont semblables à ceux du type 77. De faibles différences apparaissent lorsqu'on compare les caractéristiques électriques de types 6J7 et 77 et les mêmes résultats généraux peuvent être attendus de l'un et de l'autre.

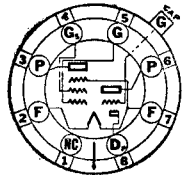
Le raccordement des broches du type 6J7G correspond à celui du type 6J7, excepté pour la broche n° 1 qui est connectée à une cage interne. Cette broche peut être raccordée à la grille écran, comme cela a lieu dans le type 77, ou bien mise à la masse. Dans le second cas, le blindage est meilleur, mais la conductance mutuelle est légèrement plus faible.



8-Z



8-T



8-AJ

6J7GT	Pentode	6J7G	T9-E	6.3	0.30	Dét. amplif.	Mêmes caractéristiques que 6J7G, excepté capacités interélectrodes.									
6K6GT	Pentode	6K6G	T9-D1	6.3	0.40	Ampl. puiss.	Mêmes caractéristiques que 6K6G.									
6K7GT	Pentode	6K7G	T9-E	6.3	0.30	Amplificateur	Mêmes caractéristiques que 6K7G, excepté capacités interélectrodes.									
6K8GT	Triode-Hexode	6K8G	T9-E	6.3	0.30	Oscill. mod.	Mêmes caractéristiques que 6K8G, excepté capacités interélectrodes.									
6Q7GT	Double Diode-Triode	6Q7G	T9-E	6.3	0.30	Détecteur	Mêmes caractéristiques que 6Q7G, excepté capacités interélectrodes.									
6X5GT	Double Diode	6X5G	T9-D1	6.3	0.60	Redresseur	Mêmes caractéristiques que 6X5G.									
12A8GT	Heptode	6A8G	T9-E	12.6	0.15	Convertisseur	Mêmes caractéristiques que 6A8G, excepté chauffage et capacités interélectr.									
12B8GT	Pentode-Triode	8-T	T9-E	12.6	0.30	Amplif. Pent. Amplif. Triode	100 | 3.0 | 100 | 8.0 | 2.0 | 170000 | 2100 | 360 | Sect. pentode. 100 | 1.0 | ..... | 0.6 | ..... | 73000 | ..... | 110 | Sect. triode.								
12F5GT	Triode	6F5G	T9-E	12.6	0.15	Amplificateur	Mêmes caractéristiques que 6F5G, excepté chauffage et capacités interélectr.									
12J5GT	Triode	6J5G	T9-D	12.6	0.15	Amplificateur	Mêmes caractéristiques que 6J5G, excepté chauffage et capacités interélectr.									
12J7GT	Pentode	6J7G	T9-E	12.6	0.15	Dét. Amplif.	Mêmes caractéristiques que 6J7G, excepté chauffage et capacités interélectr.									
12K7GT	Pentode	6K7G	T9-E	12.6	0.15	Amplificateur	Mêmes caractéristiques que 6K7G, excepté chauffage et capacités interélectr.									
12Q7GT	Double Diode-Triode	6Q7G	T9-E	12.6	0.15	Détecteur	Mêmes caractéristiques que 6Q7G, excepté chauffage et capacités interélectr.									
25A7GT	Diode-Pentode	25A7G	T9-D1	25.0	0.30	Redresseur Pent. Puiss.	Mêmes caractéristiques que 25A7G.									
25B8GT	Pentode-Triode	8-T	T9-E	25.0	0.15	Pent. Puiss. Tri. Amplific.	100 | 3.0 | 100 | 7.6 | 2.0 | 185000 | 2000 | 370 | Sect. pentode. 100 | 1.0 | ..... | 0.6 | ..... | 75000 | 1500 | 112.5 | Sect. triode.								
25L6GT	Tétrode	25L6G	T9-D1	25.0	0.30	Ampl. puiss.	Mêmes caractéristiques que 25L6G.									
25Z6GT	Double Diode	25Z6G	T9-D1	25.0	0.30	Doubleur	Mêmes caractéristiques que 25Z6G.									
32L7GT	Diode-Tétrode	8-Z	T9-D1	32.5	0.30	Redresseur Ampl. puiss.	125 efficaces | ..... | 60 | ..... | ..... | ..... | ..... | ..... | ..... 110 | 7.5 | 110 | 40* | 3.0* | 15000 | 6000 | 81 | 2600 | 1000								
35L6GT	Tétrode	35L6G	T9-D1	35.0	0.15	Ampl. puiss.	Mêmes caractéristiques que 35L6G.									
35Z4GT	Diode	5-AA	T9-D1	35.0	0.15	Redresseur D-O	125 efficaces | | 100 | | | | | |									
35Z5GT	Diode	35Z5G	T9-D1	35.0	0.15	Redresseur	Mêmes caractéristiques que 35Z5G.									
70L7GT	Diode-Tétrode	8-AA	T9-D1	70.0	0.15	Redresseur Ampl. puiss.	125 efficaces | ..... | 70 | ..... | ..... | ..... | ..... | ..... | ..... 110 | 7.5 | 110 | 40* | 3.0* | 15000 | 7500 | ..... | 2000 | 4800								

* Signal zéro.

from RMA release #124, Feb. 21, 1938

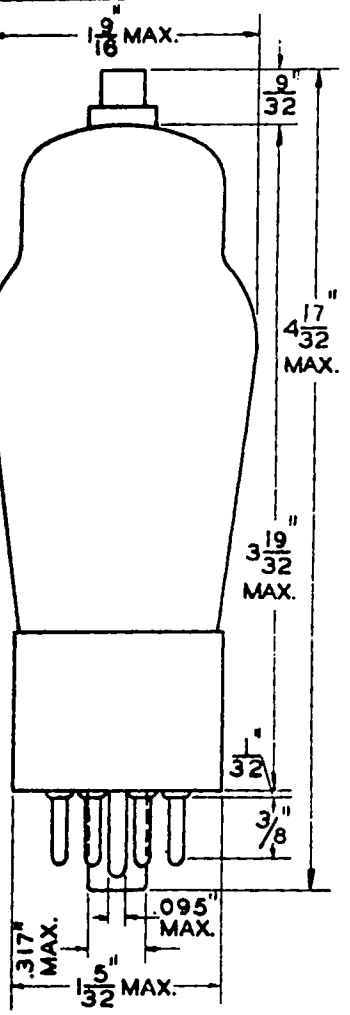
Hygrade Sylvania CORPORATION

TECHNICAL DATA

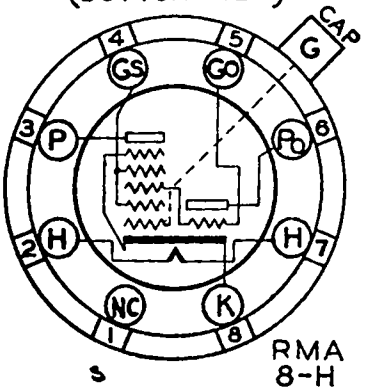
SYLVANIA TYPE 6J8G

Triode Heptode Converter

SYLVANIA
6J8G



TUBE AND BASE DIAGRAM
(BOTTOM VIEW)



CHARACTERISTICS

Heater Voltage AC or DC	6.3	Volts
Heater Current	0.3	Ampere

DIRECT INTERELECTRODE CAPACITANCES

Grid G to Heptode Plate*	0.01	μμF Max.
Grid G to Oscillator Plate*	0.015	μμF
Grid G to Grid Go*	0.13	μμF
Grid Go to Oscillator Plate	2.2	μμF
Grid G to all other Electrodes (R-F Input)	4.4	μμF
Plate Po to all other Electrodes (Osc. Output)	5.5	μμF
Grid Go to all other Electrodes (Osc. Input)	11.7	μμF
Heptode Plate to all other Electrodes (Mixer Output)	8.8	μμF

* With standard tube shield (not close fitting)

OPERATING CONDITIONS AND CHARACTERISTICS

Heater Voltage	6.3	6.3	Volts
Plate Voltage (Heptode)	100	250	Volts Max.
Control Grid Voltage (Heptode)	-3	-3	Volts
Screen Voltage (Heptode)	100	100	Volts Max.
Oscillator Plate Voltage (Triode)	100	250°	Volts Max.
Oscillator Grid Resistor (Triode)	50,000	50,000	Ohms
Plate Current (Heptode)	1.4	1.3	Ma.
Screen Current (Heptode)	3.0	2.9	Ma.
Oscillator Plate Current (Triode)	3.0	5.0	Ma.
Oscillator Grid Current (Triode)	0.3	0.4	Ma.
Plate Resistance (Heptode)	0.9	4.0	Megohms App.
Conversion Conductance	250	290	μmhos
Control Grid Voltage (Heptode) for 2 μmhos Conversion Conductance	-20	-20	Volts

°Applied through 20,000 ohm dropping resistor.

TRIODE SECTION ONLY

Plate Voltage	100	Volts
Grid Voltage	0	Volts
Plate Current	7	Ma.
Plate Resistance	10,600	Ohms
Mutual Conductance	1,600	μmhos (App.)
Amplification Factor	17	(Approx.)

CIRCUIT APPLICATION

Sylvania Type 6J8G is a new converter tube consisting of a triode unit and a heptode unit having a common cathode and assembled in the same envelope. The use of a triode as an oscillator with a pentagrid mixer tube is well known. Type 6J8G is essentially this combination of tubes in a single bulb, but offers some advantages because of improved operating characteristics.

The applications of the 6J8G are quite similar to those of the separate oscillator and mixer tube combination. However, this new tube construction makes possible some circuit simplifications and improved performance at high frequencies.

Type 6J8G provides true electron coupling since the grid of the triode oscillator is directly connected to an injector grid in the mixer section. The unusually high plate resistance (4 megohms) of this tube results in very low plate loading, making it possible to use highly efficient i-f transformers to advantage. Lower frequency drift than that associated with other existing types of converter tubes should make this type especially attractive.

Because of this high frequency stability it should be possible to reduce the filtering in the oscillator plate supply of the tube and not encounter "fluttering", such as is encountered with other converters.

It will be noted that under the 100 volt operating conditions the heptode plate, heptode screen grid, and the oscillator plate may all be operated at the same d-c potential. This makes possible the elimination of the dropping resistor which is usually employed in the screen circuit when the Type 6A8G or its equivalent is used in ac-dc or d-c receivers.

Although the basing arrangement of this tube is such that in some instances it may be substituted directly for Type 6A8G, neceessitating only slight realigning, it is not intended to be used in this manner. For optimum performance advantage should be taken of the low input loading together with the high plate impedance, and the circuit components (antenna coil, oscillator coil, and i-f transformer) should be designed accordingly.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-6½
Base	E10-73, 10-Pin, Center Pin Added to E9-1 Base
Outline	6-13
Basing	10G
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

Heater Operation	Series	Parallel	
Heater Voltage	6.3	6.3[1]	Volts
Heater Current	450[1]	450	Ma
Heater Warm-up Time[2]	11	-	Seconds

Ratings (Design Maximum Values)

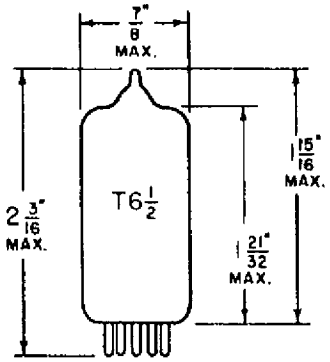
	Min.-Max.	Min.-Max.	
Heater Voltage[3]	- -	5.7-6.9	Volts
Heater Current[3]	420-480	- -	Ma
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode	100	100	Volts
Heater Positive with Respect to Cathode	100	100	Volts

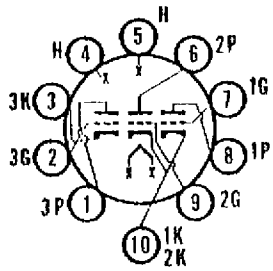
DIRECT INTERELECTRODE CAPACITANCES[4]

	Shielded[5]	Unshielded	
Grid to Plate (Sections 1 and 3)	1.6	1.6	μμf
Grid to Plate (Section 2)	1.5	1.5	μμf
Input (Each Section)	2.6	2.4	μμf
Output (Section No. 1)	1.1	0.28	μμf
Output (Section No. 2)	1.5	0.44	μμf
Output (Section No. 3)	1.1	0.26	μμf
Heater to Cathode (Section No. 3)	3.2	3.2	μμf
Heater to Cathode (Sections 1 and 2)	6.2	6.2	μμf

QUICK REFERENCE DATA

Type 6J9 is a triple triode contained in a T-6½ 10-Pin bulb. It is designed to provide the combined functions of RF amplifier, oscillator and mixer into the VHF frequency range.





10 G

SYLVANIA ELECTRONIC TUBES
A Division of
Sylvania Electric Products, Inc.
RECEIVING TUBE OPERATIONS
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

from JEDEC release #3687, April 16, 1962

146 (10-58)

RATINGS (Design Maximum Values -- Each Section)

Plate Voltage	330	Volts	Max.
Plate Dissipation (Each Plate)	2.0	Watts	Max.
Plate Dissipation (Plates 1, 2 and 3)	5.0	Watts	Max.
Positive Grid Voltage	0	Volts	Max.
Negative Grid Voltage	50	Volts	Max.

TYPICAL OPERATION

Class A1 Amplifier -- Each Section

Plate Voltage	125	Volts
Grid Voltage	-1.0	Volts
Plate Current	6.0	Ma
Plate Resistance	11,000	Ohms
Transconductance	5,200	μmhos
Amplification Factor	57	
Ec for Ib = 20 μa (approx.)	-5.4	Volts

NOTES:

1. For series/parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current/voltage.

2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

3. Heater voltage supply variations shall be restricted to maintain heater voltage/current within the specified values.

4. Section No. 1 connects to Pins 7, 8, and 10; Section No. 2 connects to Pins 6, 9, and 10; Section No. 3 connects to Pins 1, 2, and 3.

5. Shield No. 315 tied to cathode of triode under test.

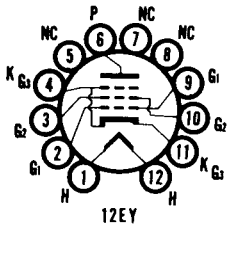
Color Television Type

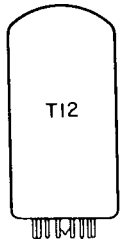
VERTICAL DEFLECTION AMPLIFIER

6JC5/6JB5/6HE5

Beam Power Pentode

Construction.....Compactron T-12
Base .....Button 12 Pin, E12-74
Basing 12EY
Outline
Maximum Diameter ..... 1.562 In.
Maximum Seated Height ..... 2.750 In.
Maximum Overall Height ..... 3.125 In.





ELECTRICAL DATA

HEATER OPERATION

Heater Voltage	6.3 Volts
Heater Current	800 Ma
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate (Max.)	0.54 Pf
Input: g1 to (h + k + g2 + g3)	9.5 Pf
Output: p to (h + k + g2 + g3)	7.0 Pf

RATINGS (Design Maximum Rating System)

Vertical Deflection Amplifier(1)

Plate Voltage (Max.)	350 Volts
Peak Positive Pulse Plate Voltage (Abs. Max.)	2500 Volts
Grid No. 2 Voltage (Max.)	300 Volts
Plate Dissipation (Max.)(2)	19 Watts
Grid No. 2 Input (Max.)(2)	2.75 Watts
Average Cathode Current (Max.)	75 Ma
Peak Cathode Current (Max.)	260 Ma
Bulb Temperature (Max.)	200 °C
Grid Circuit Resistance	
Fixed Bias (Max.)	1.0 Megohm
Cathode Bias (Max.)	2.2 Megohms

CHARACTERISTICS AND TYPICAL OPERATION

Plate Voltage	250 Volts
Grid No. 2 Voltage	250 Volts
Grid No. 1 Voltage	−20 Volts
Plate Current	43 Ma
Grid No. 2 Current	3.5 Ma
Transconductance	4100 μmhos

Plate Resistance (Approx.)	5000 Ohms
Ec1 Voltage for Ib = 100 μa (Approx.)	-50 Volts

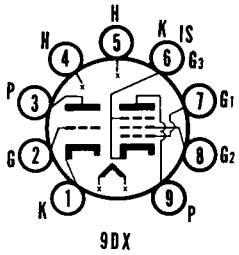
NOTES:

(1) For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations; Federal Communications Commission," the duty cycle of the voltage pulse must not exceed 15% of one horizontal scanning cycle.

(2) In stages operating with grid-leak bias, an adequate bias resistor or other suitable means is required to protect the tube in the absence of excitation.



SYLVANIA TYPES 6JE8 8JE8 11JE8



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button, 9-Pin
Outline	6-3
Basing	9D X
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Operation	11JE8 Series	8JE8 Series	6JE8 Parallel
Heater Voltage	10.9	8.2	6.3 Volts
Heater Current	450	600	780 Ma
Heater Warm-up Time	11	11	— Seconds
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
Total D C and Peak	200	200	200 Volts
Heater Positive with Respect to Cathode			
D C	100	100	100 Volts
Total D C and Peak	200	200	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section	
Grid to Plate	4.2 μμf
Input: g to (h+k)	2.4 μμf
Output: p to (h+k)	0.4 μμf
Pentode Section	
Grid No. 1 to Plate	0.1 μμf Max.
Input: g1 to (h+k+g2+g3+I.S.)	10 μμf
Output: p to (h+k+g2+g3+I.S.)	3.6 μμf
Coupling	
Pentode Grid No. 1 to Triode Plate	.005 μμf Max.
Triode Grid to Pentode Plate	.018 μμf Max.
Pentode Plate to Triode Plate	.17 μμf Max.

RATINGS (Design Maximum Values)

Plate Voltage	300	330 Volts Max.
Grid No. 2 Supply Voltage	—	330 Volts Max.
Grid No. 2 Voltage	See 6AM8 Rating Chart	
Plate Dissipation	1.0	5[1] Watts Max.
Grid No. 2 Dissipation	—	2[1] Watts Max.
Positive Grid No. 1 Voltage	0	0 Volt Max.
Grid No. 1 Circuit Resistance		
Fixed Bias	0.5	0.25 Megohm Max.
Self Bias	1.0	1.0 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

	Triode Section	Pentode Section
Plate Voltage	200	250 Volts
Grid No. 2 Voltage	—	170 Volts
Grid No. 1 Voltage	−2	0 Volts
Cathode Bias Resistor	—	82 Ohms
Plate Current	4.5	22 Ma
Grid No. 2 Current	—	4.0 Ma
Transconductance	4200	12,000 μmhos
Amplification Factor	70	—
Plate Resistance (approx.)	—	140,000 Ohms
Ec1 for Ib = 10 μa (approx.)	−5	−10 Volts

Instantaneous Plate Knee Characteristics
Eb = 60 V; Ec2 = 170 V; and Ec1 = 0 V
Ib = 48 Ma (approx.) and Ic2 = 12 Ma (approx.)

NOTE:

1. These are design maximum dissipation ratings for television video amplifier applications. The two watts maximum Grid No. 2 Dissipation should not occur simultaneously with the five watts maximum plate dissipation. The two watts maximum Grid No. 2 Dissipation may be operated simultaneously with a Plate Dissipation of 4.0 Watts or 1.5 Watts. Maximum Grid No. 2 Dissipation may be operated simultaneously with a Plate Dissipation of 5.0 Watts.

APPLICATION

The Sylvania Types 6JE8, 8JE8 and 11JE8 are sharp cutoff pentodes, high mu triodes featuring a controlled plate knee characteristic for the pentode section. The triode section may be used as a sync separator and voltage amplifier. The pentode section is designed to serve as a video amplifier.

Types 8JE8 and 11JE8 have controlled heater warm-up time for series string operation.

6JK6

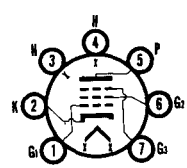
4JK6, 5JK6

Color Television Type

IF AMPLIFIER

Sharp Cutoff Pentode

Construction .....Miniature T-5½
Base .....Button 7 Pin, E7-1
Basing 7CM
Outline 5-2
Maximum Diameter .....0.750 In.
Maximum Seated Height .....1.875 In.
Maximum Overall Height .....2.125 In.



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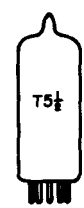


ELECTRICAL DATA

HEATER OPERATION

	4JK6	5JK6	6JK6
Heater Voltage	3.7	4.9	6.3 Volts
Heater Current	600	450	350 Ma
Heater Warm-up Time	11	11	— Seconds
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
Total DC and Peak			200 Volts
Heater Positive with Respect to Cathode			
DC			100 Volts
Total DC and Peak			200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate (Max.)	0.02 Pf
Input: g1 to (h + k + g2 + g3 + IS)	9.5 Pf
Output: p to (h + k + g2 + g3 + IS)	2.7 Pf

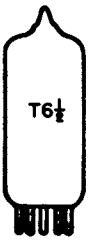
RATINGS (Design Maximum Rating System)

Plate Voltage (Max.)	275 Volts
Grid No. 2 Supply Voltage (Max.)	275 Volts
Grid No. 2 Voltage	See Rating Chart (Gen. Info. Sec.)
Plate Dissipation (Max.)	2.5 Watts
Grid No. 2 Dissipation (Max.)	0.6 Watt
Cathode Current (Max.)	22 Ma
Grid No. 1 Circuit Resistance (Self Bias) (Max.)	0.5 Megohm

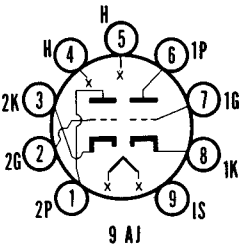
CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

Plate Voltage	125 Volts
Grid No. 3 Voltage	Connected to Cathode at Socket
Grid No. 2 Voltage	125 Volts
Cathode Bias Resistor	68 Ohms
Plate Current	11.5 Ma
Grid No. 2 Current	3.9 Ma
Transconductance	18,000 μmhos
Plate Resistance (Approx.)	0.15 Megohm
Grid No. 1 Voltage for Ib = 20 μa (Approx.)	−3.5 Volts
R Input at 44 MHz	4000 Ohms



SYLVANIA TYPES 6JK8 8JK8 17JK8



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9AJ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Operation	17JK8 Series	8JK8 Series	6JK8 Parallel
Heater Voltage	16.8	8.4	6.3 Volts
Heater Current	150	300	400 Ma
Heater Warm-up Time	17	—	— Seconds
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
Total D C and Peak			100 Volts
Heater Positive with Respect to Cathode			
Total D C and Peak			100 Volts

DIRECT INTERELECTRODE CAPACITANCES (Shielded)

	Section No. 1	Section No. 2
Grid to Plate	1.4	.60 μμf
Input: g to (h+k+I.S.+E.S.)	3.0	5.0 μμf
Output: p to (h+k+I.S.+E.S.)	1.0	4.0 μμf
Heater to Cathode	2.8	2.8 μμf
Grid to Grid	.003	μμf Max.
Plate to Plate	.009	μμf Max.

RATINGS (Design Maximum Values)

	Oscillator Section No. 1	R-F Amp. Section No. 2
Plate Voltage	165	200 Volts Max.
Plate Dissipation	1.0	2.0 Watts Max.
D C Cathode Current	22	22 Ma Max.
Negative Grid Voltage	50	50 Volts Max.
Grid Circuit Resistance (Self Bias)	1.0	1.0 Megohms Max.

CHARACTERISTICS AND TYPICAL OPERATION

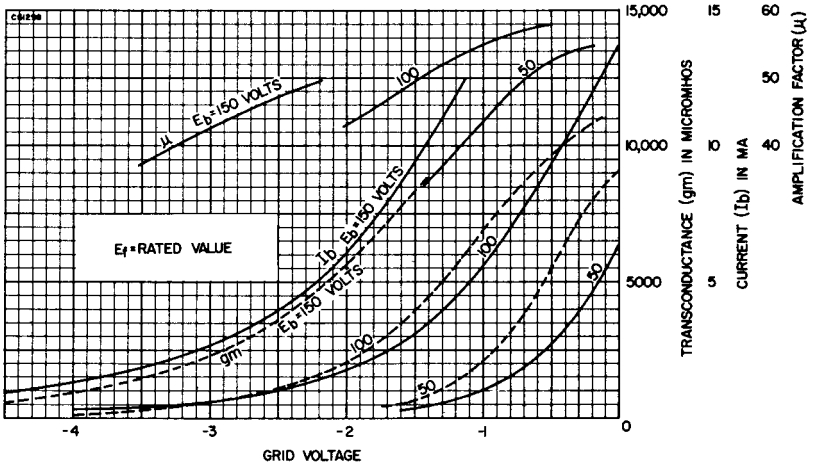
	Oscillator Section No. 1	R-F Amp. Section No. 2
Class A1 Amplifier		
Plate Voltage	100	135 Volts
Grid Voltage	−1.0	−1.2 Volts
Plate Current	5.3	10 Ma
Transconductance	6800	13,000 μmhos
Amplification Factor	55	70
Plate Resistance (approx.)	8000	5400 Ohms
Ec for Ib = 20 μA (Approx.)	−4.4	— Volts
Ec for Gm = 150 μmhos (approx.)	—	−5.5 Volts
Ec for Gm = 1500 μmhos (approx.)	—	−2.8 Volts

APPLICATION

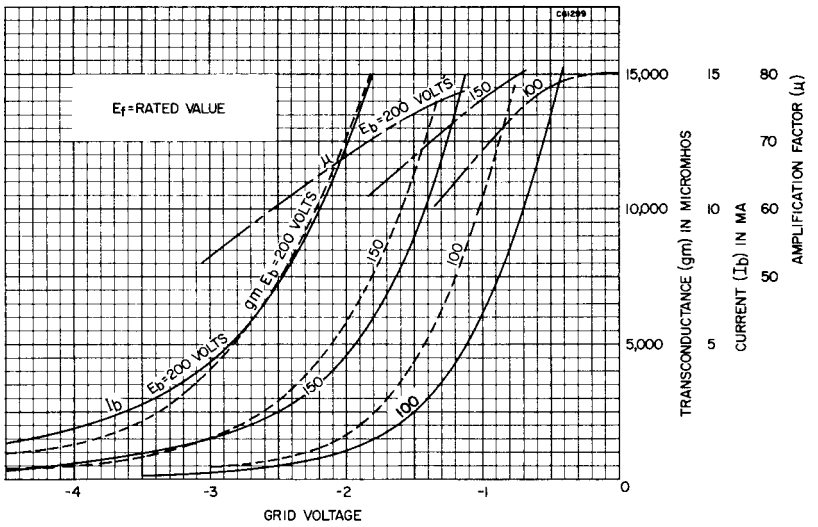
The Sylvania Types 6JK8, 8JK8, and 17JK8 are dissimilar duo triodes designed especially for FM tuners. They feature a strap frame grid RF amp. and an oscillator mixer in a T-6½ bulb. The design engineer can obtain 40 db of quieting at less than 10 μV signal with simple circuitry.

SYLVANIA TYPES 6JK8, 8JK8, 17JK8 (Cont'd)

AVERAGE TRANSFER CHARACTERISTICS
(Section No. 1)



AVERAGE TRANSFER CHARACTERISTICS
(Section No.2)



ADVANCE DATA

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7CM
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Operation	4JL6 Series	5JL6 Series	6JL6 Parallel	
Heater Voltage	3.7	4.9	6.3	Volts
Heater Current	600	450	350	Ma
Heater Warm-up Time	11	11	-	Seconds

Heater-Cathode Voltage (Design Maximum Values)

Heater Negative with Respect to Cathode		
Total DC and Peak	200 Volts	Max.
Heater Positive with Respect to Cathode		
DC	100 Volts	Max.
Total DC and Peak	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	.02 pf	Max.
Input: g1 to (h + k + g2 + g3 + IS)	9.3 pf	
Output: p to (h + k + g2 + g3 + IS)	2.7 pf	

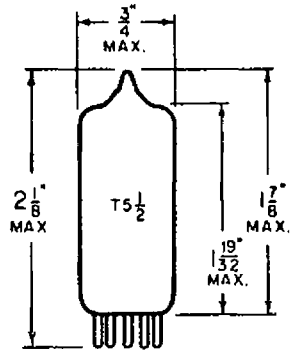
RATINGS (Design Maximum Values)

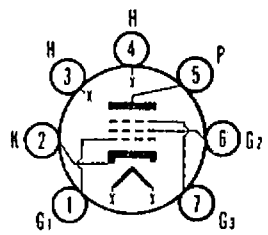
Plate Voltage	275 Volts	Max.
Grid No. 2 Supply Voltage	275 Volts	Max.
Grid No. 2 Voltage	See Rating Chart	
Plate Dissipation	2.5 Watts	Max.
Grid No. 2 Dissipation	0.6 Watt	Max.
Cathode Current	22 Ma	Max.
Grid No. 1 Circuit Resistance (Self Bias)	0.5 Megohms	Max.

QUICK REFERENCE DATA

The 6JL6, 5JL6, and 4JL6 are 7-pin miniature, semi-remote cutoff pentodes, featuring frame grid construction, very high Gm, and automated manufacturing techniques which insure exceptional product uniformity. They are designed for AGC controlled IF amplifier applications in TV receivers.

The 5JL6 and 4JL6 have controlled heater warm-up time for series string operation.





7CM

SYLVANIA
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Prepared and Released By The
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EMPORIUM, PENNSYLVANIA

February 26, 1963

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from JEDEC release #4196, March 25, 1963

AVERAGE CHARACTERISTICS

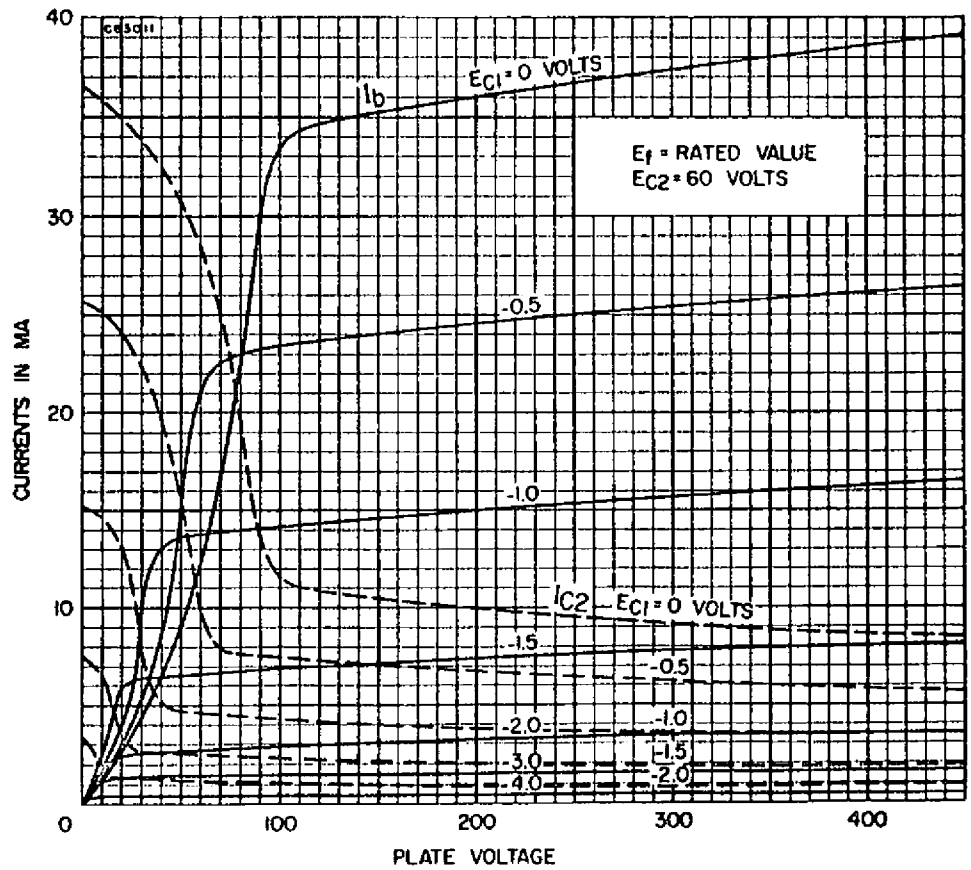
Class A_1 Amplifier

Plate Voltage	125 Volts
Grid No. 2 Voltage	60 Volts
Grid No. 3 Voltage	Connected to Cathode at Socket
Cathode Bias Resistor	68 Ohms
Plate Current	12.5 Ma
Grid No. 2 Current	4.0 Ma
Transconductance	15,500 µmhos
Plate Resistance (Approx.)	120,000 Ohms
Ecl for gm = 1500 µmhos (Approx.)	-2.7 Volts
Ecl for gm = 150 µmhos (Approx.)	-5.5 Volts

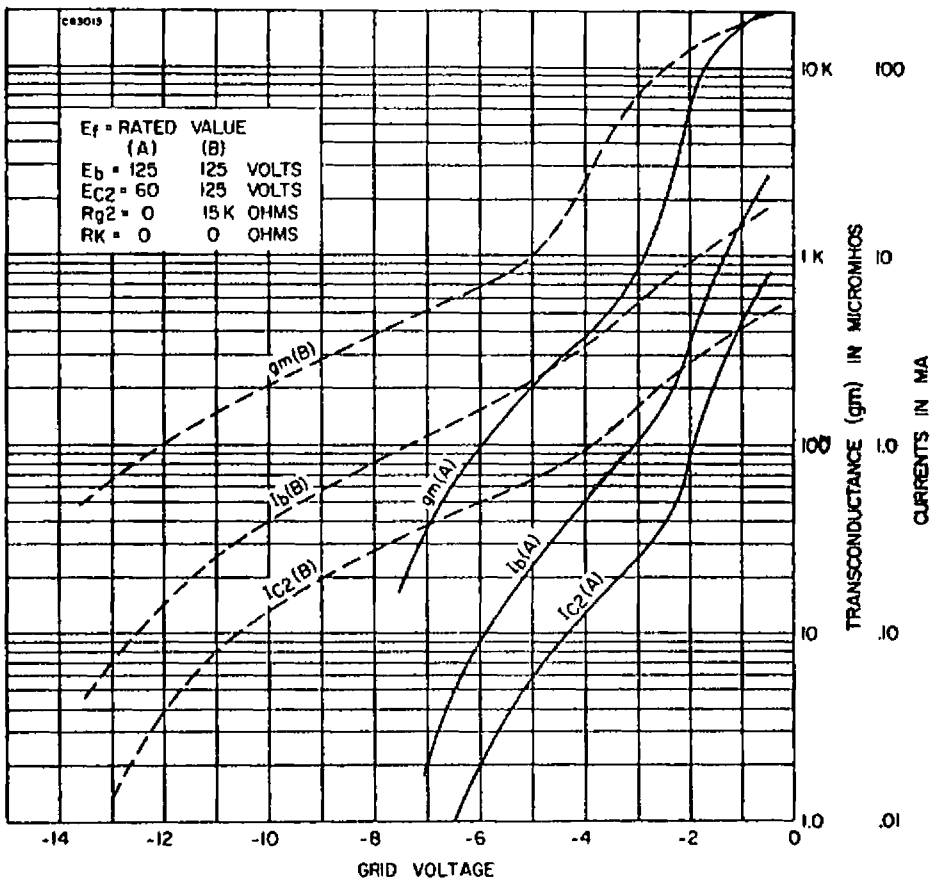
NOTES:

1. Optimized unbypassed cathode resistor for gain controlled IF service is 33 Ohms.

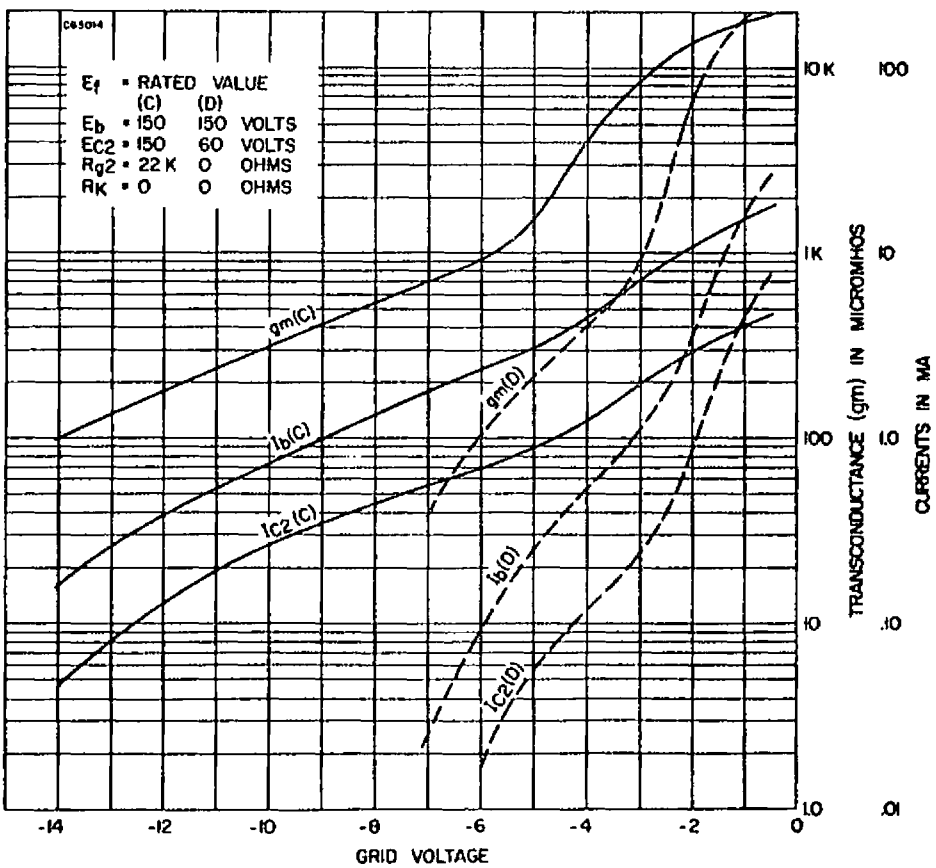
AVERAGE PLATE CHARACTERISTICS



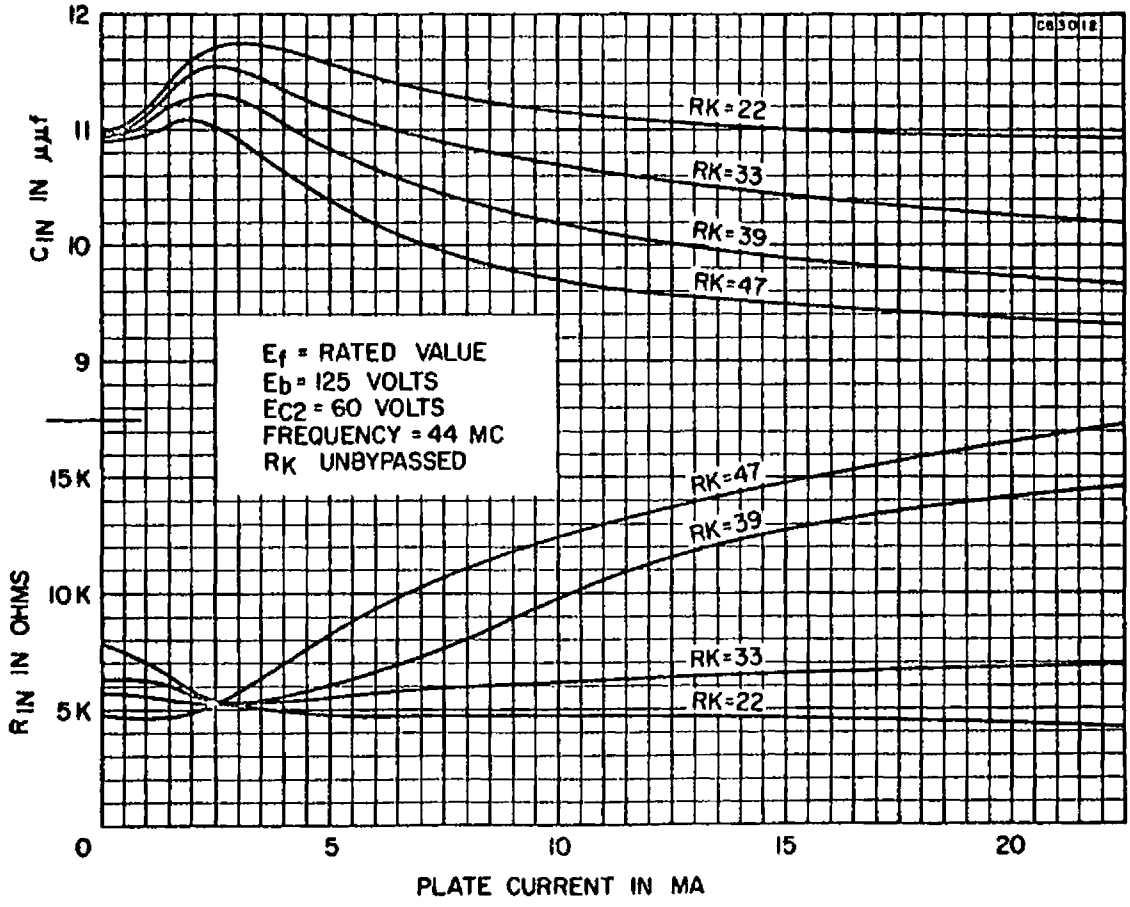
AVERAGE TRANSFER CHARACTERISTICS



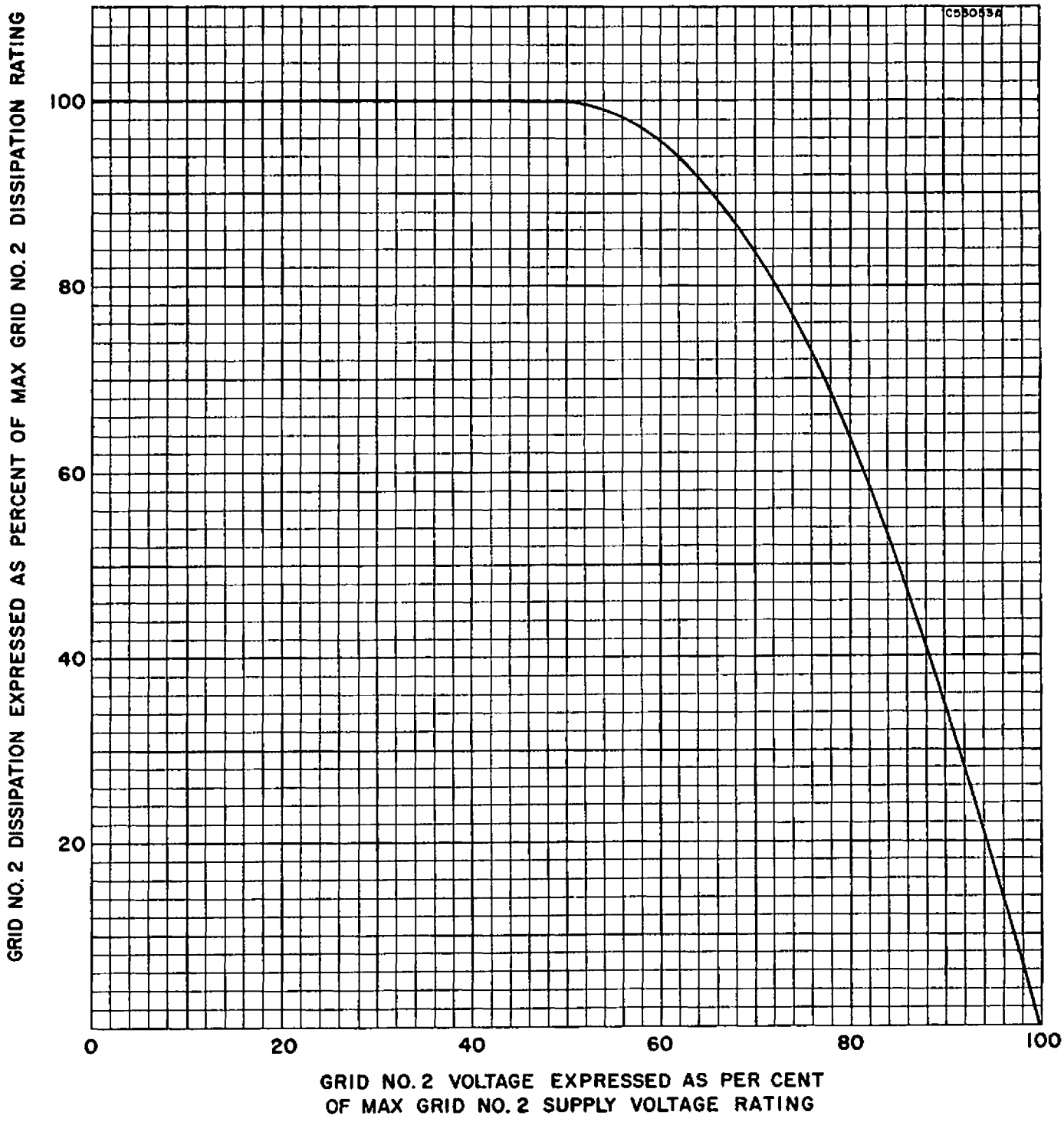
AVERAGE TRANSFER CHARACTERISTICS



AVERAGE INPUT RESISTANCE AND INPUT CAPACITANCE



RATING CHART



TECHNICAL DATA

6K4

Sylvania

TYPE 6K4

GENERAL PURPOSE TRIODE

RATINGS

Heater Voltage (AC or DC) ±10%	6.3	Volts
Maximum Plate Voltage	250	Volts
Maximum Heater to Cathode Voltage	90	Volts
Maximum Plate Dissipation (Open Air)	3.0	Watts
Maximum Cathode Current	20.0	Ma.

Direct Interelectrode Capacitances:

	Shielded*	Unshielded	
Grid to Plate	2.4	2.4	µµf.
Input	2.4	2.4	µµf.
Output	3.8	0.8	µµf.

**With a .405" diameter shield connected to cathode.*

TYPICAL OPERATING CONDITIONS

Heater Voltage	6.3	Volts
Heater Current	150	Ma.
Plate Voltage	200	Volts
Grid Voltage# Obtained from Self Bias Resistor of	680	Ohms
Plate Current	11.5	Ma.
Transconductance	3450	µmhos
Amplification Factor	16	
Plate Resistance	4650	Ohms
Grid Voltage for Plate Current Cut-Off to 10 µa.	-30	Volts

#Provides an operating bias of approximately 8.0 volts. Maximum grid circuit resistance should not exceed 1/2 megohm. Fixed bias operation is not recommended.

CIRCUIT APPLICATION

Sylvania Type 6K4 is designed for use in high frequency applications requiring a very small, light-weight tube, highly resistant to shock and vibration.

At frequencies of around 500 Mc., an output of approximately 3/4 Watt may be obtained when used in a suitable circuit.

from RMA release # 455D
Dec. 15, 1947

PHYSICAL SPECIFICATIONS

Style: Sub-Miniature

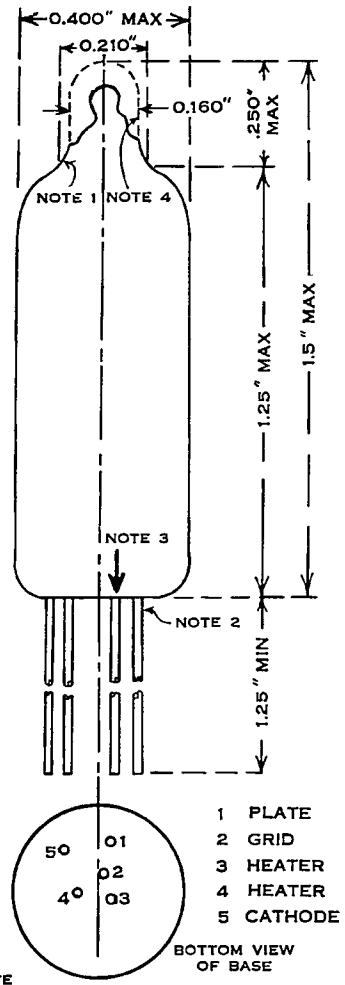
Bulb: T-3

Base: Flexible Leads

Dimensions: As per outline

Mounting Position: Any

Lead Connections: As per outline



NOTE

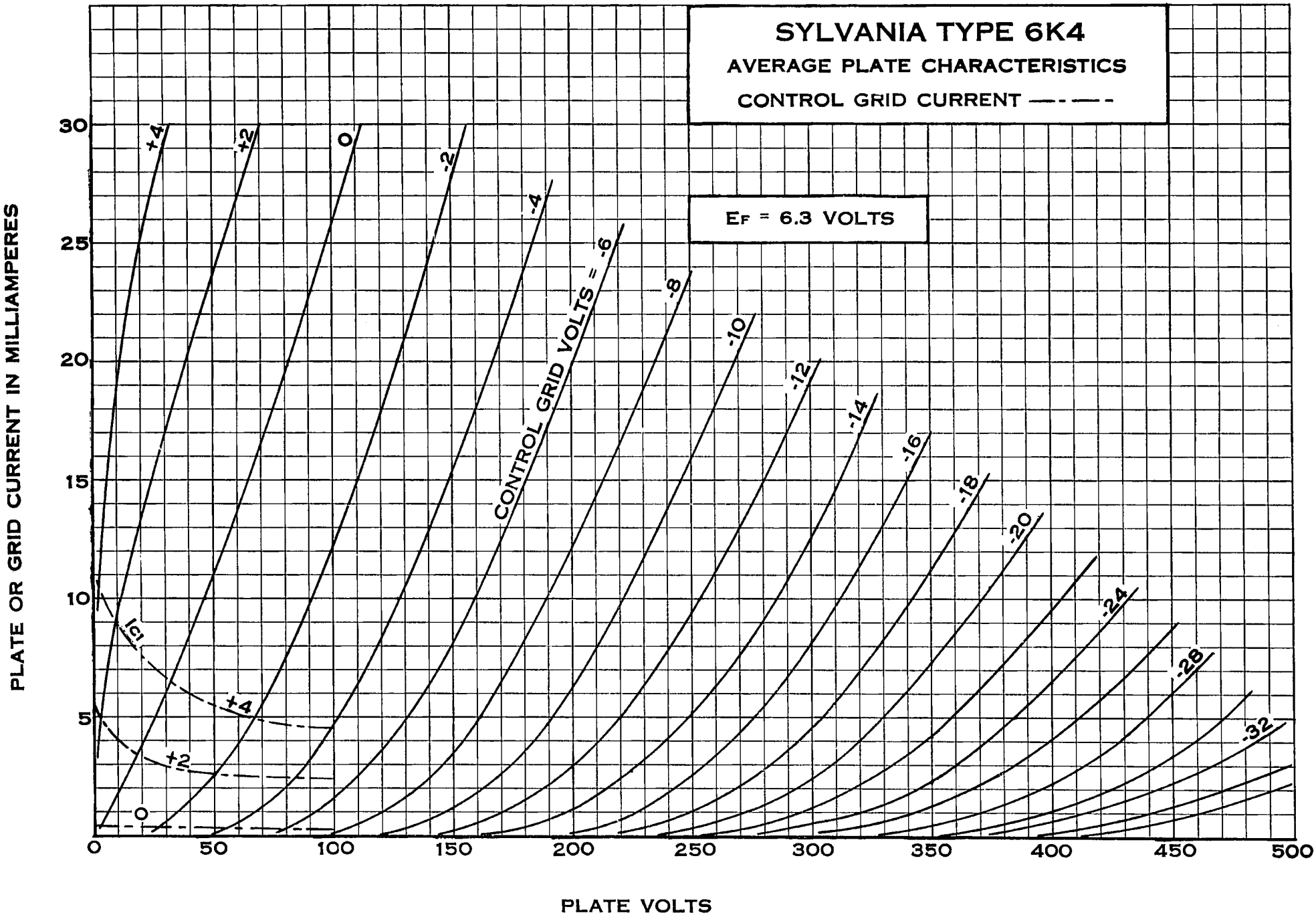
1 REFERENCE DIAMETER FROM WHICH TIP & BULB LENGTHS ARE DETERMINED

2 LEADS SHOULD NOT BE SOLDERED CLOSER THAN 1/4 FROM BASE

3 ARROW INDICATES POSITION OF PLATE LEAD

4 ALL TIPS LIE WITHIN DOTTED LINES

OCTOBER 27, 1947 COMMERCIAL ENGINEERING DEPARTMENT
Sylvania Electric Products Inc., Emporium, Pennsylvania
PRINTED IN U.S.A.


SYLVANIA TYPE 6K4
AVERAGE PLATE CHARACTERISTICS
CONTROL GRID CURRENT —·—·—
EF = 6.3 VOLTS
PLATE OR GRID CURRENT IN MILLIAMPERES
PLATE VOLTS
CONTROL GRID VOLTS = +4
+2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-24
-28
-32
Ic1
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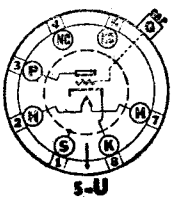
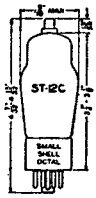


Sylvania

TYPE 6K5G

TRIODE
A MU ELEVE



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12C
Capuchon	Miniature
Culot — Octal petit 7 broches	5-U
Position de montage	Toutes

Capacités interélectrodes :

Grille à plaque	2,0 $\mu\mu f$
Entrée	2,4 $\mu\mu f$
Sortie	3,6 $\mu\mu f$

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A

Tension de chauffage	6,3	6,3 volts
Tension plaque	100	250 volts
Tension grille *	—1,5	—3 volts
Courant plaque*	0,35	1,1 ma.
Résistance interne	78,000	50,000 ohms Approx.
Conductance mutuelle	900	1,400 μmhos appr.
Coefficient d'amplification	70	70

*Valeurs normales, et non pas point de fonctionnement avec résistance de couplage (voir application.)

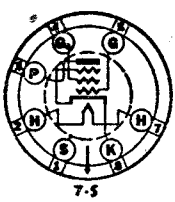
APPLICATION

Le type Sylvania 6K5G est un tube verre triode à coefficient d'amplification élevé muni d'un culot octal.

Les caractéristiques de cet amplificateur sont très semblables à celles de la section triode du type 6Q7G. Les principales différences résident dans la conductance mutuelle accrue et la résistance interne réduite.

Le coefficient d'amplification (μ=70) est plus faible que celui du type 6F5 ou de la section triode du tube 75. Cette valeur plus faible permet l'utilisation de signaux d'entrée plus forts, aussi bien avec 250 qu'avec 100 volts de tension plaque, sans qu'un courant de grille prenne naissance. La polarisation de grille est moins critique qu'avec les triodes à μ plus élevé.

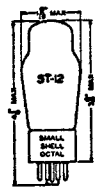
Ce tube fonctionnant avec une tension d'alimentation de plaque de 250 volts avec, en série, une résistance de charge de 100.000 à 250.000 ohms, demande une polarisation négative de grille de 2,5 volts approximativement. Avec 100 volts d'alimentation et une résistance de charge de 50.000 à 100.000 ohms, la polarisation négative sera de l'ordre de 1,4 volt. Pour des applications spéciales, ces valeurs peuvent être changées pour satisfaire aux conditions.



Sylvania

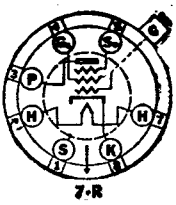
TYPE 6K6G

PENTODE DE PUISSANCE INTERMEDIAIRE



Tension de chauffage	6,3 volts
Courant de chauffage	0,4 ampère
Ampoule	ST-12
Culot — Petit octal 7 broches	7-S
Position de montage	Toutes

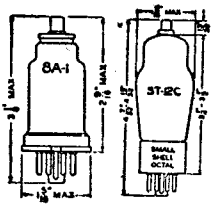
Pour toutes les autres caractéristiques, conditions de fonctionnement et applications, voir type 41.



Sylvania

TYPE 6K7
TYPE 6K7G

AMPLIFICATEURS TRIGRILLES A PENTE VARIABLE



CARACTERISTIQUES

	6K7	6K7G
Tension chauffage CA ou CC	6,3	6,3 volts
Courant chauffage	0,3	0,3 ampère
Ampoule	8A-1	ST-12C
Culot : petit octal 7 broches	7-R	7-R
Capuchon	Miniature	Miniature
Position de montage	Toutes	Toutes

Capacités directes interélectrodes :

(avec blindages standard)

	6K7	6K7G
Grille à plaque	0,005	0,007 $\mu\mu$f
Entrée	7,0	5,0 $\mu\mu$f
Sortie	12,0	12,0 $\mu\mu$f

Conditions limites de fonctionnement. (Voir page 9) :

Tension chauffage CA ou CC	6,3 volts
Courant chauffage	0,3 ampère
Tension plaque	300 volts max.
Source tension écran	300 volts max.
Tension écran	125 volts max.
Dissipation plaque	2,75 watts max.
Dissipation écran	0,35 watt max.
Polarisation grille ext.	0 volt min.

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A1

Tension de chauffage	6,3	6,3	6,3	**6,3 volts**
Tension plaque	90	180	250	250 volts
Tension grille	—3	—3	—3	—3 volts min.
Tension écran	90	75	100	125 volts max.
Grille de suppression	Connectée à la cathode.			
Courant plaque	5,4	4,0	7,0	10,5 ma.
Courant écran	1,3	1,0	1,7	2,6 ma.
Résistance interne	0,315	1,0	0,8	0,6 mégohm
Conductance mutuelle	1,275	1,100	1,450	1,650 μmhos
Coefficient d'amplification	400	1,100	1,160	990
Tension de grille*	—38,5	—32,5	—42,5	—52,5 volts

* Pour une conductance mutuelle de 2 micromhos.

Conditions de fonctionnement avec polarisation variable (mixer) :

Tension chauffage	6,3 volts
Courant chauffage	0,3 ampère
Tension grille écran	100 volts
Polarisation grille approx.	—10 volts
Grille suppression	relié cathode.

APPLICATION

Sylvania 6K7 et 6K7G sont des amplificateurs trigrilles, à pente variable, répondant à toutes les exigences imposées pour les étages H.F. et M.F. des récepteurs. Les caractéristiques de ce tube sont semblables à celles du type 78, bien connues.

Les usages du tube 6K7 ou 6K7G sont les mêmes que ceux signalés sous le titre Type 78.

Un schéma-type de récepteur toutes ondes utilisant le tube 6K7 et d'autres tubes métal sera trouvé à la fin du Manuel.

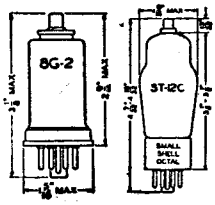


8-K

Sylvania

TYPE 6K8
TYPE 6K8G

CONVERTISSEUR TRIODE-HEXODE



CARACTERISTIQUES

	6K8	6K8G
Tension chauffage	6,3	6,3 volts
Courant chauffage	0,3	0,3 ampère
Ampoule	8G-2	St-12C
Culot — Petit octal 8 broches	8-K*	8-k*
Capuchon	Miniature	Miniature
Position de montage	Toutes	Toutes

*Les plaques du déflecteur, non indiquées sur le schéma du culot, sont connectées à la broche 1 (type 6K8) et à la broche 8) type 6K8G).

Capacités interélectrodes (approx.)* :

	6K8	6K8G	
Grille G à plaque hexode	0,03	0,08	$\mu\mu f$ max.
Grille G à plaque oscillateur	0,02	0,05	$\mu\mu f$ max.
Grille G à grille Go	0,2	0,2	$\mu\mu f$ max.
Grille Go à plaque oscillateur	1,1	1,8	$\mu\mu f$
Grille Go à plaque mixer	0,1	0,15	$\mu\mu f$ max.
Grille G à toutes autres élec. (entr. H.F.)	6,6	4,6	$\mu\mu f$
Plaque à tout. aut. élec. exc. Go (s. osc.)	3,2	3,4	$\mu\mu f$
Grille Go à tt. aut. élec. ex. Po (en osc.)	6,0	6,5	$\mu\mu f$
Plaque hexode àt t. aut. élect. (s. mixer)	3,5	4.8	$\mu\mu f$

*L'enveloppe connectée à la cathode.

Conditions limites de fonctionnement. (Voir page 9) :

CONVERTISSEUR :

Tension chauffage	6,3 volts
Courant chauffage	0,3 ampère
Tension plaque hexode	300 volts max.
Source tension écran hexode	300 volts max.
Tension écran hexode	150 volts max.
Dissipation plaque hexode	0,75 watt max.
Dissipation écran hexode	0,70 watt max.
Tension anode oscillateur	125 volts max.
Dissipation anode oscillateur	0,75 watt max.
Courant cathodique total	16 ma. max.
Tension polarisation grille signal	0 volt max.

Conditions de fonctionnement et caractéristiques :

Tension de chauffage	6,3	6,3 volts
Tension plaque hexode	100	250 volts
Tension grille de contrôle hexode	—3	—3 volts
Tension écran (hexode)	100	100 volts
Tension plaque oscillateur	100	100 volts
Résistance de grille oscillateur	50,000	50,000 ohms
Courant plaque (hexode)	2,3	2,5 ma.
Courant écran (hexode)	6,2	6,0 ma.
Courant plaque oscillateur	3,8	3,8 ma.
Courant de grille oscill. et de grille N° 1	0,15	0,15 ma.
Courant cathodique	12,5	12,5 ma.
Résistance interne (hexode)	0,4	0,6 mégohm
Conductance de conversion	325	350 μmhos
Tension grille de contrôle (hexode) pour une conductance de conversion de 2 μmhos	—30	—30 volts

APPLICATION

Le type Sylvania 6K8 ou 6K8G est un tube de construction spéciale destiné au changement de fréquence. Il comprend deux sections: une triode oscillatrice et une hexode modulatrice dans la même ampoule.

Dans les installations classiques le type 6K8 ou 6K8G donne moins de glissement de fréquence que le convertisseur à deux grille tel que le type 6A8. Une économie est possible, pour les récepteurs universels AC-DC, car la plaque hexode, la grille écran hexode et la plaque triode peuvent être au même potentiel.

Lorsque le 6K8 ou 6K8G remplace un convertisseur pentagrille, il peut être nécessaire de réduire le couplage entre la bobine de plaque de l'oscillatrice et la self de grille pour que la section oscillatrice du tube ne soit pas surexcitée. Dans les applications où les tensions de plaque d'oscillatrice et de grille écran sont prises au même point, un condensateur by-pass vers la masse peut être nécessaire.

Il est recommandé de maintenir la différence de potentiel entre cathode et filament aussi faible que possible, si la connexion directe n'est pas possible.

6KA8

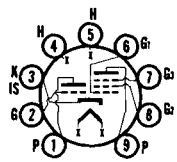
8KA8

Color Television Type

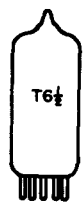
SYNC SEPARATOR (T) AGC AMP and NOISE INVERTER (P)

High Mu Triode and Sharp Cutoff Pentode

Construction .....Miniature T-6½
Base .....Button 9 Pin, E9-1
Basing 9PV
Outline 6-3
Maximum Diameter .....0.875 In.
Maximum Seated Height .....2.375 In.
Maximum Overall Height .....2.625 In.



9PV



ELECTRICAL DATA

HEATER OPERATION

	8KA8	6KA8
Heater Voltage	8.4	6.3 Volts
Heater Current	450	600 Ma
Heater Warm-up Time	11	11 Seconds
Maximum Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
Total DC and Peak		200 Volts
Heater Positive with Respect to Cathode		
DC		100 Volts
Total DC and Peak		200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section	
Grid to Plate	2.2 Pf
Input: g to (k + h + IS)	2.8 Pf
Output: p to (k + h + IS)	2.2 Pf
Pentode Section	
Grid No. 1 to Plate (Max.)	0.1 Pf
Input: g1 to (h + k + g2 + g3 + IS)	9.5 Pf
Grid No. 3 to (h + k + g2 + g1 + IS)	7 Pf
Grid No. 1 to Grid No. 3	0.5 Pf
Grid No. 3 to Plate	2.2 Pf

RATINGS (Design Maximum Rating System)

	Triode Section	Pentode Section
Plate Voltage (Max.)	300	300 Volts
Peak Positive Pulse Plate Voltage (Max.)(1)	—	600 Volts
Grid No. 2 Supply Voltage (Max.)	—	300 Volts
Grid No. 2 Voltage	See Rating Chart (Gen. Info. Sec.)	
Positive Grid No. 3 Voltage (Max.)	—	0 Volt
Negative Grid No. 3 Voltage (Max.)	—	100 Volts
Positive Grid No. 1 Voltage (Max.)	0	0 Volt
Negative Grid No. 1 Voltage (Max.)	50	50 Volts
Plate Dissipation (Max.)	1.1	2.0 Watts
Grid No. 2 Input (Max.)	—	1.1 Watt
Grid No. 1 Circuit Resistance		
Self Bias (Max.)	1.0	1.0 Megohm
Fixed Bias (Max.)	0.25	0.5 Megohm
Grid No. 3 Circuit Resistance (Max.)	—	0.68 Megohm

CHARACTERISTICS AND TYPICAL OPERATION

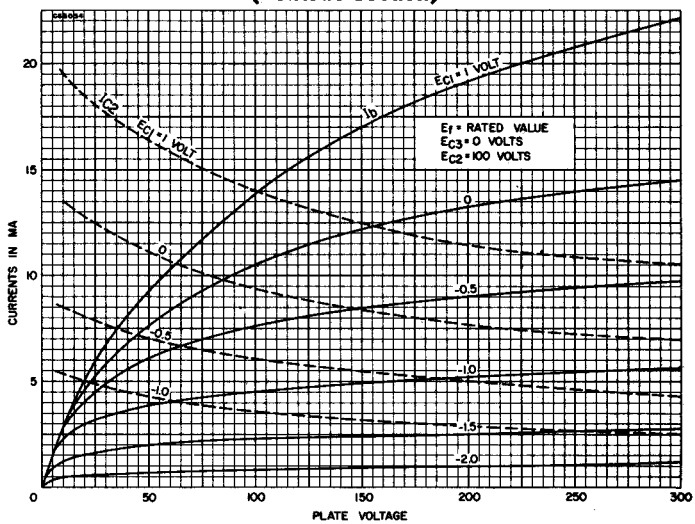
Class A1 Amplifier

	Triode Section	Pentode Section
Plate Supply Voltage	200	150 Volts
Grid No. 2 Voltage	—	100 Volts

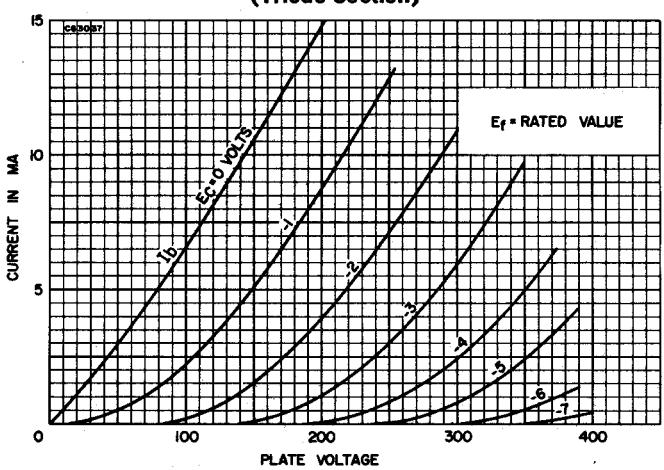
Grid No. 1 Voltage	−2	0 Volts
Cathode Bias Resistor	—	180 Ohms
Plate Current	4	4 Ma
Grid No. 2 Current	—	2.8 Ma
Amplification Factor	70	—
Plate Resistance (Approx.)	17,500	100,000 Ohms
Transconductance (G1 to P)	4000	4400 μmhos
Transconductance (G3 to P)	—	600 μmhos
Ec3 for Ib = 20 μa (Approx.)	—	−7 Volts
Ec1 for Ib = 10 μa (Approx.)	−5	— Volts
20 μa (Approx.)	—	−4 Volts

NOTE:
(1) The duration of the voltage pulse must not exceed 15% of one horizontal scanning cycle. In a 525-line, 30-frame system, 15% of one horizontal scanning cycle is 10 μsec.

AVERAGE PLATE CHARACTERISTICS
(Pentode Section)



AVERAGE PLATE CHARACTERISTICS
(Triode Section)



ADVANCE DATA

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9AE
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts	
Heater Current	400 Ma	
Heater-Cathode Voltage (Design Maximum Values)[3]		
Heater Negative with Respect to Cathode		
Total DC and Peak	200 Volts	Max.
Heater Positive with Respect to Cathode		
DC	100 Volts	Max.
Total DC and Peak	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[1]	Unshielded	
Pentode Section			
Grid No. 1 to Plate	.007	.015 μμf	Max.
Input: g1 to (h+k+g2+g3+I.S.)	5.0	5.0 μμf	
Output: p to (h+k+g2+g3+I.S.)	3.5	2.6 μμf	
Cathode to Heater	3.0[2]	3.0 μμf	
Triode Section			
Grid to Plate	1.8	1.8 μμf	
Input: g to (h+Pk+Tk+g3+I.S.)	2.8	2.8 μμf	
Output: p to (h+Pk+Tk+g3+I.S.)	2.0	1.5 μμf	
Cathode to Heater	3.0[2]	3.0 μμf	
Coupling			
Pentode Grid No.1 to Triode Plate	0.2	0.2 μμf	Max.
Pentode Plate to Triode Plate	.02	0.1 μμf	Max.

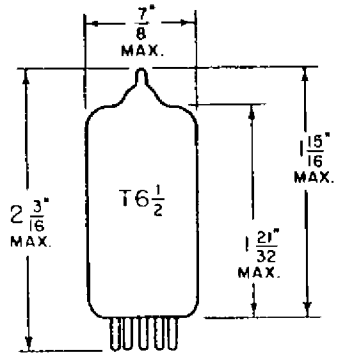
APPLICATION

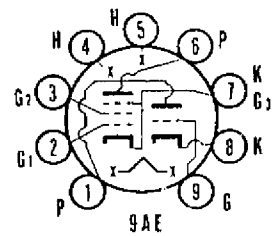
Control grid to cathode spacing on this tube type is of such low order of magnitude as to preclude the use of voltage between these elements of more than 100 volts dc or peak ac in commercial tube checkers and shorts indicating devices, particularly where mechanical excitation of the tube is employed.

from JEDEC release #3687, April 16, 1962

QUICK REFERENCE DATA

The Sylvania Type 6KD8 has a medium mu triode and sharp cutoff pentode contained in one envelope. It is intended for use as a combined VHF oscillator and mixer.





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

March 29, 1962

RATINGS (Design Maximum System)

	Triode Section	Pentode Section		
Plate Voltage	330	330	Volts	Max.
Grid No. 2 Supply Voltage		330	Volts	Max.
Grid No. 2 Voltage	See Rating Chart			
Positive DC Grid No. 1 Voltage	0	0	Volts	Max.
Plate Dissipation	2.5	3.0	Watts	Max.
Grid No. 2 Dissipation		0.55	Watt	Max.
Grid No. 1 Circuit Resistance				
Fixed Bias		0.5	Megohm	Max.
Self Bias		1.0	Megohm	Max.

CHARACTERISTICS AND TYPICAL OPERATION

	Triode Section	Pentode Section	
Plate Voltage	125	125	Volts
Grid No. 2 Voltage		110	Volts
Grid No. 1 Voltage	-1.0	-1.0	Volts
Plate Current	13.5	9.5	Ma
Grid No. 2 Current		3.5	Ma
Transconductance	7500	5000	μmhos
Amplification Factor	40		
Plate Resistance (approx.)		0.2	Megohm
Ec1 for Ib = 20 μa (approx.)	-9	-8	Volts
Gm with Ec1 = 0v, Eb = 100v and Ec2 = 70v		5500	μmhos

NOTES:

1. External shield No. 315 connected to pin number 4.
2. External shield No. 315 connected to pin number 6.
3. Heater-Cathode Voltage ratings apply to triode and pentode sections.

For Plate 2 Volts — 100 ..... 3.3 Ma

Color Television Type

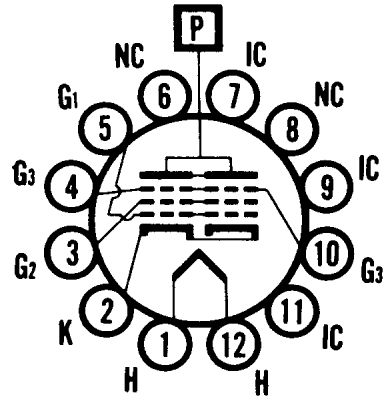
HORIZONTAL DEFLECTION AMPLIFIER

6KN6

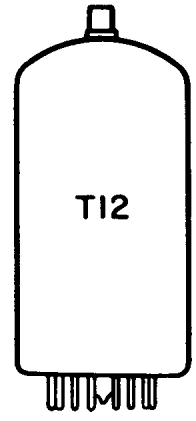
42KN6

Beam Power Pentode
(2 Sections in Parallel)

Construction.....Compactron T-12
Base .....Button 12 Pin, E12-74
Top Cap .....C1-2 or C1-3
Basing 12GU
Outline 12-82
Maximum Diameter .....1.562 In.
Maximum Seated Height .....4.000 In.
Maximum Overall Height .....4.375 In.



12GU



ELECTRICAL DATA

HEATER OPERATION

	42KN6	6KN6
Heater Voltage	42	6.3 Volts
Heater Current	450	3000 Ma
Heater Warm-up Time	11	— Seconds
Maximum Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
Total DC and Peak		200 Volts
Heater Positive with Respect to Cathode		
DC		100 Volts
Total DC and Peak		200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	1.0 Pf
Input	44.0 Pf
Output	18.0 Pf

RATINGS (Design Maximum Rating System)

Horizontal Deflection Amplifier (Sections in Parallel)(1)

DC Plate Supply Voltage (Boost + DC Power Supply) (Max.)	770 Volts
Peak Positive Pulse Plate Voltage	6500 Volts
Peak Negative Pulse Plate Voltage (Max.)	1500 Volts

Plate Dissipation (Max.)(2)		30 Watts
Peak Negative Grid No. 1 Voltage (Max.)		330 Volts
Grid No. 2 Voltage (Max.)		220 Volts
Grid No. 2 Dissipation (Max.)		5.0 Watts
Average Cathode Current (Max.)		400 Ma
Peak Cathode Current (Max.)		1500 Ma
Grid No. 1 Circuit Resistance (Max.)		1.0 Megohm
Bulb Temperature (At Hottest Point)		260 °C
CHARACTERISTICS AND TYPICAL OPERATION (Sections in Parallel)		
Plate Voltage	5500	130 Volts
Grid No. 2 Voltage	125	130 Volts
Grid No. 1 Voltage	—	−20 Volts
Plate Current	—	100 Ma
Grid No. 2 Current	—	4.0 Ma
Transconductance	—	16,000 μmhos
Plate Resistance	—	4000 Ohms
Amplification Factor(3)	—	4.5
Ec1 for Ib = 1.0 Ma (Approx.)	—	−33 Volts
Ec1 for Ib = 75 μa (Approx.)	100	— Volts

INSTANTANEOUS PLATE KNEE VALUES (Sections in Parallel)
Eb = 60 V, Ec2 = 125 V, and Ec1 = 0 V
Ib = 800 Ma; and Ic2 = 50 Ma

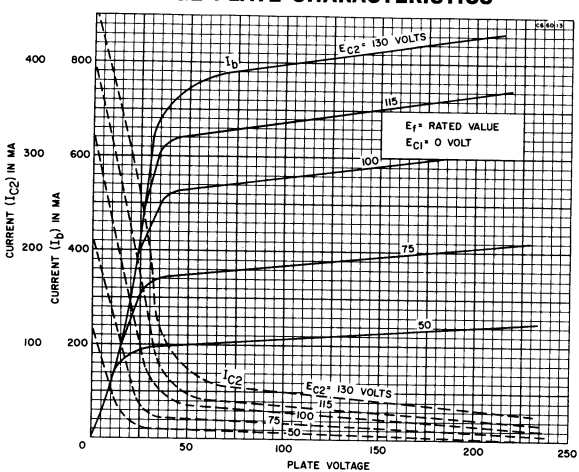
NOTES:

(1) For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations; Federal Communications Commission," the duty cycle of the voltage pulse must not exceed 15% of one horizontal scanning cycle.

(2) In stages operating with grid leak bias, an adequate cathode bias resistor or other suitable means is necessary to protect the tube in the absence of excitation.

(3) Amplification factor with tube operating as a triode with 130 volts on the plate and Grid No. 2 and −20 volts on Grid No. 1.

AVERAGE PLATE CHARACTERISTICS



ADVANCE DATA

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button, 9-Pin
Outline	6-3
Basing	9DX
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

Heater Operation	6KS8 Series	6KS8 Parallel	8KS8 Series	
Heater Voltage	6.3	6.3[1]	8.4	Volts
Heater Current	600[1]	600	450[1]	Ma
Heater Warm-up Time[2]	11	-	11	Seconds

Ratings (Design Maximum Values)

	6KS8 Min.-Max.	6KS8 Min.-Max.	8KS8 Min.-Max.	
Heater Voltage[3]	- -	5.7-6.9		Volts
Heater Current[3]	560-640		420-480	Ma
Maximum Heater-Cathode Voltage				
Heater Negative with Respect to Cathode				
Total DC and Peak	200	200	200	Volts
Heater Positive with Respect to Cathode				
DC	100	100	100	Volts
Total DC and Peak	200	200	200	Volts

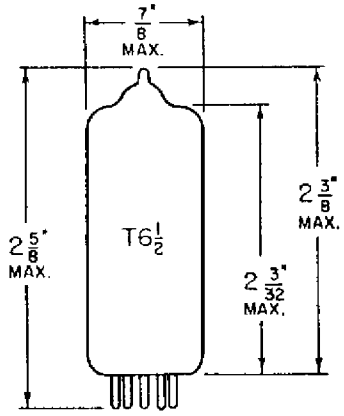
DIRECT INTERELECTRODE CAPACITANCES

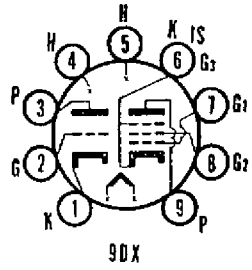
Triode Section	Shielded[4]	Unshielded
Grid to Plate	2.2	2.2 μμf
Input: g to (h+Tk+Pk,g3,I.S.)	3.4	3.2 μμf
Output: p to (h+Tk+Pk,g3,I.S.)	3.0	1.8 μμf

from JEDEC release #3823, July 23, 1962

QUICK REFERENCE DATA

Sylvania Types 6KS8 and 8KS8 have a high mu triode and a semi-remote cutoff pentode contained in a T-6½ envelope. Special design features of the pentode video amplifier section reduces overloading effects when used with simple AGC circuits. The triode section may be used as a sync separator or general purpose tube.





SYLVANIA
ELECTRONIC TUBES
A Division of
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RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

June 29, 1962

DIRECT INTERELECTRODE CAPACITANCES (Cont'd)

Pentode Section	Shielded[4]	Unshielded		
Grid No. 1 to Plate	.04	.05	µµf	Max.
Input: g1 to (h+Tk+Pk,g3,I.S.+g2)	10	10	µµf	
Output: p to (h+Tk+Pk,g3,I.S.+g2)	4.5	3.6	µµf	
Coupling				
Pentode Plate to Triode Plate	.025	.150	µµf	Max.
Pentode Grid No. 1 to Triode Plate	.005	.008	µµf	Max.

RATINGS (Design Maximum Values)

	Triode Section	Pentode Section		
Plate Voltage	330	330	Volts	Max.
Grid No. 2 Supply Voltage		330	Volts	Max.
Grid No. 2 Voltage	See J5/C4-2 Rating Chart			
Plate Dissipation	1.1	3.75	Watts	Max.
Grid No. 2 Dissipation		1.1	Watt	Max.
Positive Grid No. 1 Voltage	0	0	Volt	Max.
Grid No. 1 Circuit Resistance				
Fixed Bias	0.5	0.25	Megohm	Max.
Self Bias	1.0	1.0	Megohm	Max.

Control grid to cathode spacing of the pentode section is of such low order of magnitude as to preclude the use of voltage between these elements of more than 100 volts DC or peak AC in commercial tube checkers and shorts indicating devices, particularly where mechanical excitation of the tube is employed.

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier	Triode	Pentode	
Plate Voltage	200	150	Volts
Grid No. 2 Voltage		150	Volts
Grid No. 1 Voltage	-2	0	Volts
Cathode Bias Resistor		150	Ohms
Plate Current	4.0	20	Ma
Grid No. 2 Current		4.5	Ma
Transconductance	4000	9500	µmhos
Amplification Factor	70		
Plate Resistance (approx.)	17,500	150,000	Ohms
Ec1 for Ib = 100 µa (approx.)		-10	Volts
Ec for Ib = 20 µa (approx.)	-5		Volts

Plate Knee Characteristics
Eb=65V, Ec2=150V, Ec1=0 and Ib=60 Ma., Ic2=20 Ma.

NOTES:

1. For series/parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current/voltage.

2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

3. Heater voltage supply variations shall be restricted to maintain heater voltage/current within the specified values.

4. External shield No. 315 connected to Pins 4 and 5.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-9
Base	E9-68
Outline	9-69
Basing	9LT
Cathode	Coated Unipotential
Mounting Position	Any

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

Heater Operation	10KU8 Series	6KU8 Parallel	
Heater Voltage	10.2	6.3[1]	Volts
Heater Current	450[1]	725	Ma
Heater Warm-up Time[2]	11	-	Seconds

Ratings (Design Maximum Values)[4]

	Min-Max	Min-Max	
Heater Voltage[3]	- -	5.7-6.9	Volts
Heater Current	420-480	- -	Ma
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
Total DC and Peak	200	200	Volts
Heater Positive with Respect to Cathode			
DC	100	100	Volts
Total DC and Peak	200	200	Volts

DIRECT INTERELECTRODE CAPACITANCES (Approximate)

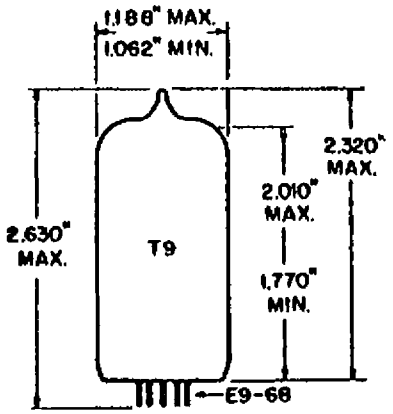
Pentode	Without Shield	
Grid No. 1 to Plate: pg1 to pp (Max.)	0.10	pf
Input: pg1 to (h+pk, g3, is+g2+di k, is)	12.0	pf
Output: pp to (h+pk, g3, is+g2+di k, is)	3.0	pf

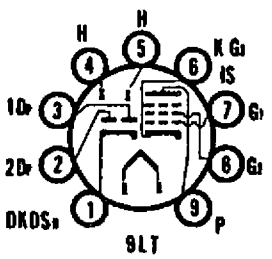
Diodes

No. 1 Plate to all: #1 di p to (h+di k, is+pk, g3, is)	1.1	pf
No. 2 Plate to all: #2 di p to (h+di k, is+pk, g3, is)	1.1	pf

QUICK REFERENCE DATA

The Sylvania Types 6KU8 and 10KU8 feature a strap frame grid sharp cutoff pentode in combination with a double diode in a T9 envelope. The pentode section has a gm of 20,000 and is designed for video amplifier service. The diode sections are designed to be used as horizontal phase detectors.





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EMPORIUM, PENNSYLVANIA

March 26, 1963

from JEDEC release #4229, April 22, 1963

DIRECT INTERELECTRODE CAPACITANCES (Approx.)

Diodes (Cont.)	Without Shield
Cathode to No. 1 Plate: di k, is to (h+#1 di p+pk, g3, is)	5.5 ~~0.8~~ pf
Cathode to No. 2 Plate: di k, is to (h+#2 di p+pk, g3, is)	5.5 ~~0.9~~ pf

Coupling	Without Shield
Pentode Grid No. 1 to No. 1 Diode Plate (Max.)	0.003 pf
Pentode Grid No. 1 to No. 2 Diode Plate (Max.)	0.003 pf
Pentode Plate to No. 1 Diode Plate (Max.)	0.008 pf
Pentode Plate to No. 2 Diode Plate (Max.)	0.008 pf

RATINGS (Design-Maximum System)[4]

	Pentode Section	
Plate Voltage	330 Volts	
Grid No. 2 Supply Voltage	330 Volts	Max.
Grid No. 2 Voltage	See J5/C4-2 Rating Chart	
Positive Grid No. 1 Voltage	0 Volts	Max.
Plate Dissipation	4.0 Watts	Max.
Grid No. 2 Dissipation	1.1 Watts	Max.
Grid No. 1 Circuit Resistance		
Fixed Bias	0.25 Megohm	Max.
Cathode Bias	1.0 Megohm	Max.

Control grid to cathode spacing of the pentode section of this type is of such low order of magnitude as to preclude the use of voltage between these elements of more than 50 volts dc or peak ac in commercial tube checkers and shorts indicating devices, particularly where mechanical excitation of the tube is employed.

CHARACTERISTICS AND TYPICAL OPERATION

	Pentode Section
Plate Voltage	200 Volts
Grid No. 2 Voltage	100 Volts
Grid No. 1 Voltage	0 Volts
Cathode Bias Resistor	82 Ohms
Plate Current	17 Ma
Grid No. 2 Current	3.5 Ma
Transconductance	20,000 µmhos
Amplification Factor	
Plate Resistance (Approx.)	50,000 Ohms
Ecl for Ib = 100 µa (Approx.)	-5 Volts

INSTANTANEOUS PLATE KNEE CHARACTERISTICS[5] (Pentode Section)

Eb = 50 Volts, Ec^2 = 100 Volts and Ecl = 0 Volts
Ib = 55 Ma and Ic^2 = 18 Ma

DIODE CHARACTERISTICS (Each Diode)

Average Current with 10 Vdc Applied	2.0 Ma

NOTES:

1. For series/parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current/voltage.

2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

3. Heater voltage supply variations shall be restricted to maintain heater voltage/current within the specified values.

4. Design Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron tube of a specified type as defined by its published data and should not be exceeded under the worst probable conditions.

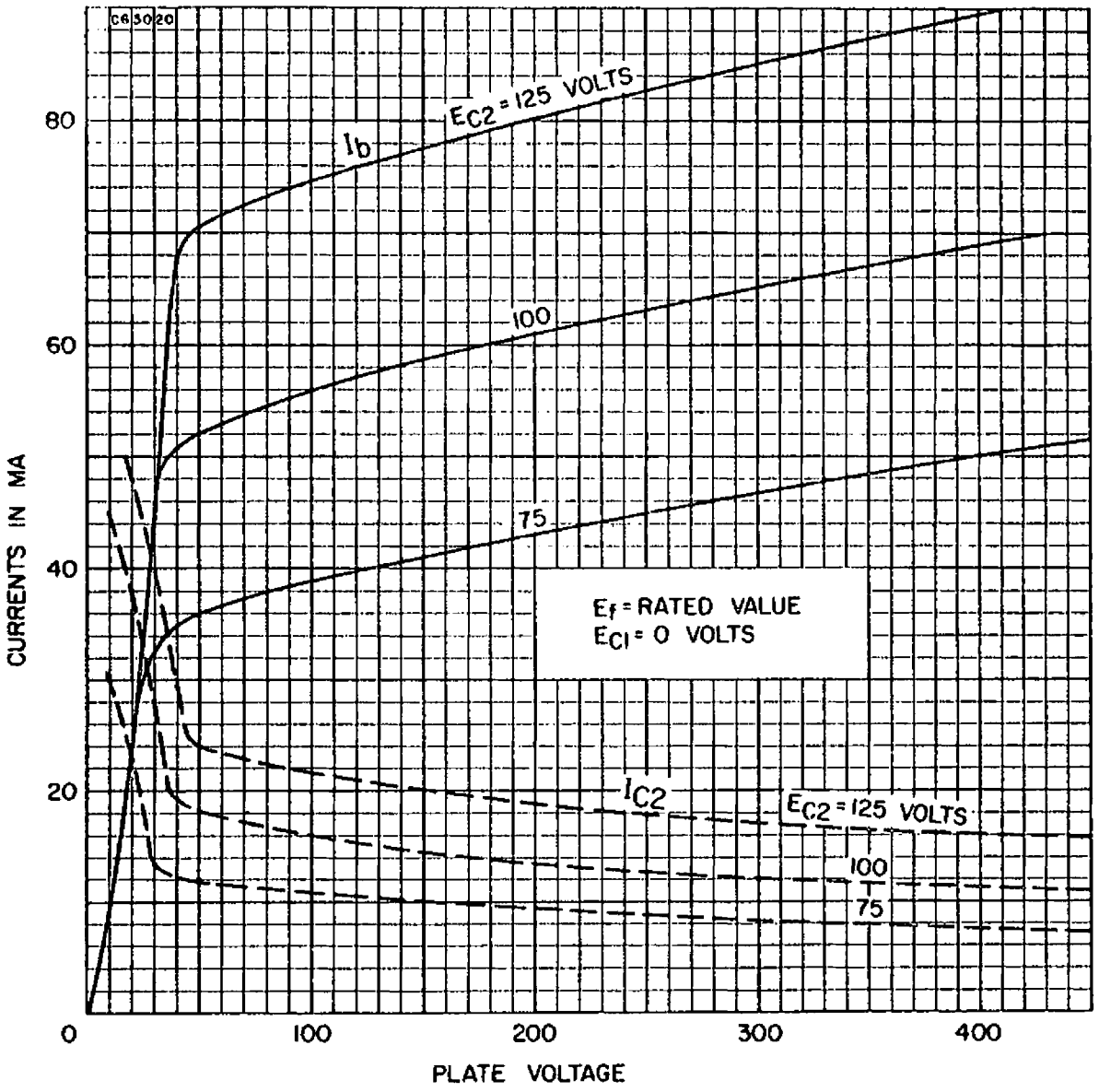
   The tube manufacturer chooses these values to provide acceptable serviceability of the tube, making allowance for the effects of changes in operating conditions due to variations in the characteristics of the tube under consideration.

   The equipment manufacturer should design so that initially and throughout life no design maximum value for the intended service is exceeded with a bogey tube under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all other electron devices in the equipment.

5. Applied for short interval (2 sec. max.) so as not to damage tube.

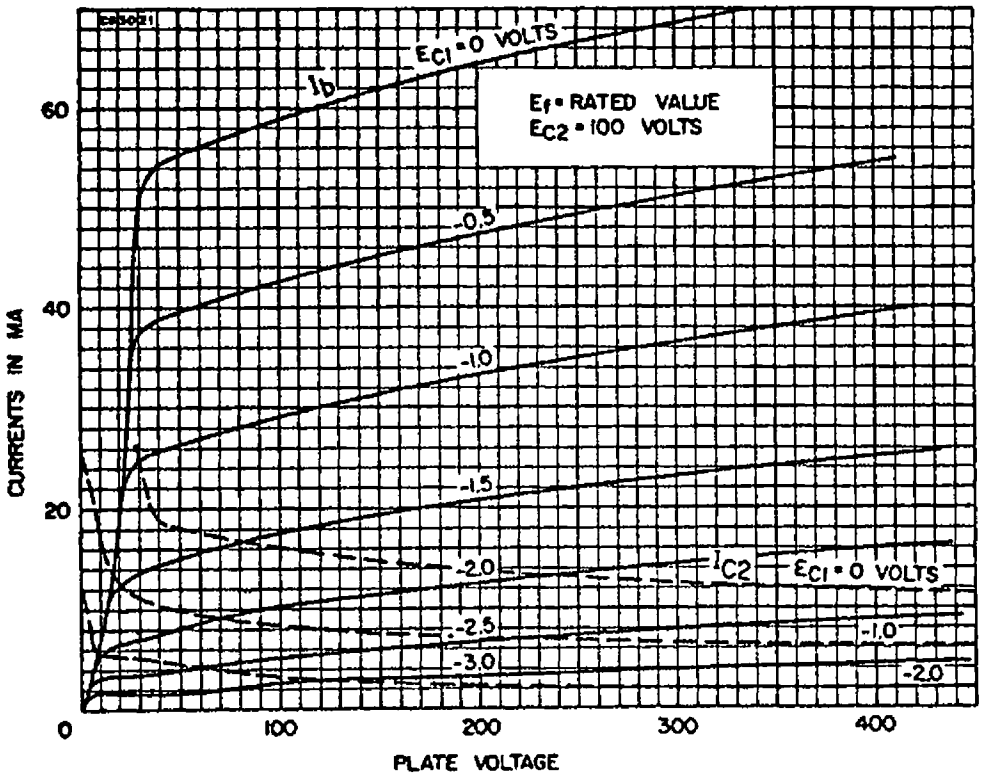
AVERAGE PLATE CHARACTERISTICS

PENTODE SECTION



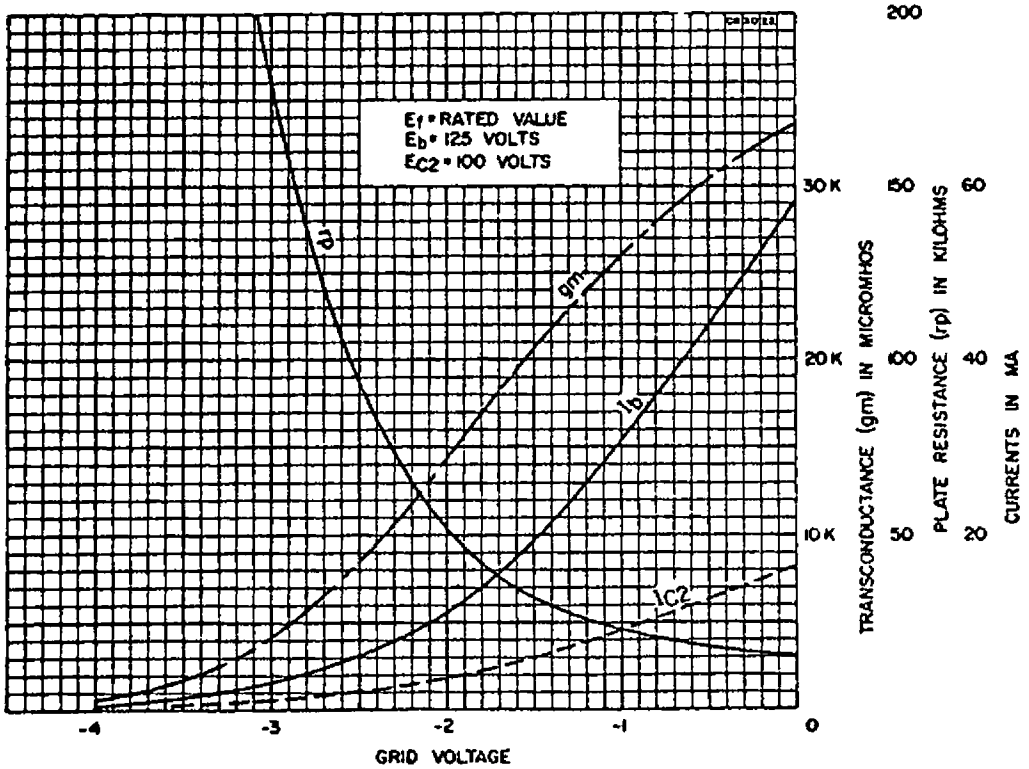
AVERAGE PLATE CHARACTERISTICS

PENTODE SECTION



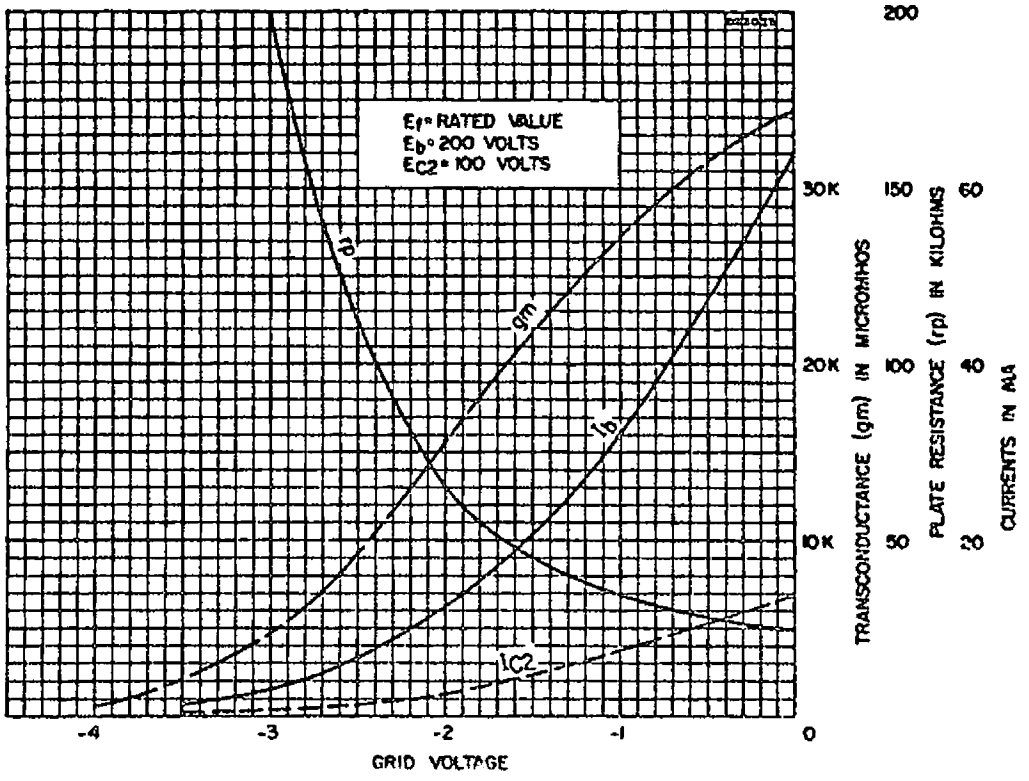
AVERAGE TRANSFER CHARACTERISTICS

PENTODE SECTION

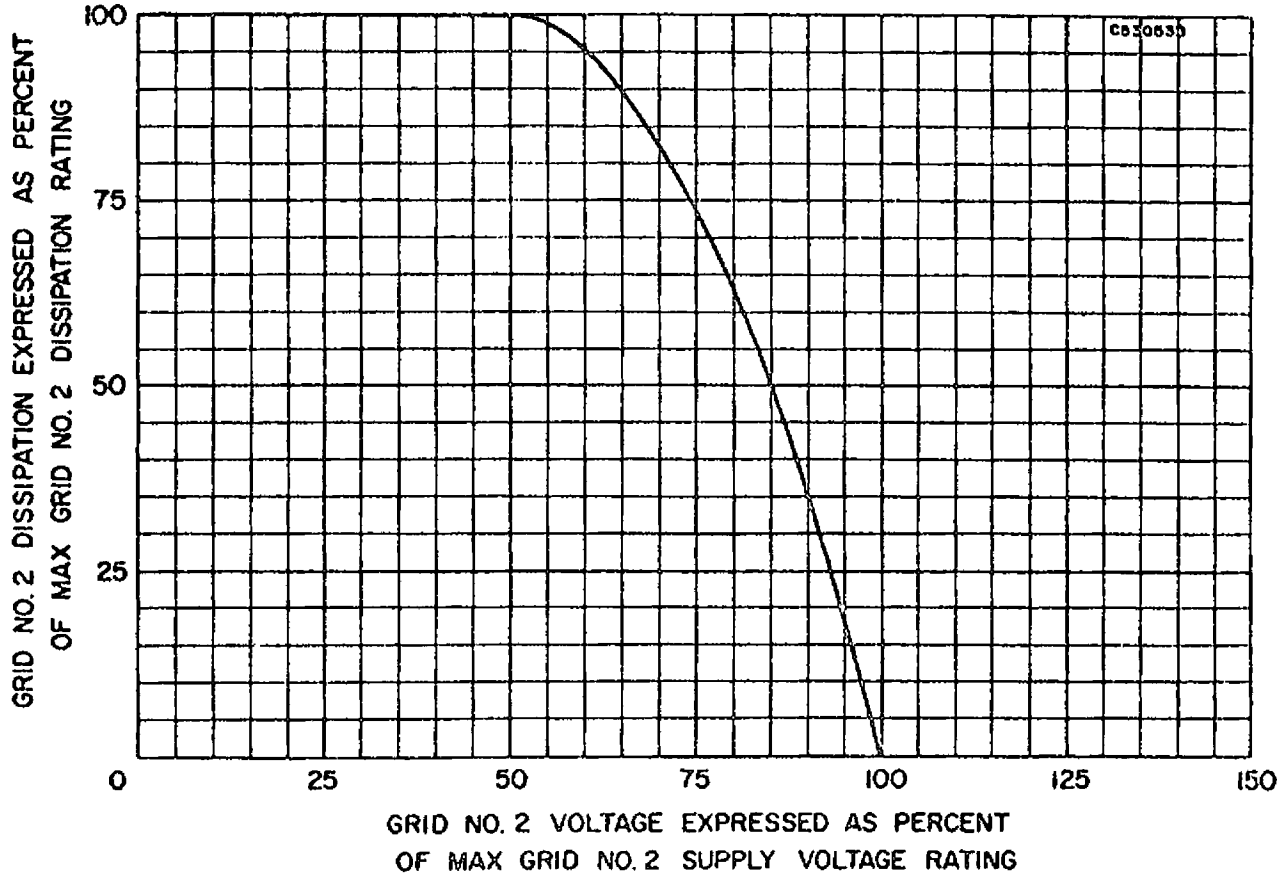


AVERAGE TRANSFER CHARACTERISTICS

PENTODE SECTION



J5/CL-2 RATING CHART



Color Television Type

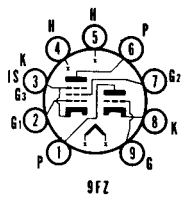
VHF OSCILLATOR and MIXER

6KZ8

5KZ8, 9KZ8

Medium Mu Triode and Sharp Cutoff Pentode

Construction .....Miniature T-6½
Base .....Button 9 Pin, E9-1
Basing 9FZ
Outline 6-2
Maximum Diameter .....0.875 In.
Maximum Seated Height .....1.937 In.
Maximum Overall Height .....2.187 In.



9FZ



ELECTRICAL DATA

HEATER OPERATION

	9KZ8	5KZ8	6KZ8
Heater Voltage	9.45	4.7	6.3 Volts
Heater Current	300	600	450 Ma
Heater Warm-up Time	11	11	11 Seconds
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
Total DC and Peak			200 Volts
Heater Positive with Respect to Cathode			
DC			100 Volts
Total DC and Peak			200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Shielded)(1)

Triode Section	
Grid to Plate	1.6 Pf
Input: g to (Tk + Pk + g3 + h + IS)	3.2 Pf
Output: p to (Tk + Pk + g3 + h + IS)	1.8 Pf
Heater to Cathode	3.2(2) Pf
Pentode Section	
Grid No. 1 to Plate (Max.)	0.01 Pf
Input: g1 to (k + g3 + g2 + h + IS)	5.5 Pf
Output: p to (k + g3 + g2 + h + IS)	3.4 Pf
Heater to Cathode	3.2(2) Pf

RATINGS (Design Maximum Rating System)

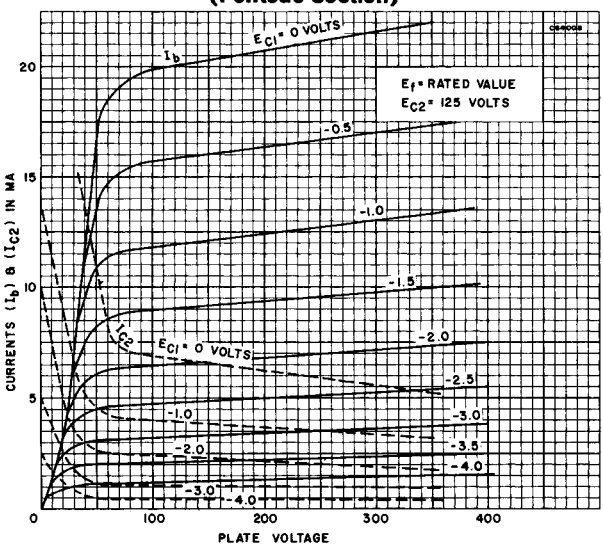
	Triode Section	Pentode Section
Converter Service		
Plate Voltage (Max.)	330	330 Volts
Grid No. 2 Supply Voltage (Max.)	—	330 Volts
Grid No. 2 Voltage	See Rating Chart (Gen. Info. Sec.)	
Plate Dissipation (Max.)	2.5	2.5 Watts
Screen Dissipation (Max.)	—	0.55 Watt
Positive Grid No. 1 Voltage (Max.)	0	0 Volt
Grid No. 1 Circuit Resistance		
Fixed Bias (Max.)	0.25	0.25 Megohm
Self Bias (Max.)	0.5	0.5 Megohm

CHARACTERISTICS AND TYPICAL OPERATION

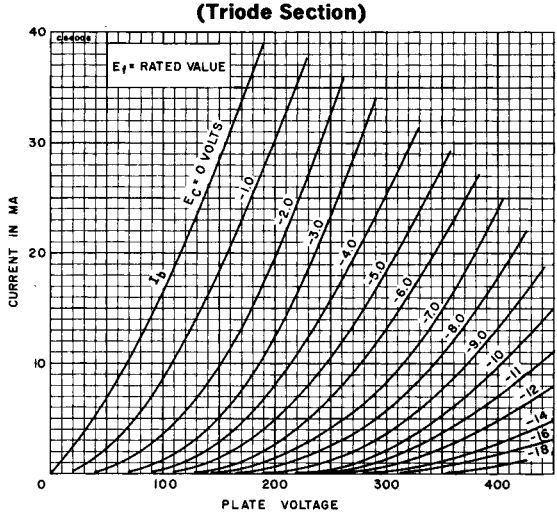
	Triode Section	Pentode Section
Plate Voltage	125	125 Volts
Grid No. 2 Voltage	—	125 Volts
Grid No. 1 Voltage	−1	−1 Volt
Plate Current	13.5	12 Ma
Grid No. 2 Current	—	4.0 Ma
Transconductance	8500	7500 μmhos
Amplification Factor	46	—
Plate Resistance (Approx.)	5400	200,000 Ohms
Ec1 for Ib = 10 μa (Approx.)	−8	−8 Volts

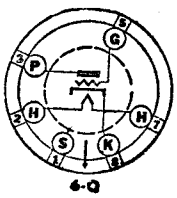
NOTES:
(1) Shield No. 315 connected to cathode.
(2) Shield No. 315 connected to ground.

AVERAGE PLATE CHARACTERISTICS
(Pentode Section)



AVERAGE PLATE CHARACTERISTICS
(Triode Section)

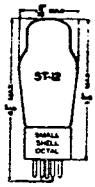




Sylvania

TYPE 6L5G

SUPER TRIODE AMPLIFICATEUR DETECTEUR



CARACTERISTIQUES

Tension de chauffage CA ou CC	**6,3 volts**
Courant chauffage	**0,150 ampère**
Ampoule	ST-12
Culot — Petit octal 7 broches	**6-Q**
Position de montage	**Toutes**

Capacités interéleetrodes :

Grille à plaque avec blindage R.M.A.	2,8 $\mu\mu f$
Entrée avec blindage R.M.A.	2,8 $\mu\mu f$
Sortie avec blindage R.M.A.	5,0 $\mu\mu f$

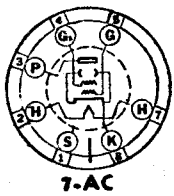
Conditions de fonctionnement et caractéristiques :

Tension de chauffage	6,3	6,3 volts
Tension plaque	100	250 volts max.
Tension grille	—3	—9 volts
Courant plaque	4,0	8,0 ma.
Résistance interne	10,000	9,000 ohms
Conductance mutuelle	1,500	1,900 μmhos
Coefficient d'amplification	15	17

APPLICATION

Le type Sylvania 6L5G est un amplificateur triode, dont les caractéristiques sont très semblables à celles des types 6C5 et 6C5G. Ce tube à culot octal a un filament qui ne consomme que 0,150 ampère. La broche n° 4, quoique non représentée sur le croquis du culot, est présente mais non raccordée.

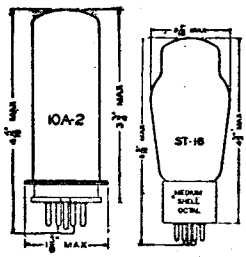
Le type 6L5G est recommandé comme amplificateur, oscillateur ou détecteur. Ses applications sont semblables à celles des types 6C5G et 76. Pour de plus amples renseignements, voir type 76.



Sylvania

TYPE 6L6
TYPE 6L6G

AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

	6L6	6L6G
Tension de chauffage	6,3	6,3 volts
Courant de chauffage	0,9	0,9 ampère
Ampoule	10A-2	ST-16
Culot — Octal 7 broches	7-AC	7-AC
Position de montage	Toutes	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

	Triode	Un Tube	Push Pull
Tension chauffage	6,3	6,3	6,3 volts
Courant chauffage	0,9	0,9	0,9 ampère
Tension plaque	250	350	360 volts max.
Tension écran	Relié à P.	250	270 volts max.
Dissipation plaque	10	18,5	18,5 watts max.
Dissipation écran...	—	2,7	2,7 watts max.

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A1 (Un tube)

Tension chauffage	6,3	6,3	6,3 volts
Tension plaque	250	300	350 volts
Tension écran	250	200	250 volts
Tension grille	—14	—12,5	—18 volts
Tension pointe (signal B.F.) ...	14	12,5	18 volts
Courant plaque (signal zéro) ...	72	48	54 ma.
Idem (signal maximum)	79	55	66 ma.
Courant écran (signal zéro) ...	5	2,5	2,5 ma.
Idem (signal maximum)	7,2	4,7	7,0 ma.
Conductance mutuelle	6,000	5,300	5,200 μmhos
Résistance interne	22,500	35,000	33,000 ohms
Impédance de charge	2,500	4,500	4,200 ohms
Puissance modulée	6,5	6,5	10,8 watts
Distorsion harmonique totale ...	10	11	15 pour cent.

AMPLIFICATEUR PUSH-PULL — CONNEXION PENTODE

	CLASSE A1.	— CLASSE AB1,		— CLASSE AB2		
Tension chauff.	6,3	6,3	6,3	6,3	6,3	6,3 volts
Tension plaque	250	270	360	360	360	360 volts
Tension écran	250	270	250	270	250	270 volts
Tension grille	—16	—17,5	—22,5	22,5	—18	22,5 volts
Tension de pointe B. F. G à G	32	35	45	45	52	72 volts
Courant P* ...	120	134	88	88	78	88 ma.
Courant P**	140	155	132	140	142	205 ma.
Courant écran*	10	11	5	5	3,5	5 ma.
Cour. écran**	16	17	15	11	11	16 ma.
Conduc. mut.	5,500	5,700	—	—	—	— μmhos
Résist. interne	24,500	23,500	—	—	—	— ohms
Impéd. charge	5,000	5,000	6,600	3,800	6,000	3,800 ohms
Puissance mod.	14,5	17,5	26,5	18	31	47 watts
Distorsion harmon. totale	2	2	2	2	2	2 pour cent.

* Signal zéro.

**Signal maximum.

Dans chaque classe, la 1re colonne indique polarisation fixe, la seconde la polarisation automatique.

OPERATION TRIODE

AMPLIFICATEUR CLASSE A1, un seul tube :

Tension chauffage	6,3 volts
Tension plaque	250 volts
Tension écran	Relié plaque
Tension grille	—20 volts
Tension pointe (signal B.F.)	20 volts
Courant plaque (signal zéro)	40 ma.
Courant plaque (signal maximum)	44 ma.
Résistance interne	1,700 ohms
Conductance mutuelle	4,700 μmhos
Facteur d'amplification	8
Impédance de charge	5,000 ohms
Puissance modulée	1,4 watt
Distorsion harmonique totale	5 pour cent.

APPLICATION

Le tube Sylvania 6L6 ou 6L6G est un amplificateur de puissance destiné à être utilisé dans l'étage final des récepteurs et particulièrement dans les récepteurs devant posséder une réserve de puissance importante. Ce tube procure une puissance modulée élevée ; il a une grande sensibilité et un grand rendement.

Ces propriétés sont imputables au principe nouveau sur lequel repose la conception de ce tube. Ses éléments sont disposés de façon à produire un champ électrostatique obligeant les électrons à parcourir l'espace grille écran-plaque en rayons de grande densité. La charge spatiale qui existe ainsi entre écran et plaque empêche les électrons secondaires émis par la plaque d'atteindre la grille écran. La puissance prise par la grille écran est très faible.

La distorsion due au second harmonique est intentionnellement élevée, en vue de réduire au minimum l'amplitude du troisième harmonique et des harmoniques supérieurs. L'élimination du second harmonique peut être obtenue par le montage de deux tubes en push-pull. Si l'on n'utilise qu'un seul tube dans un amplificateur à couplage par résistance, le second harmonique peut être réduit en créant dans un étage précédent un second harmonique de phase opposée, ou par dégénérescence.

La tension de chauffage des types 6L6 et 6L6G est de 6,3 volts. Des précautions seront prises pour prévenir toute surtension de chauffage au delà de 7,0 volts, même pendant les survoltages du réseau. Une différence de tension, aussi basse que possible, entre cathode et filament sera maintenue.

Les maxima de dissipation plaque et écran ne doivent pas être dépassés. Des précautions seront prises contre les surtensions du réseau, spécialement quand le fonctionnement est prévu avec polarisation fixe. Les systèmes de couplage par transformateur ou par impédance sont recommandés et la valeur de la résistance dans le circuit grille sera aussi basse que possible. Pour la polarisation fixe, la résistance ne dépassera pas 100.000 ohms. En cas de polarisation automatique, la résistance du circuit grille peut être de 0,25 mégohm, si la tension chauffage ne dépasse pas 7 volts (voir ci-dessus).

Dans le fonctionnement en classe AB, l'étage pilote sera conçu de façon à fournir la puissance de pointe requise, avec faible distorsion aux grilles de l'étage B.F.

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6L6G

MECHANICAL DATA

Bulb	ST16
Base	B7-12, Medium Shell Octal, 7-Pin
Outline	16-3
Basing	7S
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	900 Ma

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate: (g^1 to p)	0.9 $\mu\mu$f
Input: g^1 to (h+k+g^2+bp)	11.5 $\mu\mu$f
Output: p to (h+k+g^2+bp)	9.5 $\mu\mu$f

RATINGS (Design Center Values)

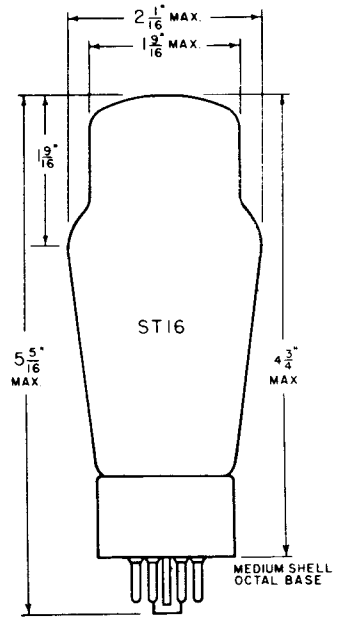
	Triode Connection	Pentode Connection
Plate Voltage	275	360 Volts Max.
Grid No. 2 Voltage		270 Volts Max.
Plate Dissipation	19	19.0 Watts Max.
Grid No. 2 Dissipation		2.5 Watts Max.
Heater-Cathode Voltage	180	180 Volts Max.
Grid No. 1 Circuit Resistance		
Fixed Bias	0.1	0.1 Megohms Max.
Cathode Bias	0.5	0.5 Megohms Max.

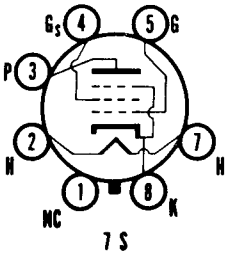
CHARACTERISTICS AND TYPICAL OPERATION

	Triode Connection	Pentode Connection		
Class A_1 Amplifier (Single Tube)				
Plate Voltage	250	250	300	350 Volts
Grid No. 2 Voltage		250	200	250 Volts
Grid No. 1 Voltage[1]	-20	-14	-12.5	-18 Volts
Peak A F Signal Voltage	20	14	12.5	18 Volts
Plate Current (Zero Signal)	40	72	48	54 Ma
Plate Current (Max. Signal)	44	79	55	66 Ma
Grid No. 2 Current (Zero Signal)		5.0	2.5	2.5 Ma
Grid No. 2 Current (Max. Signal)		7.3	4.7	7.0 Ma
Transconductance	4700	6000	5300	5200 μmhos
Plate Resistance	1700	22500	35000	33000 Ohms
Load Resistance	5000	2500	4500	4200 Ohms
Power Output	1.4	6.5	6.5	10.8 Watts
Total Harmonic Distortion	5	10	11	15 Percent

QUICK REFERENCE DATA

The Sylvania Type 6L6G is a beam power audio amplifier designed for service in the output stage of radio receivers or other equipment requiring high power output, power sensitivity and efficiency. Electrically, the 6L6G and 6L6 are identical.





SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
MARCH 1954

TYPICAL OPERATION CONT'D

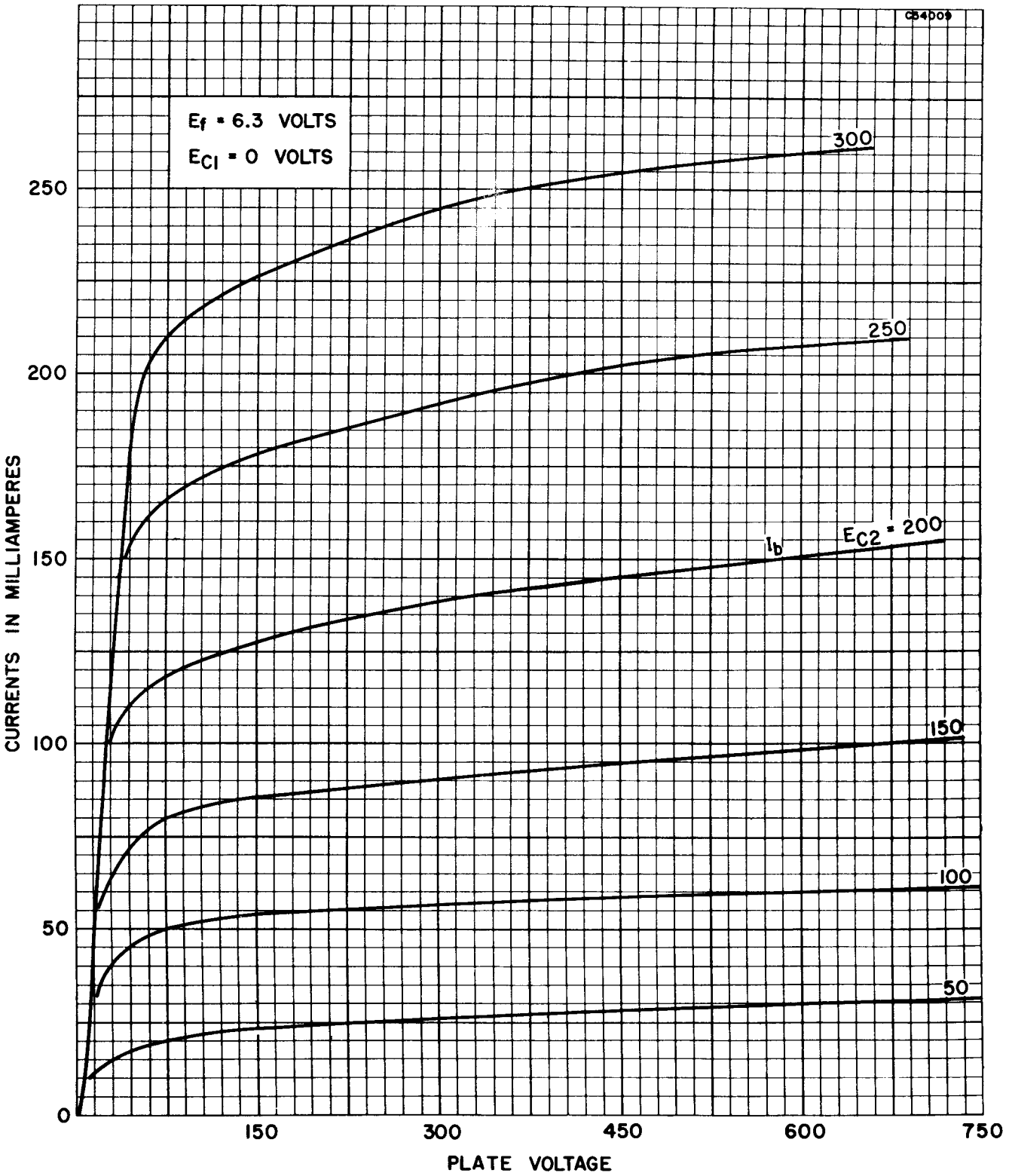
Push-Pull Amplifier

	Class A_1		Class AB_1		Class AB_2		
Plate Voltage	250	270	360	360	360	360	Volts
Grid No. 2 Voltage	250	270	270	270	225	270	Volts
Grid No. 1 Voltage[1]	-16	-17.5	-22.5	-22.5	-18	-22.5	Volts
Peak A F Grid to Grid Voltage	32	35	45	45	52	72	Volts
Plate Current (Zero Signal)	120	134	88	88	78	88	Ma
Plate Current (Max. Signal)	140	155	132	140	142	205	Ma
Grid No. 2 Current (Zero Signal)	10	11	5	5	3.5	5	Ma
Grid No. 2 Current (Max. Signal)	16	17	15	11	11	16	Ma
Transconductance (Each Tube)	5500	5700					μmhos
Plate Resistance (Each Tube)	24500	23500					Ohms
Load Resistance	5000	5000	6600	3800	6000	3800	Ohms
Power Output	14.5	17.5	26.5	18	31	47	Watts
Total Harmonic Distortion	2	2	2	2	2	2	Percent

NOTE:

1. *For fixed bias operation the grid bias resistor should not exceed 0.1 megohm. A grid circuit resistance of .25 megohm may be used for self bias providing the heater voltage will not exceed 7.0 volts under any probable operating condition.*

AVERAGE PLATE CHARACTERISTICS



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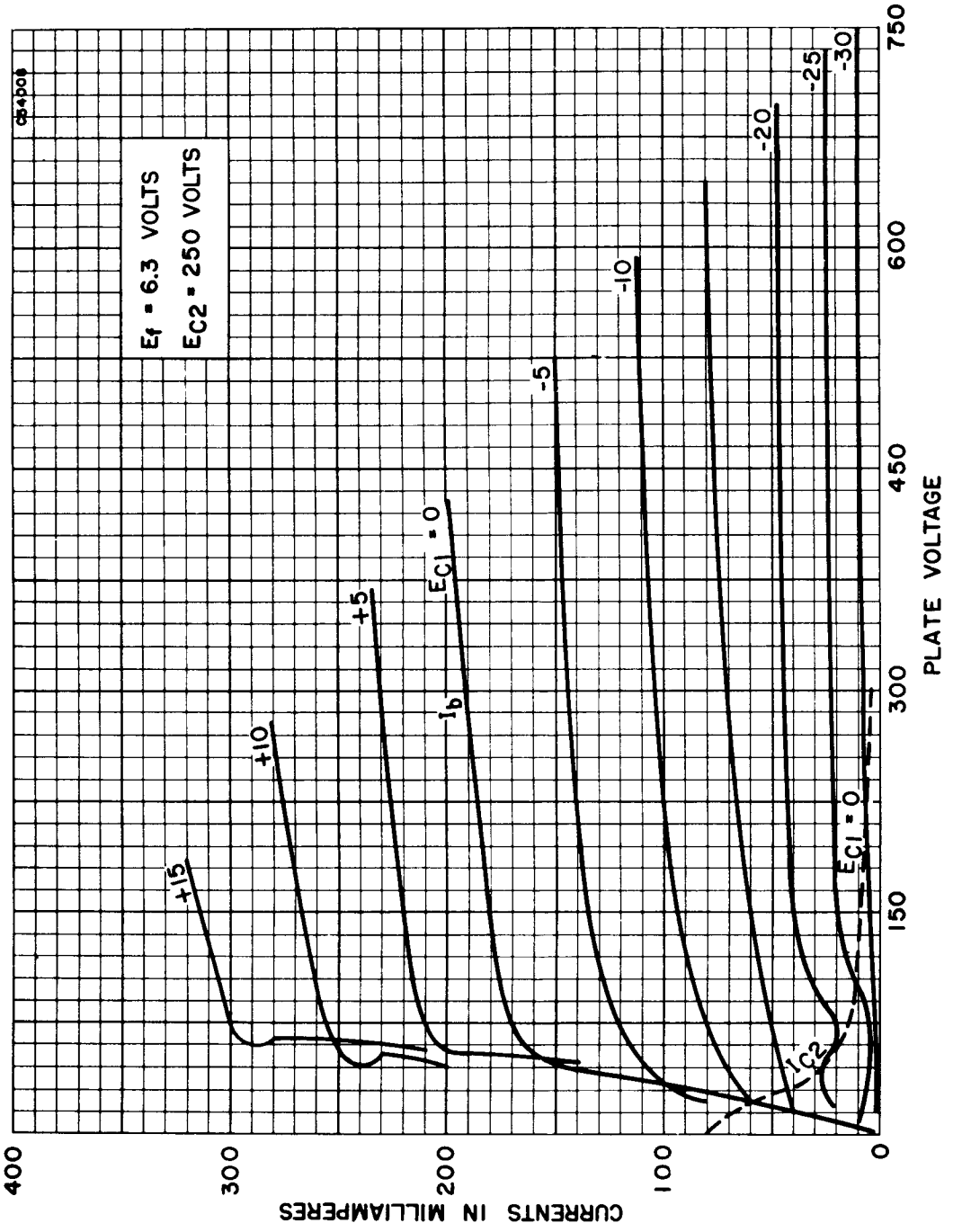
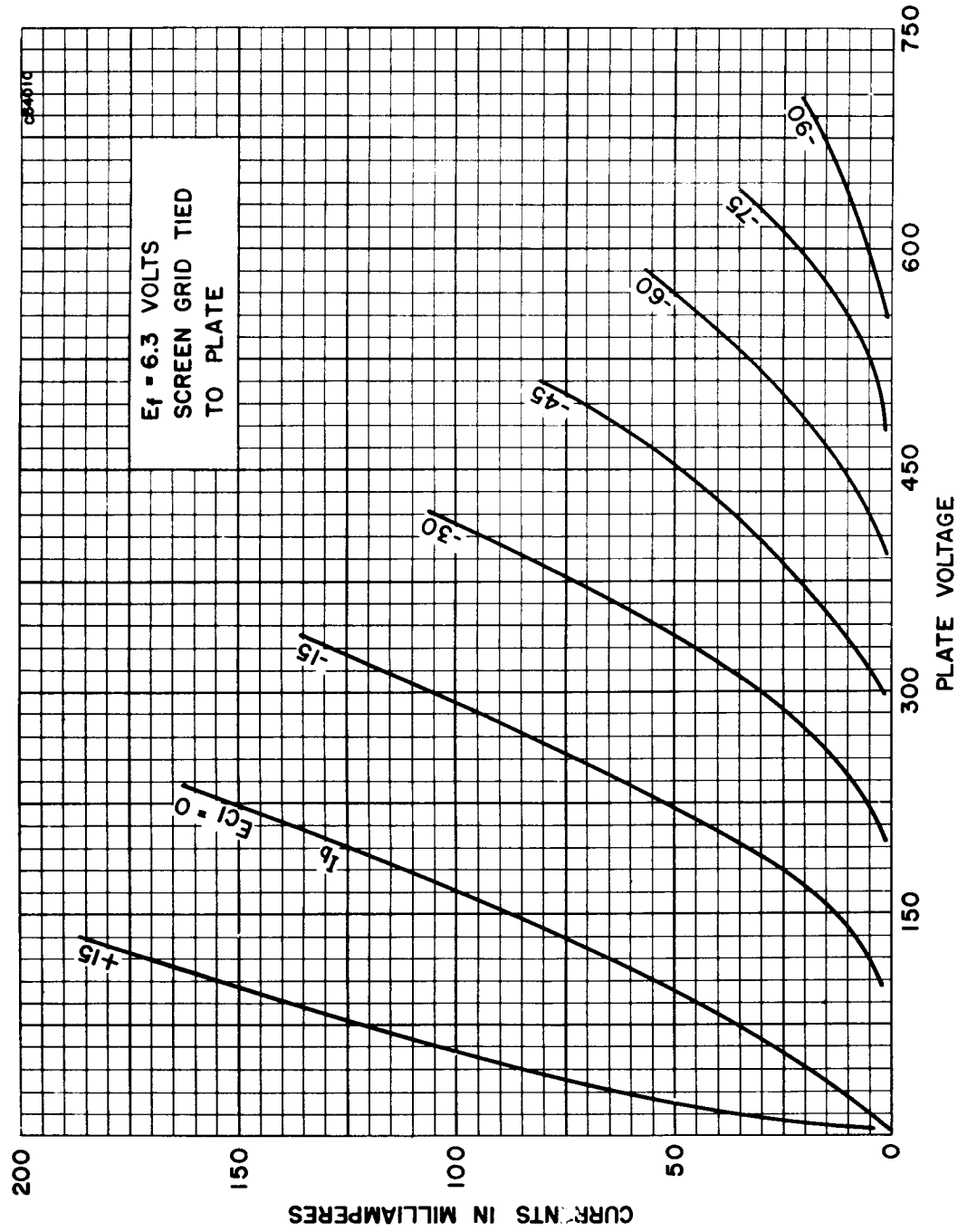
6L6G

AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS
TRIODE CONNECTED



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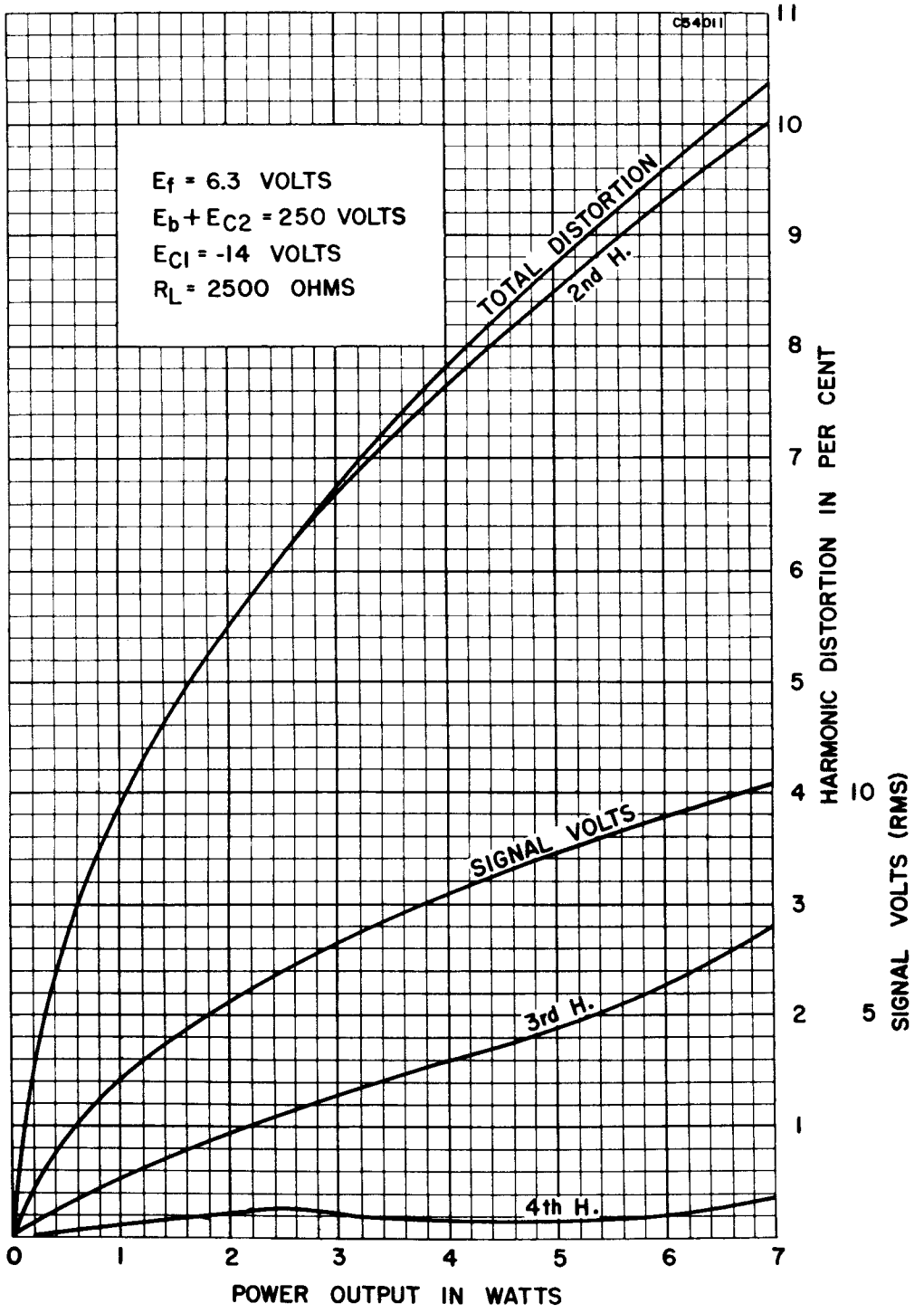
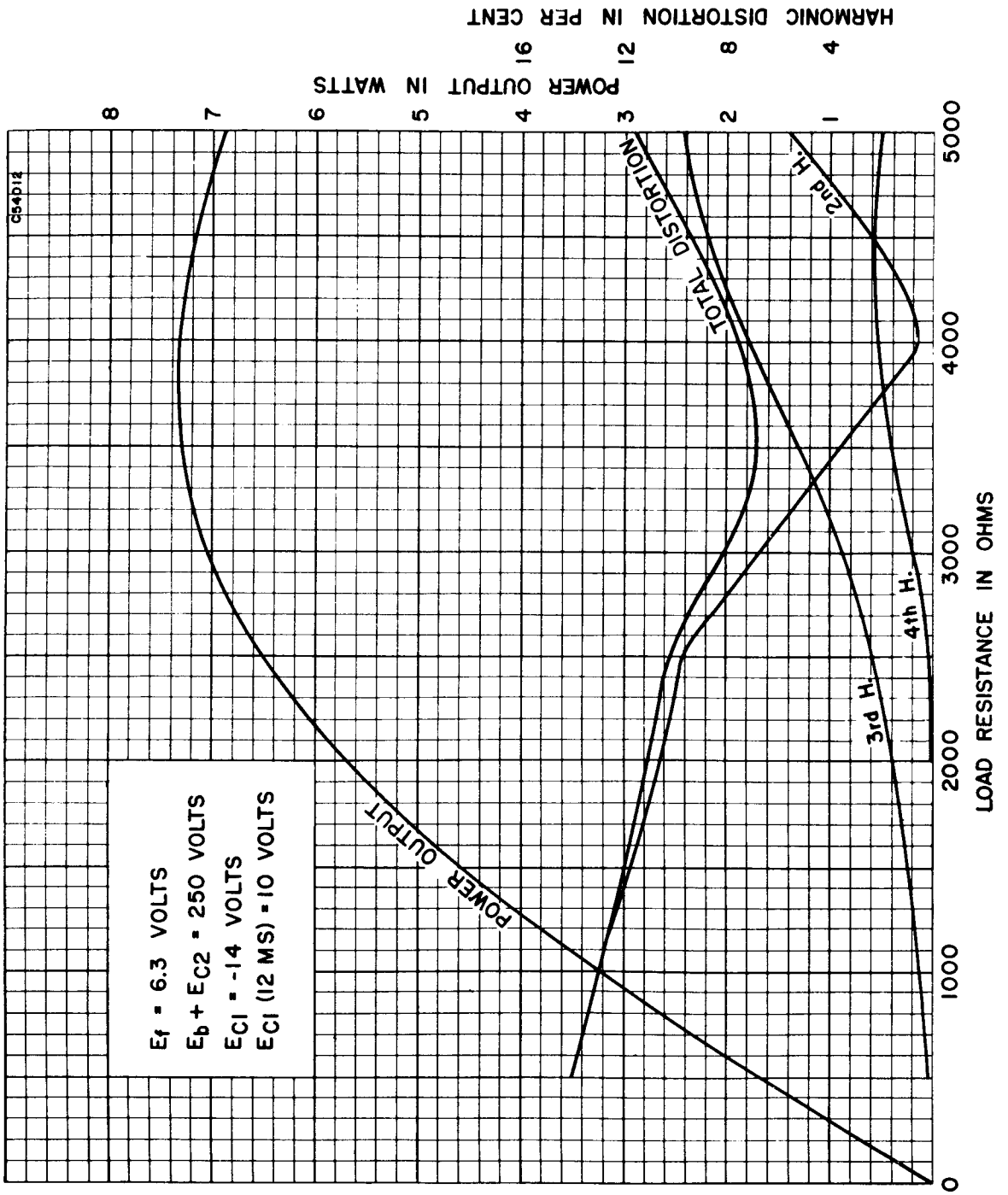
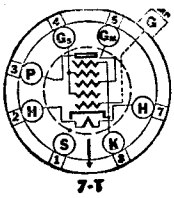
6L6G

AVERAGE OPERATION CHARACTERISTICS



AVERAGE OPERATION CHARACTERISTICS

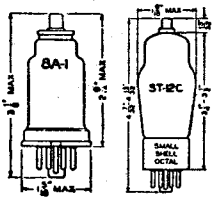




Sylvania

TYPES 6L7-6L7G

MODULATEUR PENTAGRILLE AMPLIFICATEUR



CARACTERISTIQUES

	6L7	6L7G
Tension chauffage CA ou CC	6,3	6,3 volts
Courant chauffage	0,3	0,3 ampère
Ampoule	8A-1	ST-12C
Capuchon	miniature	miniature
Culot : petit octal 7 broches	7-T	7-T
Position de montage	Toutes	Toutes

Capacités directes interélectrodes* :

Grille G à grille Gm	0,20	0,20	$\mu\mu$f max.
Grille G à plaque	0,001	0,005	$\mu\mu$f max.
Grille Gm à plaque	0,10	0,24	$\mu\mu$f
Grille à toutes autres électrodes	7,5	6,0	$\mu\mu$f
Grille Gm à idem	10,0	12,0	$\mu\mu$f
Plaque à toutes autres électrodes	11,0	10,0	$\mu\mu$f

* Avec blindage standard R. M. A.

Conditions limites de fonctionnement. (Voir page 9) :

	Mixer	Amplificateur
Tension chauffage CA ou CC	6,3	6,3 volts
Courant chauffage	0,3	0,3 ampère
Tension plaque	300	300 volts max.
Tension écran	100	150 volts max.
Dissipation plaque	1,0	1,5 watt max.
Dissipation écran	1,5	1,0 watt max.

Fonctionnement-type :

PREMIER DETECTEUR (Modulateur)

Tension de chauffage	6,3	6,3 volts
Tension plaque	250	250 max. v.
Tension écran (Gs)	100	150 max. v.
Tension grille de contrôle (G)	—3	—6 min. v.
Tension grille de contrôle (Gm)	—10	—15 approx. v.
Tension pointe d'oscillation appliquée à Gm	12	18 approx. v.
Courant plaque	2,4	3,3 ma.
Courant écran	7,1	9,2 ma.
Résistance interne	plus grande que 1 mégohm	
Conductance de conversion	375	350 μmhos
Tension sur G pour une cond. de conversion de 5 micromhos	—30	—45 volts

AMPLIFICATEUR CLASSE A1

Tension de chauffage	6,3 volts
Tension plaque	250 max. volts
Tension écran (Gs)	100 max. volts
Tension grille de contrôle (G)	—3 min. volts
Tension grille de contrôle (Gm)	—3 volts
Courant plaque	5,3 ma.
Courant écran	6,5 ma.
Résistance interne	0,8 mégohm
Conductance mutuelle	1,100 μmhos
Conductance mutuelle à { —15 v. polarisation sur G / —15 v. polarisation sur Gm }	5 μmhos
Coefficient d'amplification	670

APPLICATION.

Sylvania 6L7 ou 6L7G est un tube amplificateur et modulateur pentagrille qui diffère considérablement des autres pentagrilles, tel que 6A7, 6A8 ou 6A8G.

En partant de la cathode, on rencontre une première grille G connectée au capuchon. Le circuit d'entrée est connecté à cette grille et le retour peut être relié au circuit d'A.V.C. La seconde grille sert d'écran électrostatique entre les grilles G et Gm et est reliée à la quatrième grille, à l'intérieur de l'ampoule. Donc, les seconde et quatrième grilles ensemble constituent la grille écran (Gs). La troisième grille est celle à laquelle on applique la tension d'oscillation locale. La cinquième grille est la grille de suppression et est raccordée à la cathode à l'intérieur de l'ampoule.

Un couplage purement électronique est obtenu, puisque la tension d'oscillation est appliquée à la grille Gm. La capacité entre Gm et la terre est assez élevée et ce fait doit être pris en considération dans le calcul du circuit oscillateur, pour que ce dernier puisse couvrir la gamme de fréquences désirée.

En plus de son utilisation comme modulateur, le tube 6L7 ou 6L7G peut également servir d'amplificateur. En appliquant une polarisation variable aux deux grilles de contrôle G et Gm, le point de cut-off (coupure du courant plaque) peut être atteint beaucoup plus rapidement et une tension d'A.V.C. moins importante peut servir au contrôle de volume.

Le type 6L7 équipe le récepteur dont le schéma est indiqué en fin de volume.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-9
Base	E9-68
Outline	9-69
Basing	9DX
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

Heater Operation	10LB8 Series	6LB8 Parallel	
Heater Voltage	10.2[1]	6.3[1]	Volts
Heater Current	450[1]	725	Ma
Heater Warm-up Time[2]	11	-	Seconds

Ratings (Design Maximum Values)[4]

	Min-Max	Min-Max	
Heater Voltage[3]	- -	5.7-6.9	Volts
Heater Current[3]	420-480	- -	Ma
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
Total DC and Peak	200	200	Volts
Heater Positive with Respect to Cathode			
DC	100	100	Volts
Total DC and Peak	200	200	Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section

Grid to Plate	2.8	pf
Input: g to (h+Tk+Pk,g3,I.S.)	1.9	pf
Output: p to (h+Tk+Pk,g3,I.S.)	1.8	pf

Pentode Section

Grid No. 1 to Plate	.10	pf Max.
Input: g1 to (h+Pk,g3,I.S.+g2)	12	pf
Output: p to (h+Pk,g3,I.S.+g2)	3.0	pf

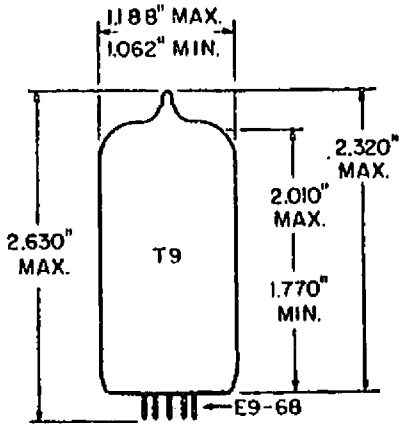
Coupling

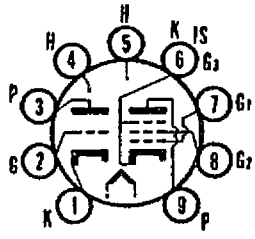
Triode Grid to Pentode Plate	.02	pf Max.
Pentode Grid No. 1 to Triode Plate	.004	pf Max.
Pentode Plate to Triode Plate	.13	pf Max.

QUICK REFERENCE DATA

The Sylvania Types 6LB8 and 10LB8 feature a strap frame grid sharp cutoff pentode in combination with a medium mu triode in a 9-T9 envelope. The pentode section has a gm of 20,000 and is designed for video amplifier service. The triode section is designed to be used as a voltage amplifier.

The 10LB8 has controlled heater warm-up time and is designed for series string circuits.





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ELECTRONIC TUBES
A Division of
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RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
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EMPORIUM, PENNSYLVANIA

January 11, 1963

from JEDEC release #4160, Feb. 25, 1963

RATINGS (Design-Maximum System)[4]

	Triode Section	Pentode Section		
Plate Voltage	330	330	Volts	Max.
Grid No. 2 Supply Voltage		330	Volts	Max.
Grid No. 2 Voltage	See J5/C4-2 Rating Chart			
Positive Grid No. 1 Voltage	0	0	Volts	Max.
Plate Dissipation[6]	2.0	4.0	Watts	Max.
Grid No. 2 Dissipation		1.1	Watts	Max.
Grid No. 1 Circuit Resistance				
Fixed Bias	0.5	0.25	Megohm	Max.
Cathode Bias	1.0	1.0	Megohm	Max.

Control grid to cathode spacing of the pentode section of this type is of such low order of magnitude as to preclude the use of voltage between these elements of more than 50 volts dc or peak ac in commercial tube checkers and shorts indicating devices, particularly where mechanical excitation of the tube is employed.

CHARACTERISTICS AND TYPICAL OPERATION

	Triode Section	Pentode Section	
Plate Voltage	125	200	Volts
Grid No. 2 Voltage		100	Volts
Grid No. 1 Voltage	0	0	Volts
Cathode Bias Resistor	68	82	Ohms
Plate Current	13	17	Ma
Grid No. 2 Current		3.5	Ma
Transconductance	5,000	20,000	µmhos
Amplification Factor	30		
Plate Resistance (Approx.)	6,000	50,000	Ohms
Ec1 for Ib = 100 µa (Approx.)	-	-5	Volts
Ec for Ib = 20 µa (Approx.)	-10	-	Volts

INSTANTANEOUS PLATE KNEE CHARACTERISTICS[5] (Pentode Section)

Eb = 50 Volts, Ec_2 = 100 Volts and Ec1 = 0 Volts
Ib = 55 Ma and Ic_2 = 18 Ma

NOTES:

1. For series/parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current/voltage.

2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

NOTES: (Cont'd)

3. Heater voltage supply variations shall be restricted to maintain heater voltage/current within the specified values.

4. Design Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron tube of a specified type as defined by its published data and should not be exceeded under the worst probable conditions.

   The tube manufacturer chooses these values to provide acceptable serviceability of the tube, making allowance for the effects of changes in operating conditions due to variations in the characteristics of the tube under consideration.

   The equipment manufacturer should design so that initially and throughout life no design maximum value for the intended service is exceeded with a bogey tube under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all other electron devices in the equipment.

5. Applied for short interval (2 Sec. Max.) so as not to damage tube.

6. Maximum total plate dissipation, both plates, should not exceed 5.0 watts.

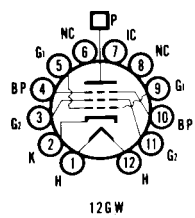
6LF6

Color Television Type

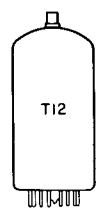
HORIZONTAL DEFLECTION AMPLIFIER

Beam Pentode

Construction.....Compactron T-12
Base E12-74
Top Cap C1-1
Basing 12GW
Outline
Maximum Diameter .....1.563 In.
Maximum Seated Height .....4.570 In.
Maximum Overall Height .....4.950 In.



12GW



ELECTRICAL DATA

HEATER OPERATION

Heater Voltage	6.3 Volts
Heater Current	2.0 Amp.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	3.0 pf
Input: g1 to (h + k + g2 + bp)	37 pf
Output: p to (h + k + g2 + bp)	18.5 pf

RATINGS (Design Maximum Rating System)

Horizontal Deflection Amplifier

DC Plate Supply Voltage at Zero Current (Max.)	990 Volts
Peak Positive Plate Voltage(1) (Max.)	8000 Volts
Beam Plate Voltage (Max.)	50 Volts
Grid No. 2 Voltage (Max.)	275 Volts
Peak Negative Grid No. 1 Voltage (Max.)	550 Volts
Plate Dissipation (Max.)	40 Watts
Peak Cathode Current (Max.)	1400 Ma
Beam Plate Circuit Resistance (Max.)	0.01 Megohms
Bulb Temperature (At Hottest Point) (Max.)	300 °C

AVERAGE CHARACTERISTICS (Measured Under Pulse Conditions)

	Max.	Min.	During Flyback
Plate Voltage	160	50	7000 Volts
Grid No. 2 Voltage	160	175	175 Volts
Grid No. 1 Voltage	0	−10	−185 Volts
Beam Plate Voltage		Tied to Cathode	
Plate Current	1400	800	<0.05 Ma
Grid No. 2 Current	45	70	— Ma

NOTE:

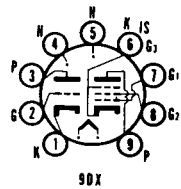
(1) Maximum pulse duration is 22% of a cycle, maximum 18 μsec.

Color Television Type

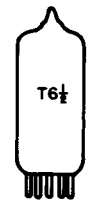
VIDEO AMPLIFIER (T) GENERAL PURPOSE AMPLIFIER (P)

6LF8

High Mu Triode and Sharp Cutoff Pentode



9DX



Construction	Miniature T-6½
Base	Button 9 Pin, E9-1
Basing	9DX
Outline	6-3
Maximum Diameter	0.875 In.
Maximum Seated Height	2.375 In.
Maximum Overall Height	2.625 In.

ELECTRICAL DATA

HEATER OPERATION

Heater Voltage	6.3 Volts
Heater Current	600 Ma
Heater Warm-up Time	11 Seconds
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section	
Grid to Plate	2.2 Pf
Input: g to (h + Tk + Pk, g3, IS)	3.2 Pf
Output: p to (h + Tk + Pk, g3, IS)	1.8 Pf
Pentode Section	
Grid No. 1 to Plate (Max.)	0.06 Pf
Input: g1 to (h + Pk, g3, IS + g2)	10 Pf
Output: p to (h + Pk, g3, IS + g2)	3.6 Pf
Coupling	
Pentode Plate to Triode Plate (Max.)	0.150 Pf
Pentode Grid No. 1 to Triode Plate (Max.)	0.008 Pf

RATINGS (Design Maximum Rating System)

	Triode Section	Pentode Section
Plate Voltage (Max.)	330	330 Volts
Grid No. 2 Supply Voltage (Max.)	—	330 Volts
Grid No. 2 Voltage	See Rating Chart (Gen. Info. Sec.)	
Plate Dissipation (Max.)	1.1	3.75 Watts
Grid No. 2 Dissipation (Up to Ec2 = 165 V) (Max.)	—	1.1 Watt
Above 165 V	See Rating Chart (Gen. Info. Sec.)	
Positive Grid No. 1 Voltage (Max.)	4	0 Volts
Negative Grid No. 1 Voltage (Max.)	55	55 Volts
Grid No. 1 Current	8	0 Ma
Grid No. 1 Circuit Resistance		
Fixed Bias (Max.)	0.5	0.25 Megohm
Self Bias (Max.)	1.0	1.0 Megohm

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

	Triode Section	Pentode Section	
Plate Voltage	200	40	100 Volts
Grid No. 2 Voltage	—	—	150 Volts
Grid No. 1 Voltage	−2	3	2.5 Volts
Plate Current	4.0	11	20 Ma
Grid No. 2 Current	—	—	5.0 Ma
Grid No. 1 Current	0	2.7	0 Ma
Transconductance	4000	4000	11,000 μmhos
Amplification Factor	70	40	—
Plate Resistance (Approx.)	17,500	10,000	200,000 Ohms
Ec for Ib = 20 μa (Approx.)	−5	—	8 Volts

INSTANTANEOUS PLATE KNEE CHARACTERISTICS

Eb = 65 V, Ec2 = 150 V, Ec1 = 0 V
Ib = 60 Ma, Ic2 = 20 Ma

6LU8

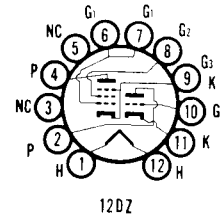
16LU8, 21LU8

Color Television Type

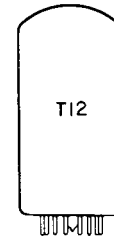
VERTICAL DEFLECTION OSCILLATOR and AMPLIFIER

High Mu Triode and Beam Power Pentode

Construction .....Compactron T-12
Base .....Button 12 Pin, E12-74
Basing 12DZ
Outline 12-57
Maximum Diameter .....1.562 In.
Maximum Seated Height .....2.750 In.
Maximum Overall Height .....3.125 In.



12DZ



ELECTRICAL DATA

HEATER OPERATION

	21LU8	16LU8	6LU8
Heater Voltage	21	15.8	6.3 Volts
Heater Current	450	600	1500 Ma
Heater Warm-up Time	11	11	— Seconds
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
Total DC and Peak			200 Volts
Heater Positive with Respect to Cathode			
DC			100 Volts
Total DC and Peak			200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section	
Grid to Plate: tg to tp	6.0 Pf
Input: tg to (h + Tk)	7.0 Pf
Output: tp to (h + Tk)	2.0 Pf
Pentode Section	
Grid No. 1 to Plate: pg1 to pp	0.5 Pf
Input: pg1 to (h + Pk + Pg2)	16 Pf
Output: pp to (h + Pk + Pg2)	9.0 Pf
Coupling	
Pentode Grid No. 1 to Triode Plate (Max.)	0.13 Pf
Pentode Plate to Triode Plate (Max.)	0.40 Pf

RATINGS (Design Maximum Rating System)

Vertical Deflection Oscillator and Amplifier(1)

	Triode Osc.	Pentode Amp.
Plate Voltage (Max.)	400	400 Volts
Grid No. 2 Voltage (Max.)	—	300 Volts
Peak Positive Pulse Plate Voltage (Max.)	—	2500 Volts
Peak Negative Grid No. 1 Voltage (Max.)	400	250 Volts
Plate Dissipation (Max.)(2)	2.5	14 Watts
Grid No. 2 Dissipation (Max.)	—	2.75 Watts
Average Cathode Current (Max.)	30	75 Ma
Peak Cathode Current (Max.)	105	260 Ma
Grid Circuit Resistance		
Self Bias (Max.)	2.2	2.2 Megohms
Fixed Bias (Max.)	—	1.0 Megohm
Bulb Temperature (Max.)	—	210 °C

CHARACTERISTICS AND TYPICAL OPERATION

	Triode Section	Pentode Section
Plate Voltage	250	135 Volts
Grid No. 2 Voltage	—	120 Volts
Grid No. 1 Voltage	−4	−10 Volts
Plate Current	2.3	56 Ma
Grid No. 2 Current	—	3 Ma
Transconductance	3600	9300 μmhos
Amplification Factor	58	6.5(3)
Plate Resistance (Approx.)	16,000	12,000 Ohms
Ec for Ib = 10 μa	−6.6	— Volts
Ec for Ib = 1 Ma (Approx.)	—	−26 Volts
Ec for Ib = 100 μa	—	−30 Volts

INSTANTANEOUS PLATE KNEE VALUES

Eb = 45 V; Ec2 = 125 V; and Ec = 0 V
Ib = 200 Ma, and Ic2 = 20 Ma

Color Television Type

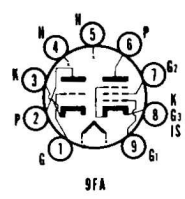
BURST AMPLIFIER (P) VIDEO AMPLIFIER (T)

6MB8

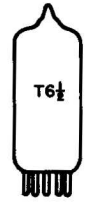
5MB8

Medium Mu Triode and Sharp Cutoff Pentode

Construction .....Miniature T-6½
Base .....Button 9 Pin, E9-1
Basing 9FA
Outline 6-2
Maximum Diameter .....0.875 In.
Maximum Seated Height .....1.938 In.
Maximum Overall Height .....2.185 In.



9FA



ELECTRICAL DATA

HEATER OPERATION

	5MB8	6MB8
Heater Voltage	4.5	6.3 Volts
Heater Current	450	400 Ma
Heater Warm-up Time	11	— Seconds
Maximum Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
Total DC and Peak		200 Volts
Heater Positive with Respect to Cathode		
DC		100 Volts
Total DC and Peak		200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Shielded)

Triode Section	
Grid to Plate	1.4 Pf
Input: g1 to (Tk + Pk + Pg3 + IS + h)	2.2 Pf
Output: p to (Tk + Pk + Pg3 + IS + h)	1.9 Pf
Pentode Section	
Grid No. 1 to Plate (Max.)	0.015 Pf
Input: g1 to (k + g3 + IS + g2 + h)	5.5 Pf
Output: p to (k + g3 + IS + g2 + h)	3.4 Pf

RATINGS (Design Maximum Rating System)

	Triode Section	Pentode Section
Plate Voltage (Max.)	280	280 Volts
Grid No. 2 Supply Voltage (Max.)	—	280 Volts
Grid No. 2 Pulse Voltage (Max.)(1)	—	300 Volts
Grid No. 2 Voltage	See Rating Chart (Gen. Info. Sec.)	
Cathode Current (Max.)	20	20 Ma
Plate Dissipation (Max.)	2.0	2.0 Watts
Grid No. 2 Dissipation (Max.)	—	0.5 Watt
Positive Grid No. 1 Voltage (Max.)	0	0 Volt
Maximum Grid No. 1 Circuit Resistance		
Self Bias (Max.)	0.5	0.25 Megohm
Fixed Bias (Max.)	1.0	0.5 Megohm

Control grid to cathode spacing of the pentode section of this type is of such low order of magnitude as to preclude the use of voltage between these elements of more than 30 volts DC and peak AC in commercial tube checkers and shorts indicating devices, particularly where mechanical excitation of the tube is employed.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

	Triode Section	Pentode Section
Plate Voltage	125	125 Volts
Grid No. 2 Voltage	—	125 Volts
Grid No. 1 Voltage	0	0 Volt
Cathode Bias Resistor	68	33 Ohms
Plate Current	13	10 Ma
Grid No. 2 Current	—	2.8 Ma
Transconductance	8000	12,000 μmhos
Amplification Factor	40	—
Plate Resistance (Approx.)	5000	125,000 Ohms
Ec1 for Ib = 100 μa	-5	— Volts
Ec1 for Ib = 50 μa	—	-3 Volts

NOTE:

(1) Rating determined at television horizontal deflection sweep frequency of 15,750 Hertz.

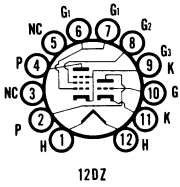
6MF8

15MF8

Color Television Type

VERTICAL DEFLECTION OSCILLATOR and AMPLIFIER

High Mu Triode and Beam Power Pentode



12DZ



Construction.....Compactron T-12
Base .....Button 12 Pin, E12-74
Basing 12DZ
Outline 12-57
Maximum Diameter .....1.562 In.
Maximum Seated Height .....2.750 In.
Maximum Overall Height .....3.125 In.

ELECTRICAL DATA

HEATER OPERATION

	15FM8	6MF8
Heater Voltage	14.7	6.3 Volts
Heater Current	600	1400 Ma
Heater Warm-up Time	11	— Seconds
Maximum Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
Total DC and Peak		200 Volts
Heater Positive with Respect to Cathode		
DC		100 Volts
Total DC and Peak		200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section	
Grid to Plate	6.0 Pf
Input	6.5 Pf
Output	1.6 Pf
Pentode Section	
Grid No. 1 to Plate (Max.)	0.54 Pf
Input	9.5 Pf
Output	7.0 Pf
Coupling	
Pentode Grid No. 1 to Triode Plate (Max.)	0.12 Pf
Pentode Plate to Triode Plate (Max.)	0.32 Pf

RATINGS (Design Maximum Rating System)

Vertical Deflection Oscillator and Amplifier(1)

	Tri. Osc.	Pent. Amp.
Plate Voltage (Max.)	400	400 Volts
Grid No. 2 Voltage (Max.)	—	300 Volts
Peak Positive Pulse Plate Voltage (Max.)	—	2500 Volts
Peak Negative Grid No. 1 Voltage (Max.)	400	— Volts
Plate Dissipation (Max.)(2)	2.5	12 Watts
Grid No. 2 Dissipation (Max.)(2)	—	2.75 Watts
Average Cathode Current (Max.)	30	75 Ma
Peak Cathode Current (Max.)	105	260 Ma
Peak Power Output (Max.)	2.5	— Watts
Grid Circuit Resistance		
Self Bias (Max.)	2.2	2.2 Megohms
Fixed Bias (Max.)	—	1.0 Megohm
Bulb Temperature (Max.)	—	200 °C

CHARACTERISTICS AND TYPICAL OPERATION

	Triode Section	Pentode Section
Plate Voltage	250	250 Volts
Grid No. 2 Voltage	—	250 Volts
Grid No. 1 Voltage	−4	−20 Volts
Plate Current	2.6	50 Ma
Grid No. 2 Current	—	3.5 Ma

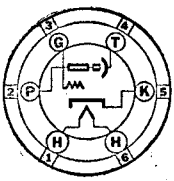
Transconductance	4100	4100 μmhos
Amplification Factor	58	—
Plate Resistance (Approx.)	14,000	5000 Ohms
Ec for Ib = 10 μa	-6.6	— Volts
Ec for Ib = 100 μa	—	-65 Volts

INSTANTANEOUS PLATE KNEE VALUES
Eb = 60 V; Ec2 = 250 V; and Ec = 0 V
Ib = 200 Ma, and Ic2 = 20 Ma

NOTES:

(1) For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations; Federal Communications Commission," the duty cycle of the voltage pulse must not exceed 15% of one horizontal scanning cycle.

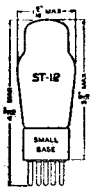
(2) In stages operating with grid leak bias, an adequate bias resistor or other suitable means is required to protect the tube in the absence of excitation.



Sylvania

TYPE 6N5

TRIODE INDICATEUR VISUEL D'ACCORD



CARACTERISTIQUES

Tension chauffage CA ou CC	6,3 volts
Courant chauffage	0,150 ampère
Ampoule	ST-12
Culot : petit 6 broches	6-R
Position de montage	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension chauffage	6,3 volts
Courant chauffage	0,3 ampère
Source tension plaque	180 volts max.
Tension coupelle	100 volts min.
Tension coupelle	180 volts max.

Conditions de fonctionnement et caractéristiques :

Tension chauffage	6,3 volts
Source tension plaque	135 volts
Source tension coupelle	135 volts
Courant plaque (triode)*	0,5 ma. max
Courant coupelle (approx.)*	2,0 ma.
Courant grille (triode)**	0,0 volt appr.
Courant grille (triode)***	—12 volts appr.
Résistance interne triode	0,25 mégohm

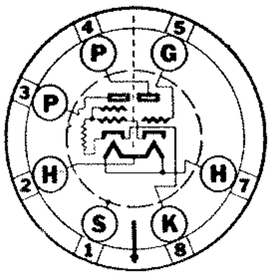
* Polarisation grille triode à zéro volt.
** Pour secteur d'ombre à 90 degrés.
*** Pour secteur d'ombre à 0 degré.

APPLICATION.

Sylvania type 6N5 est un indicateur d'accord triode conçu pour indiquer de visu l'effet de variation de polarisation de la grille. Le secteur d'ombre produit sur la coupelle fluorescente varie de 90° à 0° suivant variation de la polarisation.

Dans les circuits, les variations de polarisation négative pour contrôler le secteur d'ombre peuvent être obtenues d'un point quelconque du circuit A.V.C., donnant ainsi une indication de résonance quand le secteur d'ombre est à son minimum.

Type 6N5 fonctionne d'une manière similaire à celle des types 6E5 et 6U5/6G5, malgré les différences dans les caractéristiques électriques. Sauf l'ampoule et la coupure de courant plaque, type 6N5 est similaire à type 6AB5. Ils ont tous deux un courant de chauffage de 150 millis, tandis que celui des types 6E5 et 6U5/6G5 est de 300 millis.



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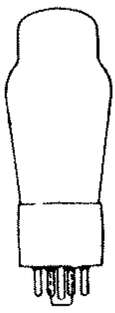


Sylvania Type 6N6G

DIRECT COUPLED POWER AMPLIFIER

PHYSICAL SPECIFICATIONS

Base	Medium Octal 7 Pin
Bulb	ST14
Maximum Overall Length	4 5/8"
Maximum Seated Height	4 1/16"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC	6.3 Volts
Heater Current	0.8 Ampere
Maximum Output Plate Voltage	300 Volts
Maximum Input Plate Voltage	300 Volts
Maximum Heater-Cathode Voltage	90 Volts

TYPICAL OPERATION

CLASS A AMPLIFIER

Heater Voltage	6.3 Volts
Heater Current	0.8 Ampere
Plate Voltage (Output)	300 Volts
Plate Voltage (Input)	300 Volts
Grid Voltage (Input)	0 Volt
Plate Current (Output)	42 Ma.
Plate Current (Input)	9 Ma.
Plate Resistance	24000 Ohms
Mutual Conductance†	2400 μmhos
Amplification Factor	58
Load Resistance	7000 Ohms
Power Output*	4.0 Watts
Power Output**	6.5 Watts

†Input grid—output plate Mutual Conductance.
*15 volts (r-m-s) signal; total distortion 5%.
**Input grid begins to draw grid current; total distortion 10%.

APPLICATION

Sylvania 6N6G is a heater type output tube comprising two triode units mounted in an ST-14 bulb. The smaller or input section acts as a driver tube for the larger output unit and is directly coupled to it. The input cathode and output grid are connected internally.

Type 6N6G may be employed in the output stage of a-c operated receivers to deliver large amounts of power with low percentage distortion. Two tubes may be used in a push-pull circuit if additional power is desired.

In general, the circuits designed for the Type 6N6G will be somewhat simplified since the number of component parts required will be less than with other power amplifier tubes. The tube operates without bias so that there is no need for a cathode resistor and its associated by-pass condenser. The output cathode is connected directly to minus B. Nevertheless, the input grid does not draw any current since a grid bias is automatically developed within the tube. The tube may therefore be fed by resistance coupling.

The optimum load resistance for single tube operation is 7000 ohms. When two Type 6N6G tubes are operated in push-pull the plate to plate load resistance should be 10,000 ohms.

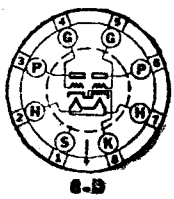
The characteristics are shown for 300 volt operation. However, it is permissible to operate Type 6N6G with a plate voltage of 325 volts and a grid bias of —4.5 volts. Under these conditions the current values will be substantially the same as those shown above.

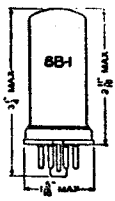
Type 6N6G is the "G" equivalent of Type 6B5.

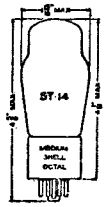
Sylvania

TYPE 6N7
TYPE 6N7G

AMPLIFICATEURS DE PUISSANCE CLASSE B



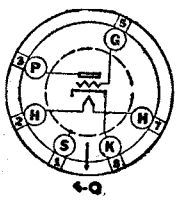




CARACTERISTIQUES

	6N7	6N7G
Tension de chauffage CA ou CC	6,3	6,3 volts
Courant de chauffage	0,8	0,8 ampère
Ampoule...	8B-1	ST-14
Culot — Octal 8 broches	8-B	8-B
Position de montage	Toutes	Toutes

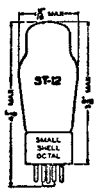
Types 6N7 et 6N7G sont les équivalents dans la série métal et G du type 6A6 auquel on se référera pour caractéristiques et applications.



Sylvania

TYPE 6P5G

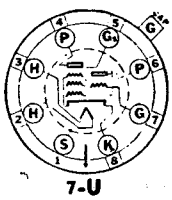
TRIODE AMPLIFICATEUR DETECTEUR



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12
Culot — Petit octal 6 broches	6-Q
Position de montage	Toutes

* Pour toutes les autres caractéristiques et les applications, voir type 76, qui ne diffère du 6P5G que par le culot.

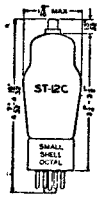


7-U

Sylvania

TYPE 6P7G

PENTODE TRIODE



CARACTERISTIQUES

Tension de chauffage CA ou CC ... ... 6,3 volts
Courant de chauffage ... ... 0,3 ampère
Ampoule ST-12C
Culot — Petit octal 8 broches 7-U
Position de montage ... ... Toutes

Pour toutes les autres caractéristiques et les applications, voir 6F7, qui ne diffère du 6P7G que par le culot et quelques petites différences dans les capacités interélectrodes.

TENTATIVE DATA ON THE TUBE TYPE 6Q6G

Heater Voltage	6.3 volts
Heater Current	0.150 amp.

Direct Interelectrode Capacitances (with tight fitting shield)

Grid to Plate	1.8	uuf
Grid to Cathode	2.3	uuf
Plate to Cathode	5.2	uuf

Operating Conditions

Plate Voltage	135	250	volts
Grid Voltage	-1.5	-3.0	volts
Plate Current	0.9	1.2	ma
Mutual Conductance	1000	1050	umhos
Amplification Factor	65	65	

DIODE UNIT;- Equivalent to a SINGLE diode of a Type 55 Or 6B7

Bulb	ST 12
Cap	Min.
Base	Octal,6 pin

Basing-

Pin 1	Not connected
Pin 2	Heater
Pin 3	Plate
Pin 5	Diode Plate
Pin 7	Heater
Pin 8	Cathode
Cap	Grid.

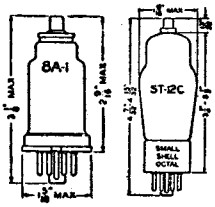
from RMA release #76, June 12, 1936
sponsored by Hygrade-Sylvania Corp.



Sylvania

TYPE 6Q7
TYPE 6Q7G

DOUBLE DIODE TRIODE A GRAND MU



CARACTERISTIQUES

	6Q7	6Q7G
Tension chauffage CA ou CC	6,3	6,3 volts
Courant chauffage	0,3	0,3 ampère
Ampoule	8A-1	ST-12C
Capuchon	Miniature	Miniature
Culot — Petit octal 7 broches	7-V	7-V
Position de montage	Toutes	Toutes

Capacités directes interélectrodes (section triode) :

	6Q7	6Q7G
Grille à plaque	1,5	1,7 $\mu\mu$f
Entrée	5,5	2,2 $\mu\mu$f
Sortie	5,0	3,2 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A (Section triode)

Tension de chauffage	6,3	6,3 volts
Tension plaque	100	250 volts
Tension grille*	—1,5	—3 volts
Courant plaque*	0,35	1,1 ma.
Résistance interne	88,000	58,000 ohms
Conductance mutuelle	800	1,200 μmhos
Cœfficient d'amplification	70	70

* Valeurs normales et non pas point de fonctionnement avec couplage par résistance. — Voir « application ».

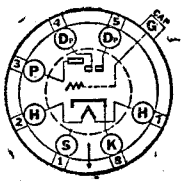
APPLICATION

Les diodes de ces tubes sont les mêmes que celles utilisées dans les types 75 et 6B7 et peuvent par conséquent être utilisées pour des applications similaires. La section triode a un coefficient d'amplification quelque peu inférieur à celui de la 75. Cette valeur plus faible a été choisie pour pouvoir appliquer un signal d'entrée plus fort (dans les deux conditions de fonctionnement avec 250 ou 100 volts plaque), sans que le courant grille ne prenne naissance. Cette propriété rend la valeur de la polarisation de grille moins critique que pour un tube à coefficient d'amplification plus élevé.

La section triode fonctionnant avec une tension d'alimentation de 250 volts et une impédance de plaque de 100.000 à 250.000 ohms, doit être polarisée à —2,5 volts approximativement.

Lorsque la tension d'alimentation est de 100 volts et la résistance de charge de 50.000 à 100.000 ohms, la polarisation doit être de l'ordre de —1,4 volt. Pour des applications spéciales, ces valeurs peuvent être changées, pour répondre aux conditions imposées.

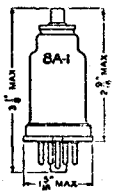
Dans le schéma-type à la fin du volume, un tube 6Q7 est utilisé comme second détecteur et premier amplificateur de basse fréquence.

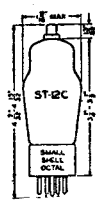


Sylvania

TYPE 6R7
TYPE 6R7G

DOUBLE DIODE TRIODE A MOYEN MU





CARACTERISTIQUES

	6R7	6R7G
Tension chauffage CA ou CC	6,3	6,3 volts
Courant chauffage	0,3	0,3 ampère
Ampoule	8A-1	ST-12C
Capuchon	Miniature	Miniature
Culot — Petit octal 7 broches	7-V	7-V
Position de montage	Toutes	Toutes

Capacités directes interélectrodes (section triode) :

Grille à plaque	2,5	2,3 $\mu\mu$F
Entrée	5,5	2,0 $\mu\mu$F
Sortie	4,0	3,0 $\mu\mu$F

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A (Section triode)

Tension de chauffage	6,3 volts
Tension plaque	250 volts
Tension grille	—9 volts
Courant plaque	9,5 ma.
Résistance interne	8,500 ohms
Conductance mutuelle	1,900 μmhos
Cœfficient d'amplification	16
Puissance modulée, sans distorsion	285 m. w.

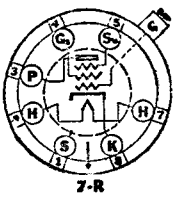
APPLICATION.

Sylvania 6R7 ou 6R7G est un tube à chauffage indirect destiné aux récepteurs pour CA, CC ou pour batterie. Ce tube comporte deux diodes et une section triode dans la même ampoule et peut être utilisé comme détecteur diode, amplificateur triode et pour donner la tension de régulation d'A.V.C.

En général, ce tube peut être considéré comme l'équivalent du type 85, quoique des corrections de polarisation, de résistance de charge, etc., doivent être faites lorsque, dans un circuit déterminé on remplacera l'un par l'autre. La section triode a une conductance mutuelle et un coefficient d'amplification plus élevés que ceux du type 85.

Les diodes du tube 6R7 ou 6R7G sont les mêmes que celles des types 6Q7, 6Q7G et 85 et sont, par conséquent, susceptibles des mêmes applications. Les diodes sont bien isolées électrostatiquement de la section triode, ce qui empêche toute interaction entre leurs circuits respectifs.

Pour de plus amples renseignements, voir sous le titre Type 85.

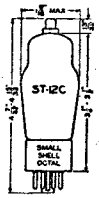


7-R

Sylvania

TYPE 6S7G

SUPER-AMPLIFICATEUR TRIGRILLE A PENTE VARIABLE



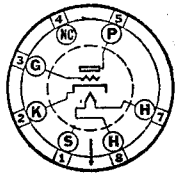
CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage...	0,15 ampère
Ampoule	ST-12C
Capuchon	Miniature
Culot : petit octal 7 broches...	7-R
Position de montage	Toutes

Capacités directes interélectrodes :

Grille à plaque (avec blindage)	0,008 $\mu\mu f$
Entrée	4,4 $\mu\mu f$
Sortie	8,0 $\mu\mu f$

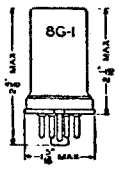
Pour toutes caractéristiques et applications, conditions limites de fonctionnement, se référer aux types 6D6 et 6U7G. Cependant, le courant de chauffage n'est que de 150 millis.



8-P



8-R



Sylvania « Single Ended » (sans capuchon)
Série 6, 3 Volts - Métal

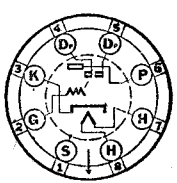
Ces tubes n'ont pas de capuchon de grille, toutes les connexions aboutissant au culot permettent le câblage 100 % sous le châssis. Dans certains cas, il en résulte des caractéristiques améliorées et une meilleure stabilité d'oscillation de fréquence



8-S



8-N



8-Q

TYPE	CLASSE	Culot pour Type	Ampoule	Filament Volts	Filament Amp.	USAGE	Tension Plaque volts	Polarisation grille	Tension écran volts	Courant Plaque ma.	Courant écran ma.	Résist. int. ohms	Conduct. mut. umhos	Facteur amplification	Impéd. charge ohms	Puiss. modulée watt	REMARQUES
6SA7	Heptode	8-R	8G-1	6-3	0 3	Convertisseur	250	—2	100	3.4	8	800000	450	—	—	—	Voir 6A7.
6SC7	Double Triode	8-S	8G-1	6-3	0.3	Amplificat.	250	—2	—	2.0	—	53000	1323	70	—	—	Triodes à grand MU.
6SF5	Triode	8-P	8G-1	6-3	0.3	Amplificat. B.F.	Caractéristiques identiques à 6F5, excepté capacités interélectrodes.										
6SJ7	Pentode	8-N	8G-1	6-3	0.3	Amplificat.	250	—3	100	3.0	0.8	1.5 Mg	1650	2500	—	—	Voir 6J7.
6SK7	Pentode	8-N	8G-1	6-3	0.3	Amplificat.	Caractéristiques similaires 6K7.										
6SQ7	Double Diode-Triode	8-Q	8G-1	6-3	0.3	Détecteur	Caractéristiques identiques à 6Q7, excepté capacités interélectrodes.										

Position de montage : Toutes.

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6SL7WGT

MECHANICAL DATA

Bulb	T-9
Base[1]	Intermediate Shell Octal, Low Loss Phenolic 8-Pin
Basing	8BD
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS

Shock (Intermittent Service-Abs. Max.)	450	g
Vibration (Continuous Service-Design Center)	2.5	g
Mechanical Resonance	None Below 100	cps

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (Avg.)	6.3	Volts
Heater Voltage (Abs. Max.)	7.0	Volts
Heater Voltage (Design Center)	6.3	Volts
Heater Current (Avg.)[2]	300	Ma
Heater Current (Max.)	325	Ma
Heater Current (Min.)[2]	275	Ma

RATINGS

	Absolute Max.	Design Center	
Plate Voltage	275	250	Volts
Plate Dissipation (Each Plate)	1.1	1.0	Watts
Positive Grid Voltage		0	Volts
Heater-Cathode Voltage	100	90	Volts

CHARACTERISTICS AND TYPICAL OPERATION

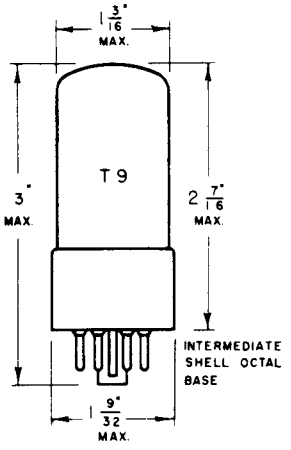
Class A Amplifier	Min.[2]	Avg.	Max.[2]	
Plate Voltage		250		Volts
Grid Voltage		−2		Volts
Cathode Bias Resistor		870		Ohms
Plate Current	1.4	2.3	3.2	Ma
Transconductance	1200	1600	2000	μmhos
Amplification Factor	55	70	85	
Plate Current When E_c = −5.75 Volts			25	μa
Heater-Cathode Leakage at ±100 Volts			20	μa
Grid Current			1.0	μa

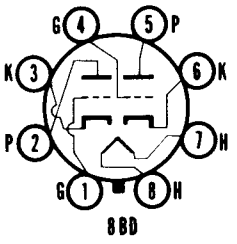
NOTES:

1. *Maximum base dielectric loss factor is 0.1. Reference: ASTM Designation D-150-47T.*
2. *Limits given here are the extremes which may be found in production.*

QUICK REFERENCE DATA

Rugged high mu twin triode designed for service as a resistance coupled amplifier or phase inverter in applications requiring resistance to shock and vibration.





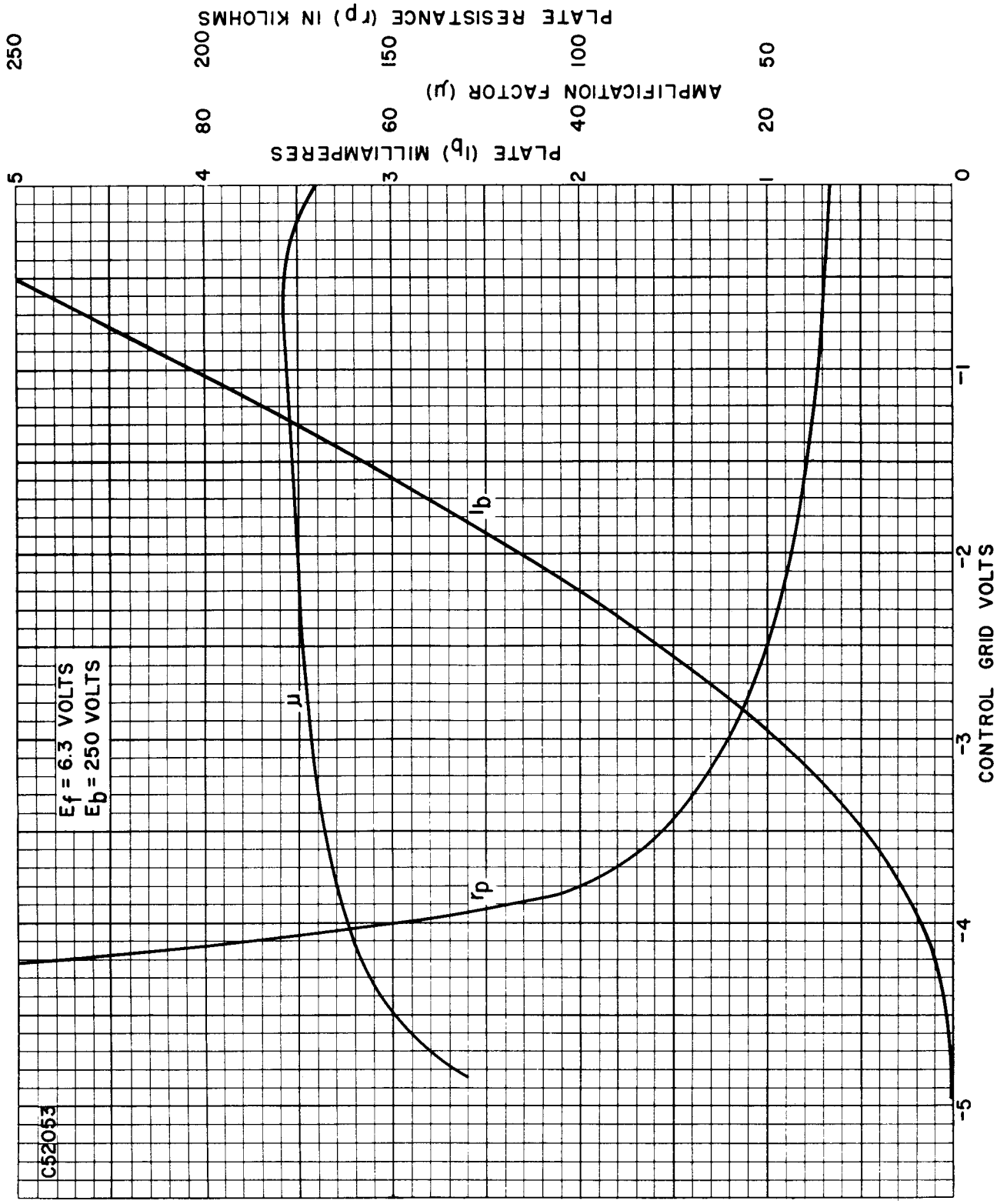
SYLVANIA ELECTRIC PRODUCTS INC.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

APRIL 1953

6SL7WGT

AVERAGE TRANSFER CHARACTERISTICS



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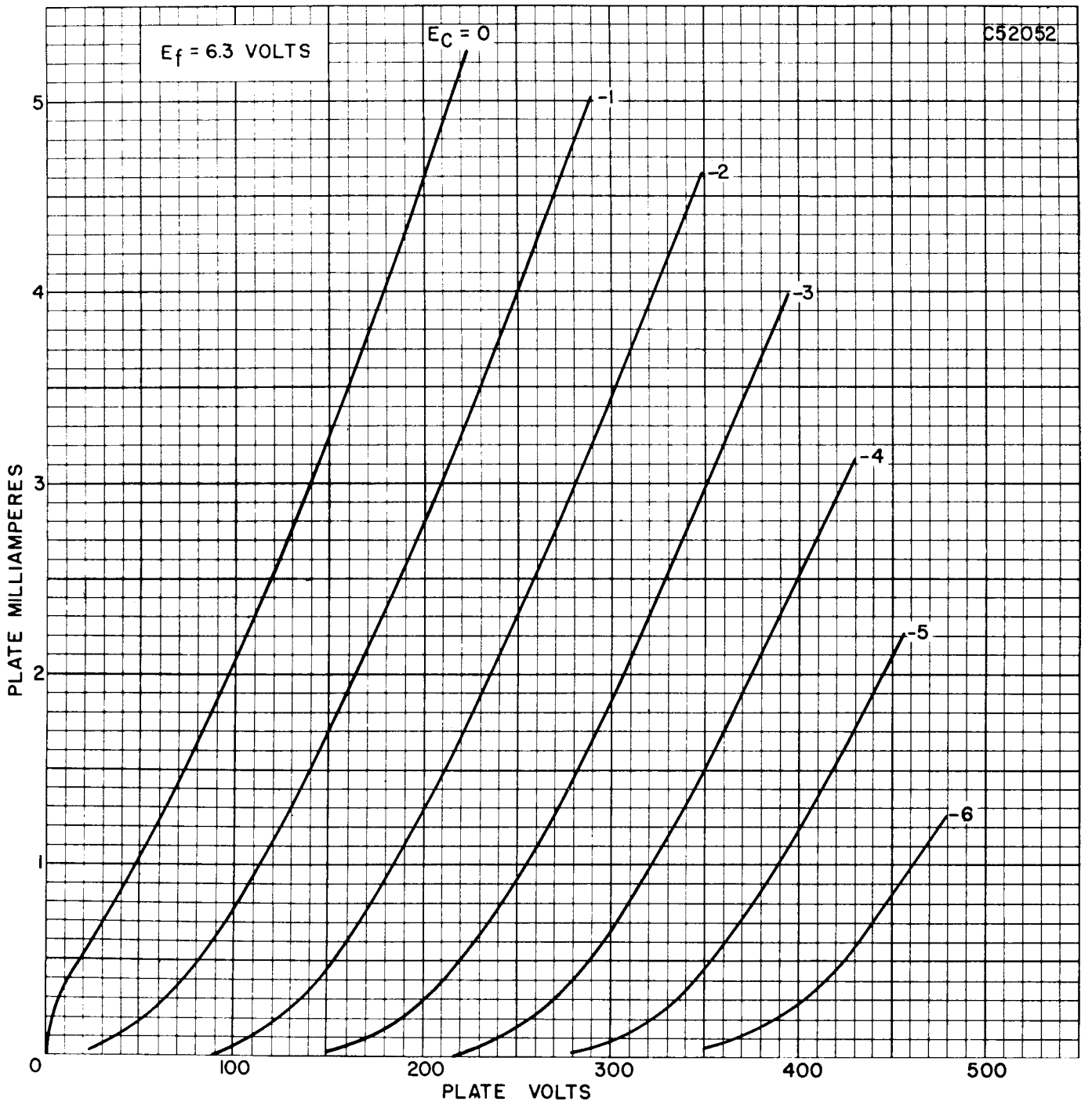
6SL7WGT

AVERAGE PLATE CHARACTERISTICS



MECHANICAL DATA

Bulb	T-9
Base	B8-6, Intermediate Shell Octal 8-Pin or B8-58, Short Intermediate Shell Octal 8-Pin
Outline	9-11 or 9-41
Basing	8BD
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA[1]

HEATER CHARACTERISTICS

	6SN7GT	12SN7GT
Heater Voltage	6.3	12.6 Volts
Heater Current	600	300 Ma
Heater-Cathode Voltage (Design Center Values)		
Heater Negative with Respect to Cathode		
Total DC and Peak	200	200 Volts Max.
Heater Positive with Respect to Cathode		
DC	100	100 Volts Max.
Total DC and Peak	200	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded — approx.)

	Section 1[2]	Section 2
Grid to Plate	3.8	4.0 $\mu\mu$f
Input	2.8	3.0 $\mu\mu$f
Output	0.8	1.2 $\mu\mu$f

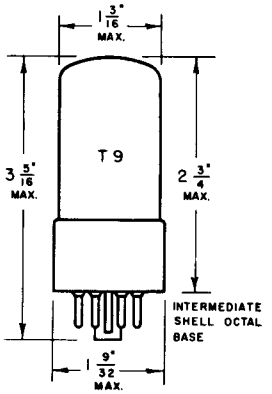
RATINGS — Each Section (Design Center Values — Except as Noted)

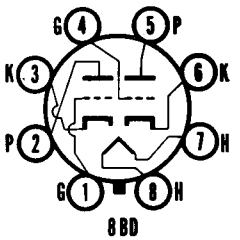
	Class A_1 Amplifier	Vertical[3] Deflection Amplifier	
Plate Voltage	300	300	Volts Max.
Peak Positive Plate Voltage (Abs. Max.)		1200	Volts Max.
Plate Dissipation			
Each Plate	3.5	3.5	Watts Max.
Both Plates	5.0	5.0	Watts Max.
Peak Negative Grid Voltage		250	Volts Max.
Cathode Current	20	20	Ma Max.
Peak Cathode Current		70	Ma Max.
Grid Circuit Resistance	1.0		Megohm Max.
Cathode Bias		2.2	Megohms Max.

	Vertical[3] Deflection Oscillator	Horizontal[3] Deflection Oscillator	
Plate Voltage	300	300	Volts Max.
Plate Dissipation			
Each Plate	3.5	3.5	Watts Max.
Both Plates	5.0	5.0	Watts Max.
Peak Negative Grid Voltage	400	600	Volts Max.
Average Cathode Current	20	20	Ma Max.
Peak Cathode Current	70	300	Ma Max.
Grid Circuit Resistance	2.2	2.2	Megohms Max.

QUICK REFERENCE DATA

The 6SN7GT is a medium mu double triode intended for use as a resistance coupled amplifier, or combined vertical oscillator and vertical deflection amplifier in television receivers. Except for heater characteristics, the 6SN7GT is identical to the 12SN7GT.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

SEPTEMBER 1955

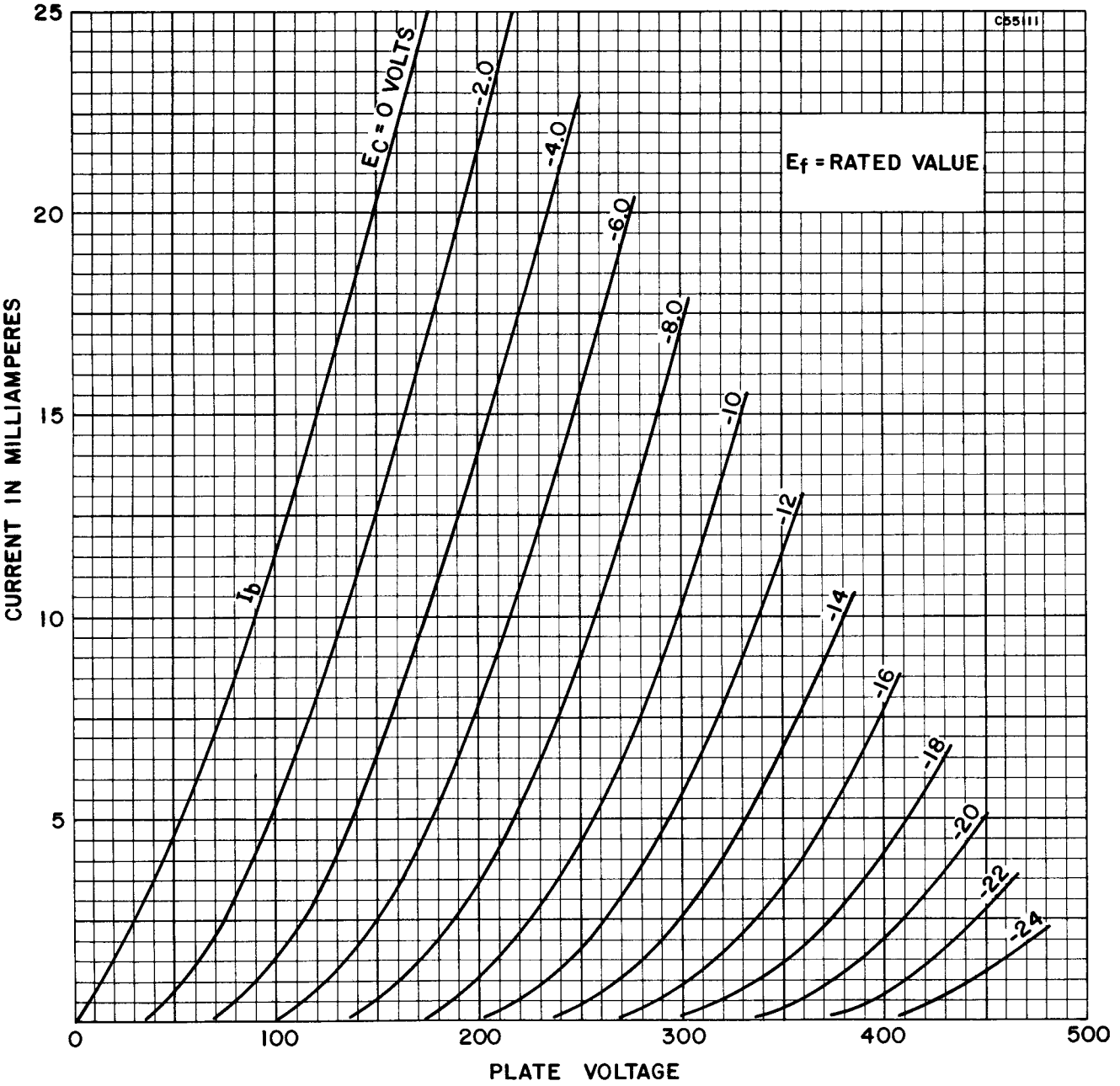
CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier		
Plate Voltage	90	250 Volts
Grid Voltage	0	-8.0 Volts
Plate Current	10	9.0 Ma
Plate Resistance (approx.)	6700	7700 Ohms
Transconductance	3000	2600 μmhos
Amplification Factor	20	20
Plate Current at E_c = -12.5 Volts		1.3 Ma
Grid Voltage for I_b = 10 μa (approx.)	-7.0	-18 Volts

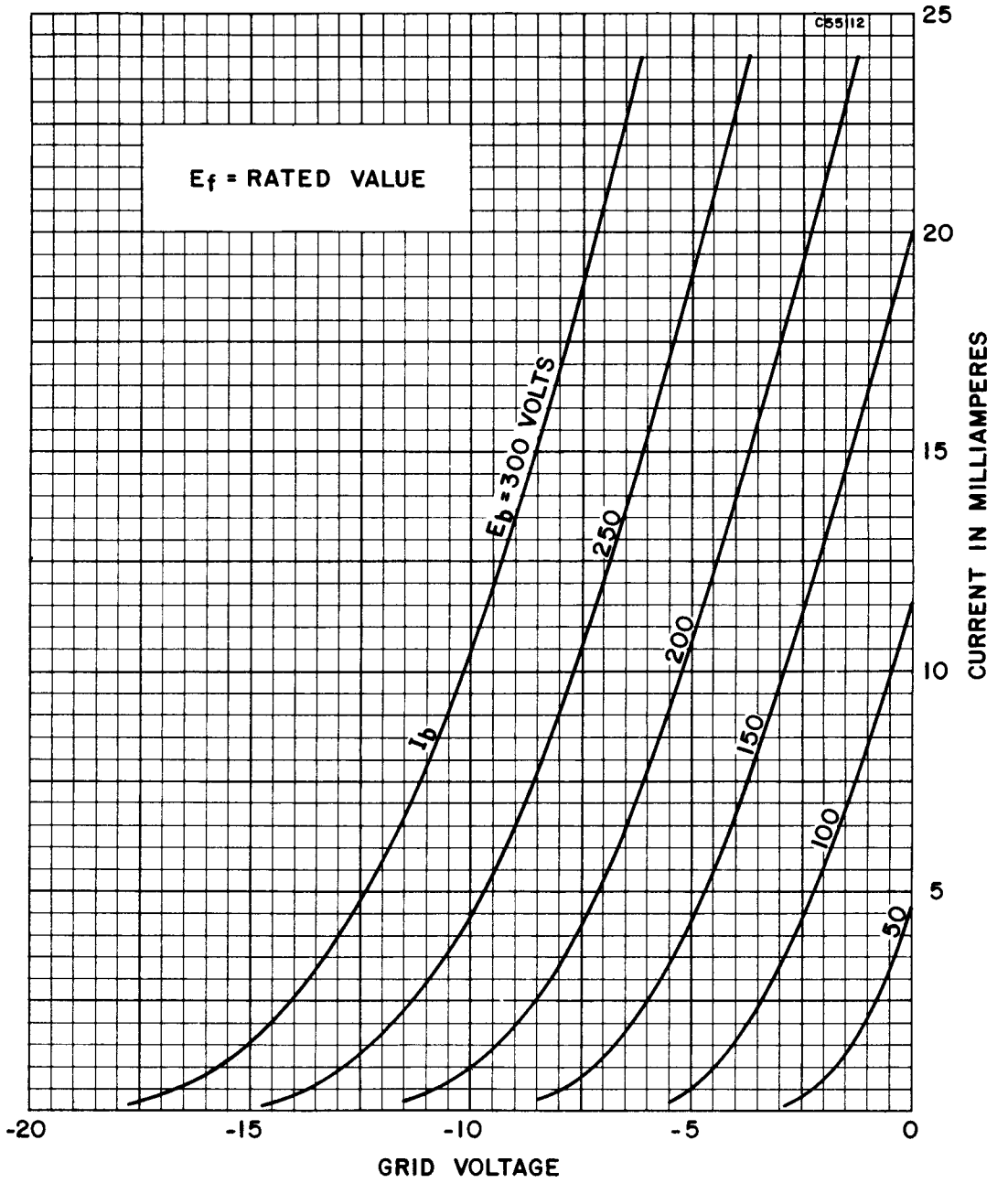
NOTES:

1. *All ratings, operating conditions and characteristics are for each section except where otherwise stated.*
2. *Section No. 1 connects to pins 4, 5 and 6. Section No. 2 connects to pins 1, 2 and 3.*
3. *For operation in a 525 line, 30-frame system as described in "Standards of Good Engineering Practice for Television Broadcasting Stations; Federal Communications Commission". The duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.*

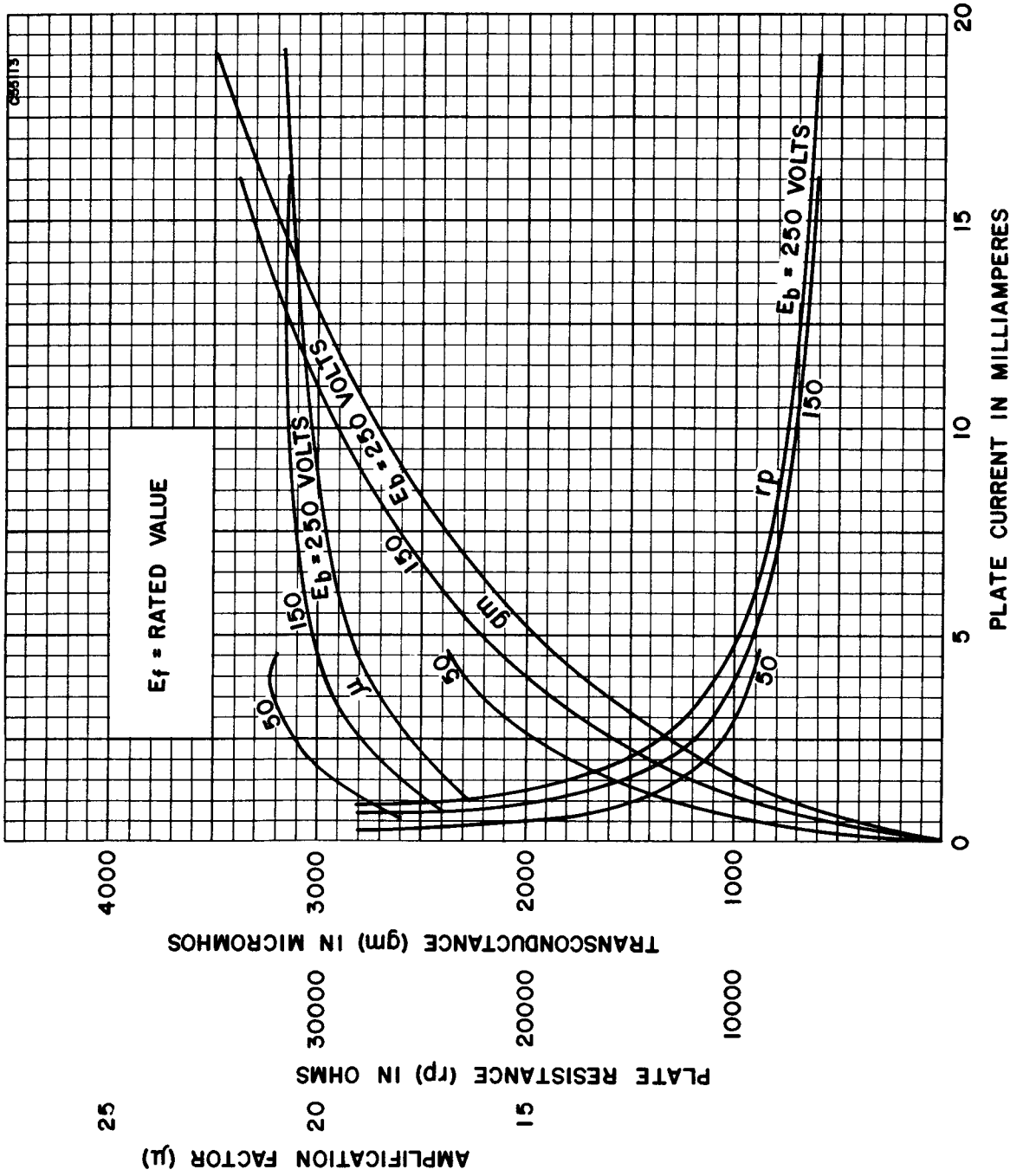
AVERAGE PLATE CHARACTERISTICS
EACH SECTION



AVERAGE TRANSFER CHARACTERISTICS
EACH SECTION



AVERAGE TRANSFER CHARACTERISTICS
EACH SECTION



SYLVANIA

engineering data service

6SN7GTA
6SN7GTB
8SN7GTB
12SN7GTA

MECHANICAL DATA

Bulb	T-9
Base	B8-6, Intermediate Shell Octal 8-Pin or B8-58, Short Intermediate Shell Octal 8-Pin
Outline	9-11 or 9-41
Basing	8BD
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6SN7GTA	6SN7GTB	8SN7GTB	12SN7GTA	
Heater Voltage	6.3	6.3	8.4	12.6 Volts	
Heater Current	600	600	450	300 Ma	
Heater Warm-up Time[1]		11	11	Seconds	
Heater-Cathode Voltage (Design Center Values)					
Heater Negative with Respect to Cathode					
Total DC and Peak.	200	200	200	200 Volts	Max.
Heater Positive with Respect to Cathode					
DC	100	100	100	100 Volts	Max.
Total DC and Peak.	200	200	200	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section 1[2]	Section 2
Grid to Plate	4.0	3.8 $\mu\mu$f
Input	2.2	2.6 $\mu\mu$f
Output	0.7	0.7 $\mu\mu$f

RATINGS—Each Section (Design Center Values—Except as Noted)

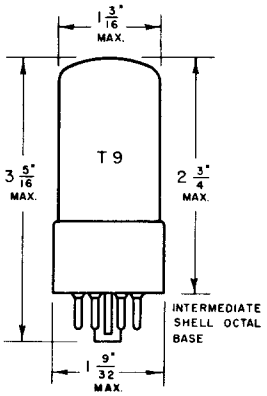
	Class A_1 Amplifier	Vertical[3] Deflection Amplifier	
Plate Voltage	450	450 Volts	Max.
Peak Positive Plate Voltage (Abs. Max.)		1500 Volts	
Plate Dissipation			
Each Plate	5.0	5.0 Watts	Max.
Both Plates	7.5	7.5 Watts	Max.
Peak Negative Grid Voltage		250 Volts	Max.
Cathode Current	20	20 Ma	Max.
Peak Cathode Current		70 Ma	Max.
Grid No. 1 Circuit Resistance			
Fixed Bias	1.0	Megohm	Max.
Cathode Bias	1.0	2.2 Megohms	Max.

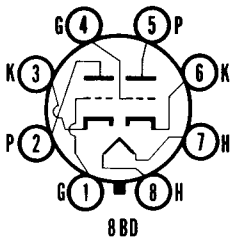
	Vertical[3] Deflection Oscillator	Horizontal[3] Deflection Oscillator	
Plate Voltage	450	450 Volts	Max.
Plate Dissipation			
Each Plate	5.0	5.0 Watts	Max.
Both Plates	7.5	7.5 Watts	Max.
Peak Negative Grid Voltage	400	600 Volts	Max.
Average Cathode Current	20	20 Ma	Max.
Peak Cathode Current	70	300 Ma	Max.
Grid Circuit Resistance	2.2	2.2 Megohms	Max.

QUICK REFERENCE DATA

The Sylvania Types 6SN7GTA, 6SN7GTB, 8SN7GTB, and 12-SN7GTA are medium mu, double triodes intended for use as horizontal multivibrators, phase inverters, and combined vertical oscillators and deflection amplifiers.

Types 6SN7GTB and 8SN7GTB have controlled heater warm-up time for series string operation.





SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

FEBRUARY, 1957

CHARACTERISTICS AND TYPICAL OPERATION

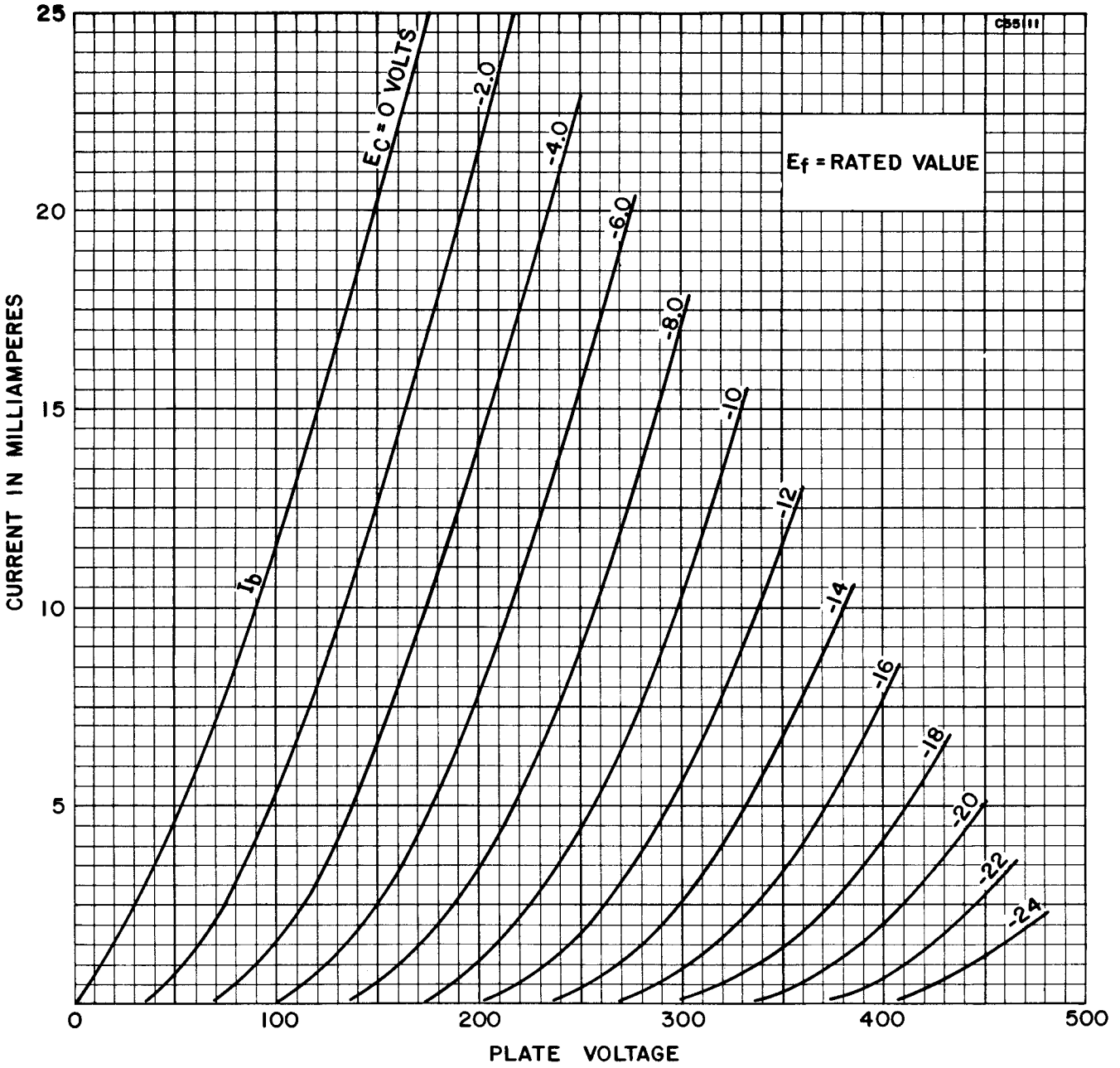
Class A_1 Amplifier—Each Section

Plate Voltage	90	250 Volts
Grid Voltage	0	-8.0 Volts
Plate Current	10	9.0 Ma
Transconductance	3000	2600 μmhos
Amplification Factor	20	20
Plate Resistance (Approx.)	6700	7700 Ohms
Plate Current at Ec = 12.5 Volts		1.3 Ma
Grid Voltage for Ib = 10 μa (Approx.)	-7.0	-18 Volts

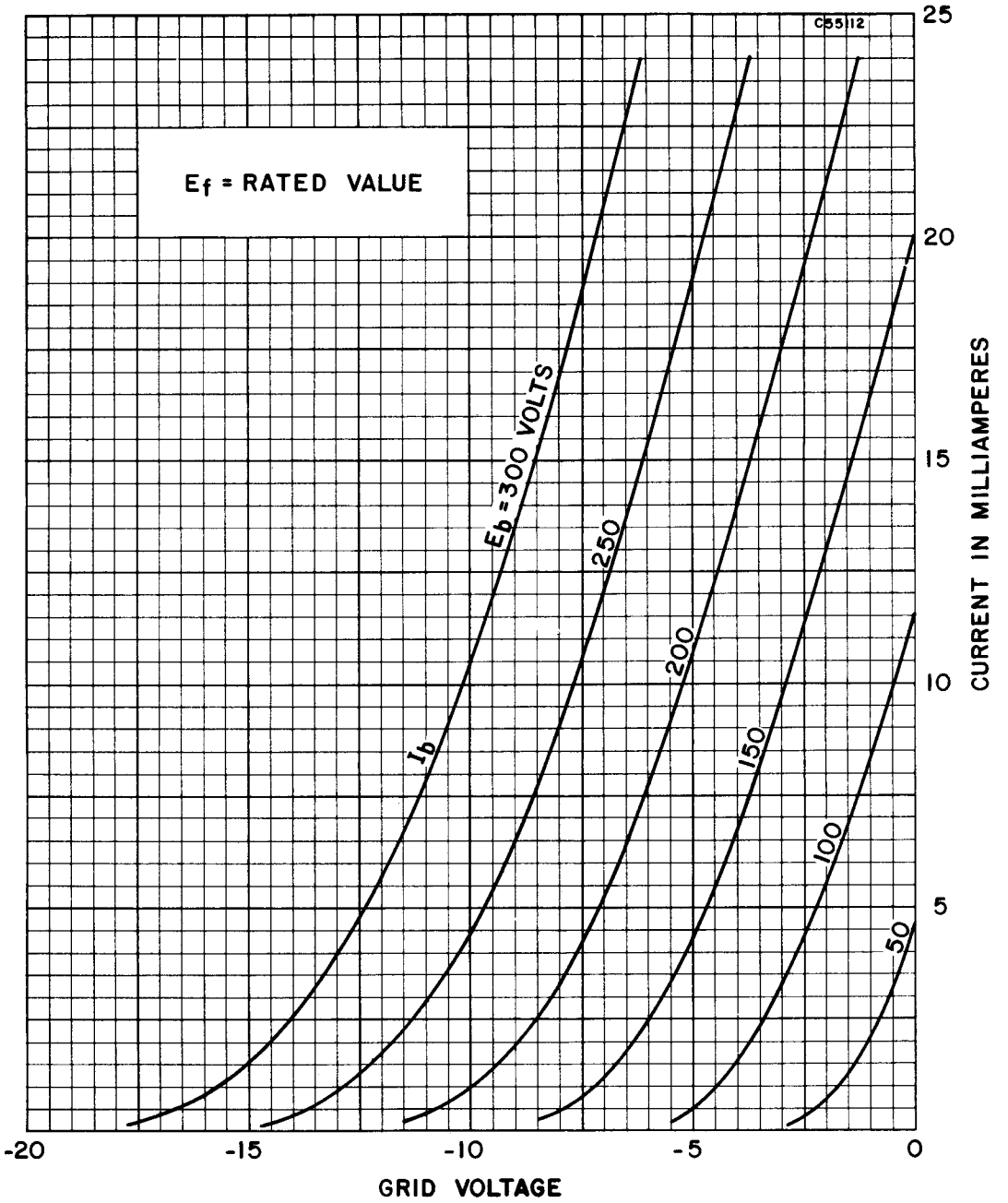
NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *Section No. 1 connects to pins 4, 5 and 6. Section No. 2 connects to pins 1, 2 and 3.*
3. *For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcasting Stations; Federal Communications Commission." The duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.*

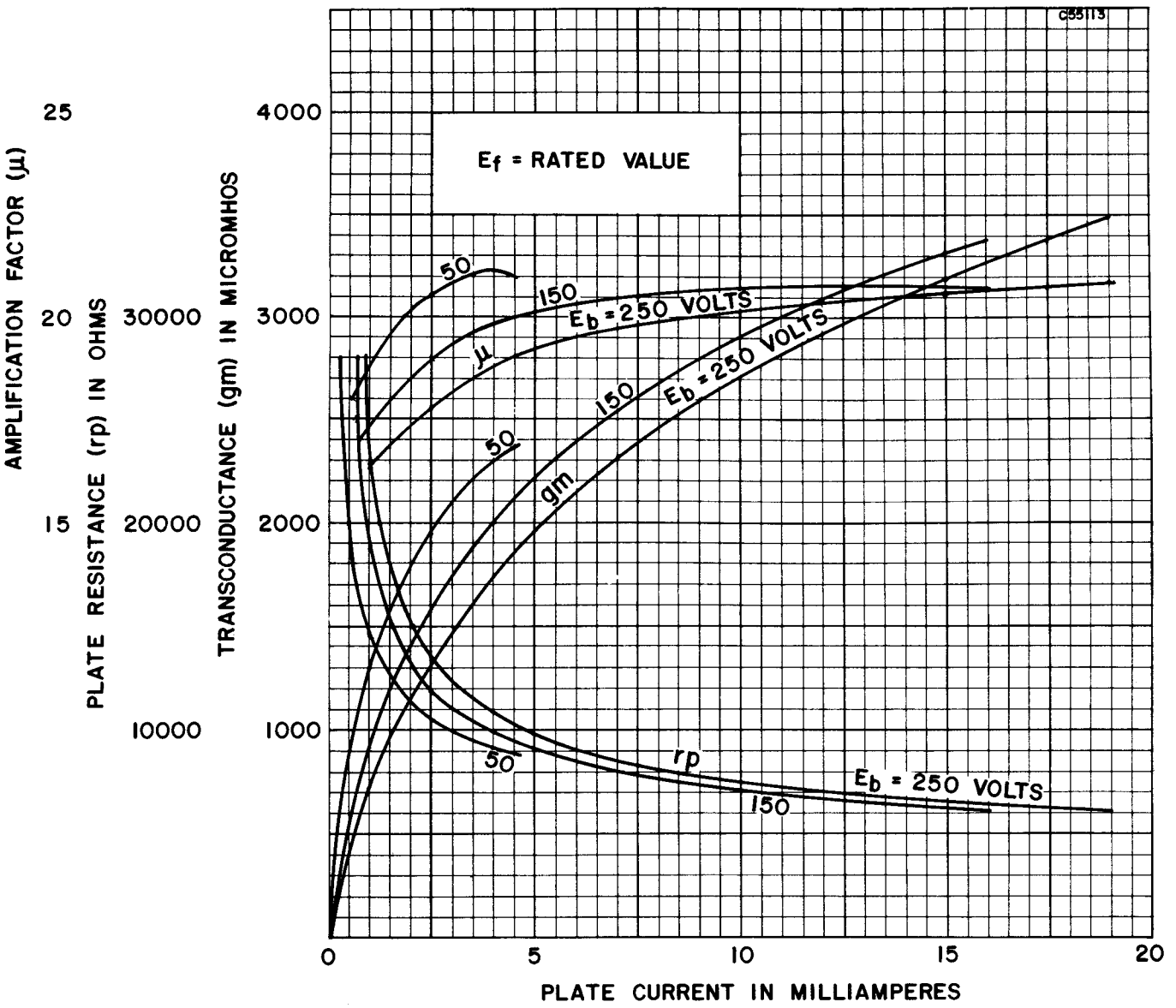
AVERAGE PLATE CHARACTERISTICS
(EACH SECTION)

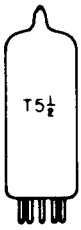


AVERAGE TRANSFER CHARACTERISTICS
(EACH SECTION)



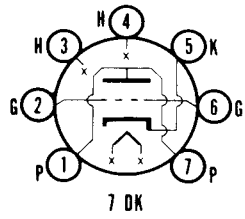
AVERAGE TRANSFER CHARACTERISTICS
(EACH SECTION)





SYLVANIA TYPE 6T4

U H F TRIODE



7 DK

MECHANICAL DATA

Bulb	T-5 ½, Outline 5-1
Base	Miniature Button 7-Pin
Basing	7DK
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	225 Ma
Maximum Heater-Cathode Voltage	
Total D C and Peak	50 Volts
D C, Heater Positive with Respect to Cathode	25 Volts

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[1]	Unshielded
Grid to Plate	1.7	1.7 $\mu\mu$f
Input	3.3	2.6 $\mu\mu$f
Output	2.0	0.4 $\mu\mu$f
Heater to Cathode[2]	3.0	3.0 $\mu\mu$f
Grid to Cathode[2]	2.4	2.4 $\mu\mu$f
Plate to Cathode[2]	.22	.24 $\mu\mu$f

MAXIMUM RATINGS (Design Center Values)

Plate Voltage	200 Volts
Plate Dissipation	3.5 Watts
Grid Current	8 Ma
Cathode Current	30 Ma

CHARACTERISTICS

Plate Voltage	80 Volts
Cathode Bias Resistor	150 Ohms
Plate Current	18 Ma
Transconductance	7000 μmhos
Amplification Factor	13
Plate Resistance	1860 Ohms
Grid Voltage for 50 μa Plate Current	−15 Volts

TYPICAL OPERATION

Oscillator at 950 Mc

Plate Voltage	80 Volts
Grid Voltage (Self Bias)	−4 Volts
Grid Resistor	10000 Ohms
Plate Current	18 Ma
Grid Current (approx.)	400 μa

NOTES:

1. Shield No. 316.
2. Measured between specified elements only. When external shield is used, it shall be grounded.

APPLICATION

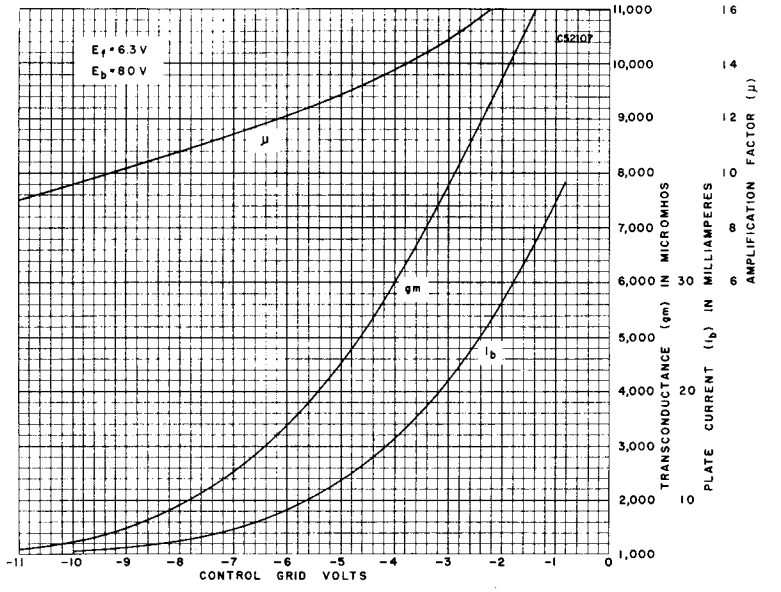
The Sylvania Type 6T4 is a miniature low-mu triode designed for service as a u h f oscillator.

SYLVANIA TUBE TESTER SETTINGS

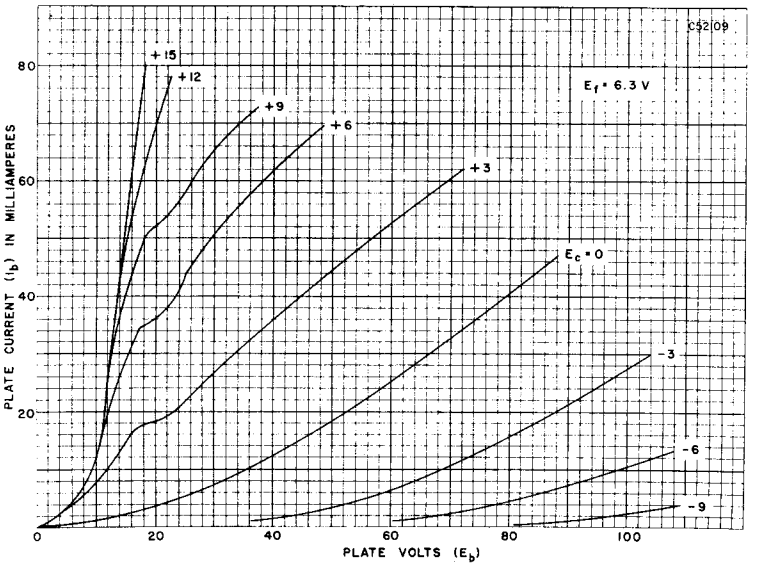
	A	B	C	D	E	F	G	Test or K
139/140	6.3	0	46	0	2	2	30	U
	6.3	0	23	0	3	6	30	U
219/220	6.3	3	467	24	4	2X	1	5
	6.3	3	124	24	4	6X	7	5

6T4 (Cont'd)

AVERAGE TRANSFER CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



from RMA release #113,
April 12, 1937

Hygrade Sylvania CORPORATION

TECHNICAL DATA

SYLVANIA TYPE 6T5

Tuning Indicator

CHARACTERISTICS

Heater Voltage AC or DC	6.3	Volts
Heater Current	0.3	Ampere

OPERATING CONDITIONS AND CHARACTERISTICS

Heater Voltage	6.3	Volts
Plate Supply Voltage	250	Volts
Target Supply Voltage	250	Volts
Plate Current (Triode Unit)*	0.24	Ma. Max.
Target Current	3.0	Ma. Approx.
Grid Voltage (Triode Unit)°	0.0	Volts
Grid Voltage (Triode Unit)°°	-22.0	Volts
Triode Plate Resistor	1.0	Megohm

* With triode grid voltage of zero volts.
° For minimum illumination of target.
°° For maximum illumination of target.

CIRCUIT APPLICATION

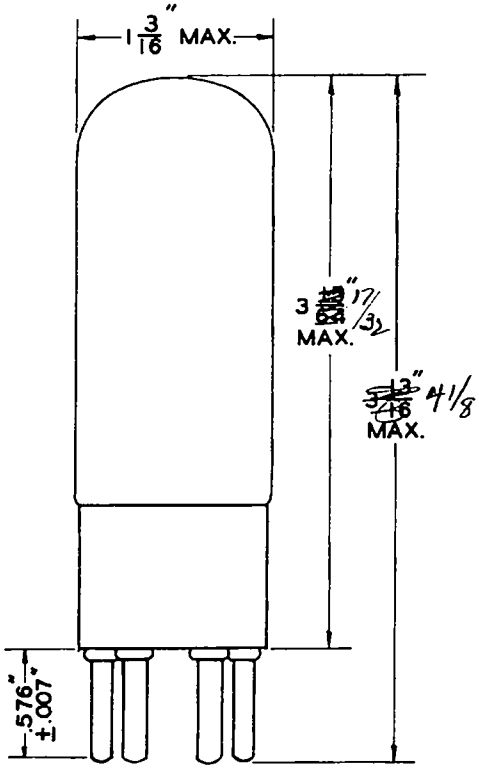
Sylvania Type 6T5 is a new tuning indicator tube which has operating conditions similar to those for the 250 volt rating of Type 6G5. It differs from the 6G5 in that the visible indication is annular in shape. The lighted portion covers only a very narrow region at the periphery of the target when no voltage is applied to the control grid of the tube. When negative voltage is applied to the control grid the width of the fluorescent ring increases until it covers practically all of the target. Changes in annular width, or diameter of the shaded section, are more readily detected than are changes in the shaded angular sector when Type 6G5 is employed.

In actual circuit use the varying negative voltage for controlling the shadow may be obtained from some point in the a-v-c circuit, thus giving an indication of resonance when the unlighted portion of the target is at a minimum.

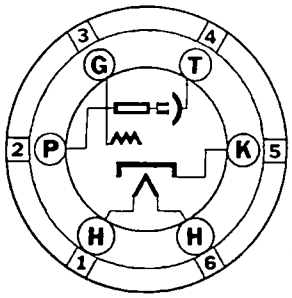
Type 6T5 is mounted in a T-9 bulb on a standard small 6-pin base. The tube is not designed for 100-volt operation.

3-23-37

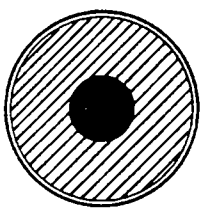
SYLVANIA
6T5



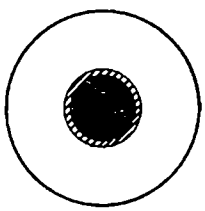
TUBE AND BASE DIAGRAM
(BOTTOM VIEW)



RMA
6-R



ZERO GRID BIAS
(MIN. SIGNAL)



MAX. GRID BIAS
(MAX. SIGNAL)

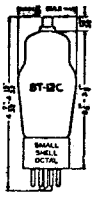
SHADOW REPRESENTED BY
CROSS-HATCHING.



Sylvania

TYPE 6T7G

DOUBLE DIODE TRIODE A MU ELEVE



CARACTERISTIQUES

Tension chauffage CA ou CC	6,3 volts
Courant chauffage	0,150 ampère
Ampoule	ST-12C
Capuchon	Miniature
Culot — Petit octal 7 broches	7-V
Position de montage	Toutes

Capacités directes interélectrodes (section triode) :

Grille à plaque	1,7 $\mu\mu$f
Entrée	1,8 $\mu\mu$f
Sortie	3,1 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A (Section triode)

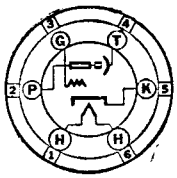
Tension de chauffage	6,3	6,3 volts
Tension plaque	100	250 volts
Tension grille*	—1,5	—3,0 volts
Courant plaque*	0,3	1,2 ma.
Résistance interne	95,000	62,000 ohms
Conductance mutuelle	680	1,050 μmhos
Cœfficient d'amplification	65	65

* Valeurs normales et non pas points de fonctionnement avec résistance de couplage.

APPLICATION

Le type Sylvania 6T7G est un tube duodiode triode à μ élevé, dont le filament ne consomme que 0,150 ampère. Ce tube a des caractéristiques semblables à celles du type 6Q7G.

Les diodes sont les mêmes que celles des types 6Q7G, 6B7 et 75 et peuvent par conséquent être utilisées dans les mêmes circuits. Pour les autres applications, voir type 6Q7G.

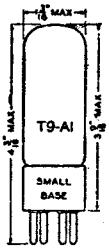


Sylvania

TYPE 6U5/6G5

TRIODE

INDICATEUR VISUEL D'ACCORD



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	T9-A1
Culot — Petit 6 broches	6-R
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

Tension de chauffage	6,3	6,3	6,3 volts
Source tension plaque	100	200	250 volts max.
Source tension coupelle	100	200	250 volts
Courant plaque (section triode)* ...	0,19	0,19	0,24 ma. max.
Courant de coupelle (approx.) ...	1,0	3,0	4,0 ma.
Tension grille (section triode)° ...	0,0	0,0	0,0 volt
Tension grille (section triode)°° ...	—8,0	—18,0	—22,0 volts
Résistance interne de la triode ...	0,5	1,0	1,0 mégohm

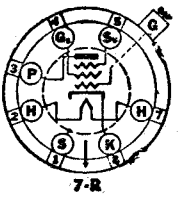
* Avec tension de grille nulle. — ° Pour secteur ombre 90°. — °° Pour secteur ombre 0°.

APPLICATION

Le tube Sylvania 6U5/6G5 est un indicateur d'accord à vide parfait, ayant des caractéristiques très semblables à celles du 6E5. La forme de l'ampoule est du type T-9, tandis que pour le 6E5 l'ampoule est du format ST-12.

Le courant de coupelle est limité par une grille, entourant la cathode du dispositif indicateur; cette grille est reliée à la cathode à l'intérieur de l'ampoule. Le culot est standard à six broches.

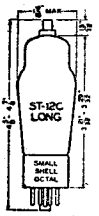
La tension de commande de la grille peut être prise à un point convenable du circuit de A.V.C.; le minimum du secteur ombré indique alors la résonance. Pour autres détails, voir description applications 6E5. Le remplacement du 6E5 par le 6U5/6G5 peut être fait sans modification. Le type 6U5/6G5 remplace également le type 6T5 supprimé.



Sylvania

TYPE 6U7G

AMPLIFICATEUR PENTODE H. F.



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12C long.
Capuchon	Miniature
Culot — Petit ocal 7 broches	7-R
Position de montage	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension de chauffage	6,3 volts
Courant de chauffage	0,3 ampère
Tension plaque	300 volts max.
Tension écran	100 volts max.
Source tension écran	300 volts max.
Polarisation grille (minimum ext.)	0 volt
Dissipation plaque	2,25 watts max.
Dissipation écran	0,25 watt max.

(Ces conditions limites s'appliquent également au type 6D6).

Toutes les autres caractéristiques, conditions de fonctionnement et applications sont identiques à celles du tube 6D6 dont il ne diffère que par le culot et les capacités directes interélectrodes.

SYLVANIA

engineering data service

SYLVANIA

6V3

MECHANICAL DATA

Bulb	T-6½
Base	Small Button 9-Pin
Basing	9BD
Cap	Skirted Miniature
Cathode	Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	1.75 Amperes

RATINGS (Design Center Values)

Half Wave Rectifier

AC Plate Voltage	350 Volts Max.
Average Tube Drop (at 150 Ma)	14 Volts
DC Output Current	125 Ma Max.
Filter Input Capacitor	20 μf
Minimum Total Effective Plate Supply Impedance	145 Ohms

RATINGS (Absolute Maximum Values)[1]

Damper Service[2]

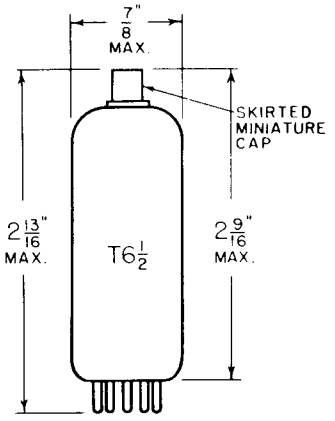
Peak Inverse Voltage	6000 Volts Max.
Steady State Peak Current	600 Ma Max.
Heater-Cathode Voltage (Heater Negative)	750 Volts Max.
Peak Heater-Cathode Voltage	6750 Volts Max.
DC Output Current	135 Ma Max.

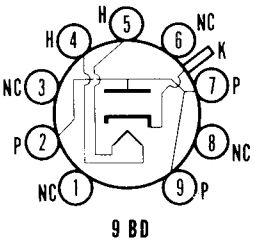
NOTES:

1. *Should not be exceeded under any condition of high line voltage or misadjustment.*
2. *For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations: Federal Communications Commission", the duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.*

QUICK REFERENCE DATA

Indirectly heated half-wave rectifier designed for service as a damping diode in television receiver direct drive sweep circuits. The cathode is connected to the top cap.





9 BD

SYLVANIA ELECTRIC PRODUCTS INC.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

MAY 1952

SYLVANIA

engineering data service

SYLVANIA

6V3A

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	(See Drawing)
Basing	9BD
Cap	C1-2, Skirted Miniature
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	1.75 Amperes
Heater Cathode Voltage	
Heater Positive with Respect to Cathode	
Design Center Values:	
DC	100 Volts Max.
Total DC and Peak	300 Volts Max.
Heater Negative with Respect to Cathode	
Absolute Values[3]:	
DC	750 Volts Max.
Total DC and Peak	6750 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Approx.)

Heater to Cathode	1.5 μμf
Plate to Cathode and Heater	8.0 μμf
Cathode to Plate and Heater	9.0 μμf

RATINGS (Design Center Values — Except as Noted)

Damper Service[1, 2]

Peak Inverse Plate Voltage (Abs. Max.)[3]	6000 Volts	
Plate Dissipation	2.7 Watts	Max.
Steady State Peak Current	800 Ma	Max.
DC Output Current	135 Ma	Max.

CHARACTERISTICS

Tube Voltage Drop	
I_b = 250 Ma DC	19 Volts

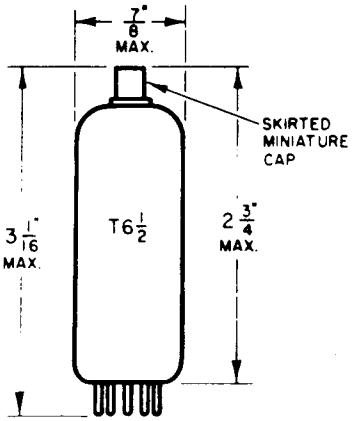
NOTES:

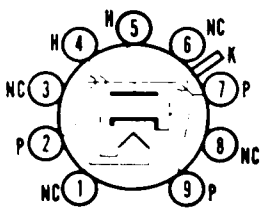
1. *For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Broadcast Stations: Federal Communications Commission", the duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.*
2. *Power rectifier operation is not recommended*
3. *Should not be exceeded under any condition of high line voltage or misadjustment.*

QUICK REFERENCE DATA

The Sylvania 6V3A is a heater cathode type diode designed for service as a damping diode in television receiver direct drive sweep circuits. The cathode is connected to the top cap.

Except for bulb length, the Type 6V3A is identical to the Type 6V3. The 6V3A should be considered as the replacement for the Type 6V3.





9BD

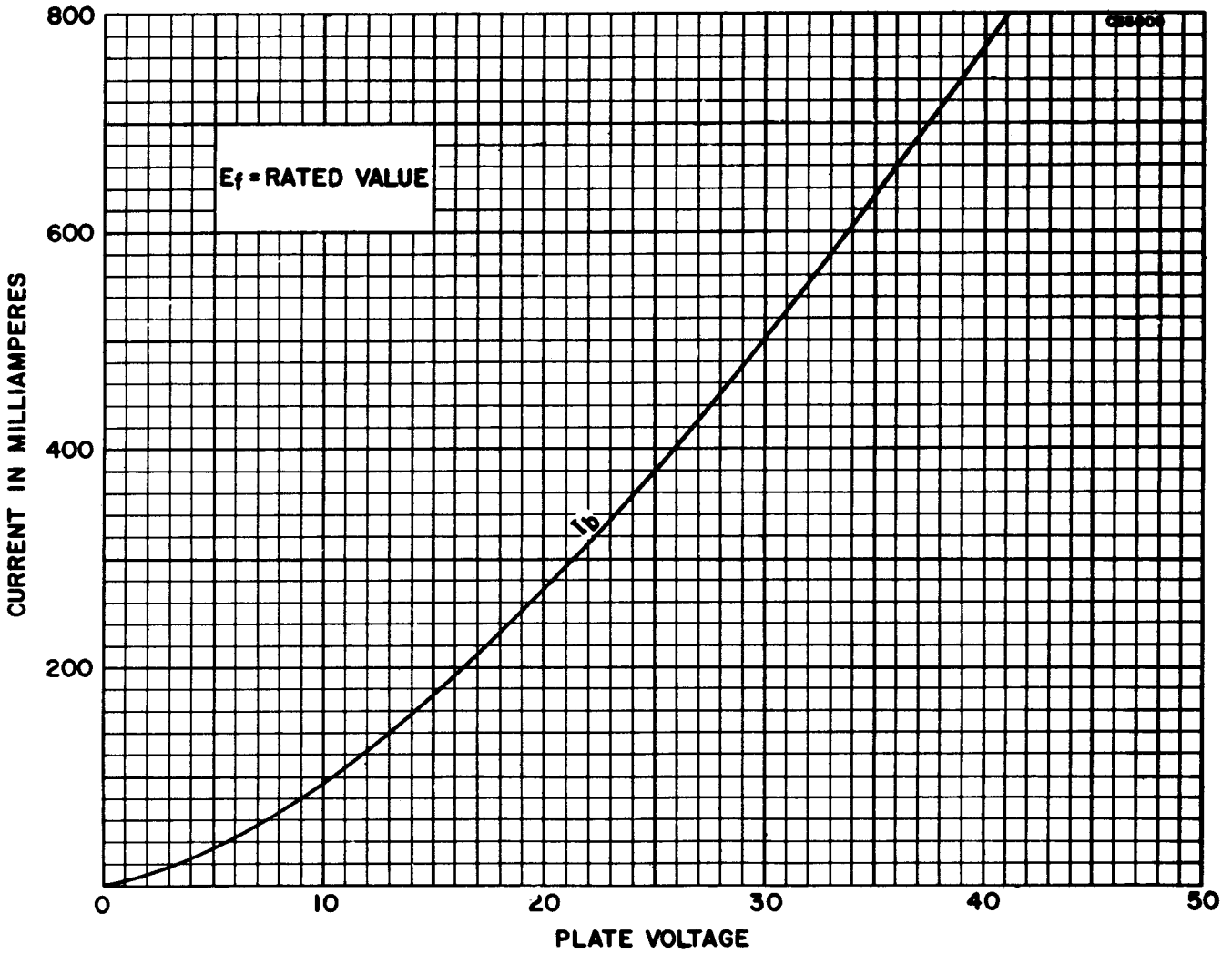
SYLVANIA ELECTRIC PRODUCTS INC.

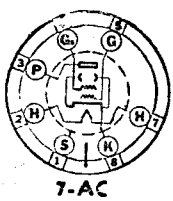
RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

FEBRUARY, 1955

AVERAGE PLATE CHARACTERISTICS

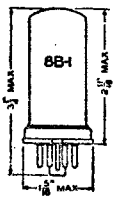


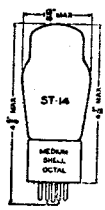


Sylvania

TYPE 6V6
TYPE 6V6G

AMPLIFICATEUR DE PUISSANCE





CARACTERISTIQUES

	6V6	6V6G
Tension de chauffage CA ou CC ...	6,3	6,3 volts
Courant de chauffage	0,45	0,45 ampère
Ampoule	8B-1	ST-14
Culot — Petit octal 7 broches	7-AC	7-AC
Position de montage	Toutes	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

	Un tube	Push-Pull
Tension de chauffage CA ou CC	6,3	6,3 volts
Courant de chauffage	0,45	0,45 ampère
Tension plaque	315	250 volts max.
Tension écran	250	250 volts max.
Dissipation plaque	12	12 watts max.
Dissipation écran	2	2 watts max.

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A1 (un tube)

Tension de chauffage	6,3 volts
Tension plaque	250 volts max.
Tension écran	250 volts max.
Tension grille*	—12,5 volts
Résistance de polarisation automatique**	240 ohms
Signal de pointe d'entrée	12,5 volts
Courant plaque (signal nul)	45 ma.
Courant plaque (signal max.)	47 ma.
Courant écran (signal nul)	4,5 ma.
Courant écran (signal max.)	7,0 ma.
Résistance interne	52,000 ohms
Impédance de charge	5,000 ohms
Conductance mutuelle	4,100 μmhos
Distorsion harmonique totale	8 pour cent
Puissance modulée	4,5 watts

* ** Voir applications.

AMPLIFICATEUR CLASSE AB1 (Push-Pull)

	Valeurs pour deux tubes	
Tension de chauffage	6,3	6,3 volts
Tension plaque	250	285 volts
Tension écran	250	285 volts
Tension grille*	—15	—19 volts
Signal de pointe (grille à grille) entrée	30	38 v. (appr.)
Courant plaque (signal nul)	70	70 ma.
Courant plaque (signal max.)	79	92 ma.
Courant écran (signal nul)	5	4 ma.
Courant écran (signal max.)	13	13,5 ma.
Conductance mutuelle	3,750	3,600 μmhos
Impédance de charge (plaque à plaque)	10,000	8,000 ohms
Résistance interne	60,000	65,000 ohms
Distorsion harmonique totale	5	3,5 pour cent
Puissance modulée	8,5	13,5 watts

*Voir applications.

APPLICATION

Le type Sylvania 6V6 ou 6V6G est un tube à faisceaux d'électrons qui procure une grande puissance de sortie avec peu de distorsion harmonique de 3e ordre et d'ordres supérieurs. Il est très sensible et a un rendement de plaque élevé.

Ces propriétés sont dues à la conception du tube 6V6 qui, comme le tube 6L6, utilise des faisceaux d'électrons dirigés. La disposition des électrodes est telle que l'émission des électrons se fait en faisceaux dé grande densité dont la charge spatiale produit au voisinage de la plaque un champ électrique empêchant le retour vers la grille écran des électrons secondaires. Une très faible puissance est absorbée par la grille écran.

La distorsion de seconde harmonique est intentionnellement élevée, la distorsion de troisième harmonique et d'harmoniques supérieures étant réduite au minimum. L'élimination de la seconde harmonique s'obtient par le montage push-pull. Si un seul tube est utilisé avec couplage par résistance, la distorsion de seconde harmonique peut être réduite par la génération dans un étage précédent B.F. d'harmonique seconde en opposition de phase.

Le type 6V6 ou 6V6G est désirable pour les applications où le courant de chauffage et le courant de plaque doivent être maintenus à un minimum. Le courant de chauffage de 0,45 ampère est relativement faible pour un tube ayant la puissance du tube 6V6. Deux tubes peuvent être utilisés en montage push-pull et fournir 13 watts modulés pour une tension plaque de 250 volts Dans ce cas, le courant total de chauffage ne dépasse pas celui d'un seul tube 6L6. De petits récepteurs pour automobile ou pour appartement peuvent utiliser dans l'étage de sortie un seul tube 6V6 qui donne des résultats supérieurs à une simple pentode.

La dissipation plaque et écran ne doit pas être dépassée. La différence de potentiel entre cathode et filament doit être maintenue à un minimum lorsque la connexion directe entre ces électrodes n'est pas possible.

Des précautions seront prises contre les variations de tension du secteur et particulièrement lorsque la polarisation est fixe.

Notes concernant les renvois du tableau des caractéristiques.

*Le couplage par transformation ou par impédance est recommandé et la résistance introduite dans le circuit de grille doit être aussi faible que possible. En polarisation fixe cette résistance ne peut pas dépasser 50,000 ohms en polarisation automatique elle doit être inférieure à 0,5 mégohm.

**La résistance de polarisation automatique doit être shuntée par une capacité suffisante pour éviter la dégénération.

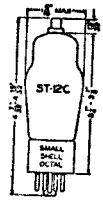
Le N° 1 en regard des termes Classe A et Classe AB indique qu'il n'y a pas de courant grille dans le circuit d'entrée.



Sylvania

TYPE 6V7G

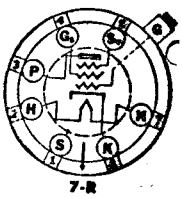
DUO DIODE TRIODE



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12C
Capuchon	Miniature
Culot — Petit octal 7 broches	7-V
Position de montage	Toutes

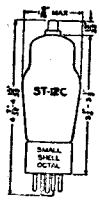
Toutes les autres caractéristiques, conditions de fonctionnement et applications sont identiques à celles du type 85, dont il ne diffère que par le culot.



Sylvania

TYPE 6W7G

AMPLIFICATEUR TRIGRILLE



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,150 ampère
Ampoule	ST-12C
Culot — Petit octal 7 broches	7-R
Capuchon	Miniature
Position de montage	Toutes

Capacités directes interélectrodes :

Grille à plaque	0,007 $\mu\mu$f
Entrée (G à toutes électrodes, excepté P)	5,0 $\mu\mu$f
Sortie (P à toutes électrodes, excepté G)	8,5 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension de chauffage	6,3 volts
Tension plaque	250 volts max.
Tension grille	—3 volts
Tension écran	100 volts max.
Grille de suppression	relié à la cathode
Courant plaque	2,0 ma.
Courant écran	0,5 ma.
Résistance interne	1,5 mg. (appr.)
Conductance mutuelle	1,225 μmhos
Tension grille pour coupure courant plaque ...	—7 volts

APPLICATION

Le type Sylvania 6W7G est un amplificateur pentode à pente fixe. Ses caractéristiques sont semblables à celles du tube 6J7G, de sorte que ses applications sont les mêmes, mais le courant de chauffage n'est que de 150 millis.

Le type 6W7G peut être utilisé dans des récepteurs fonctionnant sur courant alternatif ou continu. La tension entre filament et cathode doit être maintenue aussi faible que possible. Pour autres renseignements, voir 6J7G.

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SYLVANIA
6X4
12X4

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-3
Basing	5BS
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6X4	12X4
Heater Voltage[1]	6.3	12.6 Volts
Heater Current	600	300 Ma
Heater-Cathode Voltage (Design Center Values)		
Heater Negative with Respect to Cathode		
Total DC and Peak	450	450 Volts Max.
Heater Positive with Respect to Cathode		
Total DC and Peak	100	100 Volts Max.

RATINGS (Design Center Values)

Peak Inverse Plate Voltage	1250 Volts Max.
A C Plate Supply Voltage, R M S (Each Plate)	See Rating Chart I
Steady State Peak Plate Current, Rating Chart II (Each Plate)	210 Ma Max.
Transient Peak Plate Current, Rating Chart III (Each Plate)[2]	1.0 Ampere Max.
D C Output Current (Each Plate)	See Rating Chart I

CHARACTERISTICS

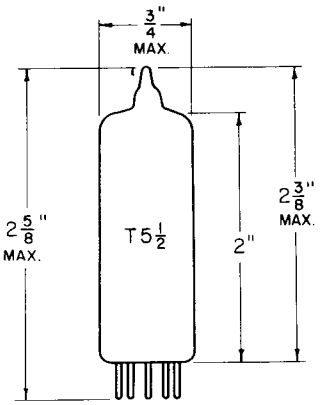
Tube Voltage Drop, I_b = 70 Ma Each Plate	22 Volts

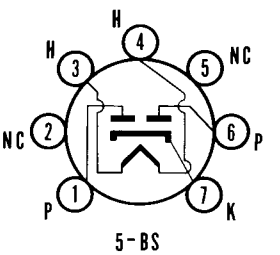
TYPICAL OPERATION

Full-Wave Rectifier-Capacitor Input	
A C Plate Supply Voltage Per Plate	325 Volts
Filter Input Capacitor[3]	10 µf
Total Effective Plate Supply Impedance (Per Plate)	525 Ohms
D C Output Current	70 Ma
D C Output Voltage at Filter Input (approx.)	
For D C Cathode Current of 35 Ma	365 Volts
70 Ma	310 Volts
Difference (Voltage Regulation)	55 Volts
Percentage Regulation	15 Percent
Full-Wave Rectifier Service — Choke Input	
A C Plate Supply Voltage Per Plate (R M S)	450 Volts
Filter Input Choke	10 Henrys
D C Output Current	70 Ma
D C Output Voltage at Filter Input (approx.)	
For D C Cathode Current of 35 Ma	395 Volts
70 Ma	385 Volts
Difference (Voltage Regulation)	10 Volts
Percentage Regulation	2.5 Percent

QUICK REFERENCE DATA

The Sylvania Types 6X4 and 12X4 are miniature, full-wave, cathode type rectifiers. They are intended for service in compact a c or auto receivers where the average current is not in excess of 70 Ma. Except for heater current and voltage the 6X4 is identical to the 12X4.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

MARCH 1956

NOTES:

1. *The 6X4 and 12X4 are intended to be used in automotive service from a nominal 6 or 12 volt battery source. The heaters and maximum ratings of these tubes provide for an adequate safety factor such that they will withstand a wide variation in supply voltages.*
2. *If capacitor input circuits are to be used, protect the circuits against the possibility of hot-switching and do not exceed a maximum peak current value of one ampere during the initial cycles of the hot-switching transient.*
3. *Higher values of capacitance than indicated may be used, but the effective plate supply impedance may have to be increased to prevent exceeding the maximum rating for hot-switching transient plate current.*

INTERPRETATION OF RATING CHARTS

Rating Charts I, II and III represent boundary conditions beyond which operation of the 6X4 and 12X4 is not permitted. With the aid of simple laboratory measurements and the use of the three charts, any application may be analyzed for proper rectifier type operation.

The boundaries of Rating Chart I are based on limits of supply voltage, plate dissipation and output current. These boundaries differ, depending upon the type of filter used. With capacitor input, operation is confined to the area bounded by FAEDG while for choke input, the entire area bounded by FABCDG may be used.

The boundary of Rating Chart II defines the limit of steady-state peak current. Operation within the boundary is permitted.

Rating Chart III defines the minimum value of effective plate supply resistance, per plate, for any given plate voltage supply which will assure that the surge currents are within a safe value.

$$R_s = N^2R_{pri} + R_{sec} + R_a$$

Where: N — Voltage step up ratio of plate transformer.
R_{pri} — D C resistance of transformer primary.
R_{sec} — Average D C resistance of transformer secondary per section.
R_a — Added series resistance.

For any application, each Chart should be consulted. On *all* Charts the points of operation should fall within the proper boundaries.

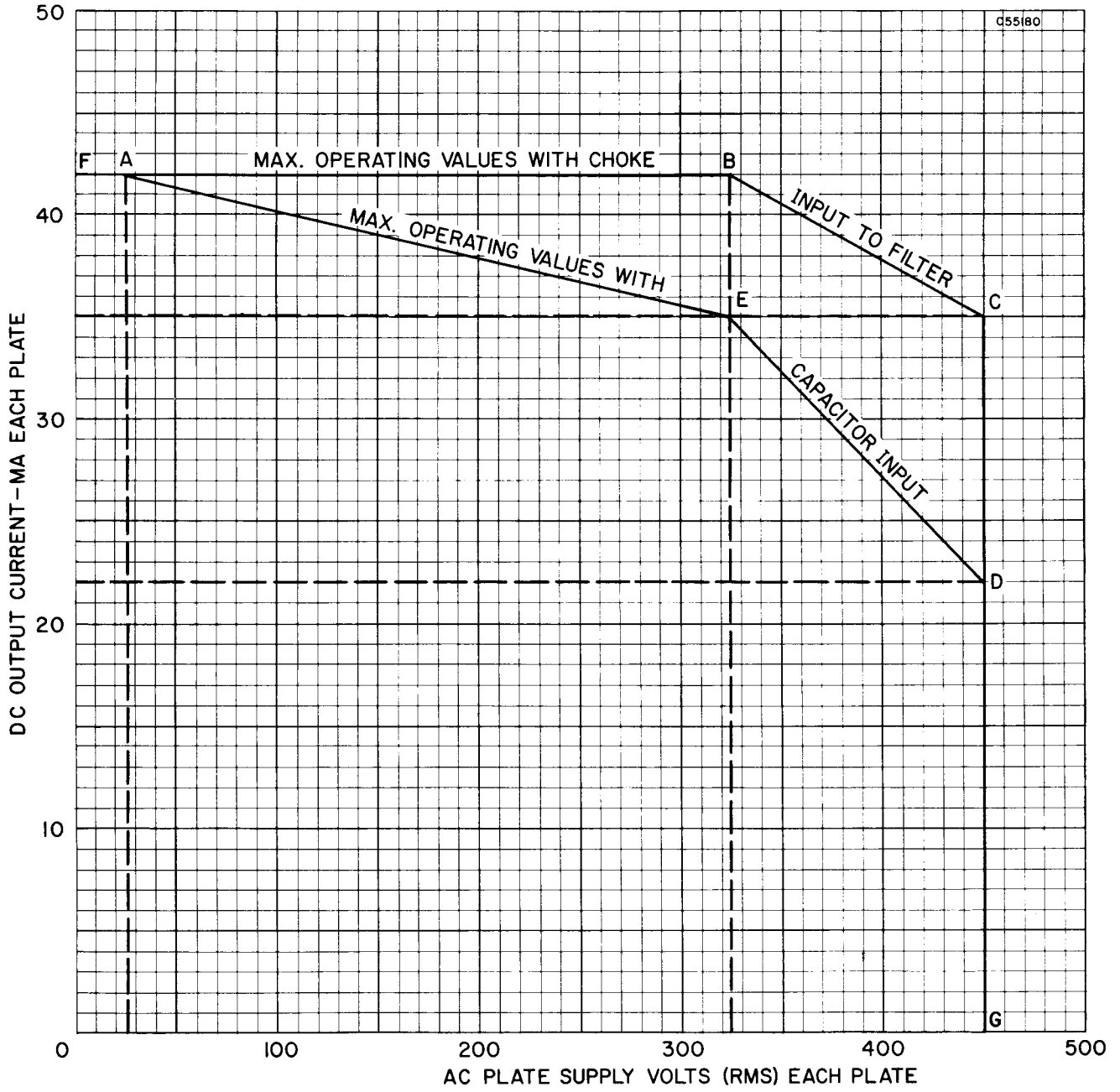
Plate supply voltages are measured with the rectifier tube non-conducting, i.e., with the transformer unloaded. This unloaded voltage is used when calculating rectification efficiency.

The rectification efficiency is defined as:

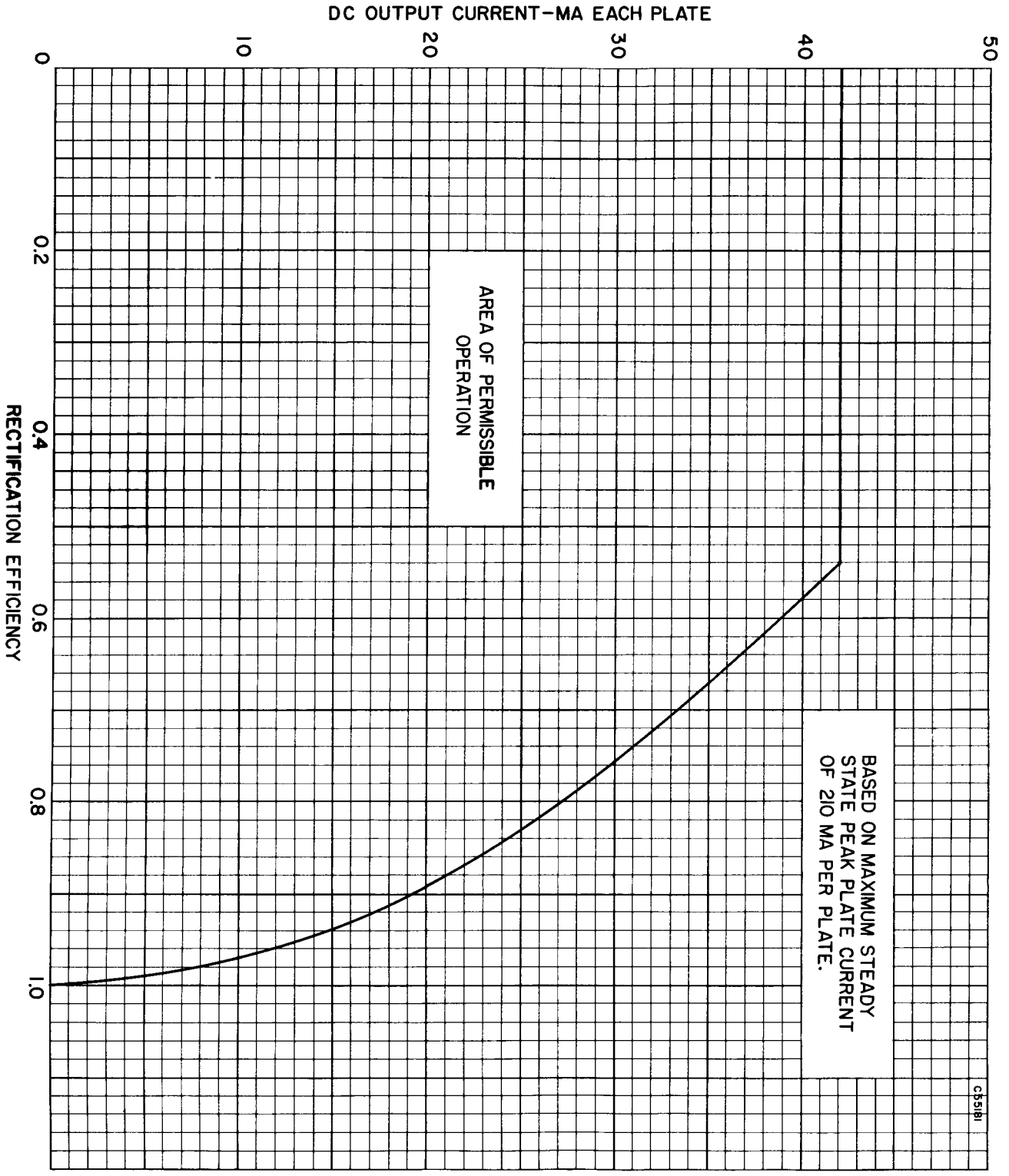
$$\frac{\text{D C Output Voltage}}{\sqrt{2}\ (\text{Unloaded RMS Supply Voltage Per Plate})}$$

The D C output voltage is measured at the input to the filter.

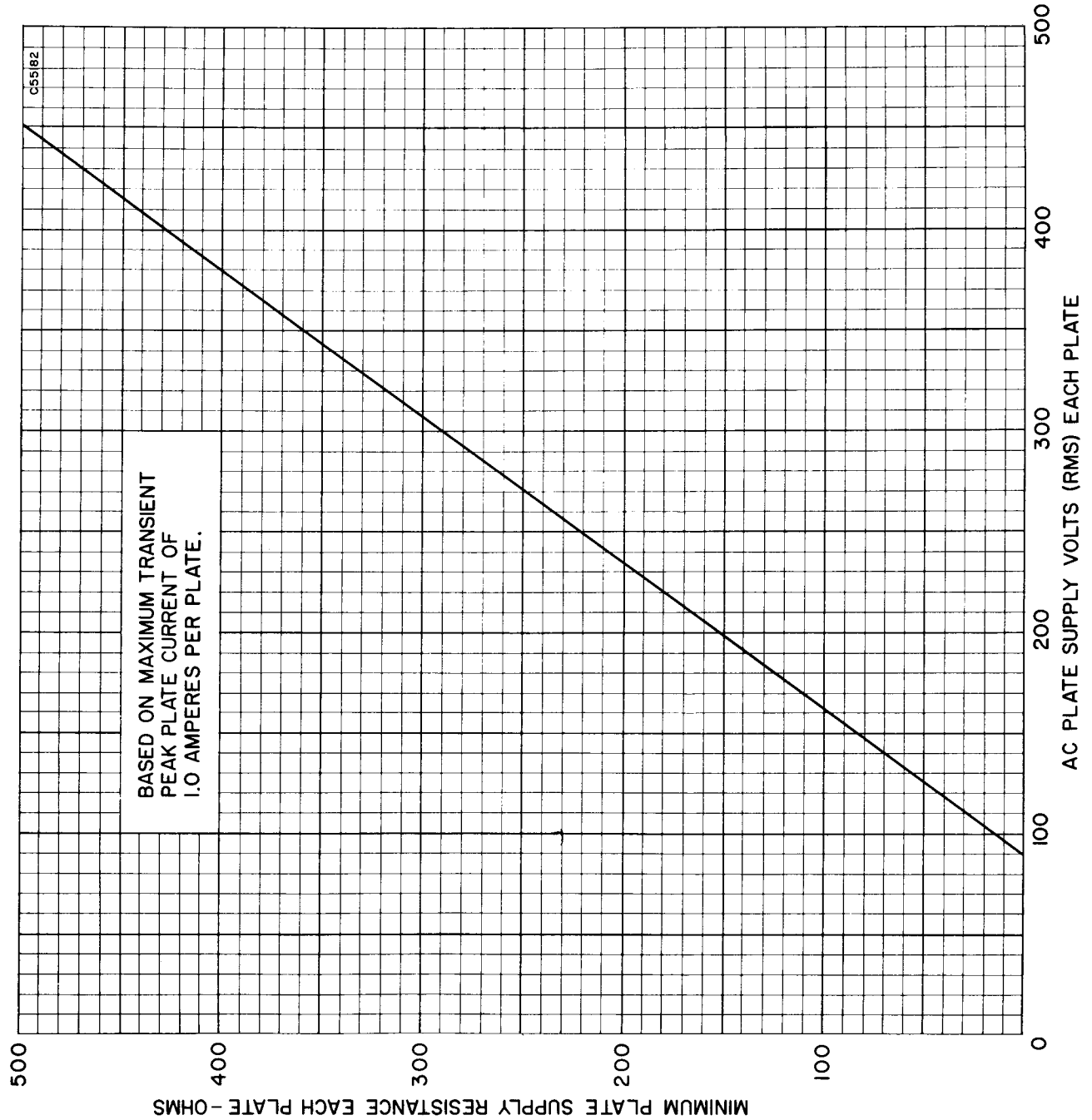
RATING CHART I

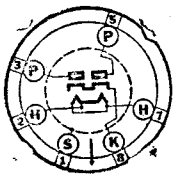


RATING CHART II



RATING CHART III

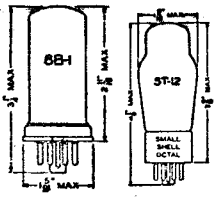




Sylvania

TYPE 6X5
TYPE 6X5G

REDRESSEUR
A VIDE PARFAIT
DEUX ALTERNANCES



CARACTERISTIQUES

	6X5	6X5G
Tension de chauffage CA ou CC ...	6,3	6,3 volts
Courant de chauffage	0,6	0,6 ampère
Ampoule	8B-1	ST-12
Culot — Petit octal 6 broches	6-S	6-S
Position de montage	Toutes	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension de chauffage	6,3 volts
Courant de chauffage	0,6 ampère
Tension inverse de pointe	1,250 volts max.
Potentiel CC filament à cathode	450 volts max.
Chute tension dans tube (60 ma. par plaque) ...	20 volts

Conditions de fonctionnement et caractéristiques :

Condensateur entrée à filtre :

Tension efficace CA par plaque	325 volts max.
Courant redressé	70 ma. max.
Impédance source de tension par plaque	65 ohms min.

Self entrée à filtre :

Tension CA par plaque	450 volts max.
Courant redressé	70 ma. max.
Valeur self entrée	10 henrys min.

(Voir courbes redressement en fin de volume.)

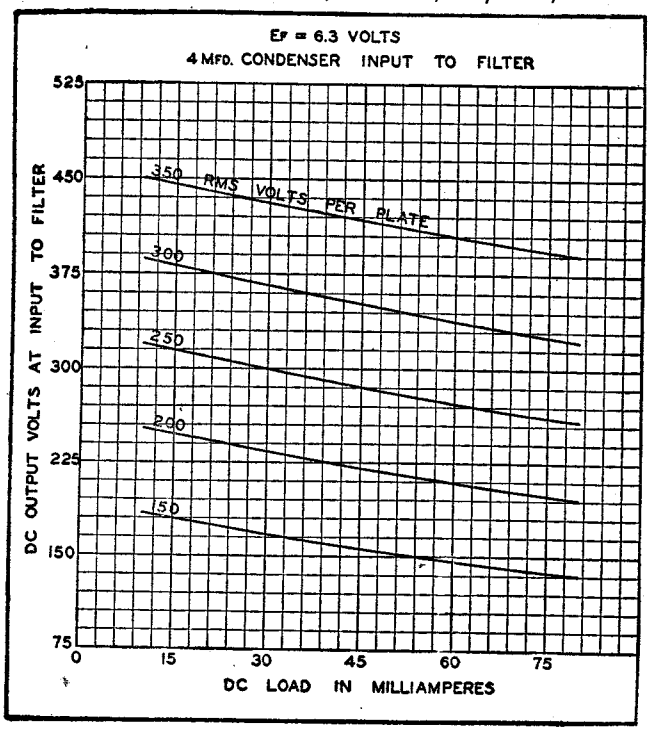
APPLICATION

Ce tube est destiné à être utilisé comme redresseur sur les récepteurs pour automobiles ou sur les récepteurs pour secteur alternatif ne demandant qu'un faible courant redressé. Il est semblable au type 84 et susceptible des mêmes applications. Dans le but d'obtenir un débit et une régulation satisfaisants, un filtrage convenable doit être utilisé. Des filtres du type à condensateur d'entrée ou à choke d'entrée sont applicables.

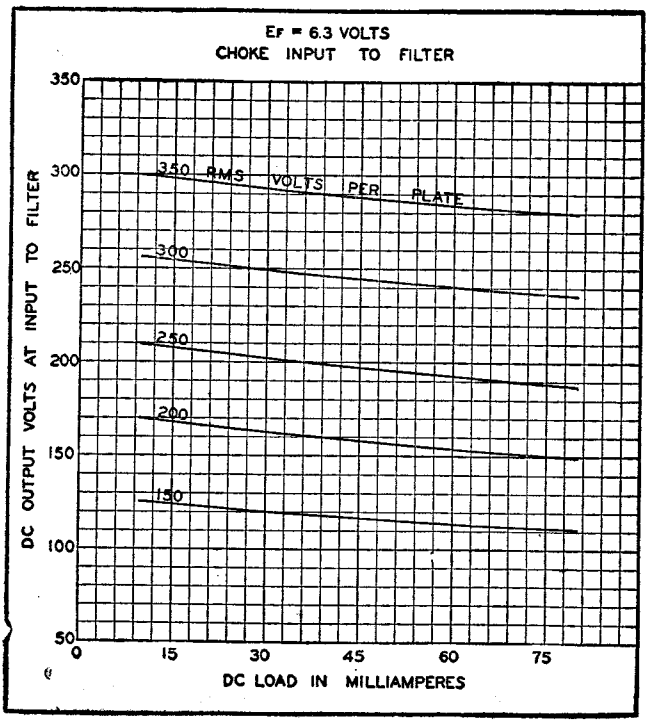
Le courant redressé sera considérablement plus grand avec un filtre à condensateur d'entrée qu'avec l'autre type ; mais avec le premier filtre, les courants de pointes sont plus intenses. Le premier condensateur de ce filtre ne pourra pas avoir une capacité trop élevée. Il n'est pas probable que la tension alternative d'entrée soit purement sinusoïdale, de sorte que la tension instantanée de pointe peut être considérablement plus grande que 1,4 fois la valeur efficace. Le condensateur doit être prévu pour supporter le maximum de tension de pointe rencontré.

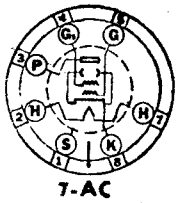
Lorsqu'il est employé avec un vibreur et transformateur combinés comme source de tension alternative, ce transformateur ainsi que le filtre doivent être étudiés avec soin, afin d'éviter de dépasser les valeurs maxima de tension et courant indiquées au tableau des caractéristiques.

TYPE 6X5, 6X5G, 6X5GT, 84/6Z4, 7Y4



TYPE 6X5, 6X5G, 6X5GT, 84/6Z4, 7Y4



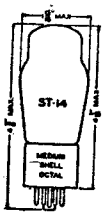


7-AC

Sylvania

TYPE 6Y6G

AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension filament CA ou CC	6,3 volts
Courant filament	1,25 ampère
Ampoule	ST-14
Culot — Moyen octal 7 broches	7-AC
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

Tension filament	6,3	6,3 volts
Tension plaque	135	200 volts max.
Tension écran	135	135 volts max.
Polarisation grille	—13,5	—14 volts
Courant plaque (signal à zéro)	58	61 ma.
Courant plaque (signal max.)	60	66 ma.
Courant écran (signal à zéro)	3,5	2,2 ma.
Conductance mutuelle	7,000	7,100 μmhos
Résistance interne	9,300	18,300 ohms
Puissance de sortie	3,6	6,0 watts
Impédance de charge	2,000	2,600 ohms
Distorsion harmonique totale	10	10 pour cent

APPLICATION

Sylvania 6Y6G est un nouvel amplificateur de sortie construit suivant les mêmes principes que ceux utilisés dans les types 6L6G et 6V6G. Il est prévu pour être utilisé dans des récepteurs alimentés sur réseau alternatif où l'économie de la tension B est essentielle, puisque la tension maximum de fonctionnement, tant pour la plaque que pour l'écran, est fixée à 135 volts.

Si le tube doit fonctionner avec des tensions plaque et écran inférieures aux valeurs maxima indiquées ci-dessus, les conditions de fonctionnement doivent être telles que les dissipations plaque et écran ne dépassent pas respectivement 12,5 et 1,75 watts maximum. D'un manquement à cette recommandation, il pourrait résulter des difficultés d'émission grille et le claquage du tube.

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SYLVANIA

6Y6GA

MECHANICAL DATA

Bulb	T-12
Base	B7-12 Medium Shell Octal, 7-Pin or, B7-119, Short Medium Shell Octal, 7-Pin
Outline	(See Drawing)
Basing	7S
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	1.25 Amperes
Heater Cathode Voltage	
Heater Negative with Respect to Cathode	180 Volts Max.
Heater Positive with Respect to Cathode	180 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Approx.)

Grid No. 1 to Plate	0.66 $\mu\mu$f
Input	12.0 $\mu\mu$f
Output	7.5 $\mu\mu$f

RATINGS (Design Center Values)

Plate Voltage	200 Volts Max.
Plate Dissipation	12.5 Watts Max.
Grid No. 2 Supply Voltage	200 Volts Max.
Grid No. 2 Voltage	See Rating Chart
Grid No. 2 Dissipation	1.75 Watts Max.
Grid No. 1 Circuit Resistance	
Fixed Bias	0.1 Megohm Max.
Cathode Bias	0.5 Megohm Max.

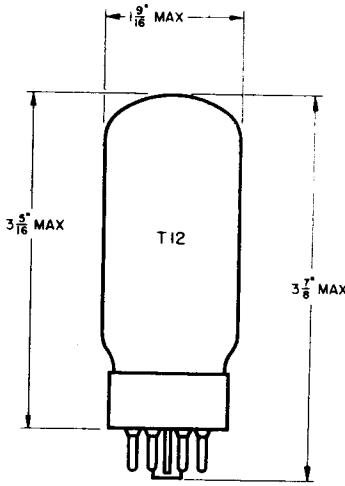
CHARACTERISTICS AND TYPICAL OPERATION (Single Tube)

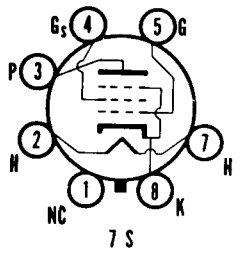
Class A_1 Amplifier

Plate Voltage	135	200 Volts
Grid No. 2 Voltage	135	135 Volts
Grid No. 1 Voltage	-13.5	-14 Volts
Peak A F Grid No. 1 Voltage	13.5	14 Volts
Zero Signal Plate Current	58	61 Ma
Maximum Signal Plate Current	60	66 Ma
Zero Signal Grid No. 2 Current	3.5	2.2 Ma
Maximum Signal Grid No. 2 Current	11.5	9 Ma
Plate Resistance (approx.)	9,300	18,300 Ohms
Transconductance	7,000	7,100 μmhos
Load Resistance	2,000	2,600 Ohms
Maximum Signal Power Output	3.6	6 Watts
Total Harmonic Distortion (approx.)	10	10 Percent

QUICK REFERENCE DATA

The Sylvania Type 6Y6GA is a beam power amplifier contained in a T-12 envelope. It is intended for operation in medium power audio applications. Except for envelope size the Type 6Y6GA is identical to the Type 6Y6G.





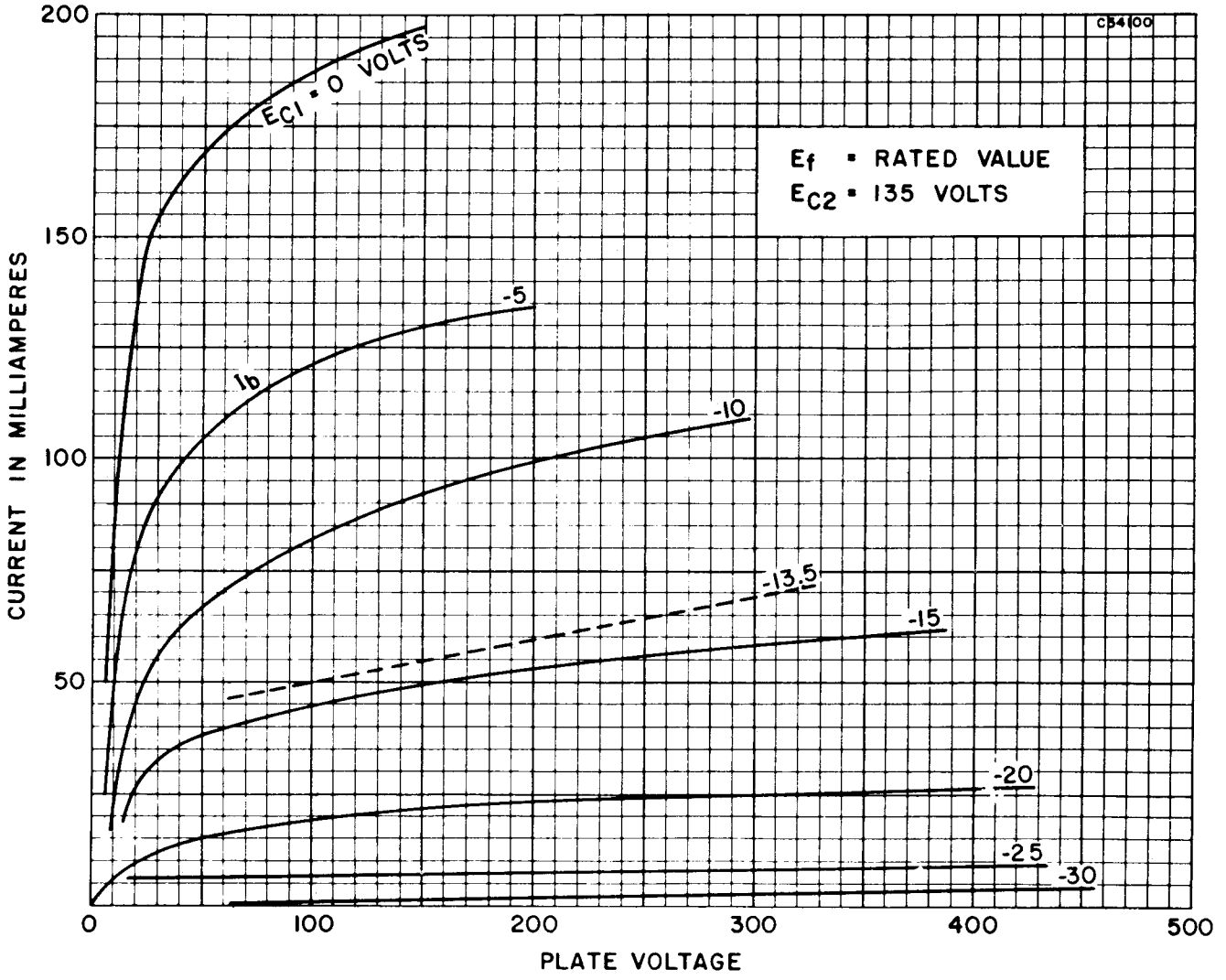
SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

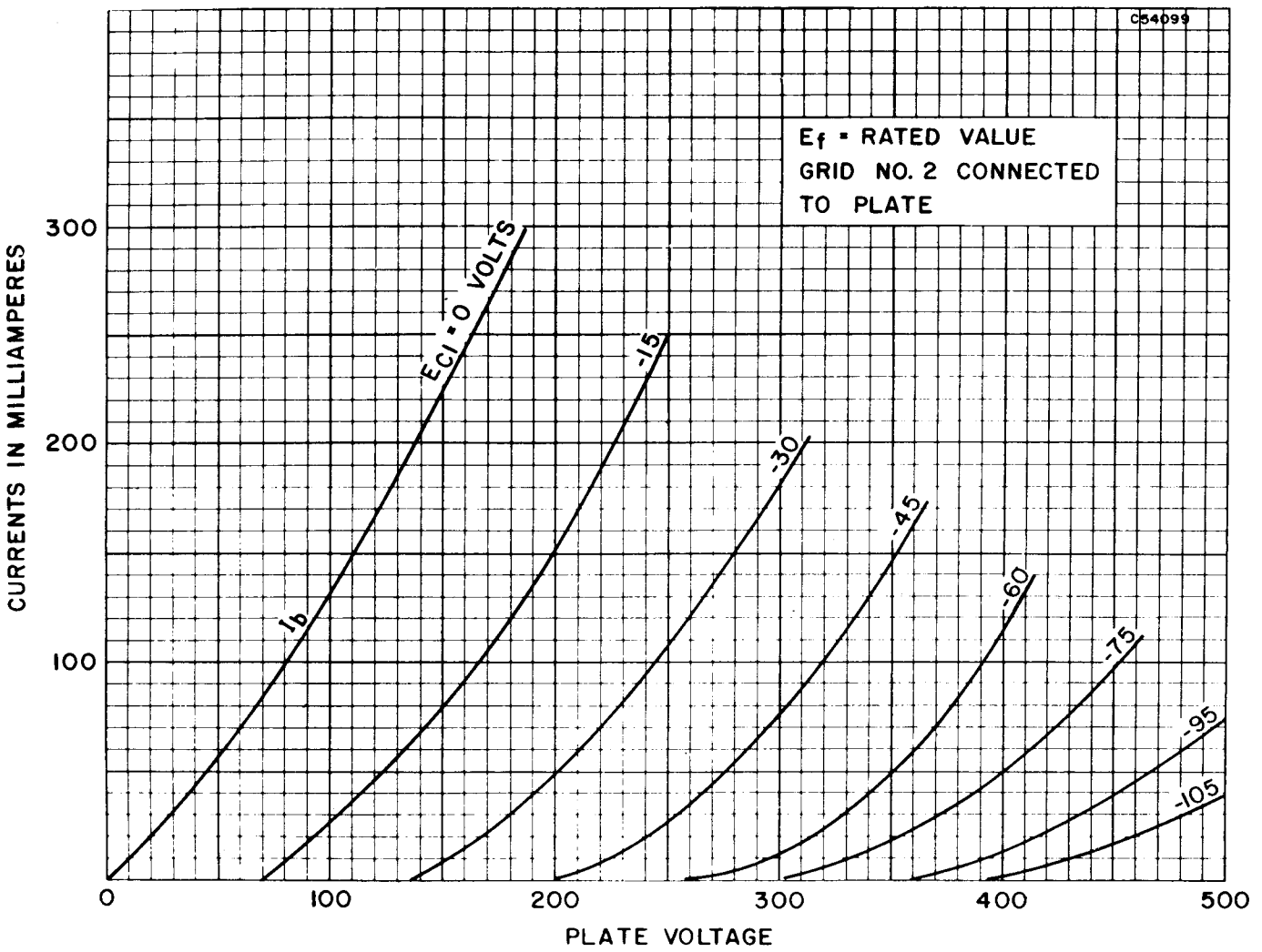
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

FEBRUARY, 1955

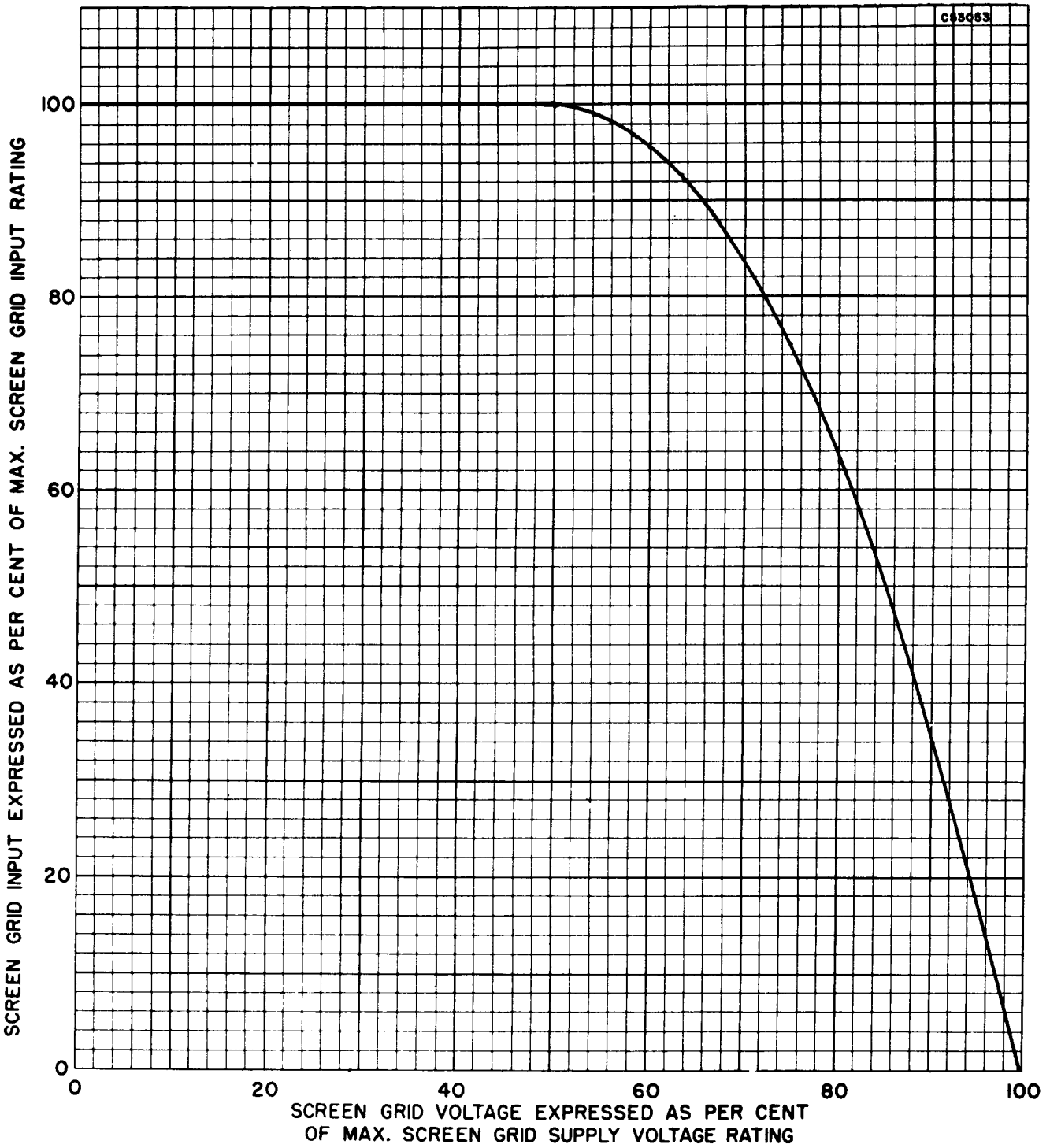
AVERAGE PLATE CHARACTERISTICS

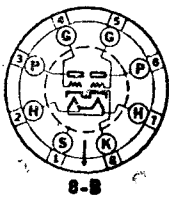


AVERAGE PLATE CHARACTERISTICS
TRIODE CONNECTED



GRID NO. 2 RATING CHART

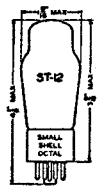




Sylvania

TYPE 6Y7G

DOUBLE TRIODE AMPLIFICATEUR CLASSE B



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,6 ampère
Ampoule	ST-12
Culot — Petit octal 8 broches	8 B
Position de montage	Toutes

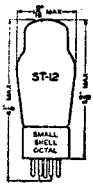
Toutes les autres caractéristiques, conditions de fonctionnement et applications sont identiques à celles du type 79. A remarquer que le capuchon de grille est supprimé et ramené à la broche 5.



Sylvania

TYPE 6Z7G

AMPLIFICATEUR DE PUISSANCE CLASSE B



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12
Culot — Petit octal 8 broches	8-B
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE B

Tension de chauffage	6,3	6,3 volts
Tension plaque	135	180 volts max.
Tension grille	0	0 volt
Courant sans signal, par plaque	3	4,2 ma.
Courant de pointe maximum par plaque	60	60 ma.
Dissipation plaque moyenne	8	8 watts max.
Impédance de charge (plaque à plaque)	15,000	20,000 ohms
Puissance modulée*	1,5	2,2 watts
Impédance de charge (plaque à plaque)	9,000	12,000 ohms
Puissance modulée**	2,5	**4,2 watts**

*Avec puissance d'entrée de 80 mw. grille à grille.
**Avec puissance d'entrée de 320 mw. grille à grille.

APPLICATION

Le tube Sylvania 6Z7G est un amplificateur classe B comprenant deux tubes triodes dans la même ampoule. Ce tube est destiné aux récepteurs utilisant les tubes à faible consommation (série 6,3 volts 150 ma.)

Il n'est pas recommandé de connecter le filament du tube 6Z7G en série avec ceux d'autres types 0,3 ampère directement sur le réseau; le filament risque dans ce cas d'être brûlé.

Le circuit d'utilisation du 6Z7G est classique comme ceux des tubes 6Y7G et 79; toutefois, les différences de caractéristiques ne peuvent pas être perdues de vue, car le type 6Z7G n'est pas interchangeable avec un autre type de tube.

SYLVANIA #116
6ZY5G

Hygrade Sylvania
CORPORATION

TECHNICAL DATA

SYLVANIA TYPE 6ZY5G

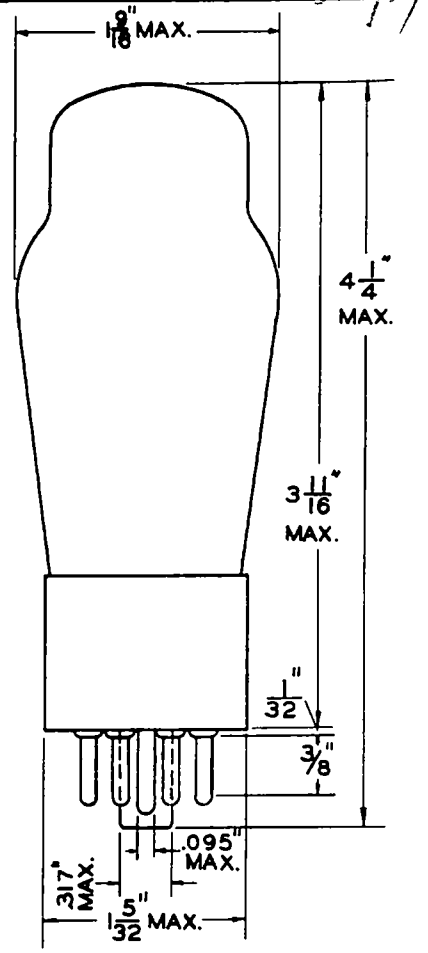
Full-Wave Rectifier

CHARACTERISTICS

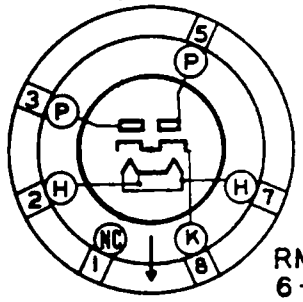
Heater Voltage AC or DC	6.3	Volts
Heater Current	0.3	Ampere

OPERATING CONDITIONS AND CHARACTERISTICS

Heater Voltage AC or DC	6.3	Volts
A-C Voltage per Plate (RMS)	350	Volts Max.
D-C Output Current	35	Ma. Max.
Peak Inverse Voltage	1000	Volts
Peak Plate Current per Plate	150	Ma.
Voltage between Heater and Cathode	400	Volts DC Max.
Tube Voltage Drop (at 35 ma.)	16.5	Volts Approx.



TUBE AND BASE DIAGRAM
(BOTTOM VIEW)



RMA
6-S

CIRCUIT APPLICATION

Sylvania Type 6ZY5G is a heater type, high vacuum, full-wave rectifier designed especially for use in receivers equipped with low current drain tubes. If a Class B output stage is employed this rectifier is capable of supplying maximum currents up to 40 milliamperes while for straight Class A operation the maximum of 35 milliamperes should not be exceeded.

In order to obtain satisfactory output and regulation careful consideration should be given to secure proper filtering. Filter circuits of the condenser-input or the choke-input type are applicable. Special ratings for the choke-input condition will be available in the near future.

If the d-c resistance from the plate to center-tap of the power transformer is not greater than 225 ohms enough resistance should be inserted in series with each plate to provide this minimum of resistance.

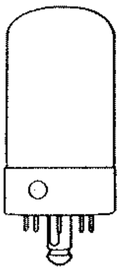
from RMA release #116, May 25, 1937

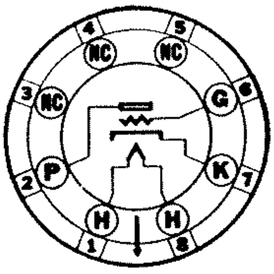
5-21-37

7A4 Sylvania Type

MEDIUM-MU TRIODE

GT EQUIVALENT 6J5GT





5AC-L-0

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T-9
Maximum Overall Length	$2\frac{25}{32}$"
Maximum Seated Height	$2\frac{1}{4}$"
Mounting Position	Any

Heater Voltage (Nominal) AC or DC	7.0 Volts
Heater Current (Nominal)	0.32 Ampere
Maximum Plate Voltage	300 Volts
Maximum Plate Dissipation	2.5 Watts
Minimum External Grid Bias Voltage	0 Volt
Maximum Heater-Cathode Voltage	90 Volts

Direct Interelectrode Capacitances:*

Grid to Plate	4.0 $\mu\mu$f.
Grid to Cathode	3.4 $\mu\mu$f.
Plate to Cathode	3.0 $\mu\mu$f.

*With $1\frac{5}{16}$" diameter shield (RMA Std. M8-308) connected to cathode.

TYPICAL OPERATION

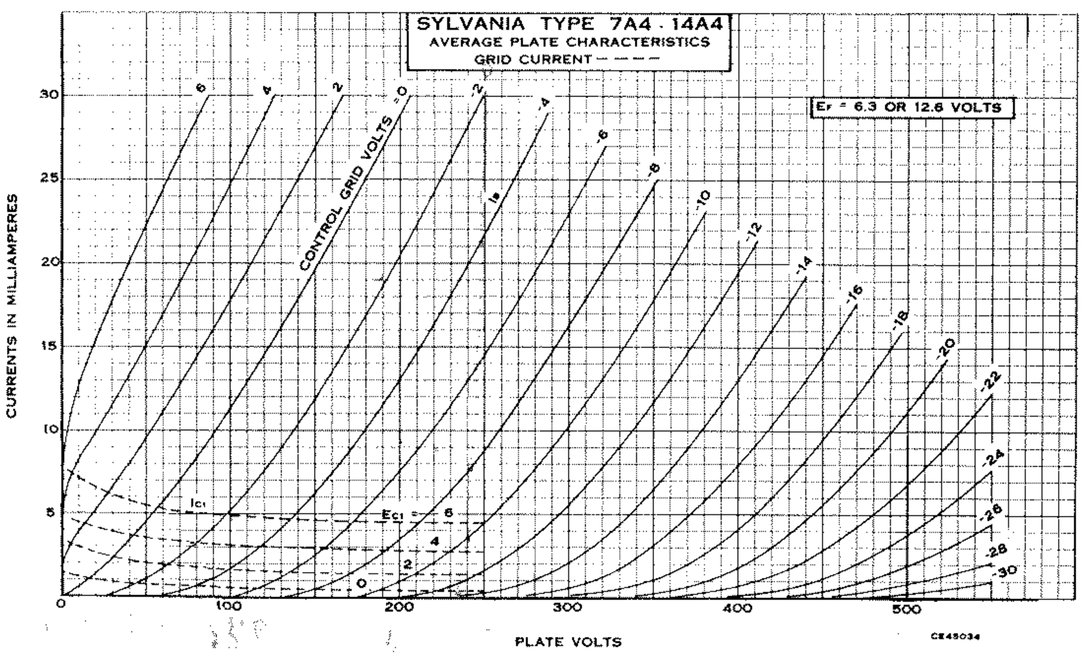
CLASS A AMPLIFIER

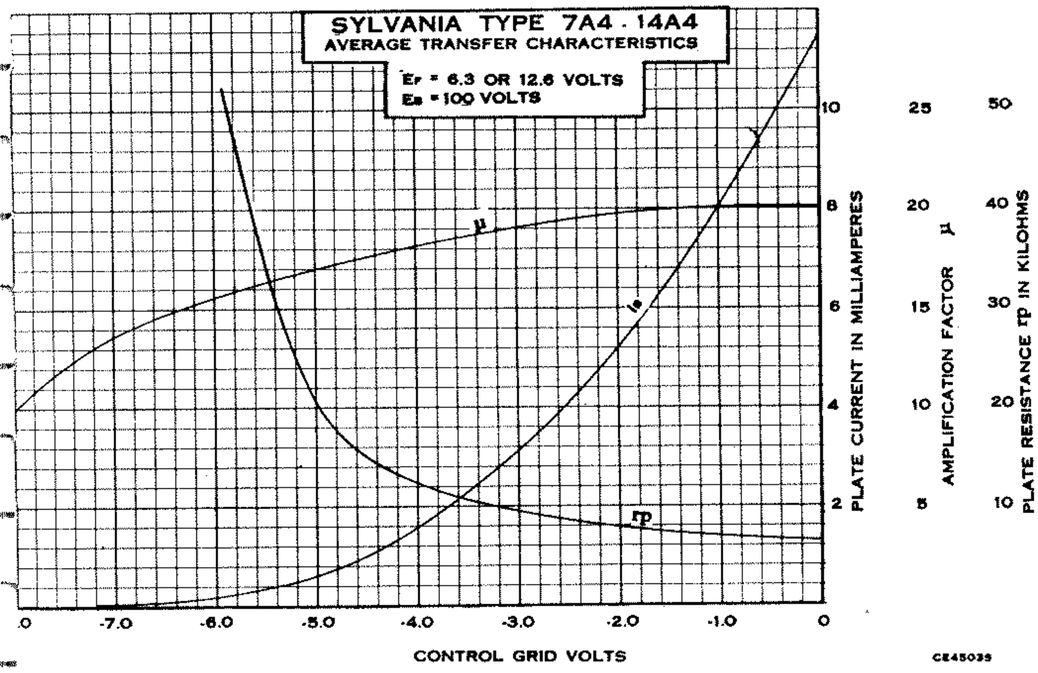
Heater Voltage	6.3	6.3 Volts
Heater Current	0.3	0.3 Ampere
Plate Voltage	90	250 Volts
Grid Voltage	0	−8 Volts
Self-Bias Resistor	0	900 Ohms
Plate Current	10	9 Ma.
Plate Resistance (Approximate)	6700	7700 Ohms
Mutual Conductance	3000	2600 μmhos
Amplification Factor	20	20

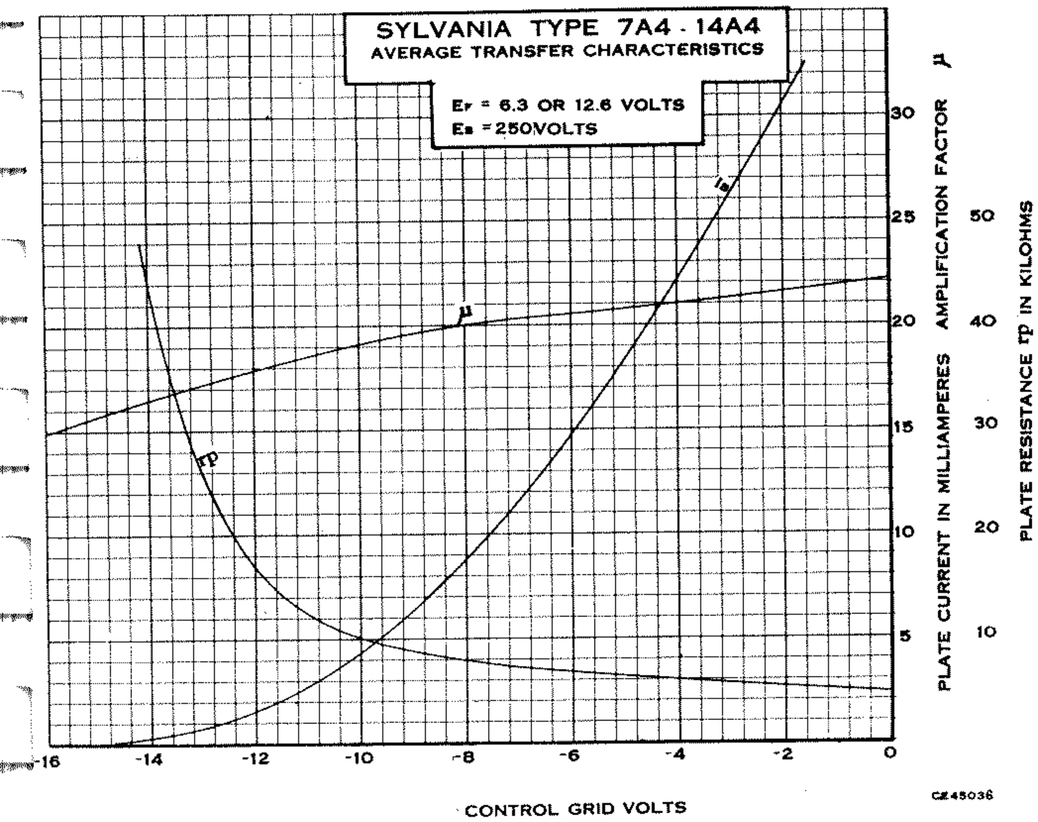
APPLICATION

Sylvania Type 7A4 is a medium-mu triode designed for use as an oscillator, detector or amplifier. It is quite similar to types 6J5GT but gives improved performance especially at the higher frequencies, due to the lock-in type of construction. This construction results in shorter leads, lower capacitances, and lower base losses. This tube may be used successfully to about 225 mc. as an oscillator. For higher frequencies, types 7E5/1201 or 7F8 should be considered.

Tabulated data for resistance coupled operation will be found on page 46.

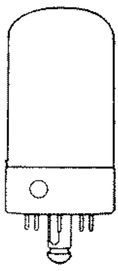


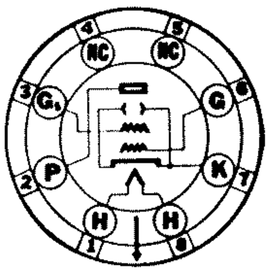

SYLVANIA TYPE 7A4 - 14A4
AVERAGE TRANSFER CHARACTERISTICS
Ef = 6.3 OR 12.6 VOLTS
Eb = 100 VOLTS
μ
ib
rp
10
8
6
4
2
25
20
15
10
5
50
40
30
20
10
PLATE CURRENT IN MILLIAMPERES
AMPLIFICATION FACTOR μ
PLATE RESISTANCE rp IN KILOHMS
.0
-7.0
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0
CONTROL GRID VOLTS
CE45035


SYLVANIA TYPE 7A4 - 14A4
AVERAGE TRANSFER CHARACTERISTICS
Ef = 6.3 OR 12.6 VOLTS
Eb = 250VOLTS
μ
ib
rp
30
25
20
15
10
5
50
40
30
20
10
PLATE CURRENT IN MILLIAMPERES
AMPLIFICATION FACTOR μ
PLATE RESISTANCE rp IN KILOHMS
-16
-14
-12
-10
-8
-6
-4
-2
0
CONTROL GRID VOLTS
CE45036

7A5 Sylvania Type

BEAM POWER AMPLIFIER





6AA-L-0

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T-9
Maximum Overall Length	3 5/32"
Maximum Seated Height	2 5/8"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC (Nominal)	7.0 Volts
Heater Current (Nominal)	0.8 Ampere
Maximum Plate Voltage	125 Volts
Maximum Screen Voltage	125 Volts
Maximum Plate Dissipation	5.5 Watts
Maximum Screen Dissipation	1.2 Watts
Maximum Heater-Cathode Voltage	90 Volts

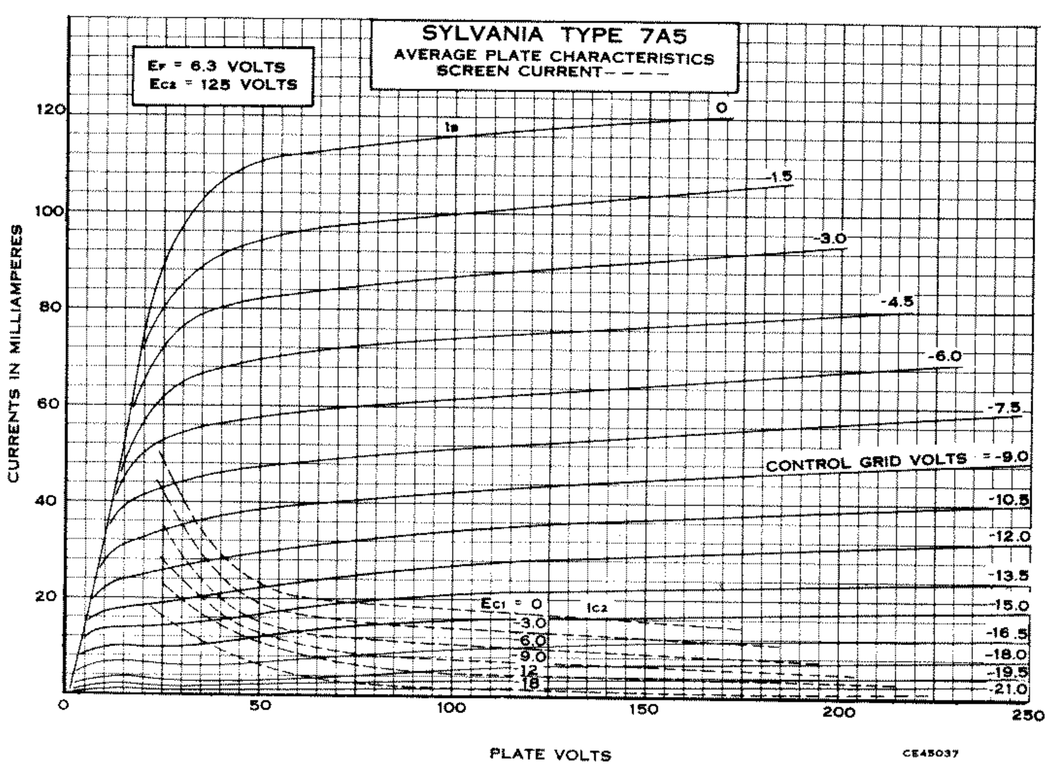
TYPICAL OPERATION

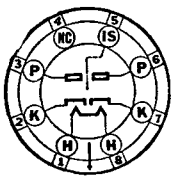
Heater Voltage	6.3	6.3 Volts
Heater Current	0.75	0.75 Ampere
Plate Voltage	110	125 Volts
Screen Voltage	110	125 Volts
Grid Voltage	−7.5	−9 Volts
Self-Bias Resistor	175	190 Ohms
Plate Current (Zero Signal)	40.0	44.0 Ma.
Plate Current (Maximum Signal)	41.0	45.0 Ma.
Screen Current (Zero Signal)	3.0	3.3 Ma.
Screen Current (Maximum Signal)	7.0	9.5 Ma.
Mutual Conductance	5800	6000 μmhos
Plate Resistance	16000	17000 Ohms
Load Resistance	2500	2700 Ohms
Power Output	1.5	2.2 Watt
Total Harmonic Distortion	10	10 Per Cent

APPLICATION

Sylvania Type 7A5 is a Lock-In type beam power amplifier designed to operate at plate voltages of about 110 volts. Except for heater ratings, it is similar to type 35A5. The curve data given for type 35A5 is applicable for the 110 volt condition.

Grid circuit resistance should not exceed 0.1 megohm for fixed bias operation or 0.5 megohm for self-bias operation.



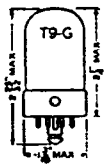


7-AJ

Sylvania

TYPE LOKTAL 7A6

DOUBLE DIODE



CARACTERISTIQUES

Tension de chauffage CA ou CC (nominale) ...	7,0 volts
Courant de chauffage (nominal)	0,160 ampère
Ampoule	T9-G
Culot : loktal 8 broches	T-AJ
Position de montage	Toutes

Capacités directes interélectrodes :

Plaque à plaque	0,05 $\mu\mu$f

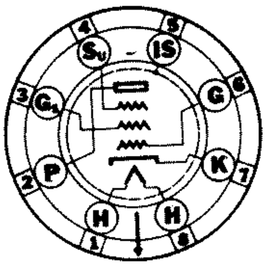
Conditions de fonctionnement et caractéristiques :

Tension de chauffage	
Courant de chauffage	
Tension efficace CA par plaque	
Courant redressé	
Chute tension (10 ma. par plaque)	8 volts

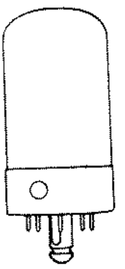
(Voir page 9 pour interprétation conditions limites de fonctionnement.)

APPLICATION

Sylvania type 7A6 est un double diode ayant deux plaques et deux cathodes aboutissant à des broches séparées, de construction LOKTAL. Les deux sections diodes sont séparées l'une de l'autre par un blindage interne connecté à la broche nº 5. Ce tube est similaire à types 6H6 ou 6H6G, sauf pour le courant chauffage réduit à 150 ma. Les applications sont identiques et type 7A6 peut être utilisé comme A.V.C., pour redresseur de faibles courants ou comme détecteur. Le filament convient pour fonctionner soit en série, soit en parallèle. En service sur C.A., la tension nominale de 7 volts correspond à un secteur de 130 volts.



8V-L-5



Sylvania Type 7A7

REMOTE CUT-OFF RF PENTODE

GT EQUIVALENT 6SK7GT

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T-9
Maximum Overall Length	$2^{25}/_{32}$"
Maximum Seated Height	$2\frac{1}{4}$"
Mounting Position	Any

RATINGS

Heater Voltage (Nominal) AC or DC	7.0 Volts
Heater Current (Nominal)	0.32 Ampere
Maximum Plate Voltage	300 Volts
Maximum Screen Voltage	125 Volts
Maximum Plate Dissipation	4.0 Watts
Maximum Screen Dissipation	0.4 Watt
Minimum External Grid Bias Voltage	0 Volt
Maximum Heater-Cathode Voltage	90 Volts

Direct Interelectrode Capacitances:*

Grid to Plate	0.005 $\mu\mu$f. Max.
Input; Grid to (F+K+G_2+G_3)	5.5 $\mu\mu$f.
Output; Plate to (F+K+G_2+G_3)	7.0 $\mu\mu$f.

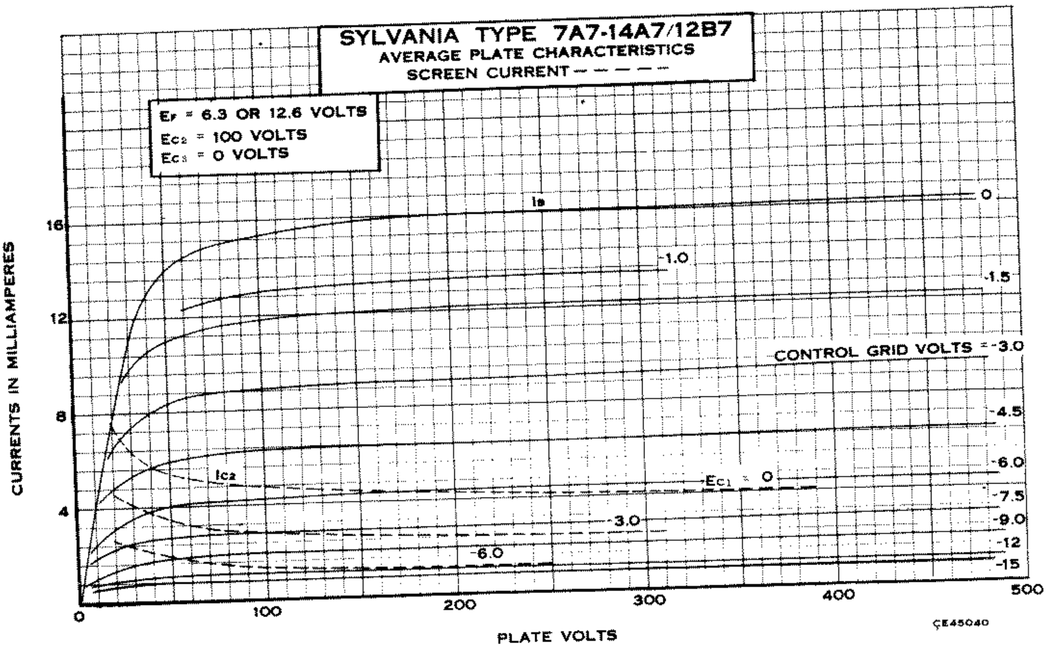
*With $1^5/_{16}$" diameter shield (RMA Std. M8-308) connected to Cathode.

TYPICAL OPERATION

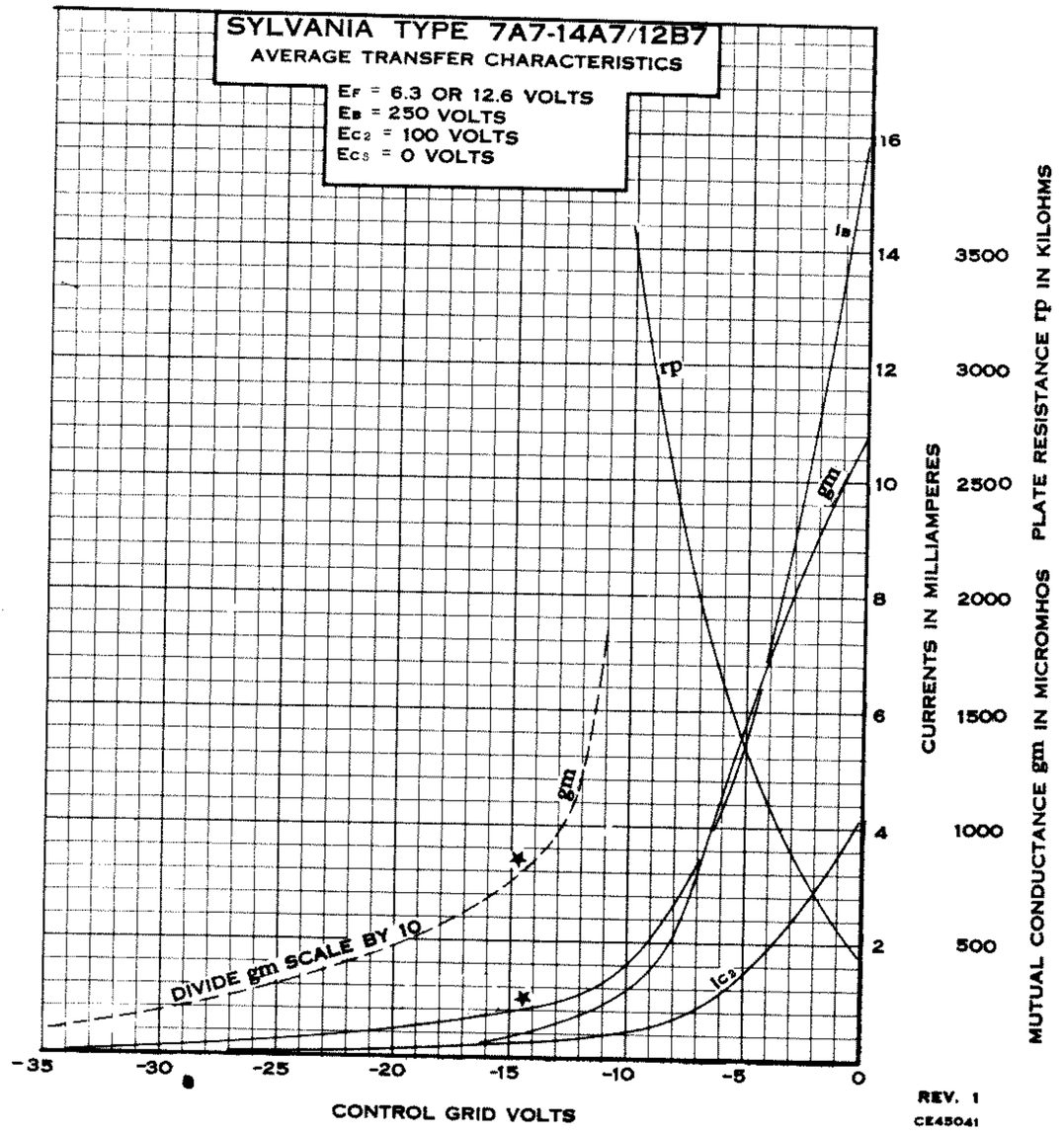
Heater Voltage	6.3	6.3 Volts
Heater Current	0.3	0.3 Ampere
Plate Voltage	100	250 Volts
Screen Voltage	100	100 Volts
Grid Voltage	−1.0	−3 Volts
Self-Bias Resistor	60	260 Ohms
Suppressor	Connect to Cathode	
Plate Current	13.0	9.2 Ma.
Screen Current	4.0	2.6 Ma.
Plate Resistance	0.12	0.8 Megohm
Mutual Conductance	2350	2000 μmhos
Grid Voltage for Mutual Conductance of 10 μmhos	−35	−35 Volts

APPLICATION

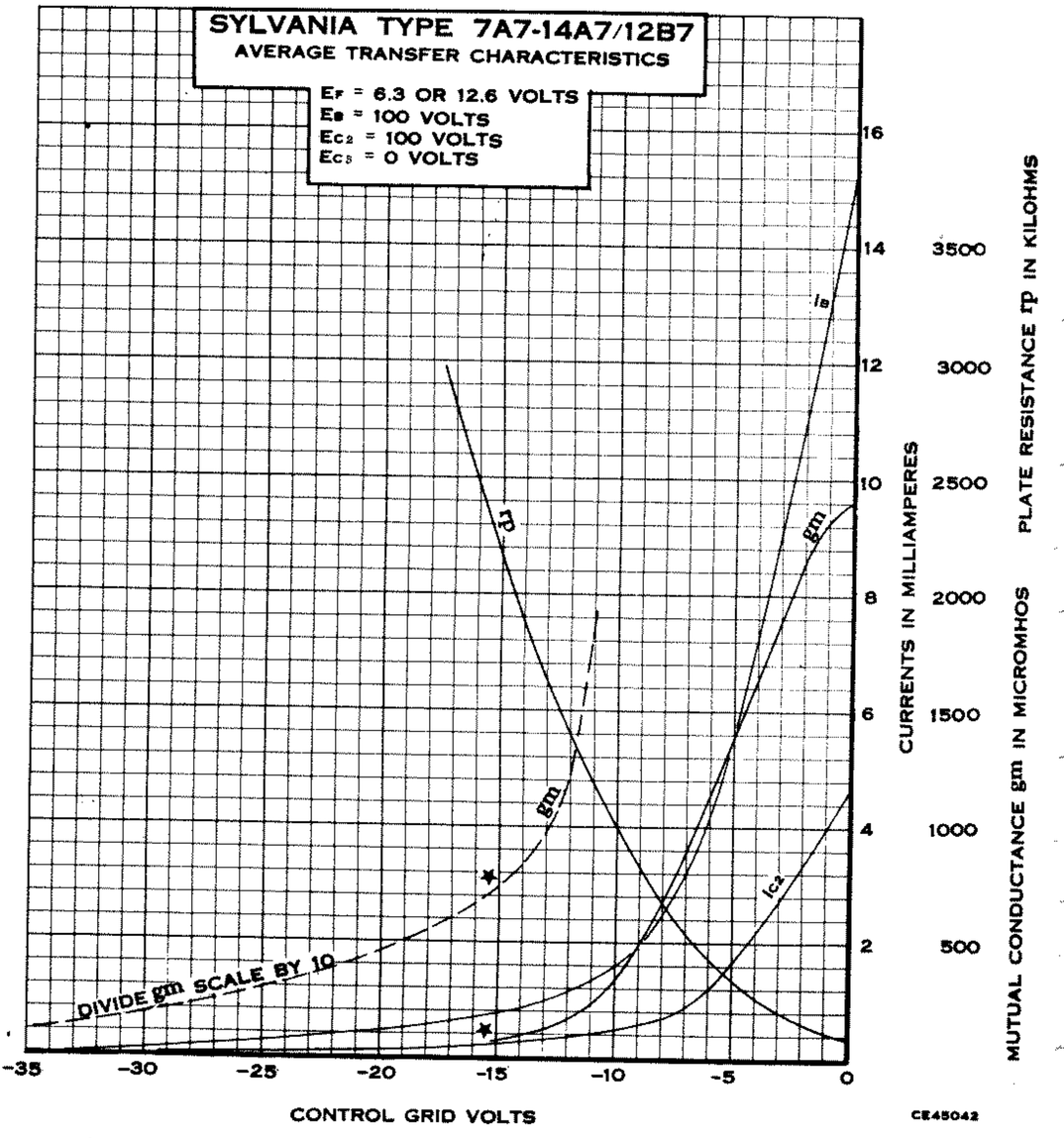
Sylvania Type 7A7 is a single-ended remote cut-off pentode designed for RF or IF service in AC or DC receivers. For AC-DC service, Types 14A7 or 7B7 may be more suitable because of lower heater current ratings. Electrical characteristics are similar to the older Types 6K7GT and 6SK7GT. In most applications the internal shield connected to pin No. 5 should provide adequate shielding, although an external shield may be required if extremely high gain circuits are used.



7A7 (Cont.)



REV. 1
CE45041



CE45042

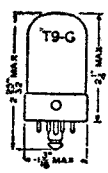


8-U

Sylvania

TYPE LOKTAL 7A8

CONVERTISSEUR OCTODE



CARACTERISTIQUES

Tension chauffage (nominale) CA ou CC	7,0 volts
Courant chauffage (nominal)	0,160 ampère
Ampoule	T9-G
Culot : loktal 8 broches	8-U
Position de montage	Toutes

Capacités directes interélectrodes* :

Grille G à plaque	0,15	$\mu\mu$f max.
Grille G à grille Ga	0,12	$\mu\mu$f
Grille G à grille Go	0,12	$\mu\mu$f
Grille Go à grille Ga	0,6	$\mu\mu$f
Grille G à toutes électrodes (entrée H. F.)	7,5	$\mu\mu$f
Grille Ga à toutes électr. exc. Go (sortie osc.)	3,4	$\mu\mu$f
Grille Go à toutes électr. exc. Ga (entrée osc.)	3,8	$\mu\mu$f
Plaques à toutes électrodes (sortie mixer)	9,0	$\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension chauffage	6,3 volts
Courant chauffage	0,150 ampère
Tension plaque	250 volts max.
Tension grille contrôle (G)	—3 volts min.
Tension écran (Gs)	100 volts max.
Tension grille anode (Ga)*	250 volts max.
Résistance grille oscillatrice (Go)	50,000 ohms
Courant plaque	3 ma.
Courant écran	2,8 ma.
Courant grille anode	4,5 ma.
Courant grille oscillatrice	0,4 ma.
Résistance de cathode	300 ohms
Resistance interne	700.000 ohms
Conductance de conversion	600 μmhos
Tension polarisation pour une conductance de conversion de 2 μmhos	—30 volts

* A travers une résistance chutrice de 20.000 ohms.

(Voir page 9 pour interprétation conditions limites de fonctionnement.)

APPLICATION

Sylvania type 7A8 est un convertisseur octode, sans capuchon de grille, de construction LOKTAL, pour utiliser sur récepteurs C.A., universels ou automobiles. Compacité, connexions très courtes aux électrodes et blindage simplifié sont quelques-uns des avantages de ce tube. Toutes les connexions externes aboutissent aux 8 broches du culot.

Les caractéristiques électriques et applications sont similaires à celles du type 6D8G convertisseur pentagrille. Les différences principales consistent dans les capacités directes interélectrodes et l'ajoute d'une grille de suppression connectée à la cathode. Cette grille supplémentaire assure un rendement amélioré, grâce à la très haute résistance interne. Les usages du type 7A8 sont semblables à ceux des tubes convertisseurs pentagrilles Sylvania et les références utiles seront consultées au type 6A7. En service sur C.A., la tension nominale chauffage (7 volts) correspond à un réseau de 130 volts.

SYLVANIA

engineering data service

SYLVANIA
7ABP7
7ABP7A
7ABP14
7ABP14A
7ABP19
7ABP19A

CHARACTERISTICS

GENERAL DATA

Focusing Method	Self Focusing (Electrostatic)
Deflection Method	Magnetic
Deflection Angle (approx.)	50 Degrees
Phosphor	P7
Fluorescence	Blue-White
Phosphorescence	Yellow
Persistence	Long
Faceplate	Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ±10% Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	6 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12M
Bulb Contact Aligns with Pin No. 3	±10 Degrees

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	11,000 Volts	dc
Grid No. 4 (Focusing Electrode) Voltage	−550 to +1100 Volts	dc
Grid No. 2 Voltage	770 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	200 Volts	dc
Positive Bias Value[1]	0 Volts	dc
Positive Peak Value	0 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

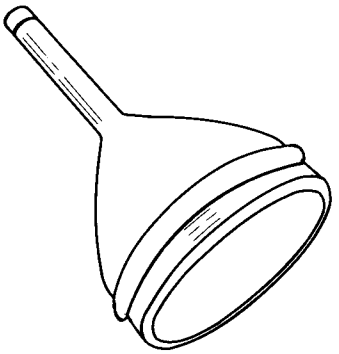
Anode Voltage[2]	7000 Volts	dc
Grid No. 4 Voltage for Focus[3]	0 to 250 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage[4]	−28 to −72 Volts	dc

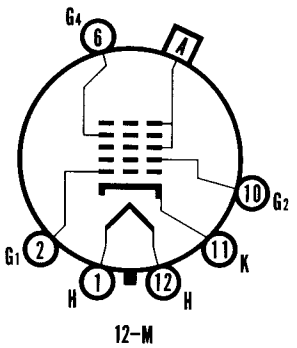
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Special Purpose Tube
7" Direct Viewed
Round Glass Type
Electrostatic Focus
Magnetic Deflection
High Resolution





12-M

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JULY, 1957

NOTES:

1. *At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts. The screen of the 7ABP19 can be permanently damaged should the current density be permitted to rise too high. To prevent burning, minimum beam current densities should be employed.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, anode voltage should not be less than 5,000 volts, except for the 7ABP19. For this type the anode voltage should not be less than 7,000 volts.*
3. *With Eg1 adjusted for Ib = 100 μa and beam focused for minimum width of individual lines at center of screen.*
4. *Visual extinction of undeflected focused spot.*

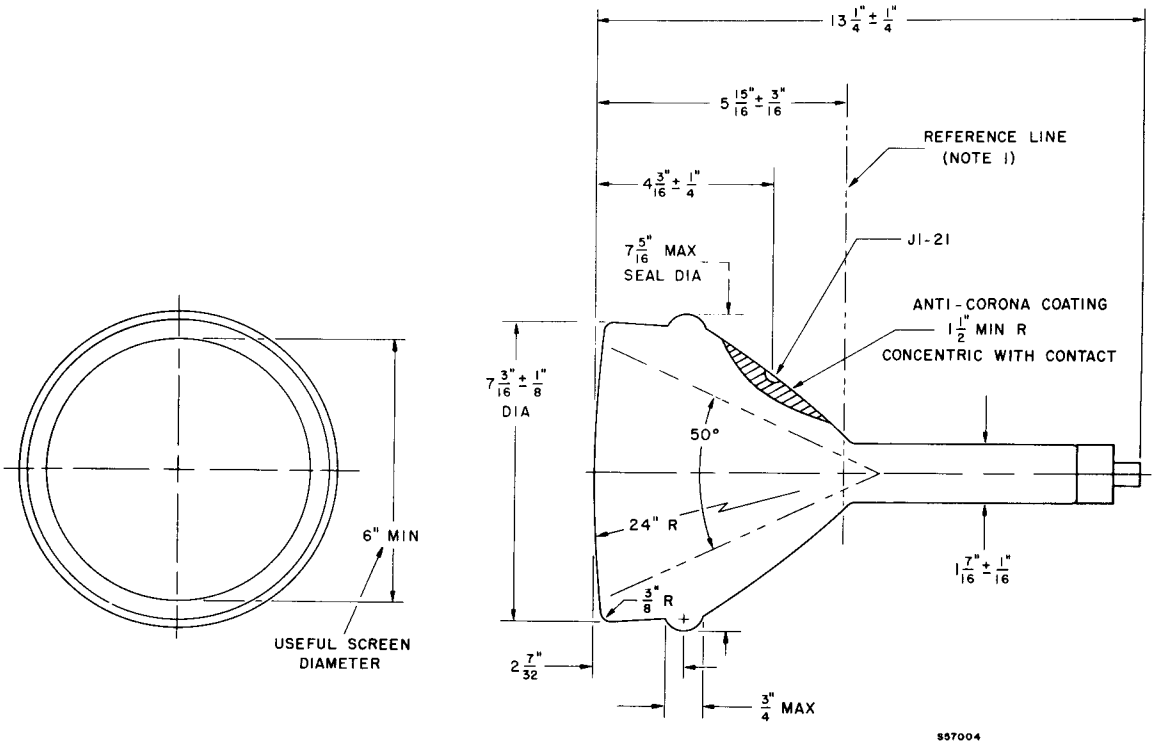


DIAGRAM NOTES:

1. *Reference line is determined by the point where 1.500 $^{+.003}_{-.000}$ inch diameter ring gauge 2 inches long will stop.*

7ABP7A

The Sylvania Type 7ABP7A is identical to the Type 7ABP7 except that it has an aluminized screen.

7ABP14

The Sylvania Type 7ABP14 is identical to the Type 7ABP7 except that it has a purple fluorescence, orange phosphorescence and medium long persistence phosphor.

7ABP14A

The Sylvania Type 7ABP14A is identical to the Type 7ABP14 except that it has an aluminized screen.

7ABP19

The Sylvania Type 7ABP19 is identical to the Type 7ABP7 except that it has an orange fluorescence and long persistence.

7ABP19A

The Sylvania Type 7ABP19A is identical to the Type 7ABP19 except that it has an aluminized screen.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

SYLVANIA engineering data service

SYLVANIA
7AEP1
7AEP*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic

Types*	Fluorescence	Phosphorescence	Persistence
7AEP1	Green	———	Medium
7AEP2	Blue - Green	Green	Long
7AEP7	Blue - White	Yellow	Long
7AEP11	Blue	———	Short

Faceplate . . . . . Flat,Clear

* In addition to the types shown, the 7AEP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Amperes

Direct Interelectrode Capacitances

	MIN.	MAX.	
Cathode to All Other Electrodes	2.9	4.5	μμf
Grid No. 1 to All Other Electrodes	3.7	6.4	μμf
D1 to D2	1.7	2.7	μμf
D3 to D4	1.0	1.8	μμf
D1 to All Other Electrodes	5.4	7.6	μμf
D2 to All Other Electrodes	5.4	7.6	μμf
D3 to All Other Electrodes	3.4	5.5	μμf
D4 to All Other Electrodes	3.4	5.5	μμf

MECHANICAL DATA

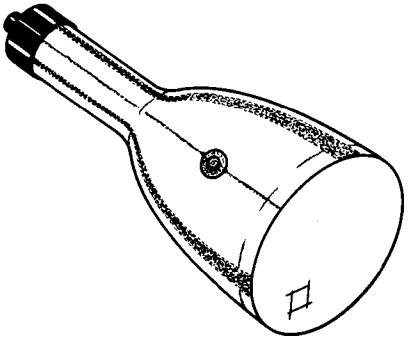
Minimum Useful Screen Diameter	6⅛ Inches
Anode No. 3 Contact (Recessed Small Ball Cap)	J1-22
Bulb	J56Y1
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14J
Base Alignment	
D1-D2 trace aligns with Pin No. 5 and tube axis	0 ± 10 Degrees
Positive Voltage on D1 deflects beam approx. toward Pin No. 5.	
Positive Voltage on D3 deflects beam approx. toward Pin No. 2	
Trace Alignment	
Angle Between Traces D1-D2 and D3-D4	90 ± 1 Degrees
Bulb Contact Alignment	
J1-22 contact aligns with D1-D2 trace	0 ± 10 Degrees
J1-22 contact on same side as Pin No. 5	
Weight (Approx.)	3½ Pounds

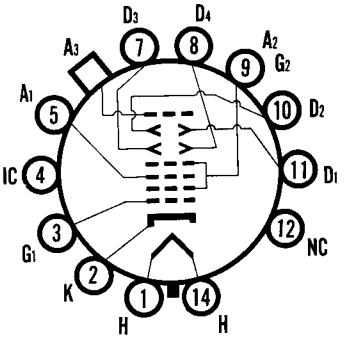
MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Input	6 Watts
Anode No. 3 Voltage	8800 Volts dc
Anode No. 2 Voltage	4400 Volts dc

QUICK REFERENCE DATA

7" Direct Viewed
Flat Faceplate
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Post Deflection Acceleration
High Deflection Sensitivity
High Deflection Accuracy
Close Tolerances





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SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

APRIL, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

MAXIMUM RATINGS (Absolute Maximum Values) (cont'd)

Ratio of Anode No. 3 Voltage to Anode No. 2 Voltage[1]	2 : 1 Maximum
Anode No. 1 Voltage (Focusing Electrode)	1375 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	220 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	0 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	200 Volts
Heater Positive with Respect to Cathode	200 Volts
Peak Voltage Between Anode No. 2 and Any Deflection Plate	825 Volts

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage	4000 Volts dc
Anode No. 2 Voltage	2000 Volts dc
Anode No. 1 Voltage for Focus	380 to 620 Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	−45 to −75 Volts dc
Deflection Factors	
Deflection Plates 1-2[3]	81 to 101 Volts dc/Inch
Deflection Plates 3-4[3]	67 to 83 Volts dc/Inch
Pattern Distortion[4]	2½% Maximum
Spot Position[5]	Within a 15 MM. Square
Modulation (Ib3 = 25μa)[6]	37 Volts dc Max.
Line Width "A" (Ib3 = 25μa)[6]	.022 Inches Max.
Light Output (7AEP1, Ib3 = 25μa)[6]	20 Ft. Lamberts Min.
Deflection Factor Uniformity[6]	3% Maximum
Focusing Electrode Current for any Operating Condition	−15 to +10 μa

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Resistance in Any Deflecting Plate Circuit[7]	1.0 Megohms Max.

NOTES:

1. *This tube is designed for optimum performance when operating at an Eb3/Eb2 ratio of 2.0. Operation at other ratios of Eb3/Eb2 may result in changes in deflection uniformity and pattern distortion.*
2. *Visual extinction of undeflected focused spot.*
3. *Deflecting plates 1-2 are nearer the screen. Deflecting plates 3-4 are nearer the base.*

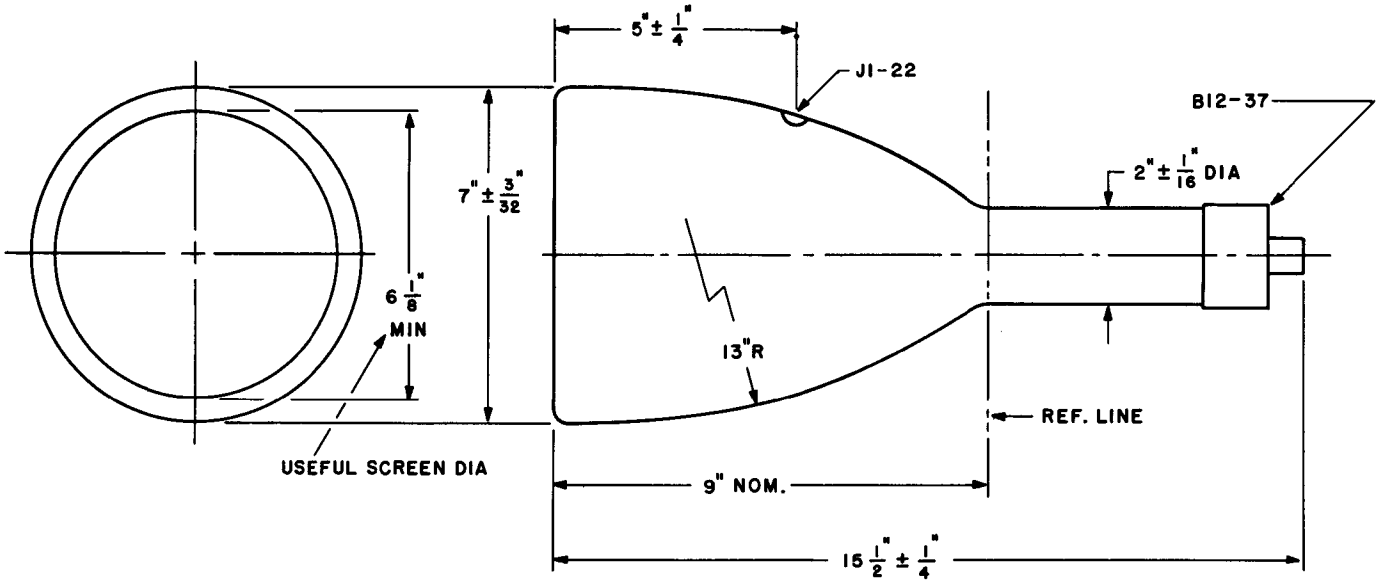
NOTES: (Cont'd)

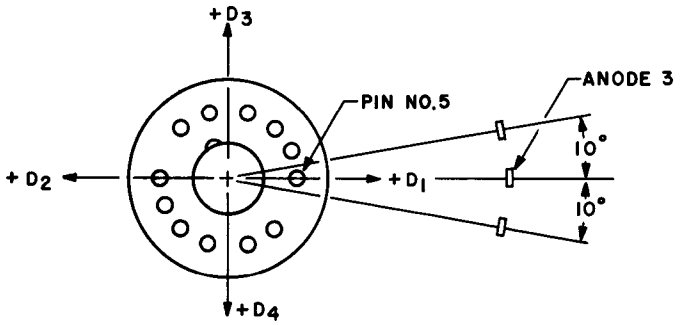
4. *All portions of a raster pattern, adjusted so its widest points just touch the sides of a 4.100 inch square will fall within the area bounded by the 4.100 inch square and an inscribed 3.900 inch square.*
5. *Centered on tube face, sides parallel to deflection axes. Tube to be magnetically shielded and deflecting plates connected to Anode No. 2.*
6. *Measured with accordance Mil-E-1 specs.*
7. *It is recommended that the deflecting plate circuit resistance be approximately equal. Higher resistance values up to five megohms may be used for low beam current operations.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE





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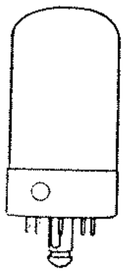
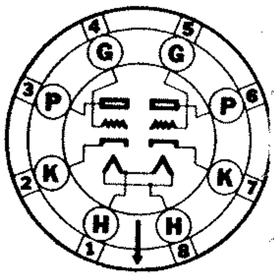
BOTTOM VIEW

7AF7 Sylvania Type

DOUBLE TRIODE AMPLIFIER





8AC-L-0

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T-9
Maximum Overall Length	$2^{25}/_{32}$"
Maximum Seated Height	$2\ 1/4$"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC (Nominal)	7.0 Volts
Heater Current	0.320 Ampere
Maximum Plate Voltage	300 Volts
Maximum Plate Dissipation (Per Plate)	2.5 Watts
Minimum External Grid Bias	0 Volt
Maximum Heater-Cathode Voltage	90 Volts

Direct Interelectrode Capacitances:*

Grid to Plate (Per Section)	2.3 μμf.
Input (Per Section)	2.2 μμf.
Output (Per Section)	1.6 μμf.
Grid 1 to Grid 2	0.20 μμf. Max.
Plate 1 to Plate 2	0.60 μμf. Max.
Grid 1 to Plate 1	0.06 μμf. Max.
Grid 2 to Plate 1	0.10 μμf. Max.

*Measured without shield.

TYPICAL OPERATION

CLASS A_1

PER SECTION EXCEPT HEATER

Heater Voltage (AC or DC)	6.3	6.3	6.3 Volts
Heater Current	0.300	0.300	0.300 Ampere
Plate Voltage	100	100	250 Volts
Grid Voltage	0	−3	−10 Volts
Self-Bias Resistor	.....	600	1100
Plate Current	10.8	5.0	9.0 Ma.
Mutual Conductance	2600	1900	2100 μmhos
Amplification Factor	17	16	16
Plate Resistance	6500	8400	7600 Ohms

APPLICATION

Sylvania Type 7AF7 is a single-ended duo triode designed for use either as a phase inverter or as a voltage amplifier. The plate, grid, and cathode connections of each triode are brought out separately to permit use in special circuits.

The characteristics of Sylvania Type 7AF7 are very similar to those of Type 7N7. It has somewhat lower interelectrode capacities which may be desirable for some applications that do not require the higher mutual conductance of Type 7N7.

TECHNICAL DATA

7AJ7

Sylvania

TYPE 7AJ7

SHARP CUT-OFF RF PENTODE

RATINGS AND CHARACTERISTICS

Heater Voltage (Nominal) AC or DC	7.0	Volts
Heater Current (Nominal)	0.320	Ampere
Maximum Plate Voltage	300	Volts
Maximum Screen Voltage	100	Volts
Maximum Screen Supply Voltage	300	Volts
Maximum Plate Dissipation	1.0	Watt
Maximum Screen Dissipation	0.1	Watt
Minimum External Grid Bias	0	Volt
Maximum Heater-Cathode Voltage	90	Volts

Direct Interelectrode Capacitances:*

Grid to Plate	.007	µµf. Max.
Input	6.0	µµf.
Output	6.5	µµf.

* *With 1 5/16" diameter shield (RMA Std. M8-308) connected to cathode.*

PHYSICAL SPECIFICATIONS

Style	Lock-In
Base	Lock-In 8-Pin
Bulb	T-9
Diameter	1 3/16" Max.
Seated Height	2 1/4" Max.
Overall Length	2 25/32" Max.
Mounting Position	Any

BASE PIN CONNECTIONS

Pin 1 - Heater
Pin 2 - Plate
Pin 3 - Screen Grid
Pin 4 - Suppressor Grid
Pin 5 - Internal Shield
Pin 6 - Grid
Pin 7 - Cathode
Pin 8 - Heater
RMA Basing 8V-L-5

TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS

Class A1 Amplifier

Heater Voltage (AC or DC)	6.3	6.3	Volts
Heater Current	0.300	0.300	Ampere
Plate Voltage	100	250	Volts
Screen Voltage	100	100	Volts
Control Grid Voltage	-1.0	-3.0	Volts
Self Bias Resistor	130	~~100~~ 1000	Ohms
Suppressor Grid & Pin No. 5	Connected to Cathode		
Plate Current	5.7	2.2	Ma.
Screen Current	1.8	0.7	Ma.
Plate Resistance (Approx.)	.400	>1.0	Megohm
Mutual Conductance	2275	1575	µmhos
Grid Bias for Plate Current Cut-off	-8.5	-8.5	Volts

CIRCUIT APPLICATION

Sylvania Type 7AJ7 is a triple grid amplifier designed specially for use in AC receivers and in the first stages of high gain amplifiers. The electrical characteristics are almost identical to those of Type 6SJ7 and are identical with those of Sylvania Type 14C7, except for the heater rating. Reference should be made to the Type 14C7 data sheet for curves and to the Type 7C7 data sheet for resistance coupled amplifier data.

from RMA release # 596A, Sept. 5, 1947

AUGUST 5, 1947 COMMERCIAL ENGINEERING DEPARTMENT
Sylvania Electric Products Inc., Emporium, Pennsylvania
PRINTED IN U.S.A.

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engineering data service

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7AK7

MECHANICAL DATA

Bulb	T-9
Base	Lock-in 8-Pin
Basing	8V
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (Nominal)	7.0 Volts
Heater Voltage	6.3 Volts
Heater Current	800 Ma

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[1]

Control Grid to Plate	0.7 $\mu\mu$f
Input	12.0 $\mu\mu$f
Output	9.5 $\mu\mu$f
Suppressor Grid to Plate	4.0 $\mu\mu$f

RATINGS (Design Center Values)

Plate Voltage	200 Volts	Max.
Screen Grid Voltage	100 Volts	Max.
Plate Dissipation	8.5 Watts	Max.
Screen Grid Dissipation	2.5 Watts	Max.
Positive DC Control Grid Voltage	50 Volts	Max.
Positive DC Suppressor Grid Voltage	100 Volts	Max.
Negative DC Control Grid Voltage	-100 Volts	Max.
Negative DC Suppressor Grid Voltage	-100 Volts	Max.
Heater-Cathode Voltage	±200 Volts	Max.
Grid Circuit Resistance		
Fixed Bias	100,000 Ohms	Max.

CHARACTERISTICS AND TYPICAL OPERATION

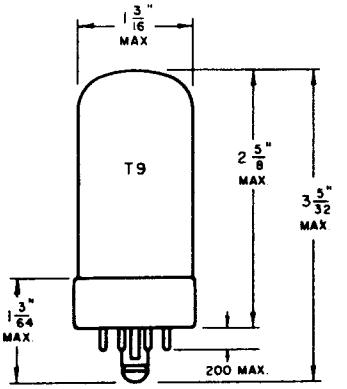
Plate Voltage	150	150	150	Volts
Screen Grid Voltage	90	90	90	Volts
Control Grid Voltage	0	-11	0	Volts
Suppressor Grid Voltage	0	0	-9.5	Volts
Transconductance	6,000			μmhos
Plate Resistance (approx.)	11,500			Ohms
Plate Current	40	2.5[3]	2.0[3]	Ma
Screen Grid Current[2]	21	0.45	60[3]	Ma
Control Grid Voltage				
For I_b=10 μa	-17.5			Volts

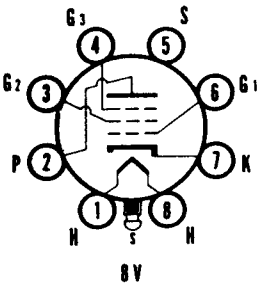
NOTES:

1. *With 1-5/16" diameter shield, RTMA No. 308 connected to cathode.*
2. *For use as a "gating" tube, the dissipation rating of the screen may approximate 4.0 watts momentarily, providing the dissipation averaged over any one-second interval does not exceed the rating.*
3. *Maximum values.*

QUICK REFERENCE DATA

Lock-in, sharp cutoff pentode with suppressor control, designed for service in electronic computers.





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Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JULY 1953

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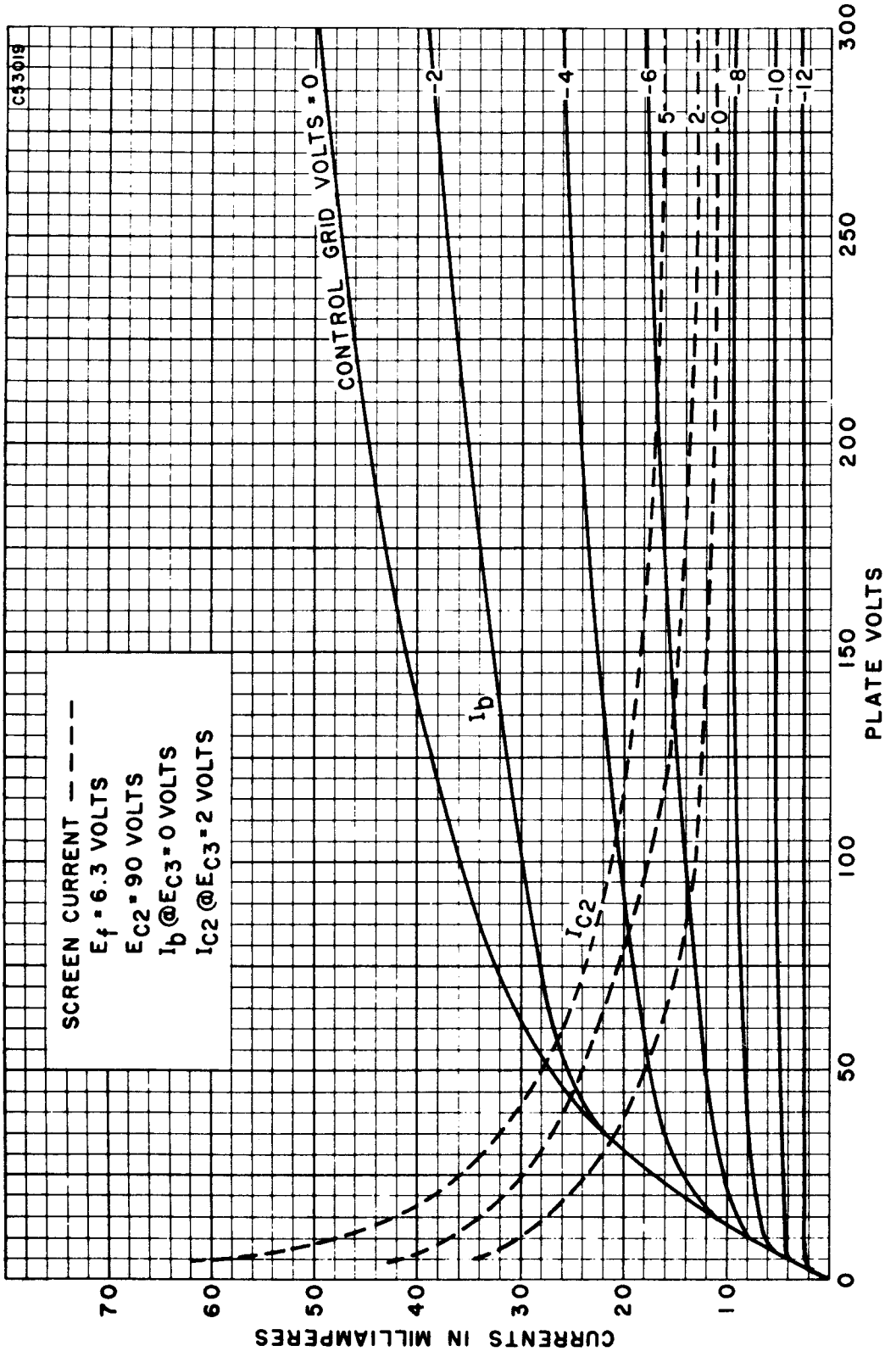
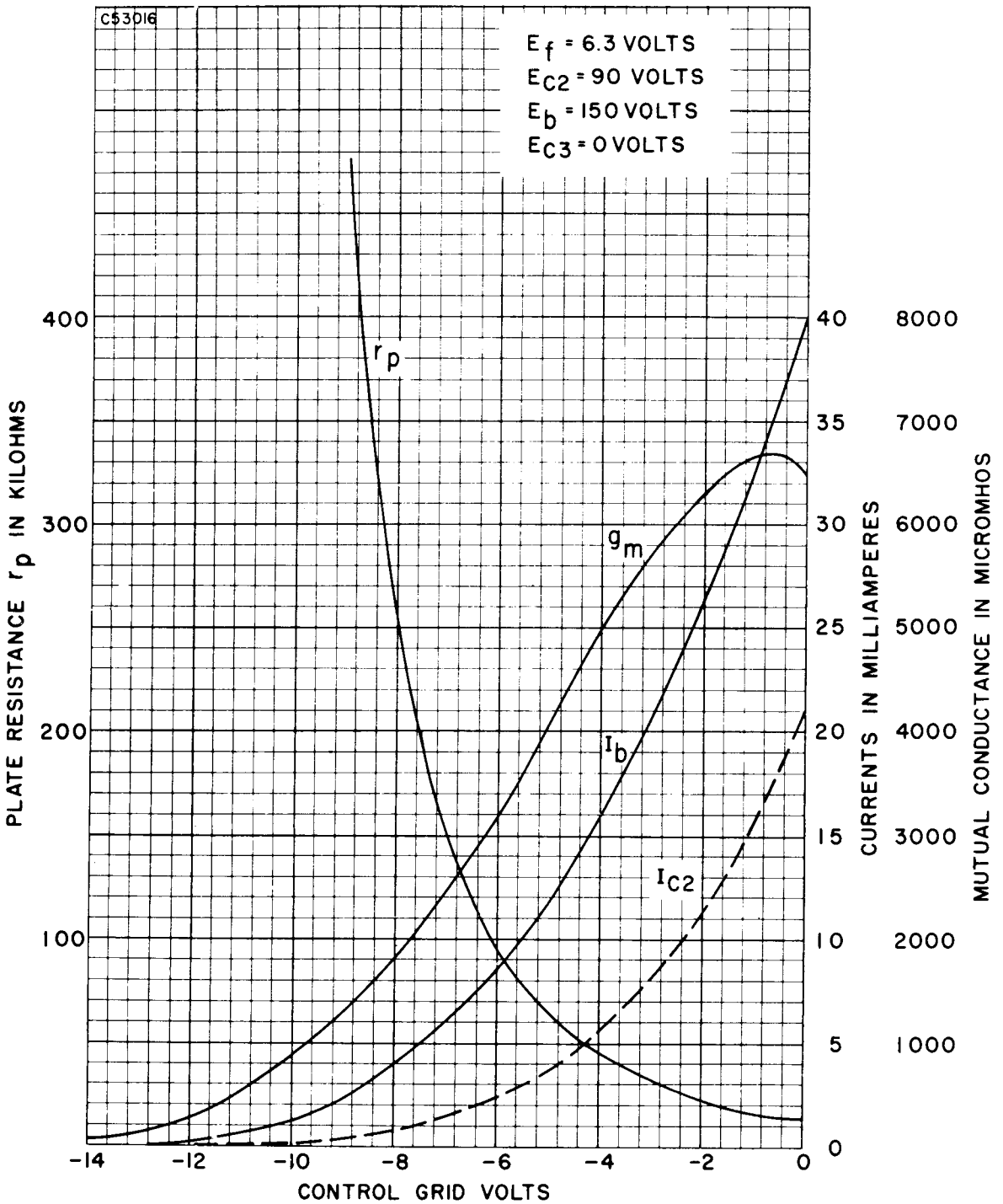
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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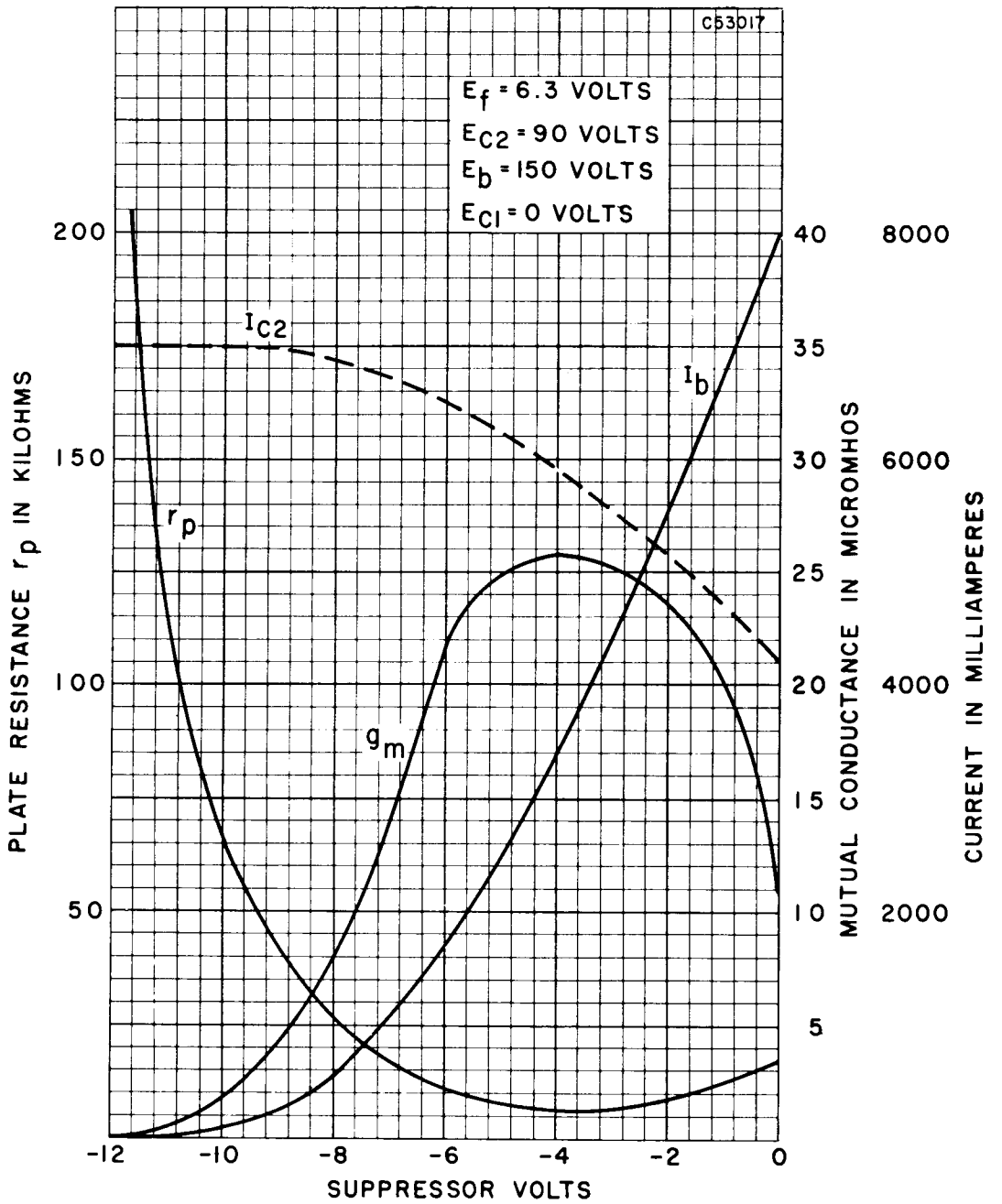
AVERAGE TRANSFER CHARACTERISTICS

PLOTED VS SUPPRESSOR GRID VOLTAGE



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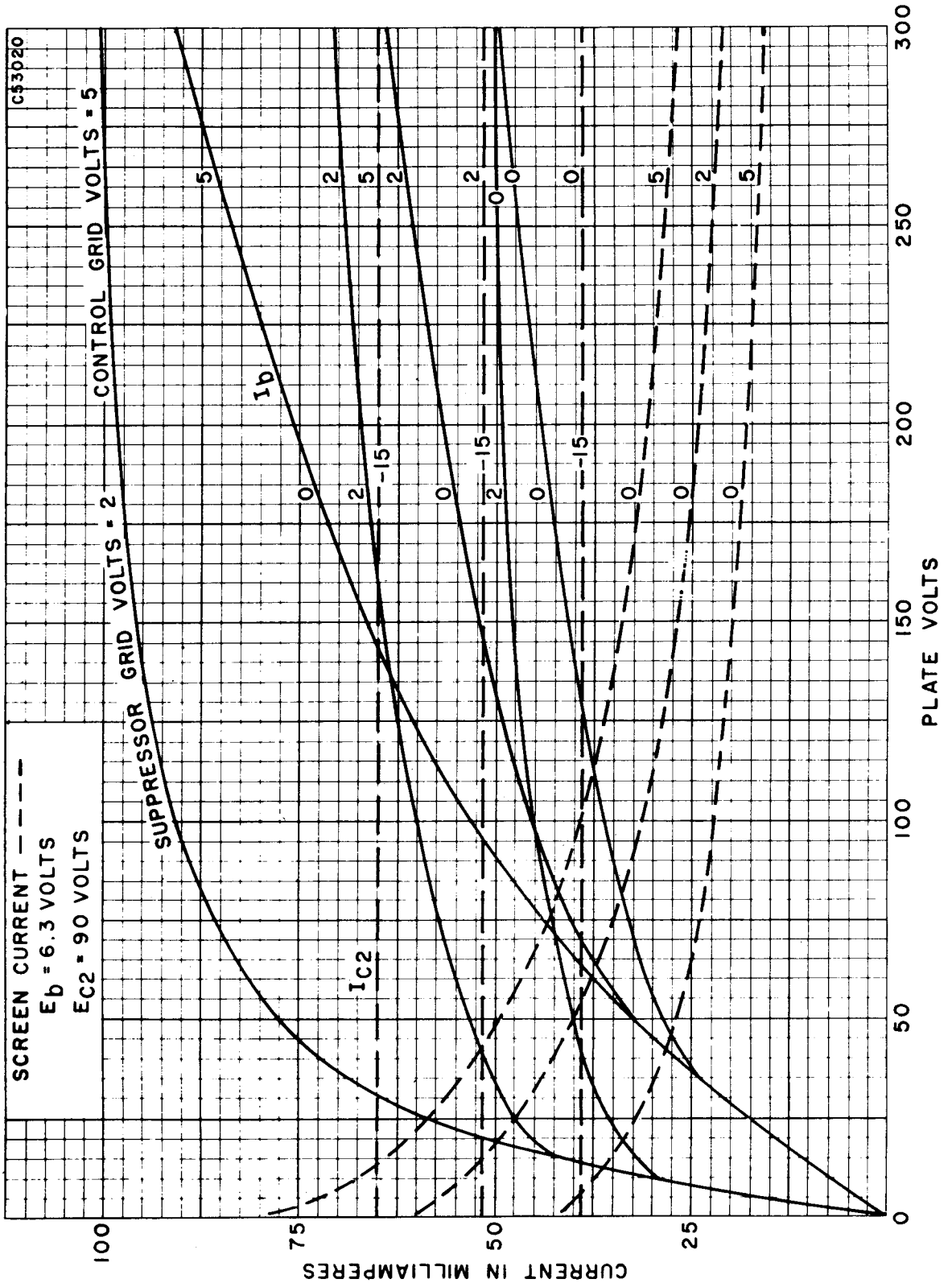

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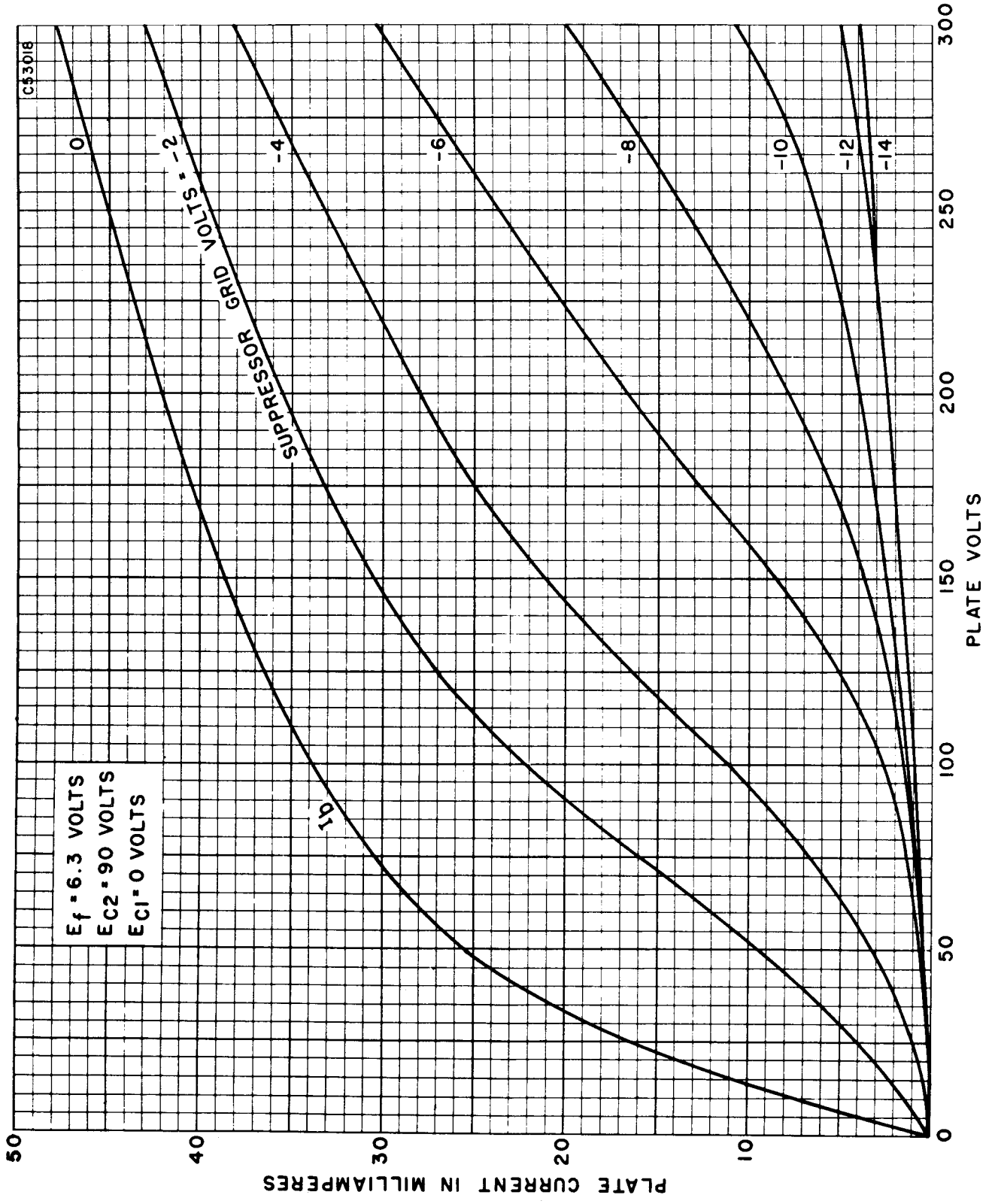
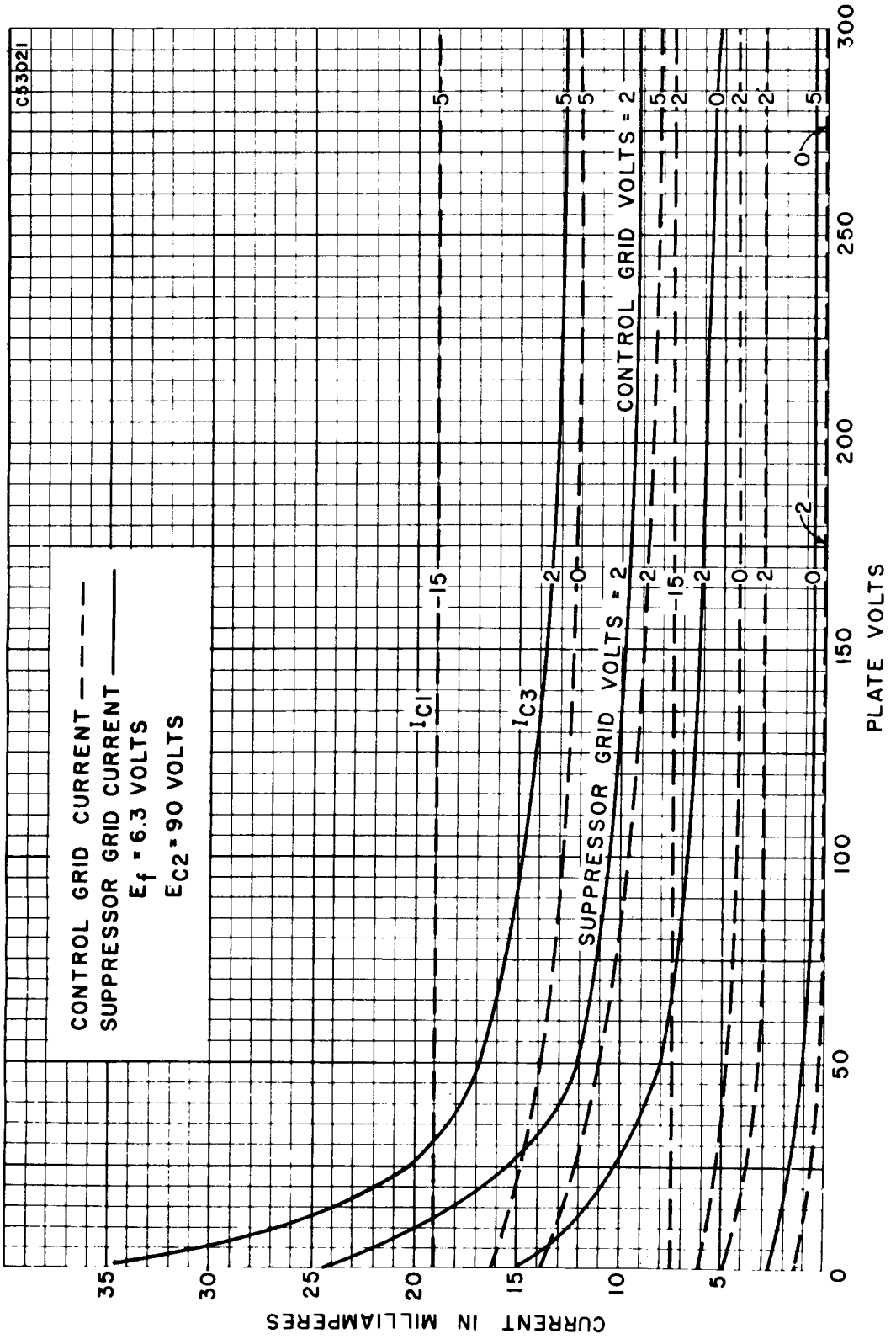
AVERAGE PLATE CHARACTERISTICS



AVERAGE CHARACTERISTICS



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engineering data service

SYLVANIA
7AUP4
7AUP7

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle (Approx.)	70 Degrees

	7AUP4	7AUP7
Phosphor*	Aluminized P4	Aluminized P7
Fluorescence	White	White
Persistence	Short to Medium	Long
Phosphorescence	—	Yellow-Green

Faceplate . . . . . Spherical, Clear Glass

*In addition to the types shown, the 7AUP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.3 ± 5% Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	7.0 μμf
Grid No. 1 to All Other Electrodes	9.0 μμf
Grid No. 2 to All Other Electrodes	7.0 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	6 Inches
Bulb	LEA 480 or Equivalent
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base[1]	E9-37
Basing	9HT
Weight (Approx.)	2¼ Pounds

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	1100 Volts	dc
Grid No. 2 Voltage	770 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	0 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

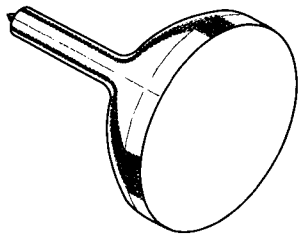
Anode Voltage	8000 Volts	dc Max.
Grid No. 4 Voltage for Focus[2]	0 to 300 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage		
Required for Spot Cutoff	−25 to −60 Volts	dc
Line Width[3]	0.012 Inch	

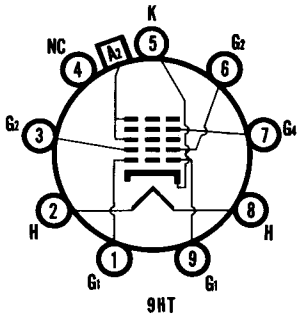
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.
Grid No. 2 Circuit Resistance[4]	10,000 Ohms	Max.
Grid No. 4 Circuit Resistance[4]	10,000 Ohms	Max.

QUICK REFERENCE DATA

Monitor Tube (7AUP4)
Radar Indicator (7AUP7)
7″ Direct Viewed
Round Glass Type
Spherical Faceplate
Clear Glass
Aluminized Screen
Magnetic Deflection
Electrostatic Focus
⅞ Inch Neck Diameter
Short Length





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ELECTRONIC TUBES
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SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
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DECEMBER, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

NOTES:

1. *A socket with a center opening to clear the tubulation should be used. Care should be exercised to avoid danger to the tubulation.*
2. *With combined Grid No. 1 Bias Voltage and Video-Signal Voltage adjusted to give an anode current of 50 μa on a 6" x 6" raster.*
3. *With an anode current of 50 μa, typical line width at center of faceplate, using half amplitude points of light energy distribution of a single line is 0.012 inch.*
4. *Protective resistance in the Grid No. 2 and Grid No. 4 circuits is advisable to prevent damage to the tube.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

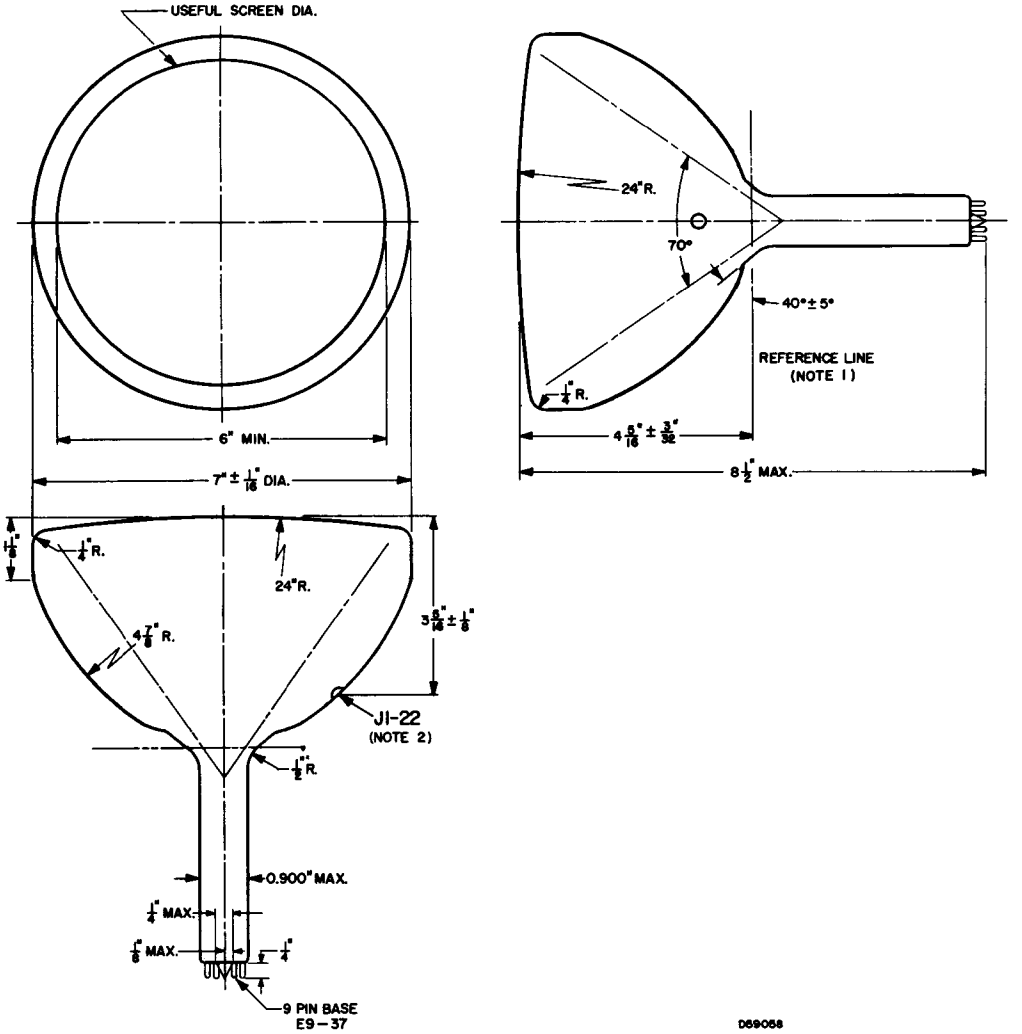


DIAGRAM NOTES:

1. *Reference Line is determined by the point where the leading edge of a 1.640 inch inside diameter ring gauge will stop.*
2. *Anode contact (J1-22) aligns with space between Pins #1 and #9.*

CHARACTERISTICS

GENERAL DATA

Focusing Method . . . . . Electrostatic
Deflecting Method . . . . . Electrostatic
Phosphors

Types	Fluorescence	Phosphorescence	Persistence
7AYP1	Green	—	Medium
7AYP2	Blue-Green	Green	Long
7AYP7	Blue-White	Yellow	Long
7AYP19	Orange	Orange	Long
7AYP25	Orange	Orange	Medium

Faceplate . . . . . Clear, Spherical

*In addition to the types shown, the 7AYP– can be supplied with several other screen phosphors.

ELECTRICAL DATA

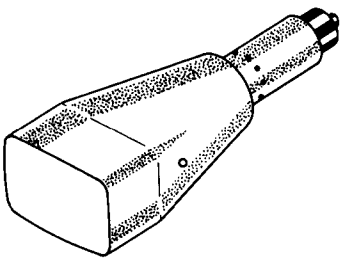
Heater Voltage . . . . . 6.3 Volts
Heater Current . . . . . 0.6 ± 10 % Ampere
Direct Interelectrode Capacitances (Approx.)
Cathode to All Other Electrodes . . . . . 6 pf
Grid No. 1 to All Other Electrodes . . . . . 7 pf
Between Deflecting Plates 1-2 . . . . . 1.5 pf
Between Deflecting Plates 3-4 . . . . . 1.3 pf
Deflecting Plate 1 to All Other Electrodes . . . 6.5 pf
Deflecting Plate 2 to All Other Electrodes . . . 6.5 pf
Deflecting Plate 3 to All Other Electrodes . . . 5.5 pf
Deflecting Plate 4 to All Other Electrodes . . . 5.5 pf

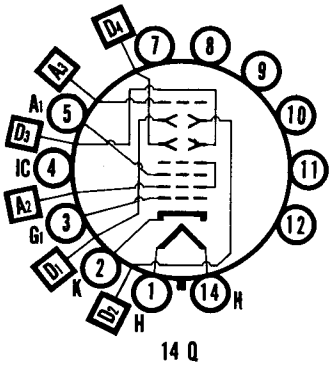
MECHANICAL DATA

Minimum Useful Screen Dimensions
(Maximum Assured) . . . . . $3\frac{1}{4}$ x $5\frac{1}{4}$ Inches
Overall Length . . . . . $17\frac{1}{2} \pm \frac{3}{8}$ Inches
Greatest Bulb Dimensions
Diagonal . . . . . $6\frac{5}{8} \pm \frac{1}{16}$ Inches
Width . . . . . $6\frac{1}{32} \pm \frac{1}{16}$ Inches
Height . . . . . $4\frac{1}{32} \pm \frac{1}{16}$ Inches
Neck Contacts . . . . . Small Ball J1-25
Bulb Contact . . . . . Recessed Small Ball Cap J1-22
Base . . . . . 12 Pin B12-37
Bulb Contact Alignment
Bulb Contact Located on Tube Centerline ± ¼ Inch on Same Side as Pin No. 5
Base Alignment
D1-D2 Aligns with Pin No. 5 and Tube Axis ±10 Degrees
Positive Voltage on D1 Deflects Beam Approximately Toward Pin No. 5
Positive Voltage on D3 Deflects Beam Approximately Toward Pin No. 1
Trace Alignment
Angle Between D3-D4 and D1-D2 Trace . . . 90 ± 1 Degrees
D1-D2 Trace Aligns with Bulb Wall . . . . . 90 ± 1 Degrees
Mounting Position . . . . . Any

QUICK REFERENCE DATA

Oscilloscope Tube
7" Direct Viewed
Rectangular Glass Type
Electrostatic Deflection
Electrostatic Focus
Clear, Spherical Faceplate





14 Q

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

JULY, 1965

File Under

SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

MAXIMUM RATING (Design Center Values)[1]

Post Accelerator Voltage	16,000 Vdc	Max.
Anode Voltage[2]	8000 Vdc	Max.
Ratio Post Accelerator Voltage to Anode Voltage	2.0	Max.
Anode Current	Note 3	
Focusing Electrode Voltage	2500 Vdc	Max.
Grid No. 1 Voltage		
Negative Bias Value	200 Vdc	Max.
Positive Bias Value	0 Vdc	Max.
Positive Peak Value	2 Vdc	Max.
Peak Heater Cathode Voltage		
Heater Negative with Respect to Cathode	180 Vdc	Max.
Heater Positive with Respect to Cathode	180 Vdc	Max.
Peak Voltage Between Anode and Any Deflection Electrode	1500 Volts	Max.

TYPICAL OPERATING CONDITIONS

Post Accelerator	10,000	8000 Vdc	
Anode Voltage	5000	4000 Vdc	
Focusing Electrode Voltage	1375 to 1875	1100 to 1500 Vdc	
Grid No. 1 Voltage[4]	−50 to −90	−40 to −72 Vdc	
Deflection Factors			
D1 to D2	125 to 150	100 to 120 Vdc/In.	
D3 to D4	100 to 125	80 to 100 Vdc/In.	
Deflection Factor Uniformity[5]		3 Percent	Max.
Focusing Electrode Current		−15 to +10 Microamperes	
Line Width[6]		0.30 mm	Max.
Spot Position[7]		5/16 In. Radius Circle	

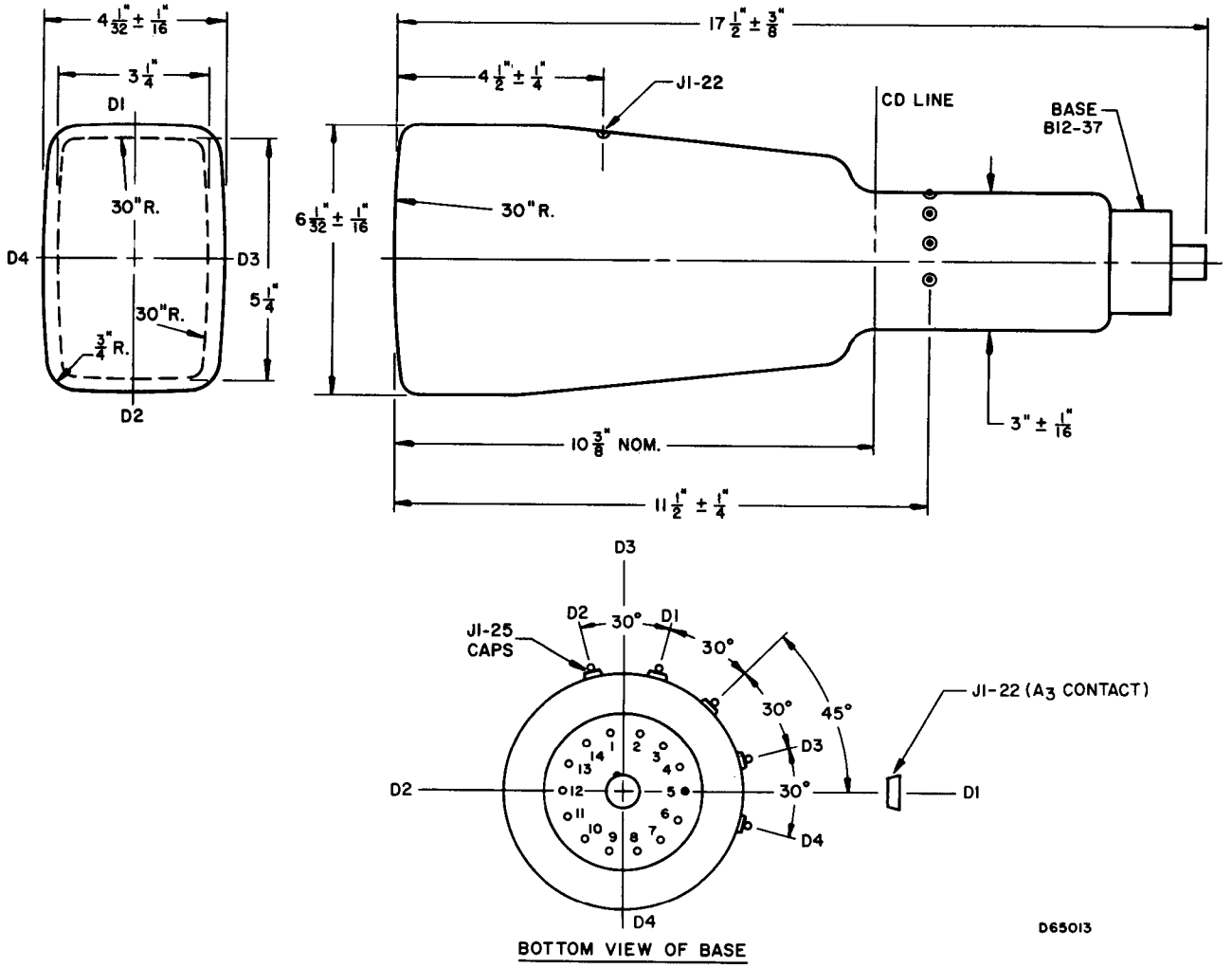
MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.
Resistance in Any Deflecting Electrode Circuit[8]	3.0 Megohms	Max.

NOTES:

1. *The maximum ratings provide a ten per cent safety factor in accordance with the standard design center system of rating cathode ray tubes. The tube will withstand the combined effects of variations in line voltage and components provided the maximum design center values are not exceeded by more than ten per cent.*
2. *Anode, Grid No. 2 and Grid No. 4 which are connected together within the tube are referred to herein as anode.*
3. *The phosphor screen may be damaged if the exciting current density is greater than 1.4 microamperes per square centimeter for P25, and if greater than .06 microamperes per square centimeter for P19.*
4. *For visual extinction of undeflected focused spot.*
5. *Deflection factor for deflection of 75 % of useful screen dimensions, shall not differ from deflection factor for deflection of 25 % of the useful screen dimensions by more than the indicated value.*
6. *Measured in accordance with MIL-E-1C specifications using Ib3 = 2μAdc, and anode voltage of 4,000 volts and a post-accelerator voltage of 8,000 volts.*
7. *The center of the focused undeflected spot will be within a circle of 5/16 inch radius, centered on the tube face.*
8. *It is recommended that the deflection electrode resistance be approximately equal.*

OUTLINE

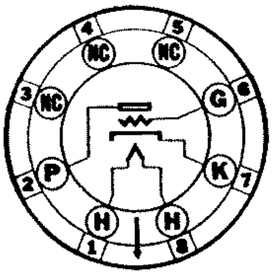


BOTTOM VIEW OF BASE

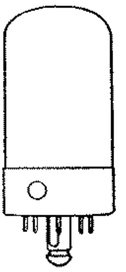
Sylvania Type 7B4

HIGH-MU TRIODE

GT EQUIVALENT 6SF5GT



5AC-L-0



PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T-9
Maximum Overall Length	$2^{25}/_{32}$"
Maximum Seated Height	$2\frac{1}{4}$"
Mounting Position	Any

RATINGS

Heater Voltage (Nominal) AC or DC	7.0 Volts
Heater Current (Nominal)	0.32 Ampere
Maximum Plate Voltage	300 Volts
Maximum Heater-Cathode Voltage	90 Volts

TYPICAL OPERATION

CLASS A_1 AMPLIFIER

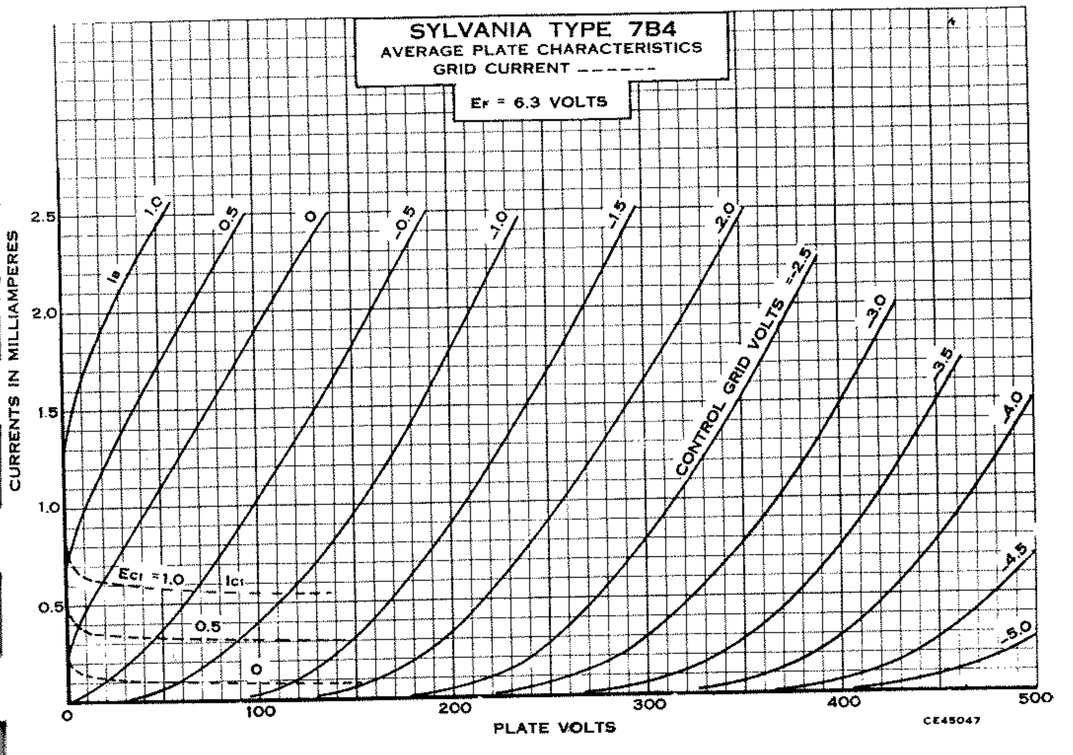
Heater Voltage	6.3	6.3 Volts
Heater Current	0.3	0.3 Ampere
Plate Voltage	100	250 Volts
Grid Voltage	−1	−2 Volts
Plate Current	0.4	0.9 Ma.
Plate Resistance (Approximate)	85000	66000 Ohms
Mutual Conductance (Approximate)	1150	1500 μmhos
Amplification Factor	100	100

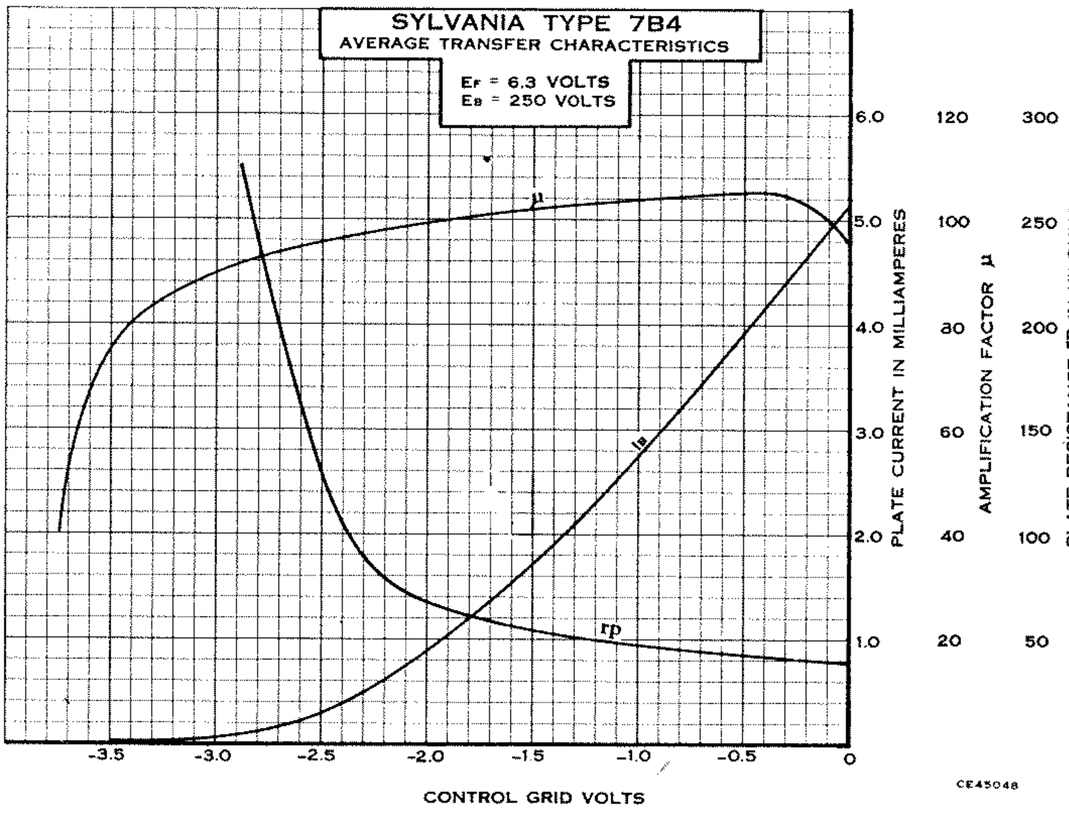
APPLICATION

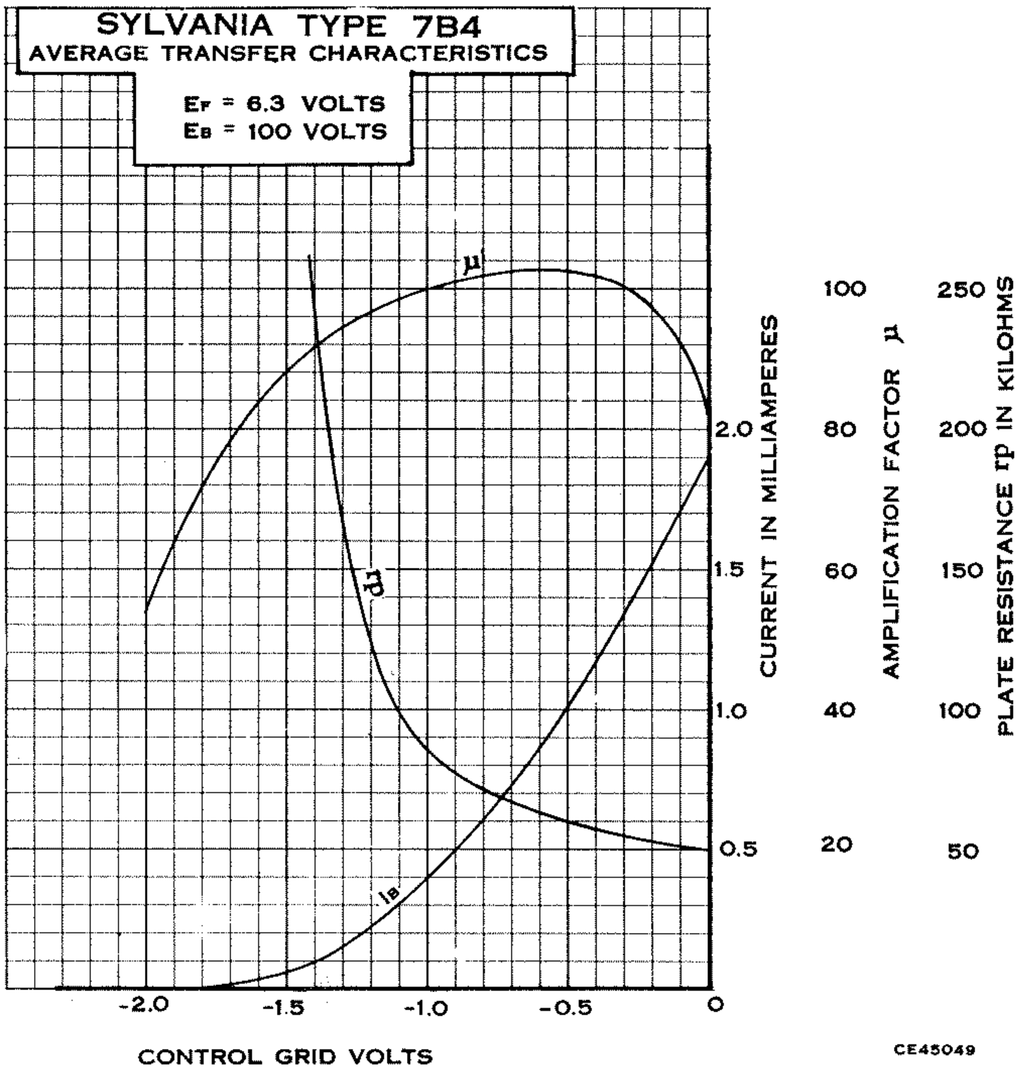
Sylvania Type 7B4 is a single-ended high-mu triode having electrical characteristics and applications similar to those for Type 6F5G.

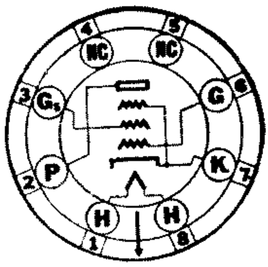
The lock-in construction employed in Type 7B4 provides compactness, suitable shielding, and the lock-in feature. For a-c service the 7-volt heater rating corresponds to a 130-volt line condition. It is also the nominal voltage for automotive receiver service. For household receivers, ratings marked Max. are design centers for a line voltage of 117 volts. For automotive service the design centers are 90% of the values indicated using a battery terminal voltage of 6.6 volts.

For data on resistance coupling circuits, refer to table on page 47.

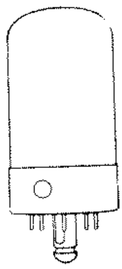



SYLVANIA TYPE 7B4
AVERAGE TRANSFER CHARACTERISTICS
EF = 6.3 VOLTS
EB = 250 VOLTS
μ
Ib
rp
-3.5
-3.0
-2.5
-2.0
-1.5
-1.0
-0.5
0
CONTROL GRID VOLTS
6.0
5.0
4.0
3.0
2.0
1.0
PLATE CURRENT IN MILLIAMPERES
120
100
80
60
40
20
AMPLIFICATION FACTOR μ
300
250
200
150
100
50
PLATE RESISTANCE rp IN KILOHMS
CE45048


SYLVANIA TYPE 7B4
AVERAGE TRANSFER CHARACTERISTICS
EF = 6.3 VOLTS
EB = 100 VOLTS
μ
rp
Ib
-2.0
-1.5
-1.0
-0.5
0
CONTROL GRID VOLTS
2.0
1.5
1.0
0.5
CURRENT IN MILLIAMPERES
100
80
60
40
20
AMPLIFICATION FACTOR μ
250
200
150
100
50
PLATE RESISTANCE rp IN KILOHMS
CE45049



6AE-L-0



Sylvania Type 7B5

POWER OUTPUT PENTODE

GT EQUIVALENT 6K6GT

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T-9
Maximum Overall Length	$3\frac{5}{32}$"
Maximum Seated Height	$2\frac{5}{8}$"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC (Nominal)	7.0 Volts
Heater Current	0.43 Ampere
Maximum Plate Voltage	315 Volts
Maximum Screen Voltage	285 Volts
Maximum Plate Dissipation	8.5 Watts
Maximum Screen Dissipation	2.8 Watts
Maximum Heater-Cathode Voltage	90 Volts

Direct Interelectrode Capacitances:*

Grid to Plate	0.8 μμf.
Input	7.4 μμf.
Output	8.0 μμf.

*With $1\frac{5}{16}$" diameter shield (RMA Std. M8-308) connected to cathode.

TYPICAL OPERATION

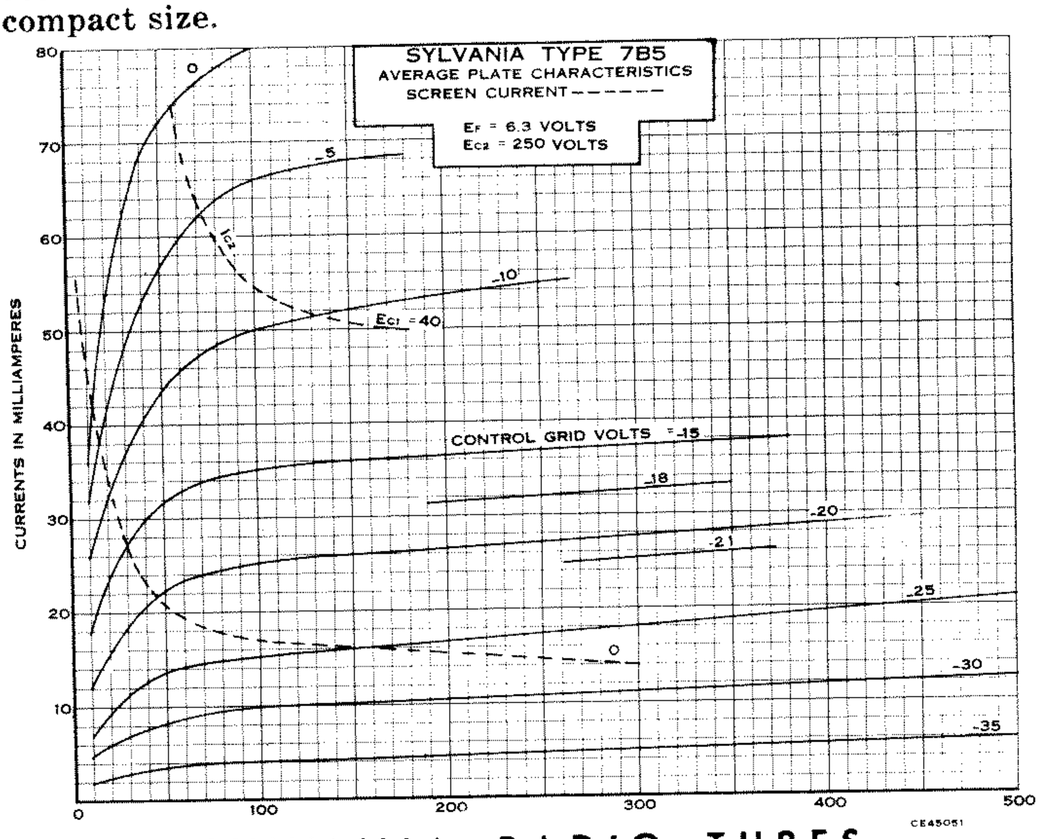
SINGLE-TUBE CLASS A_1 AMPLIFIER

Heater Voltage	6.3	6.3	6.3 Volts
Heater Current	0.4	0.4	0.4 Ampere
Plate Voltage	100	250	315 Volts
Screen Voltage	100	250	250 Volts
Grid Voltage§	−7.0	−18	−21 Volts
Self-Bias Resistor	650	500	700 Ohms
Peak Signal Voltage	7.0	18	21 Volts
Plate Current (Zero Signal)	9.0	32.0	25.0 Ma.
Plate Current (Maximum Signal)	9.0	33.0	28.0 Ma.
Screen Current (Zero Signal)	1.6	5.5	4.0 Ma.
Screen Current (Maximum Signal)	3.0	10.0	9.0 Ma.
Plate Resistance (Approximate)	104000	68000	75000 Ohms
Mutual Conductance	1500	2300	2100 μmhos
Load Resistance	12000	7600	9000 Ohms
Power Output	0.35	3.4	4.5 Watts
Total Harmonic Distortion	11	11	15 Per Cent

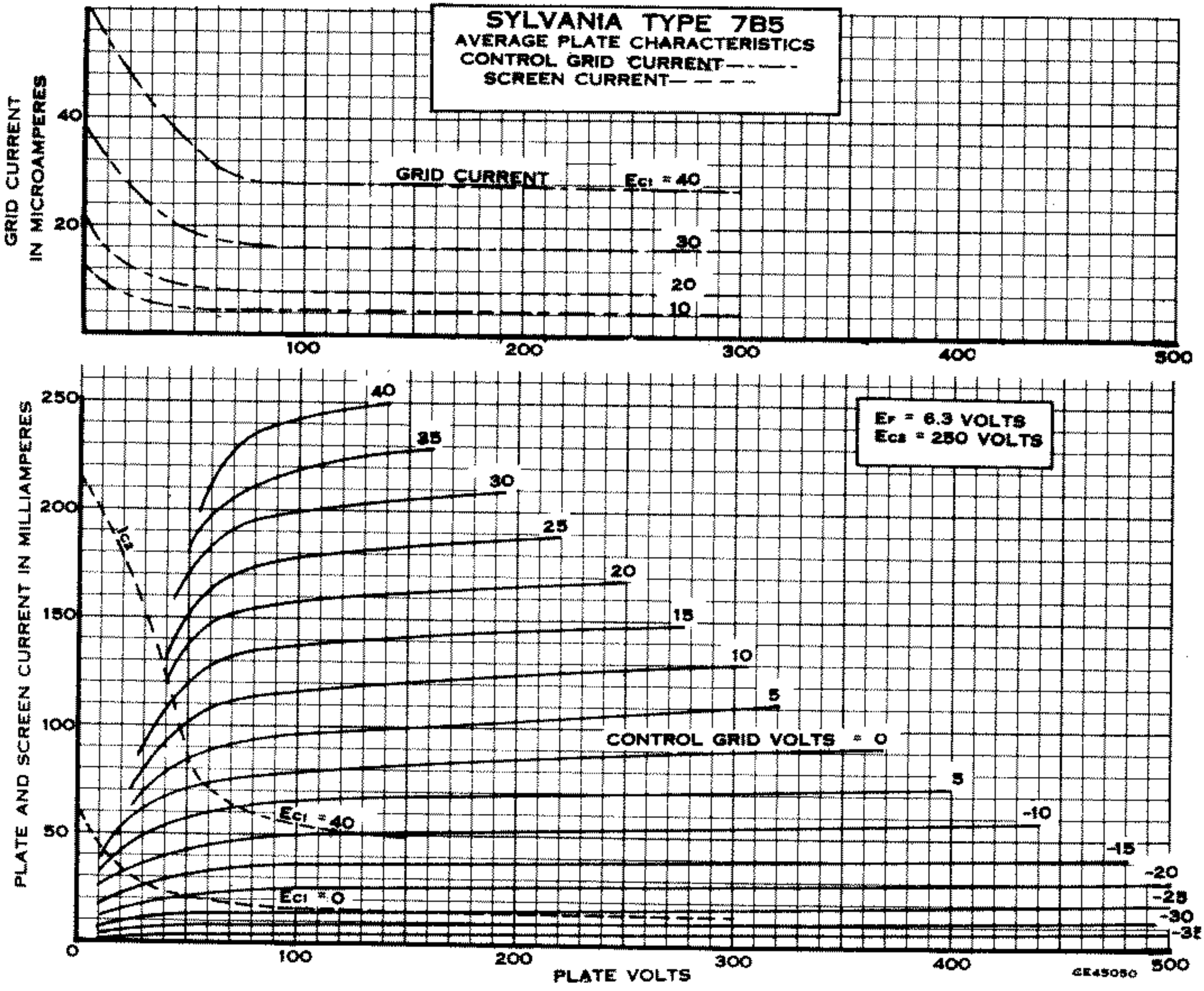
§The DC resistance in the grid circuit should not exceed 0.5 Meg.

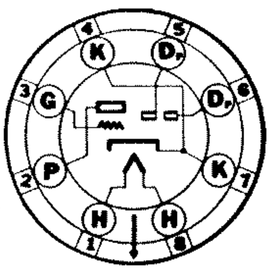
APPLICATION

Sylvania Type 7B5 is a power output pentode of lock-in design. It is suitable for use in automobile and A-C operated receivers with the lock-in design providing ruggedness and compact size.

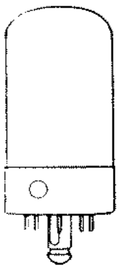


7B5 (Cont.)


SYLVANIA TYPE 7B5
AVERAGE PLATE CHARACTERISTICS
CONTROL GRID CURRENT — · — · —
SCREEN CURRENT — — —
GRID CURRENT IN MICROAMPERES
40
20
GRID CURRENT
Ec1 = 40
30
20
10
100
200
300
400
500
PLATE AND SCREEN CURRENT IN MILLIAMPERES
250
200
150
100
50
0
Ec2
40
35
30
25
20
15
10
5
Er = 6.3 VOLTS
Ec2 = 250 VOLTS
CONTROL GRID VOLTS = 0
5
-10
-15
-20
-25
-30
-35
Ec1 = 40
Ec1 = 0
100
200
300
400
500
PLATE VOLTS
GE45050



8W-L-7



Sylvania Type 7B6

DUODIODE HIGH-MU TRIODE

GT EQUIVALENT 6SQ7GT

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T9
Maximum Overall Length	$2\frac{25}{32}$"
Maximum Seated Height	$2\frac{1}{4}$"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC (Nominal)	7.0 Volts
Heater Current (Nominal)	0.32 Ampere
Maximum Plate Voltage	300 Volts
Maximum Heater-Cathode Voltage	90 Volts
Maximum Diode Drop at 0.8 Ma.	10 Volts
Maximum Diode Current per Plate (Continuous)	1.0 Ma.

Direct Interelectrode Capacitances:*

Grid to Plate	1.6 μμf.
Input	3.0 μμf.
Output	2.4 μμf.
Grid to Diode 1	0.01 μμf.
Grid to Diode 2	0.04 μμf.

*With $1\frac{5}{16}$" diameter shield (RMA Std. M8-308) connected to cathode.

TYPICAL OPERATION

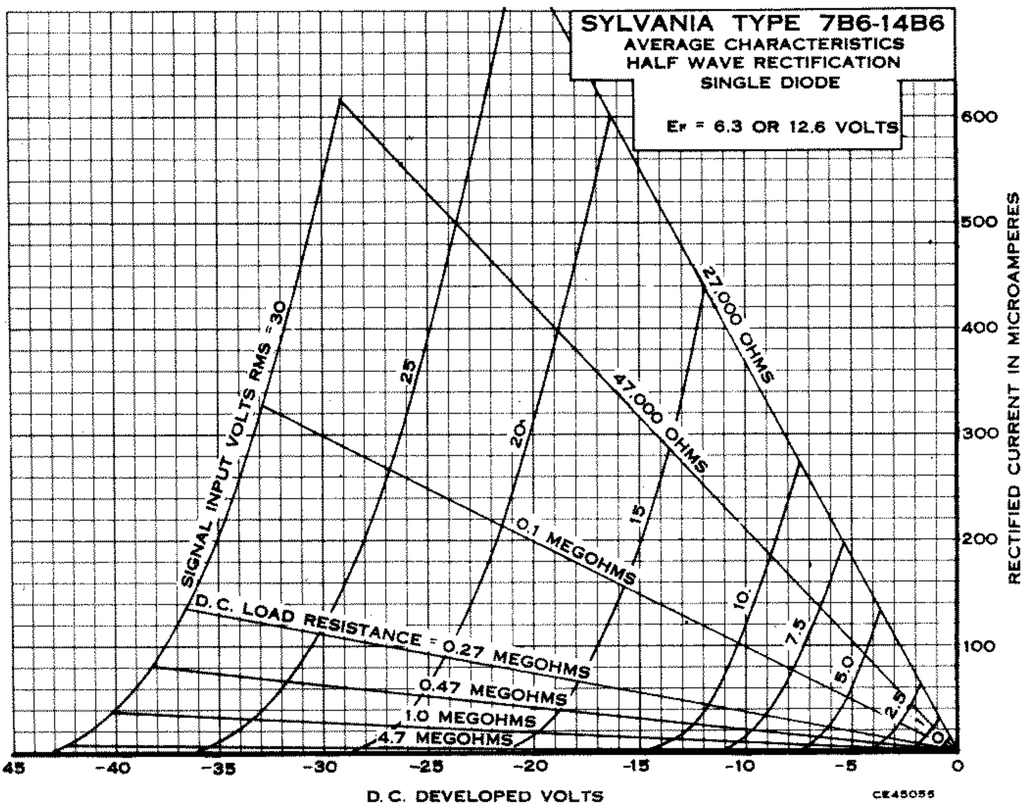
Heater Voltage	6.3	6.3 Volts
Heater Current	0.3	0.3 Ampere
Plate Voltage	100	250 Volts
Grid Voltage	−1	−2 Volts
Plate Current	0.4	0.9 Ma.
Plate Resistance	110000	91000 Ohms
Mutual Conductance	900	1100 μmhos
Amplification Factor	100	100

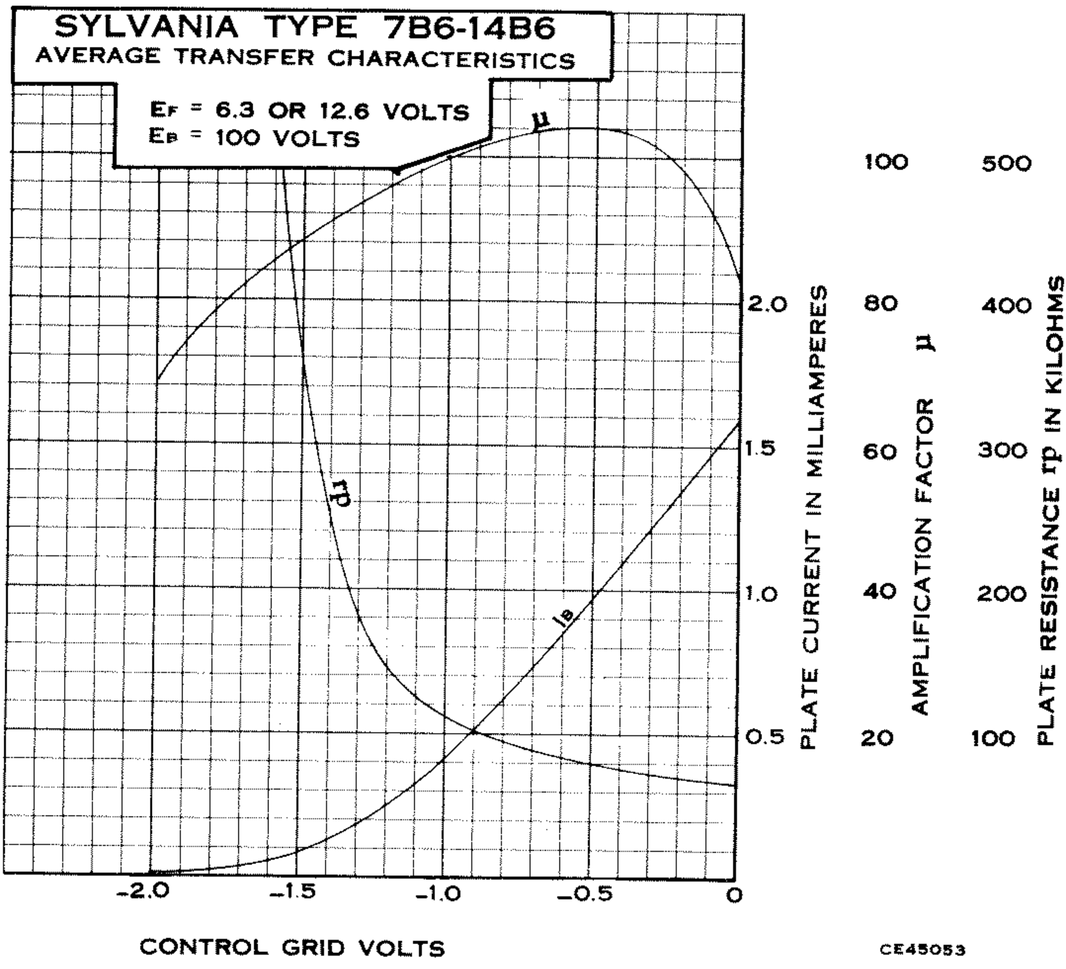
APPLICATION

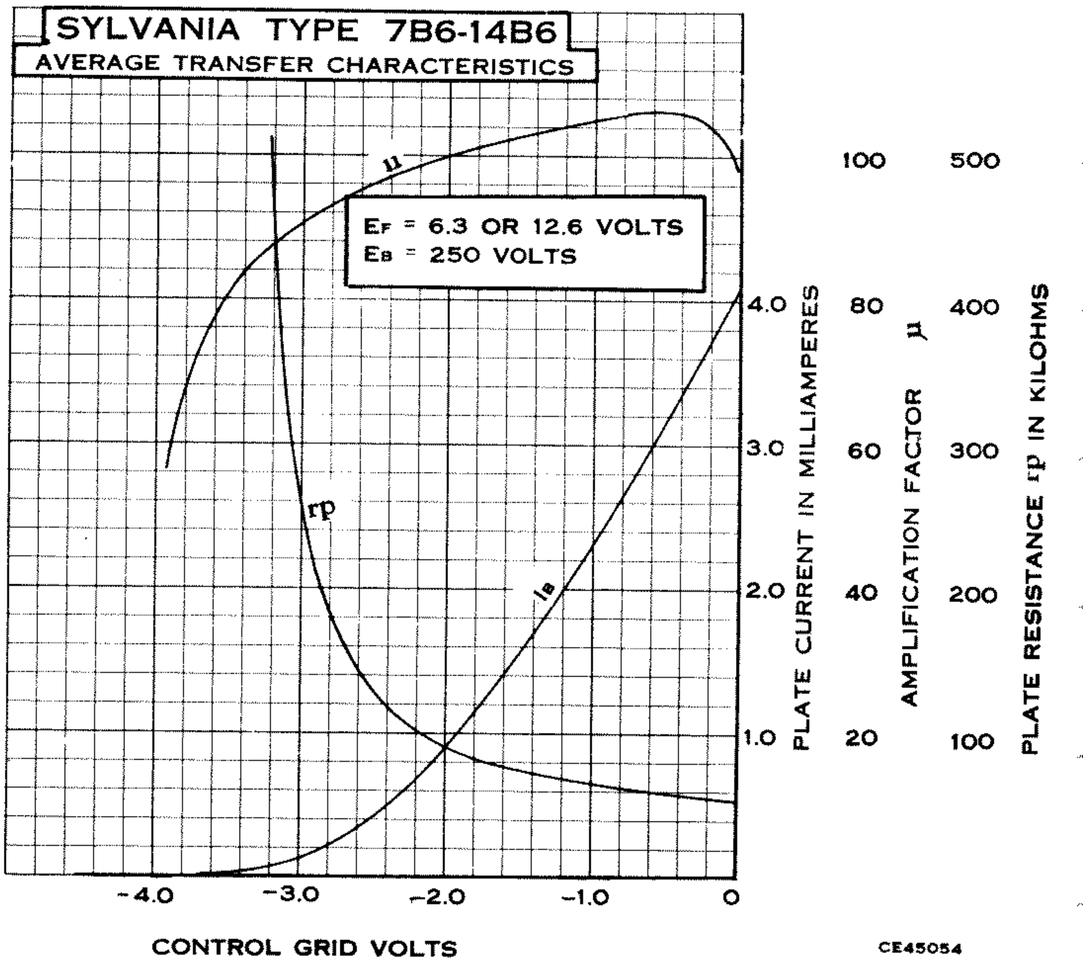
Sylvania Type 7B6 is a duodiode high-mu triode suitable for detector audio amplifier service in AC or auto receivers. For AC-DC receivers, the Types 7C6 or 14B6, having lower heater current ratings, should prove more satisfactory.

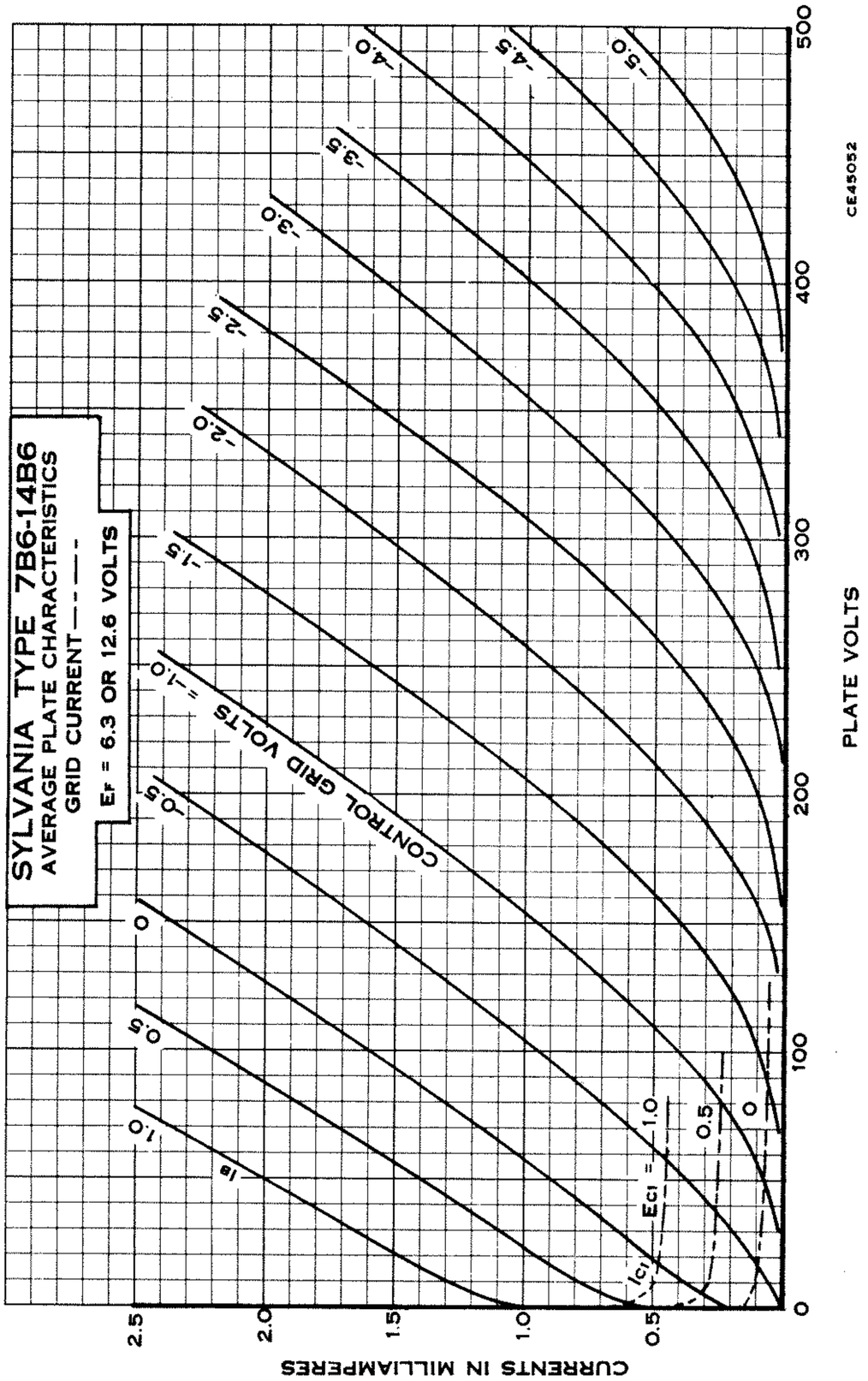
The diodes are independent of each other and of the triode unit except that the cathode structure is common to all. Type 7K7 or 7X7 should be considered if it is necessary to have more complete separation between the various sections.

Resistance coupled amplifier data will be found in the table on Page 48.



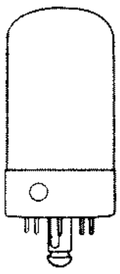

SYLVANIA TYPE 7B6-14B6
AVERAGE TRANSFER CHARACTERISTICS
EF = 6.3 OR 12.6 VOLTS
EB = 100 VOLTS
μ
rp
Ib
-2.0
-1.5
-1.0
-0.5
0
2.0
1.5
1.0
0.5
100
80
60
40
20
500
400
300
200
100
CONTROL GRID VOLTS
PLATE CURRENT IN MILLIAMPERES
AMPLIFICATION FACTOR μ
PLATE RESISTANCE rp IN KILOHMS
CE45053


SYLVANIA TYPE 7B6-14B6
AVERAGE TRANSFER CHARACTERISTICS
EF = 6.3 OR 12.6 VOLTS
EB = 250 VOLTS
μ
rp
Ib
-4.0
-3.0
-2.0
-1.0
0
4.0
3.0
2.0
1.0
100
80
60
40
20
500
400
300
200
100
CONTROL GRID VOLTS
PLATE CURRENT IN MILLIAMPERES
AMPLIFICATION FACTOR μ
PLATE RESISTANCE rp IN KILOHMS
CE45054


SYLVANIA TYPE 7B6-14B6
AVERAGE PLATE CHARACTERISTICS
GRID CURRENT - - - -
Ef = 6.3 OR 12.6 VOLTS
CONTROL GRID VOLTS
-1.0
0
0.5
1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
Ib1
Ec1 =
1.0
0.5
0
Ic1
CURRENTS IN MILLIAMPERES
2.5
2.0
1.5
1.0
0.5
0
100
200
300
400
500
PLATE VOLTS
CE45052

7B7 Sylvania Type

REMOTE CUT-OFF RF PENTODE





8V-L-5

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T9
Maximum Overall Length	$2\frac{25}{32}$"
Maximum Seated Height	$2\frac{1}{4}$"
Mounting Position	Any

RATINGS

Heater Voltage (Nominal) AC or DC	7.0 Volts
Heater Current (Nominal)	0.160 Ampere
Maximum Plate Voltage	300 Volts
Maximum Screen Voltage	100 Volts
Maximum Plate Dissipation	2.25 Watts
Maximum Screen Dissipation	0.25 Watt
Minimum External Grid Bias Voltage	0 Volt
Maximum Heater-Cathode Voltage	90 Volts

Direct Interelectrode Capacitances:*

Grid to Plate	0.007 $\mu\mu$f. Max
Input; Grid to (F+K+Gs+Su))	5.0 $\mu\mu$f.
Output; Plate to (F+K+Gs+Su)	6.0 $\mu\mu$f.

*With $1\frac{5}{16}$" diameter shield (RMA Std. M8-308) connected to cathode.

TYPICAL OPERATION

Heater Voltage	6.3	6.3 Volts
Heater Current	0.150	0.150 Ampere
Plate Voltage	100	250 Volts
Screen Voltage	100	100 Volts
Grid Voltage	−3	−3 Volts
Self-Bias Resistor	300	300 Ohms
Suppressor	Connect to Cathode	
Plate Current	8.2	8.5 Ma.
Screen Current	1.8	1.7 Ma.
Plate Resistance	0.3	0.75 Megohm
Mutual Conductance	1675	1750 μmhos
Grid Voltage for Mutual Conductance of 10 μmhos	−40	−40 Volts

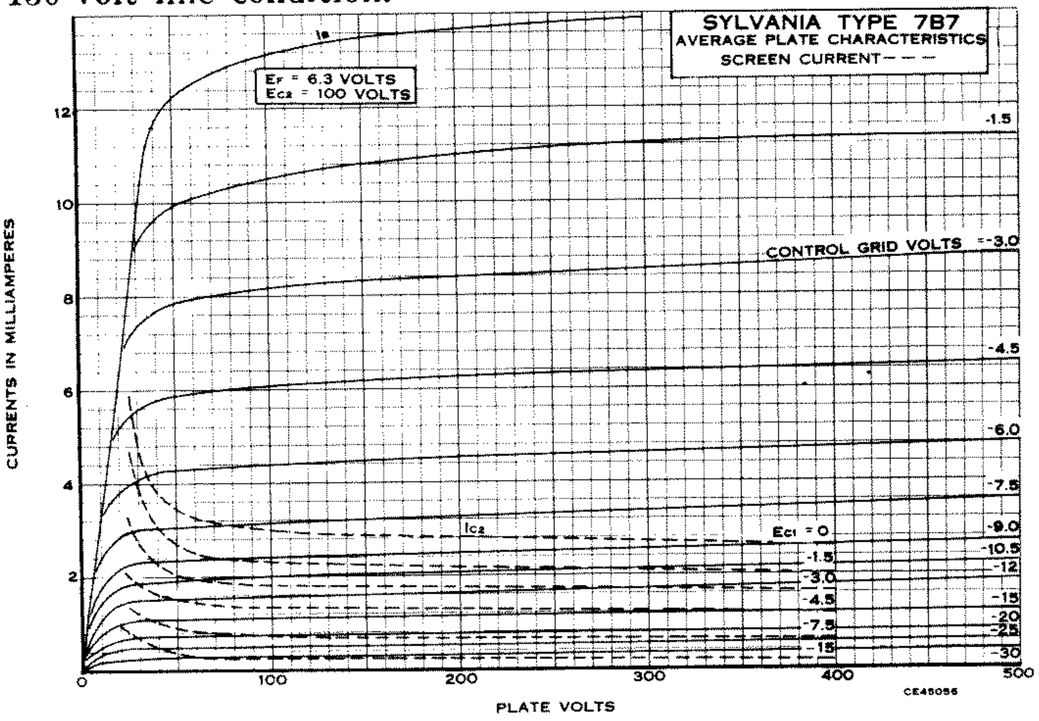
APPLICATION

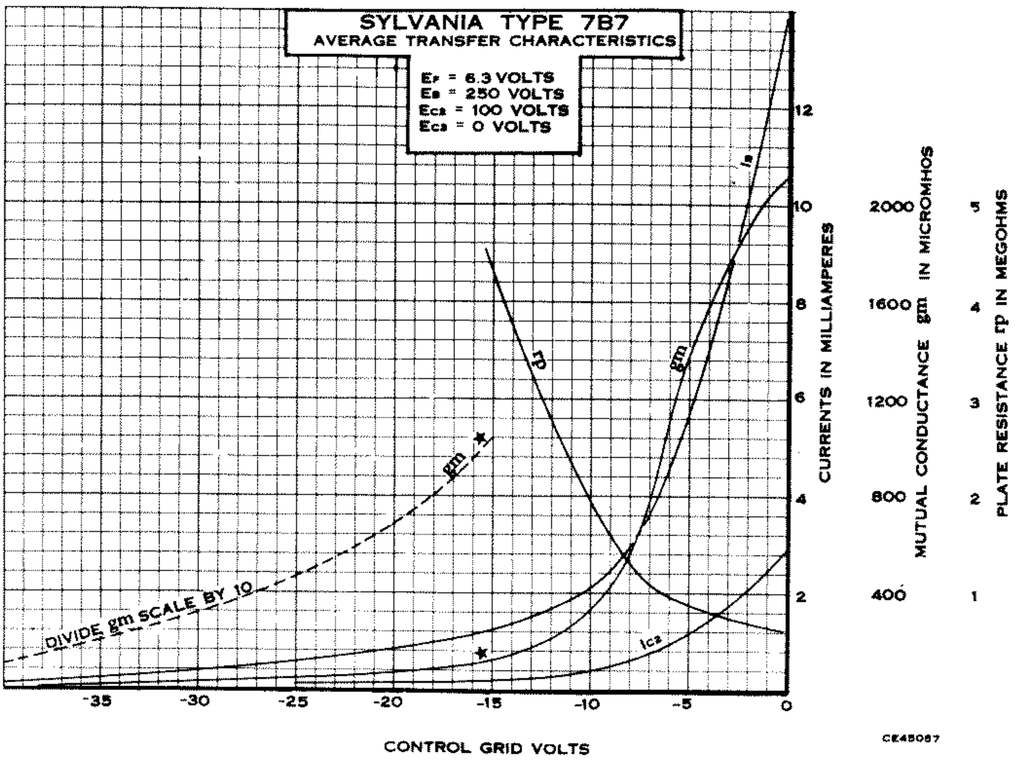
Sylvania Type 7B7 is a single-ended triple grid remote cut-off amplifier of lock-in design suitable for r-f or i-f service in a-c, ac-dc and auto receivers.

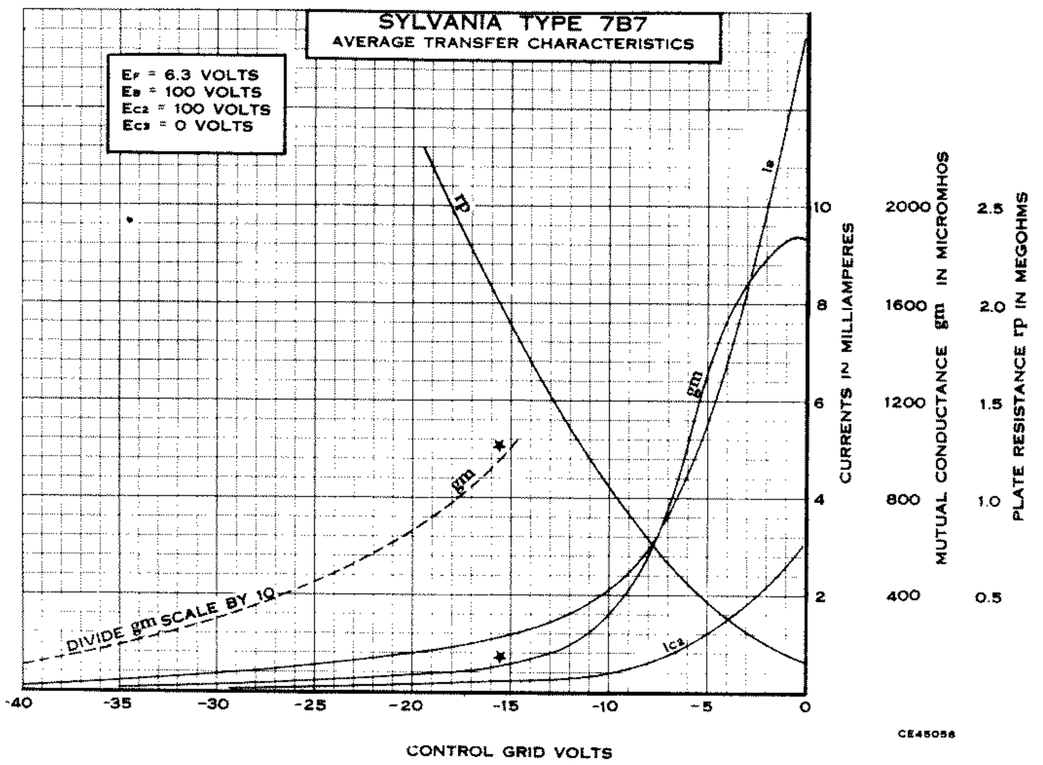
All of the grids terminate a base pins, thus providing an r-f amplifier tube without a top cap. An internal cage-like shield connected to pin Number 5 is used to obtain a small grid to plate capacity.

The electrical characteristics and applications of Type 7B7 are very similar to those for Type 7A7. Reference may be made to this type for application notes.

For a-c service the 7-volt heater rating corresponds to a 130-volt line condition.



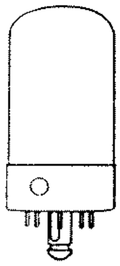

SYLVANIA TYPE 7B7
AVERAGE TRANSFER CHARACTERISTICS
Ef = 6.3 VOLTS
Eb = 250 VOLTS
Ec3 = 100 VOLTS
Ec1 = 0 VOLTS
Ia
Ec
gm
gm
DIVIDE gm SCALE BY 10
Ic2
CURRENTS IN MILLIAMPERES
MUTUAL CONDUCTANCE gm IN MICROMHOS
PLATE RESISTANCE rp IN MEGOHMS
CONTROL GRID VOLTS
CE45057


SYLVANIA TYPE 7B7
AVERAGE TRANSFER CHARACTERISTICS
Ef = 6.3 VOLTS
Eb = 100 VOLTS
Ec2 = 100 VOLTS
Ec1 = 0 VOLTS
Ia
Ec
gm
gm
DIVIDE gm SCALE BY 10
Ic2
CURRENTS IN MILLIAMPERES
MUTUAL CONDUCTANCE gm IN MICROMHOS
PLATE RESISTANCE rp IN MEGOHMS
CONTROL GRID VOLTS
CE45056

7B8 Sylvania Type

HEPTODE CONVERTER

GT EQUIVALENT 6A8GT





8X-L-0

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T9
Maximum Overall Length	$2^{25}/_{32}$"
Maximum Seated Height	$2\ 1/4$"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC (Nominal)	7.0 Volts
Heater Current (Nominal)	0.32 Ampere
Maximum Plate Voltage	300 Volts
Maximum Screen Voltage	100 Volts
Maximum Screen Supply	300 Volts
Maximum Anode Grid Voltage	200 Volts
Maximum Anode Grid Supply	300 Volts
Maximum Plate Dissipation	1.0 Watt
Maximum Screen Dissipation	0.3 Watt
Maximum Anode Grid Dissipation	0.75 Watt
Maximum Cathode Current	14 Ma.
Minimum Signal Grid Bias	0 Volt
Maximum Heater-Cathode Voltage	90 Volts

Direct Interelectrode Capacitances:*

Grid G to Plate	0.2 μμf. Max.
Grid G to Grid Ga	0.2 μμf. Max
Grid G to Grid Go	0.2 μμf. Max.
Grid Go to Grid Ga	0.9 μμf.
Grid G to all Electrodes (R-F Input)	10.0 μμf.
Grid Ga to all Electrodes except Go (Osc. Output)	3.4 μμf.
Grid Go to all Electrodes except Ga (Osc. Input)	5.0 μμf.
Plate to all Electrodes (Mixer Output)	9.0 μμf.

*With $1^{5}/_{16}$" diameter shield (RMA Std. M8-308) connected to cathode.

TYPICAL OPERATION

Heater Voltage	6.3	6.3 Volts
Heater Current	0.3	0.3 Ampere
Plate Voltage	100	250 Volts
Screen Voltage	50	100 Volts
Anode Grid Voltage	100	250** Volts
Control Grid (G) Voltage	−1.5	−3.0 Volts
Oscillator Grid (Go) Resistor	50000	50000 Ohms
Plate Current	1.1	3.5 Ma.
Screen Grid Current	1.3	2.7 Ma.
Anode Grid Current	2.0	4.0 Ma.
Oscillator Grid Current	0.25	0.4 Ma.
Self-Bias Resistor	360	300 Ohms
Plate Resistance	0.6	0.36 Megohm
Conversion Conductance	360	550 μmhos
Control Grid Voltage (Approximate)		
For 6 μmhos Conversion Conductance	.....	−35 Volts
For 3 μmhos Conversion Conductance	−20	..... Volts

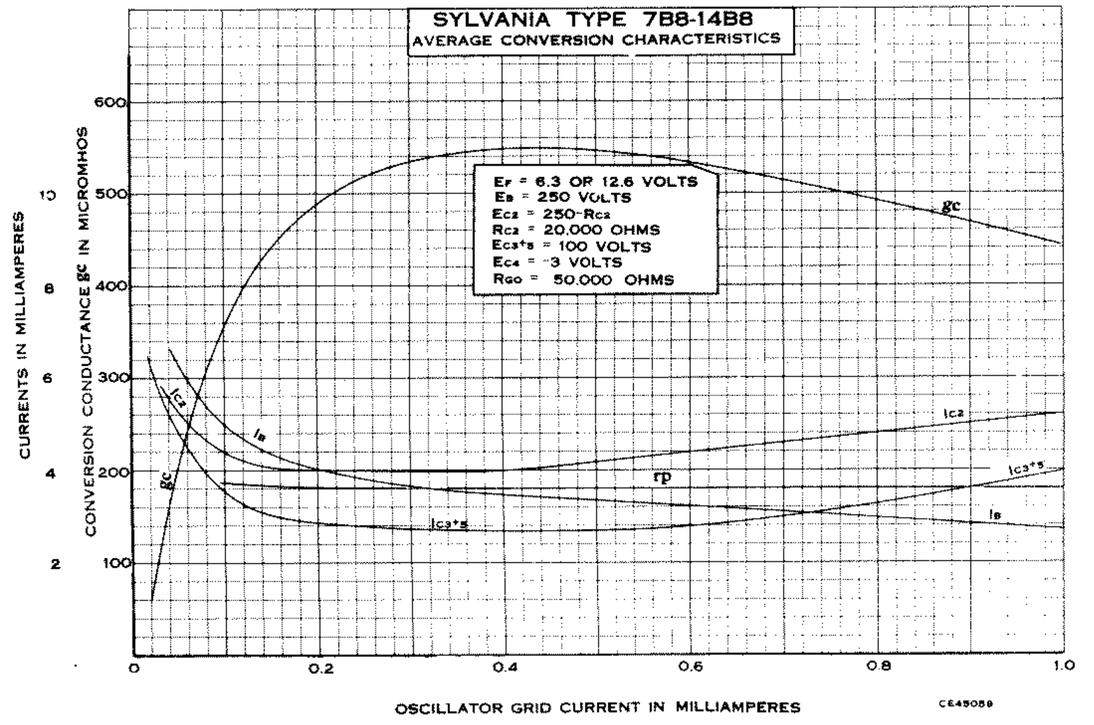
**Applied through 20,000 ohm dropping resistor.

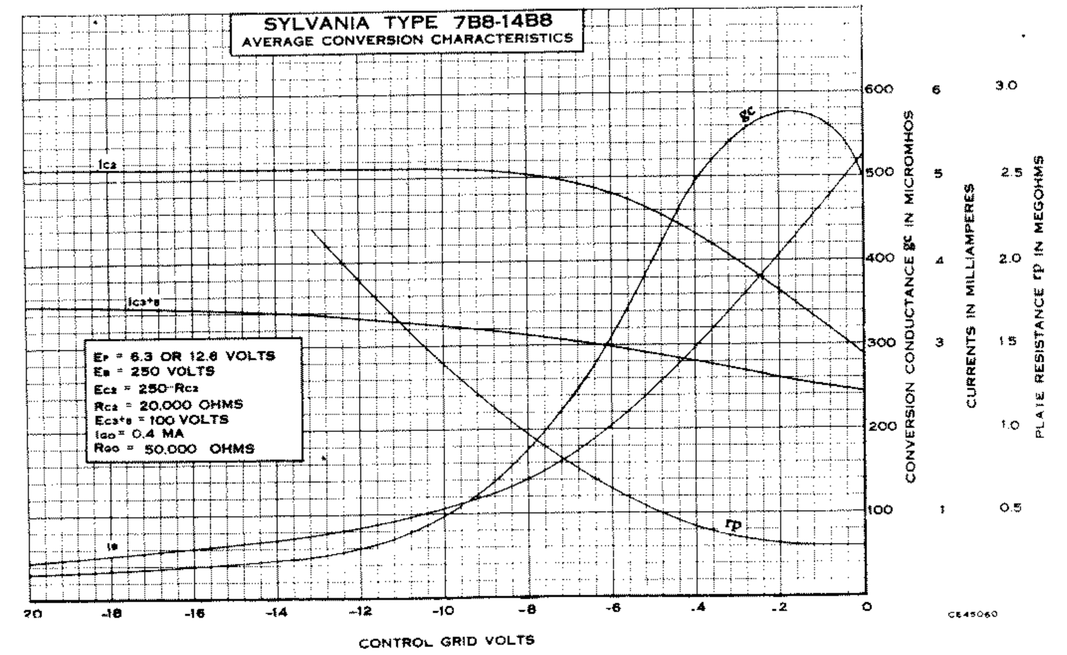
The oscillator section, not oscillating, has a Gm of 1150 μmhos, a mu of 75 at an anode grid current of 4.0 ma. when Ep = 250 Volts; Ega = 100 Volts; Egs = 55 Volts; Eg = 2.0 Volts and Ego = −1.0 Volt.

APPLICATION

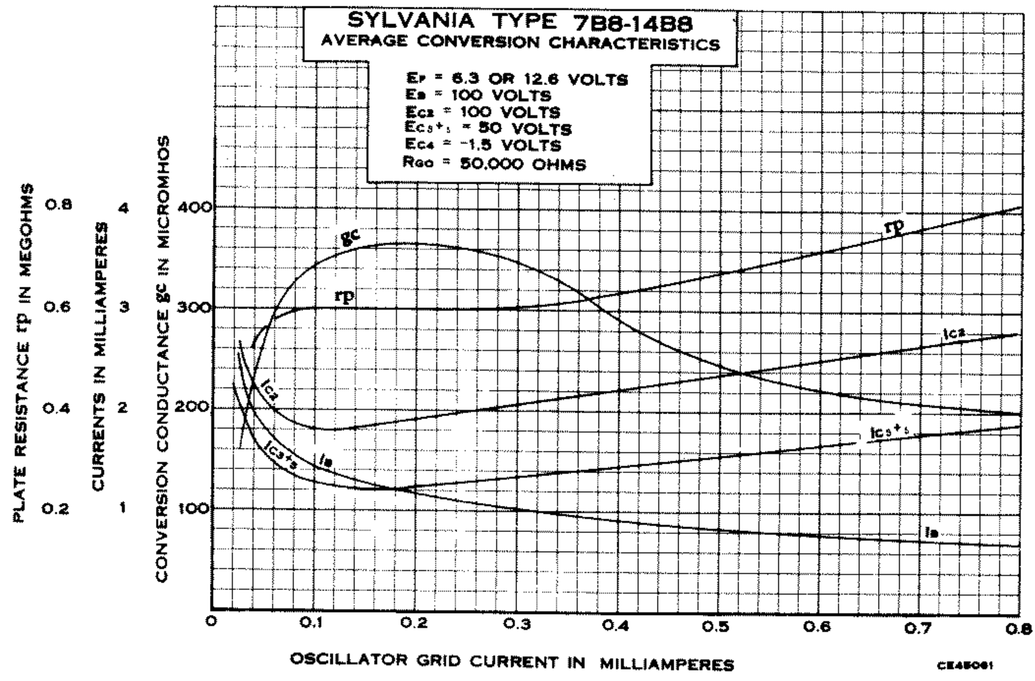
Sylvania Type 7B8 is a lock-in converter tube designed for use in AC or auto receivers. For AC-DC service, Type 14B8 with lower heater current rating will usually prove more satisfactory.

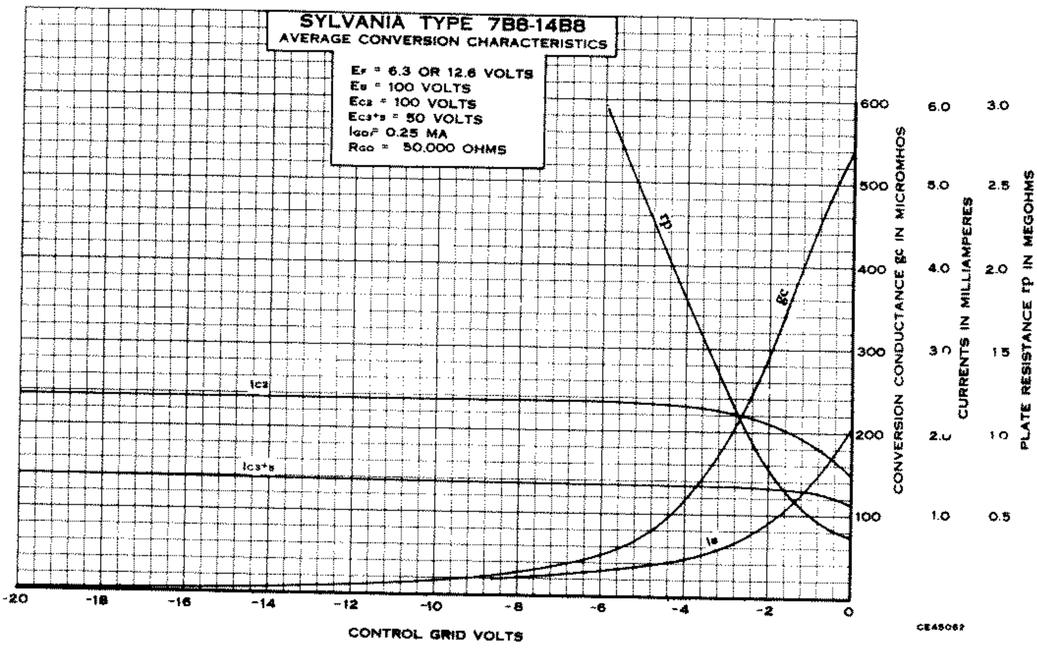
Electrically, Type 7B8 is similar to the older oscillator mixer tubes. Conventional circuits and design are readily adaptable for use with this compact rugged tube. As is usual with converter tubes, it is well to ascertain that the maximum cathode current does not exceed the rated limit under any encountered operating condition.


SYLVANIA TYPE 7B8-14B8
AVERAGE CONVERSION CHARACTERISTICS
Ef = 6.3 OR 12.6 VOLTS
Eb = 250 VOLTS
Ec2 = 250-Rc2
Rc2 = 20,000 OHMS
Ec3+s = 100 VOLTS
Ec4 = -3 VOLTS
Rgo = 50,000 OHMS
gc
Ic2
Ib
rp
Ic3+s
CURRENTS IN MILLIAMPERES
CONVERSION CONDUCTANCE gc IN MICROMHOS
OSCILLATOR GRID CURRENT IN MILLIAMPERES
CE45059


SYLVANIA TYPE 7B8-14B8
AVERAGE CONVERSION CHARACTERISTICS
Ef = 6.3 OR 12.6 VOLTS
Eb = 250 VOLTS
Ec2 = 250-Rc2
Rc2 = 20,000 OHMS
Ec3+s = 100 VOLTS
Ig0 = 0.4 MA
Rgo = 50,000 OHMS
gc
Ic2
Ic3+s
Ib
rp
CONVERSION CONDUCTANCE gc IN MICROMHOS
CURRENTS IN MILLIAMPERES
PLATE RESISTANCE rp IN MEGOHMS
CONTROL GRID VOLTS
CE45060

7B8 (Cont.)


SYLVANIA TYPE 7B8-14B8
AVERAGE CONVERSION CHARACTERISTICS
Ef = 6.3 OR 12.6 VOLTS
Eb = 100 VOLTS
Ec2 = 100 VOLTS
Ec3+1 = 50 VOLTS
Ec4 = -1.5 VOLTS
Rgc = 50,000 OHMS
PLATE RESISTANCE rp IN MEGOHMS
CURRENTS IN MILLIAMPERES
CONVERSION CONDUCTANCE gc IN MICROMHOS
OSCILLATOR GRID CURRENT IN MILLIAMPERES
gc
rp
Ic2
Ic3+5
Ib
CE45061


SYLVANIA TYPE 7B8-14B8
AVERAGE CONVERSION CHARACTERISTICS
Ef = 6.3 OR 12.6 VOLTS
Eb = 100 VOLTS
Ec2 = 100 VOLTS
Ec3+5 = 50 VOLTS
Igc = 0.25 MA
Rgc = 50,000 OHMS
CONVERSION CONDUCTANCE gc IN MICROMHOS
CURRENTS IN MILLIAMPERES
PLATE RESISTANCE rp IN MEGOHMS
CONTROL GRID VOLTS
rp
gc
Ic2
Ic3+5
Ib
CE45062

SYLVANIA

engineering data service

SYLVANIA
7BP2A
7BP-A*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic	
Deflection Method	Magnetic	
Deflection Angle (Approx.)	53	Degrees

Types*	7BP2A	7BP7A
Fluorescence	Green	Blue
Phosphorescence	—	Yellow
Persistence	Long	Long
Faceplate	Clear	

**In addition to the types shown, the 7BP-A can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Ampere
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	8.5	μμf
Grid No. 2 to All Other Electrodes	7	μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	6	Inches
Bulb	J56R or Equivalent	
Bulb Contact (Recessed Small Cavity Cap)	J1-22	
Base (Long Medium-Shell Octal 8-Pin)	B8-65	
or (Long Medium-Shell Octal 5-Pin)	B5-80	
Basing	5AN	
Weight (Approx.)	3	Pounds

RATINGS

MAXIMUM RATINGS

Anode Voltage	8,800	Volts	dc
Grid No. 2 Voltage	770	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	200	Volts	dc
Positive Bias Value[1]	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode	140	Volts	
Heater Positive with Respect to Cathode	140	Volts	

TYPICAL OPERATING CONDITIONS

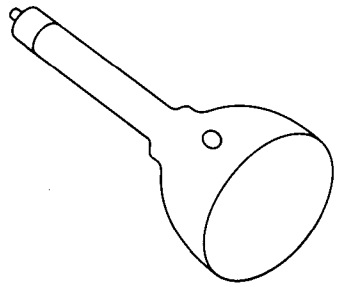
Anode Voltage[2]	4000	7000	Volts	dc
Grid No. 2 Voltage	250	250	Volts	dc
Grid No. 1 Voltage for Cutoff[3]	−25 to −70	−25 to −70	Volts	dc
Focusing-Coil Current[4]	75 to 102	99 to 135	Ma	dc
Spot Position		See Note 5		

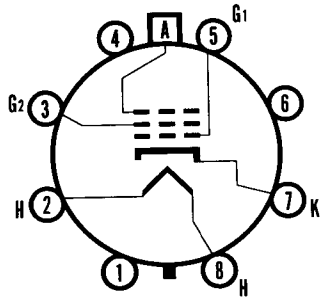
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms Max.

QUICK REFERENCE DATA

Radar Indicator
7" Direct Viewed
Round Glass Type
Magnetic Deflection
Magnetic Focus





5-AN

SYLVANIA ELECTRONIC TUBES
A Division of
SYLVANIA ELECTRIC PRODUCTS, Inc.
PICTURE TUBE
OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

DECEMBER 1958

NOTES:

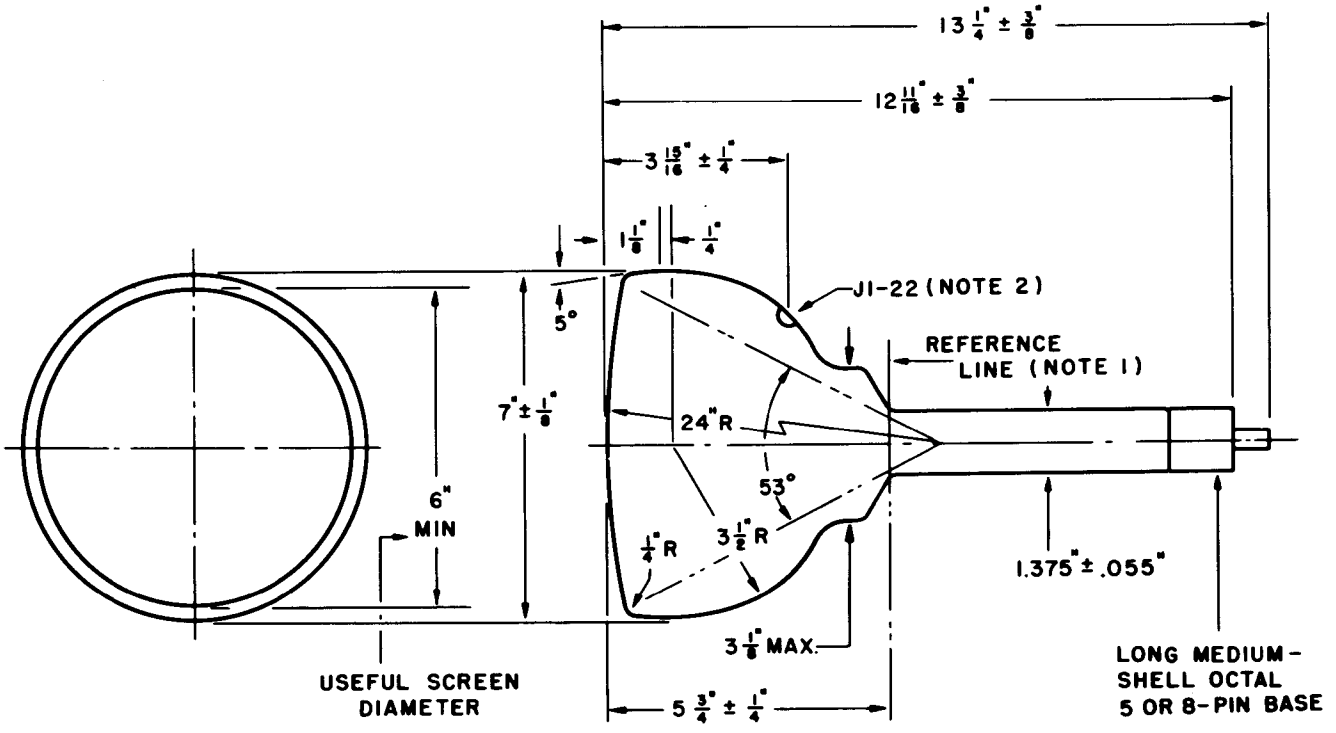
1. *At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, anode voltage should not be less than 4,000 volts.*
3. *Visual extinction of undeflected focused spot.*
4. *For JETEC Focusing Coil No. 106, or equivalent, with center line of air gap approximately 2¾ inches from reference line (See Outline Drawing) and total anode current of 200 microamperes.*
5. *The center of the undeflected, unfocused spot will fall within a circle having 12 mm radius concentric with the center of the tube face.*

7BP7

Sylvania Type 7BP7A replaces Type 7BP7.

WARNING:

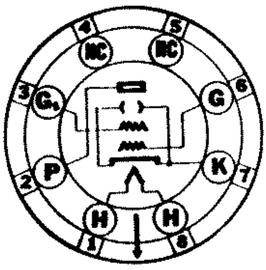
X-ray radiation shielding may be necessary to protect against danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.



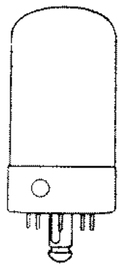
SS8011

DIAGRAM NOTES:

1. *Reference line is determined by position where gauge 1.430 $^{+\ .003}_{-\ .000}$ inch I.D. and 2 inches long will seat against the bulb cone.*
2. *The plane through the tube axis and Pin No. 5 may vary from the plane through the tube axis and anode terminal by an angular tolerance (measured about the tube axis) of 10 degrees. Anode terminal is on same side of the tube as Pin No. 5*



6AA-L-0



Sylvania Type 7C5

BEAM POWER AMPLIFIER

GT EQUIVALENT 6V6GT

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T9
Maximum Overall Length	3 5/32"
Maximum Seated Height	2 5/8"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC (Nominal)	7.0 Volts
Heater Current	0.48 Ampere
Maximum Plate Voltage	315 Volts
Maximum Screen Voltage	285 Volts
Maximum Plate Dissipation	12 Watts
Maximum Screen Dissipation	2 Watts
Maximum Heater-Cathode Voltage	90 Volts

Direct Interelectrode Capacitances:*

Grid to Plate	0.4 μμf.
Input	9.5 μμf.
Output	9.0 μμf.

*With 1 5/16" diameter shield (RMA Std. M8-308) connected to cathode.

TYPICAL OPERATION

CLASS A_1 AMPLIFIER (ONE TUBE)

Heater Voltage	6.3	6.3	6.3 Volts
Heater Current	0.45	0.45	0.45 Ampere
Plate Voltage	180	250	315 Volts
Screen Voltage	180	250	225 Volts
Grid Voltage	−8.5	−12.5	−13.0 Volts
Self-Bias Resistor	260	250	360 Ohms
Peak Input Signal	8.5	12.5	13.0 Volts
Plate Current (Zero Signal)	29	45	34 Ma.
Plate Current (Maximum Signal)	30	47	35 Ma.
Screen Current (Zero Signal)	3.0	4.5	2.2 Ma.
Screen Current (Maximum Signal)	4.0	7.0	6.0 Ma.
Plate Resistance	58000	52000	77000 Ohms
Mutual Conductance	3700	4100	3750 μmhos
Load Resistance	5500	5000	8500 Ohms
Power Output	2.0	4.5	5.5 Watts
Total Harmonic Distortion	8	8	12 Per Cent

CLASS AB_1 AMPLIFIER (PUSH-PULL)

(Values are for two tubes)

Heater Voltage	6.3	6.3 Volts
Heater Current	0.45	0.45 Ampere
Plate Voltage	250	285 Volts
Screen Voltage	250	285 Volts
Grid Voltage	−15	−19 Volts
Self-Bias Resistor	200	260 Ohms
Peak Input Signal (Grid to Grid)	30	38 Volts
Plate Current (Zero Signal)	70	70 Ma.
Plate Current (Maximum Signal)	79	92 Ma.
Screen Current (Zero Signal)	5	4 Ma.
Screen Current (Maximum Signal)	13	13.5 Ma.
Plate Resistance	60000	65000 Ohms
Mutual Conductance	3750	3600 μmhos
Load Resistance (Plate to Plate)	10000	8000 Ohms
Power Output	10.0	14.0 Watts
Total Harmonic Distortion	5	3.5 Per Cent

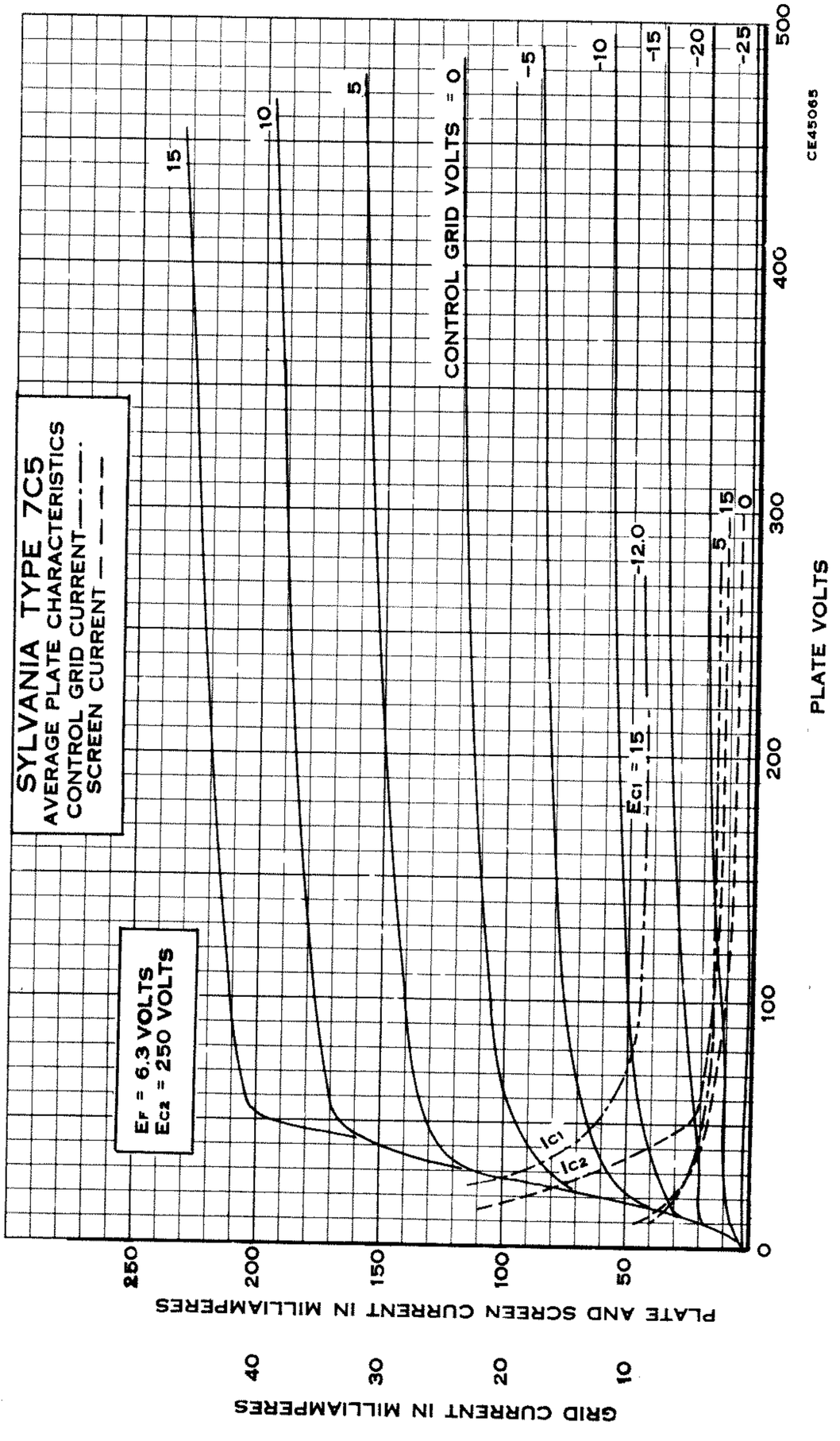
APPLICATION

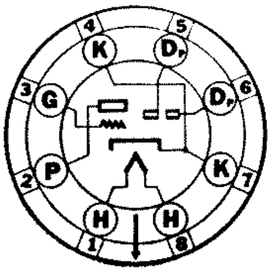
Sylvania Type 7C5 is a beam power amplifier which provides high power output, power sensitivity, and efficiency with a low percentage of third and higher order harmonics. The electrical characteristics and applications are identical with those for Types 6V6 and 6V6G. The Type 7C5 should prove very desirable in applications where heater and plate current drain must be maintained at a minimum.

The lock-in construction provides compactness, suitable shielding and the special lock-in feature. For a-c service the 7-volt heater rating corresponds to a 130-volt line condition.

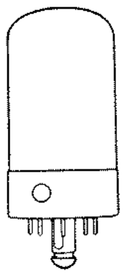
When fixed bias is employed the resistance in the grid circuit should not be greater than 0.05 megohm. With cathode bias the grid circuit resistance must not exceed 0.5 megohm.

7C5 (Cont.)


SYLVANIA TYPE 7C5
AVERAGE PLATE CHARACTERISTICS
CONTROL GRID CURRENT —·—·—
SCREEN CURRENT — — — —
Ef = 6.3 VOLTS
Ec2 = 250 VOLTS
CONTROL GRID VOLTS = 0
-5
-10
-15
-20
-25
15
10
5
Ec1 = 15
-12.0
5
15
0
Ic1
Ic2
PLATE VOLTS
0
100
200
300
400
500
PLATE AND SCREEN CURRENT IN MILLIAMPERES
250
200
150
100
50
GRID CURRENT IN MILLIAMPERES
40
30
20
10
CE45065



8W-L-7



Sylvania Type 7C6

DUODIODE HIGH-MU TRIODE

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T-9
Maximum Overall Length	$2\frac{35}{32}$"
Maximum Seated Height	$2\frac{1}{4}$"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC (Nominal)	7.0 Volts
Heater Current (Nominal)	0.16 Ampere
Maximum Plate Voltage	300 Volts
Maximum Diode Drop at .8 Ma.	10 Volts
Maximum Diode Current per Plate (Continuous)	1.0 Ma.
Maximum Heater-Cathode Voltage	90 Volts

TYPICAL OPERATION

Heater Voltage	6.3	6.3 Volts
Heater Current	0.150	0.150 Ampere
Plate Voltage	100	250 Volts
Grid Voltage*	0.0	−1.0 Volt
Plate Current*	1.0	1.3 Ma.
Plate Resistance*	0.1	0.1 Megohm
Mutual Conductance*	850	1000 μmhos
Amplification Factor*	85	100

*These are rating values only and not operating points with coupling resistor. Refer to tabulated data on page 49 for this information.

APPLICATION

Sylvania Type 7C6 is a single-ended duodiode high-mu triode having electrical characteristics quite similar to those for Type 75, except for the heater ratings.

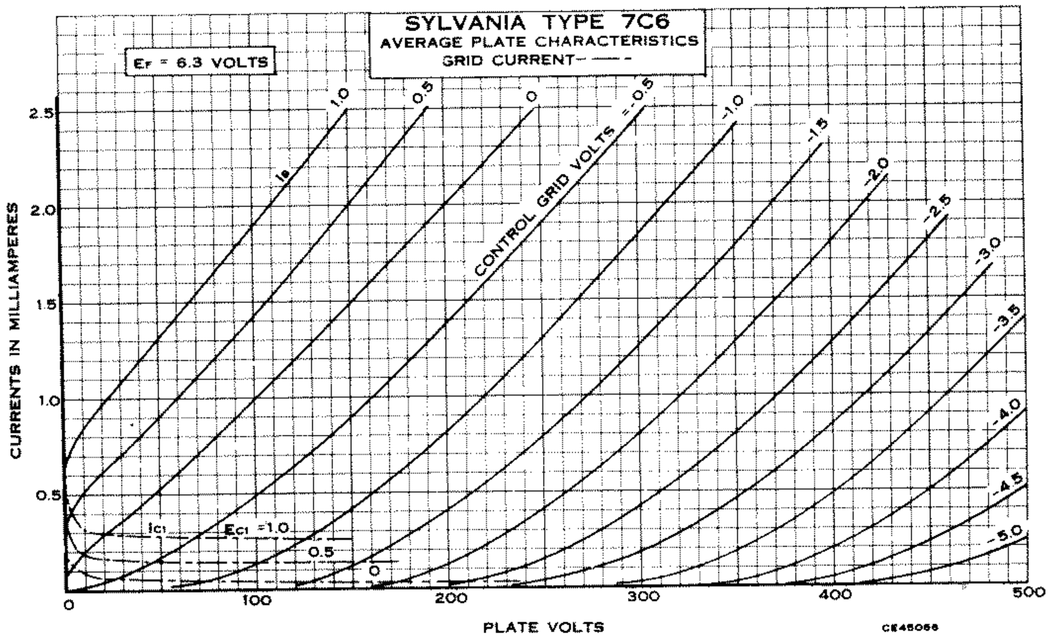
The diodes are substantially the same as those employed in other Sylvania duodiode high-mu triode types and therefore are suitable for conventional circuit applications. Diode curves are given under Type 7B6.

The triode section should not be employed with fixed bias. A high value of grid resistor is required and the triode operated essentially under zero bias conditions. With a plate supply voltage of 250 volts, the plate load resistor should be approximately 0.25 megohm. For special applications this value may be varied to suit the conditions.

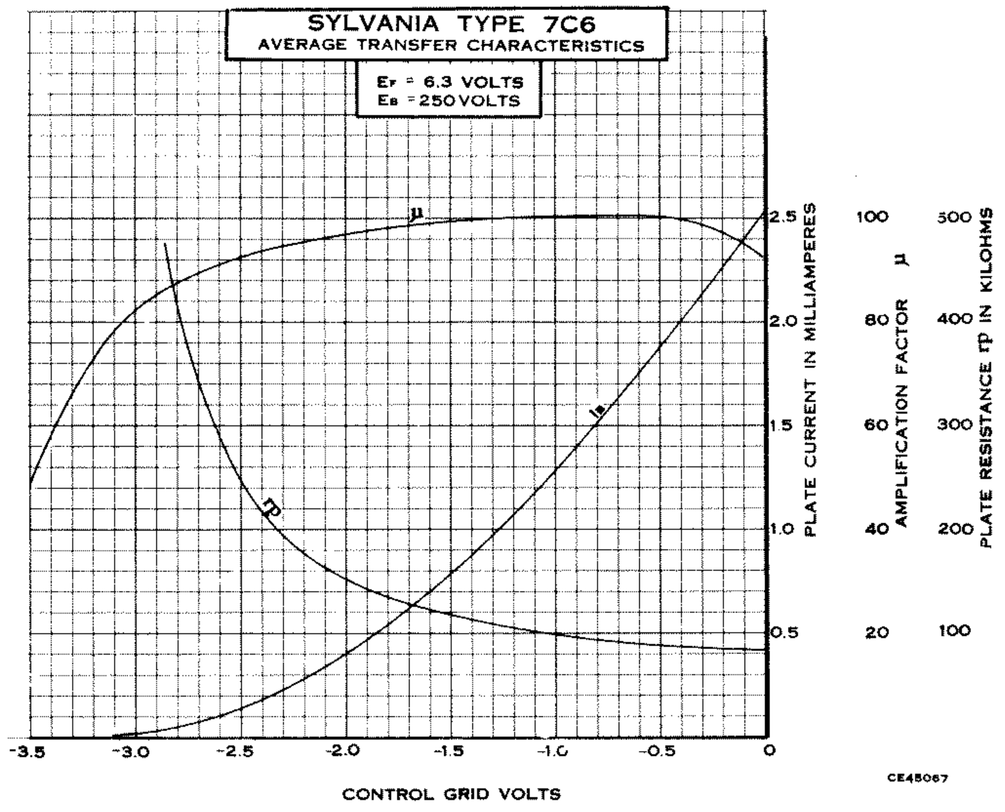
Resistance coupled data is given on page 49.

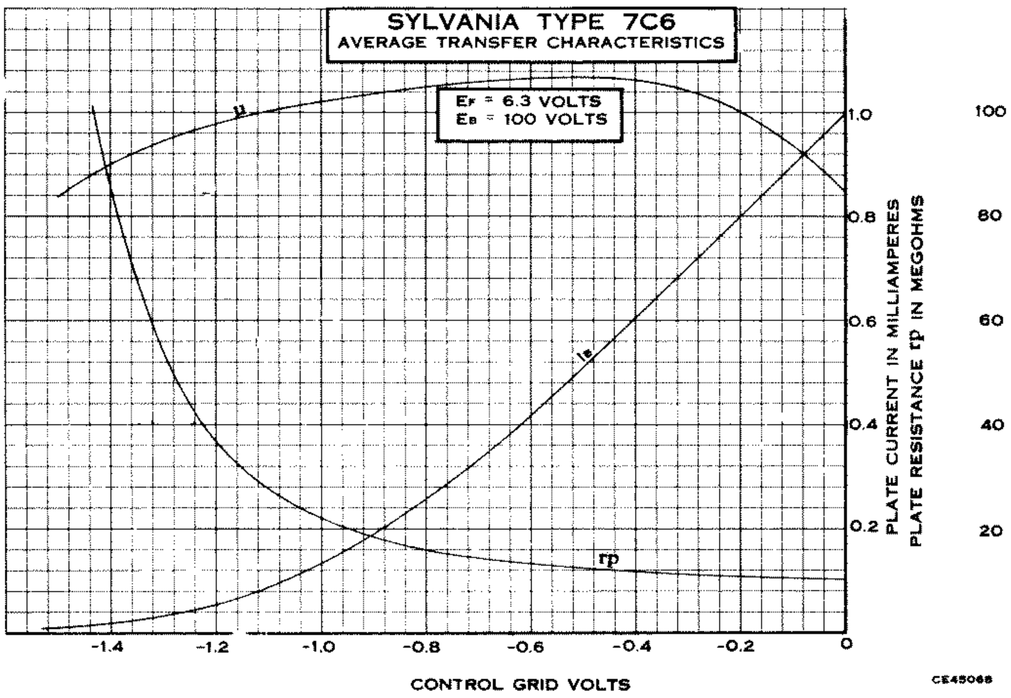
It will be noted from the base diagram that the cathode is connected to two contact pins, Numbers 4 and 7. Pin Number 4 is used as a mount support for the cathode, therefore, the potential of Pins 4 and 7 is the same.

The lock-in construction provides compactness, suitable shielding and the special lock-in feature. For a-c service the 7-volt heater rating corresponds to a 130-volt line condition.



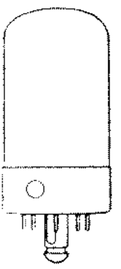
7C6 (Cont.)


SYLVANIA TYPE 7C6
AVERAGE TRANSFER CHARACTERISTICS
Ef = 6.3 VOLTS
Eb = 250 VOLTS
μ
rp
Ib
-3.5
-3.0
-2.5
-2.0
-1.5
-1.0
-0.5
0
2.5
2.0
1.5
1.0
0.5
100
80
60
40
20
500
400
300
200
100
PLATE CURRENT IN MILLIAMPERES
AMPLIFICATION FACTOR μ
PLATE RESISTANCE rp IN KILOHMS
CONTROL GRID VOLTS
CE45067


SYLVANIA TYPE 7C6
AVERAGE TRANSFER CHARACTERISTICS
Ef = 6.3 VOLTS
Eb = 100 VOLTS
μ
Ib
rp
-1.4
-1.2
-1.0
-0.8
-0.6
-0.4
-0.2
0
1.0
0.8
0.6
0.4
0.2
100
80
60
40
20
PLATE CURRENT IN MILLIAMPERES
PLATE RESISTANCE rp IN MEGOHMS
AMPLIFICATION FACTOR μ
CONTROL GRID VOLTS
CE45068



8V-L-5



Sylvania Type 7C7

SHARP CUT-OFF RF PENTODE

GT EQUIVALENT 6W7G

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T-9
Maximum Overall Length	$2^{25}/_{32}$"
Maximum Seated Height	$2\,^{1}/_{4}$"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC (Nominal)	7.0 Volts
Heater Current	0.16 Ampere
Maximum Plate Voltage	300 Volts
Maximum Screen Voltage	100 Volts
Maximum Screen Supply	300 Volts
Maximum Plate Dissipation	1.0 Watt
Maximum Screen Dissipation	0.1 Watt
Minimum Grid Bias	0 Volt
Maximum Heater-Cathode Voltage	90 Volts

Direct Interelectrode Capacitances:*

Grid to Plate (G1 to P)	0.007 $\mu\mu$f. Max.
Input; G1 to (F+K+Gs+Su+Shield)	5.5 $\mu\mu$f.
Output; P to (F+K+Gs+Su+Shield)	6.5 $\mu\mu$f.

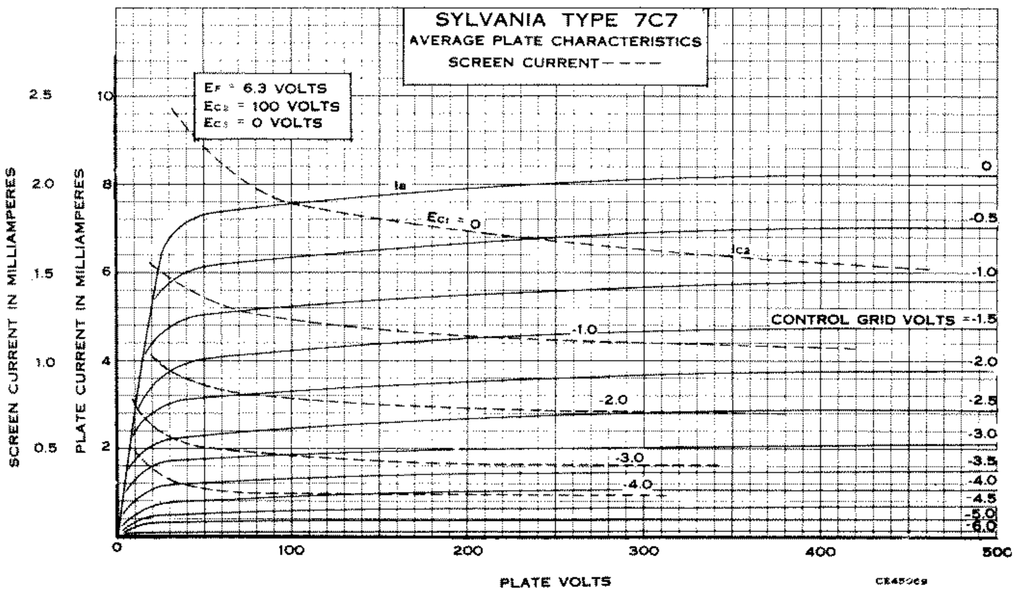
*With $1\,^{5}/_{16}$" diameter shield (RMS Std. M8-308) connected to cathode.

TYPICAL OPERATION

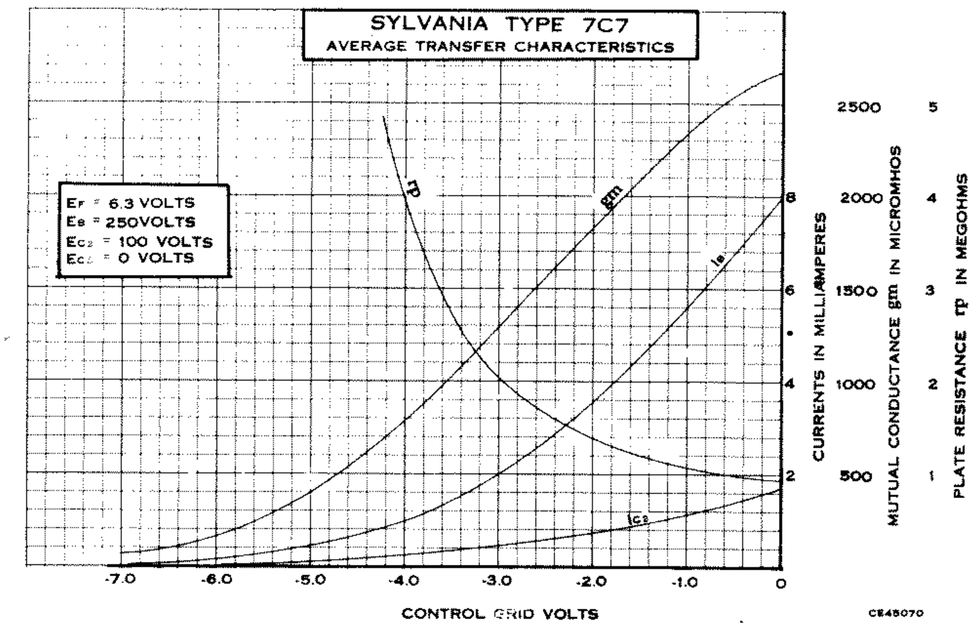
Heater Voltage	6.3	6.3 Volts
Heater Current	0.150	0.150 Ampere
Plate Voltage	100	250 Volts Max.
Screen Voltage	100	100 Volts Max.
Grid Voltage	−3	−3 Volts Min.
Self-Bias Resistor	130	120 Ohms
Suppressor Grid	Connect to Cathode	
Plate Current	1.8	2.0 Ma.
Screen Current	0.4	0.5 Ma.
Plate Resistance (Approximate)	1.2	2 Megohms
Mutual Conductance	1225	1300 μmhos

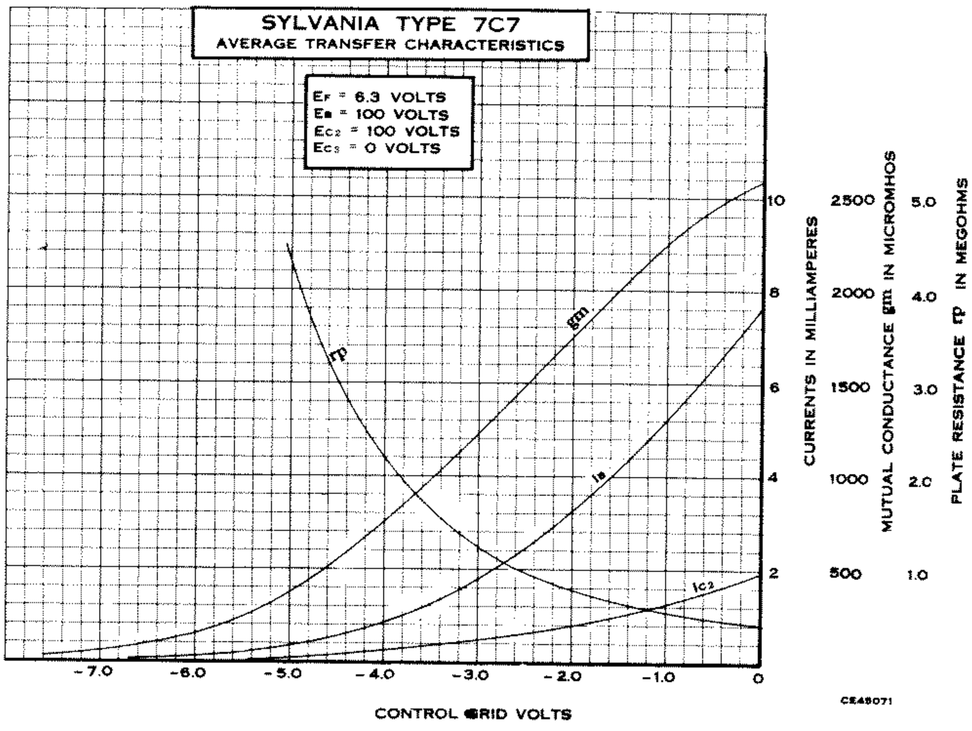
APPLICATION

Sylvania Type 7C7 is a sharp cut-off pentode with a low heater current rating. In other respects it is similar to the older Type 6J7GT. Design data for use in resistance coupled circuits appears on Page 50.



7C7 (Cont.)


SYLVANIA TYPE 7C7
AVERAGE TRANSFER CHARACTERISTICS
Ef = 6.3 VOLTS
Eb = 250VOLTS
Ec2 = 100 VOLTS
Ec3 = 0 VOLTS
rp
gm
Ib
Ic2
-7.0
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0
CONTROL GRID VOLTS
CURRENTS IN MILLIAMPERES
MUTUAL CONDUCTANCE gm IN MICROMHOS
PLATE RESISTANCE rp IN MEGOHMS
2500
2000
1500
1000
500
8
6
4
2
5
4
3
2
1
CE45070


SYLVANIA TYPE 7C7
AVERAGE TRANSFER CHARACTERISTICS
Ef = 6.3 VOLTS
Eb = 100 VOLTS
Ec2 = 100 VOLTS
Ec3 = 0 VOLTS
rp
gm
Ib
Ic2
-7.0
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0
CONTROL GRID VOLTS
CURRENTS IN MILLIAMPERES
MUTUAL CONDUCTANCE gm IN MICROMHOS
PLATE RESISTANCE rp IN MEGOHMS
2500
2000
1500
1000
500
10
8
6
4
2
5.0
4.0
3.0
2.0
1.0
CE45071

RMA Release # 199

HYGRADE SYLVANIA CORPORATION

TECHNICAL DATA

SYLVANIA TYPES 7D7 & 21A7

Triode Hexode Converters

TENTATIVE RATINGS AND CHARACTERISTICS

Heater Voltage (Nominal)	Type 7D7	7.0	Volts
Heater Voltage (Nominal)	Type 21A7	21.0	Volts
Heater Current (Nominal)	Type 7D7	0.480	Ampere
Heater Current (Nominal)	Type 21A7	0.160	Ampere

Direct Interelectrode Capacitances:*

Hexode Grid (G_1) to Hexode Plate	0.07	mmf. Max.
Hexode Grid (G_1) to Oscillator Plate	0.1	mmf. Max.
Hexode Grid (G_1) to Oscillator Grid	0.3	mmf Max.
Oscillator Grid to Oscillator Plate	2.0	mmf.
Hexode Grid (G_1) to all other Electrodes (r-f input)	5.5	mmf.
Oscillator Plate to all Electrodes except Oscillator Grid (Oscillator Output)	2.5	mmf.
Oscillator Grid to all Electrodes except Oscillator Plate (Oscillator Input)	9.5	mmf.
Hexode Plate to all Electrodes (Mixer Output)	8.0	mmf.

*Measured with Standard Tube Shield.

OPERATING CONDITIONS AND CHARACTERISTICS

Heater Voltage	Type 7D7	6.3	Volts
Heater Voltage	Type 21A7	18.9	Volts
Plate Voltage (Hexode)		250	Volts Max.
Control Grid Voltage (Hexode Grid G_1)		-3	Volts
Screen Voltage (Hexode Grids 2, 4, & 5)		100	Volts Max.
Oscillator Plate Voltage (Triode) **		250	Volts Max.
Oscillator Grid Resistor (Triode)		50000	Ohms
Plate Current (Hexode)		1.3	Ma.
Screen Current (Hexode)		2.8	Ma.
Oscillator Plate Current (Triode)		5.0	Ma.
Oscillator Grid Current (Triode)		0.4	Ma.
Plate Resistance (Hexode)		1.5	Megohm
Conversion Conductance		275	umhos
Conversion Conductance (E_{c1} = -20)		2	umhos

** Applied through 20000 ohms series resistance.

HYGRADE SYLVANIA CORPORATION

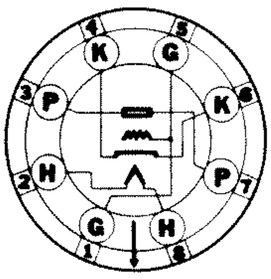
TYPES 7D7 & 21A7 continued-

TRIODE CHARACTERISTICS

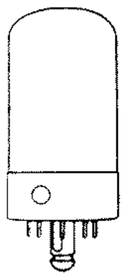
Plate Voltage	150	Volts Max.
Grid Voltage	-3	Volts
Plate Current	10.5	Ma.
Plate Resistance	7000	Ohms
Mutual Conductance	2500	umhos
Amplification Factor (Approx.)	17.5	

Base - "Loktal" 8 pin
Bulb - T-9
Max. overall length - 3 5/32"
Max. diameter - 1 3/16"
Max. seated height - 2 5/8"

BASING
Pin #1 - Heater
Pin #2 - Hexode Plate
Pin #3 - Triode Plate
Pin #4 - Triode Grid & Hexode Grid #3
Pin #5 - Hexode Grids #2,4, & 5
Pin #6 - Hexode Grid #1
Pin #7 - Shield & Cathode
Pin #8 - Heater



8BN-L-0



Sylvania Type 7E5

HIGH-FREQUENCY TRIODE

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T9
Maximum Overall Length	$2^{25}/_{32}$"
Maximum Seated Height	$2\frac{1}{4}$"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC (Nominal)	7.0 Volts
Heater Current (Nominal)	0.160 Ampere
Maximum Plate Voltage	250 Volts
Maximum Plate Current	16 Ma.
Maximum Grid Current	6 Ma.
Maximum Plate Dissipation	4 Watts
Maximum Heater-Cathode Voltage	90 Volts

Direct Interelectrode Capacitances:*

Grid to Plate	1.5 $\mu\mu$f.
Input	3.6 $\mu\mu$f.
Output	2.8 $\mu\mu$f.

*With $1^{5}/_{16}$" diameter shield (RMA Std. M8-308) connected to cathode.

TYPICAL OPERATION

CLASS A_1 AMPLIFIER

Heater Voltage	6.3 Volts
Heater Current	0.150 Ampere
Plate Voltage	180 Volts
Grid Voltage	−3.0 Volts
Plate Current	5.5 Ma.
Mutual Conductance	3000 μmhos
Plate Resistance	120000 Ohms
Amplification Factor	36

UHF OSCILLATOR—750 Mc.♦

Heater Voltage	6.3	6.3 Volts
Plate Voltage	200	250 Volts
Plate Current	11	13 Ma.
Grid Resistor	10000	20000 Ohms
Developed Bias	2.5	3.5 Volts

♦Half-wave four-line oscillator in which line shortening, due to the tube, is approximately 45% of a half-wave length.

UHF OSCILLATOR OR POWER AMPLIFIER—300 Mc.♦

Heater Voltage	6.3 Volts
Plate Supply Voltage§	150 Volts
Plate Current	16 Ma.
Grid Current	6.0 Ma.
Grid Resistor (Approximate)	1700 Ohms
Power Output	0.20 Watt

§Supplied through 3000 ohm dropping resistor.

LOCAL OSCILLATOR FOR 300 Mc. MIXER DRIVING♦

Heater Voltage	6.3 Volts
Plate Supply Voltage§	90 Volts
Plate Current	7.8 Ma.
Grid Voltage	−7.0 Volts
Grid Resistor	3000 Ohms
Mixer Developed Bias‡	−5.3 Volts

§Supplied through 3000 ohm dropping resistor.

♦Quarter wave four-line oscillator in which the line shortening is approximately 30% of a quarter wave length.

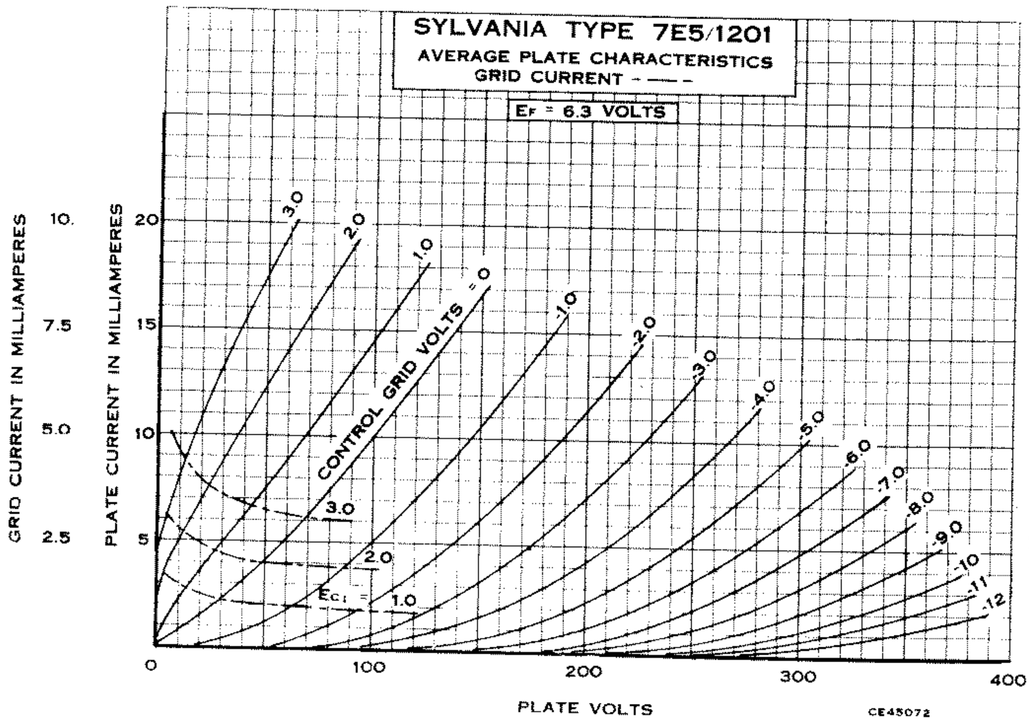
‡Developed bias across 35,000 ohm grid leak of UHF triode mixer tuned to 324 megacycles.

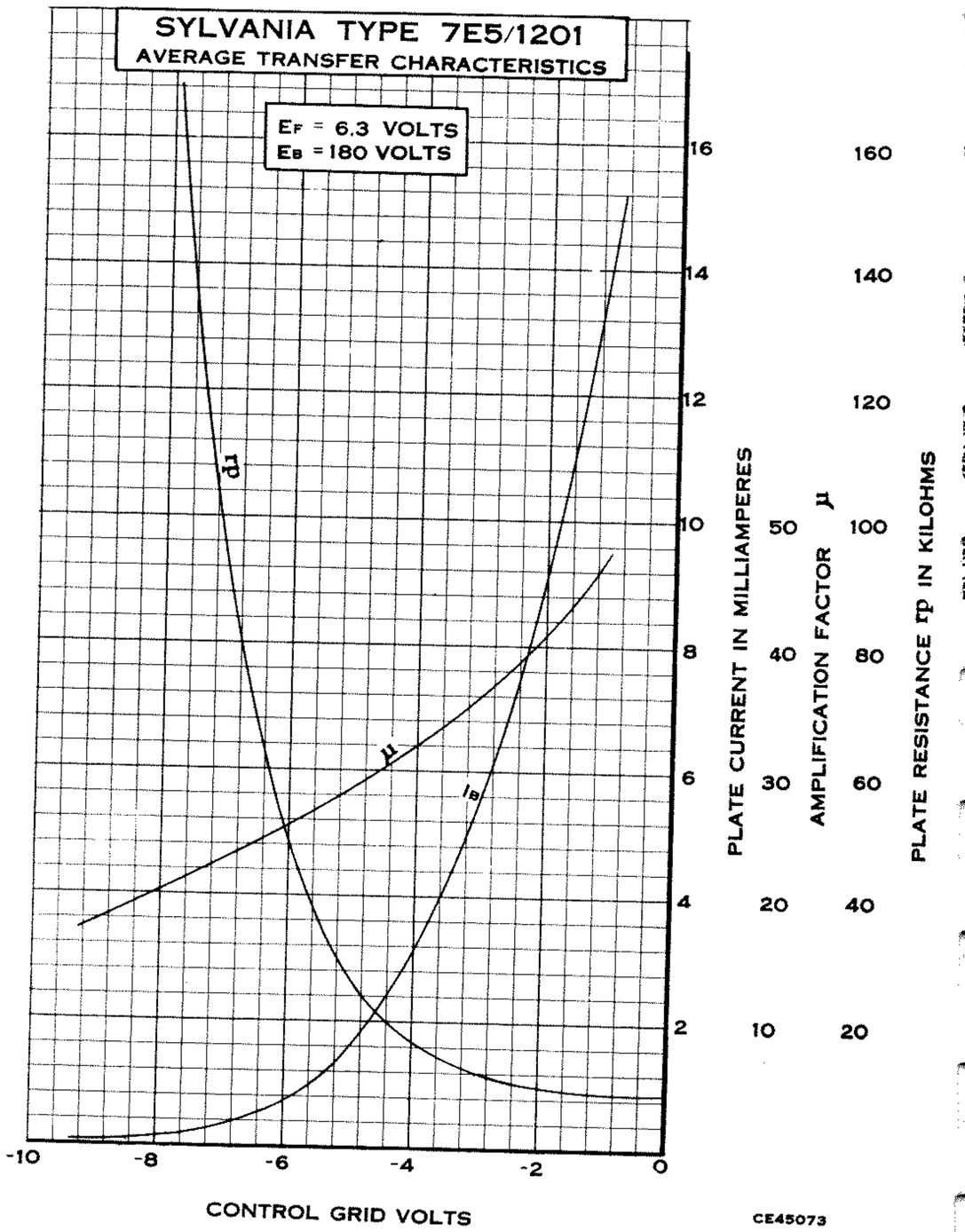
APPLICATION

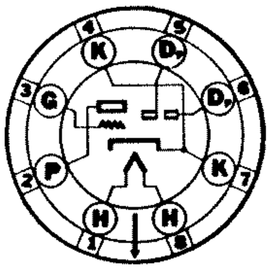
Sylvania Type 7E5 is a cathode type triode of Lock-In construction designed for ultra-high frequqency applications. This tube can be used as a signal source or local oscillator to frequencies of 750 megacycles when used in a double ended transmission line circuit. This type of operation is facilitated by a symmetrical arrangement of double grid and plate leads. These connections are brought out to the Lock-In single ended base from opposite ends of their respective element structures. Useful power output can be obtained at frequencies of 400 megacycles and lower, but below approximately 200 megacycles the use of other types, such as Sylvania Type 7A4, are recommended.

For use in resistance coupled circuits, see data on Page 51.

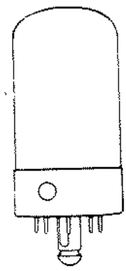
7E5 (Cont.)


SYLVANIA TYPE 7E5/1201
AVERAGE PLATE CHARACTERISTICS
GRID CURRENT - - - -
EF = 6.3 VOLTS
GRID CURRENT IN MILLIAMPERES
10.
7.5
5.0
2.5
PLATE CURRENT IN MILLIAMPERES
20
15
10
5
0
CONTROL GRID VOLTS = 0
3.0
2.0
1.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
-9.0
-10
-11
-12
Ec1 =
100
200
300
400
PLATE VOLTS
CE45072


SYLVANIA TYPE 7E5/1201
AVERAGE TRANSFER CHARACTERISTICS
EF = 6.3 VOLTS
EB = 180 VOLTS
rp
μ
IB
16
14
12
10
8
6
4
2
160
140
120
100
80
60
40
20
50
40
30
20
10
-10
-8
-6
-4
-2
0
CONTROL GRID VOLTS
PLATE CURRENT IN MILLIAMPERES
AMPLIFICATION FACTOR μ
PLATE RESISTANCE rp IN KILOHMS
CE45073



8W-L-7



Sylvania Type 7E6

DUODIODE MEDIUM-MU TRIODE

GT EQUIVALENT 6SR7GT

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T9
Maximum Overall Length	$2\frac{25}{32}$"
Maximum Seated Height	$2\frac{1}{4}$"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC (Nominal)	7.0 Volts
Heater Current	0.32 Ampere
Maximum Plate Voltage	300 Volts
Maximum Plate Dissipation	2.5 Watts
Maximum Diode Drop at .8 Ma.	10 Volts
Maximum Continuous Diode Current per Plate	1.0 Ma.
Maximum Heater-Cathode Voltage	90 Volts

Direct Interelectrode Capacitances:*

Grid to Plate	1.5 $\mu\mu$f.
Input	3.0 $\mu\mu$f.
Output	2.4 $\mu\mu$f.
Grid to Diode 1	0.01 $\mu\mu$f. Max.
Grid to Diode 2	0.04 $\mu\mu$f. Max.

*With $1\frac{5}{16}$" diameter shield (RMA Std. M8-308) connected to cathode.

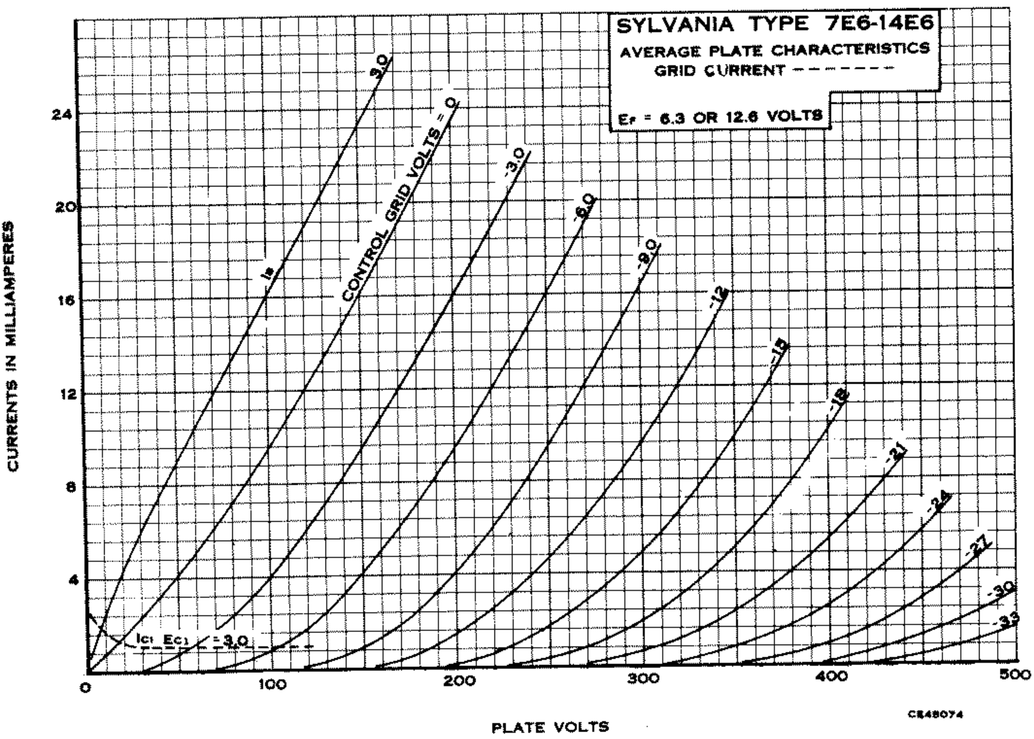
TYPICAL OPERATION

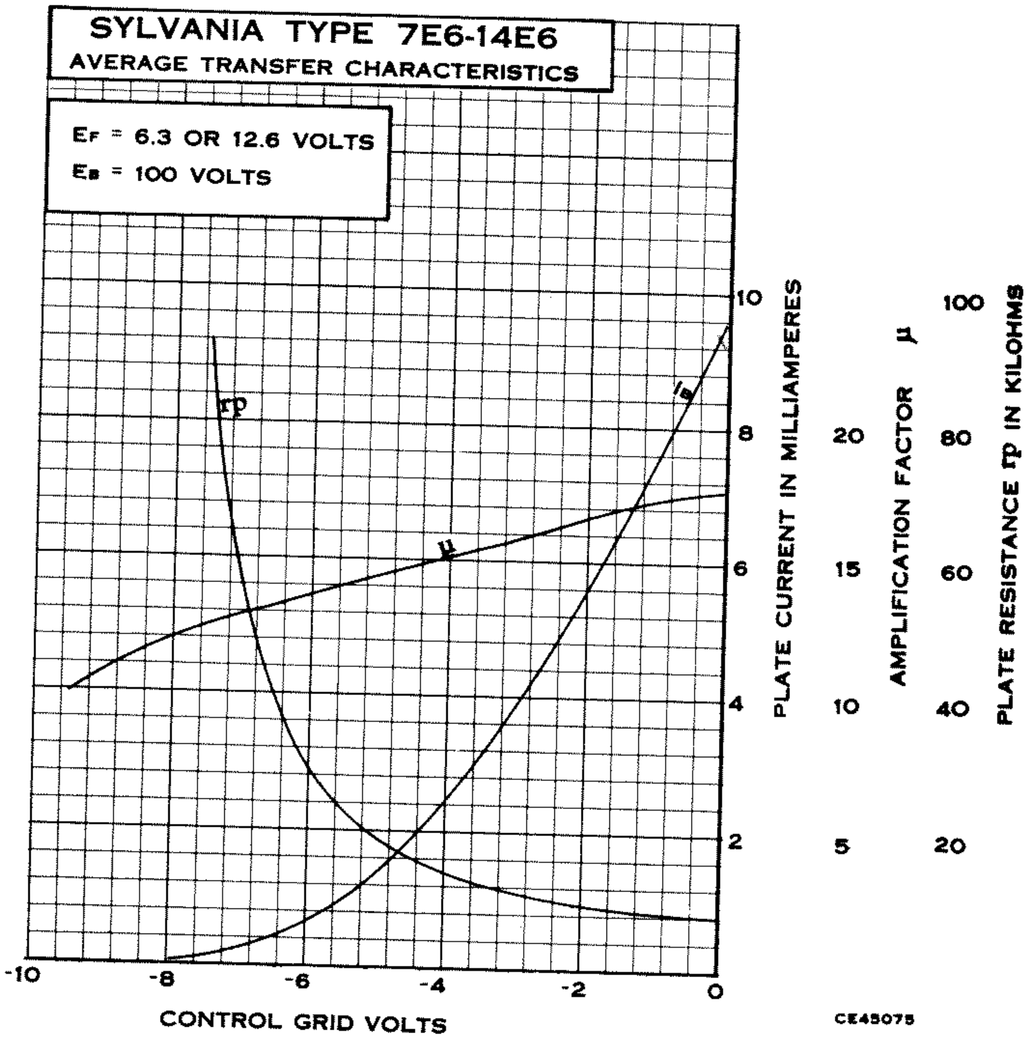
Heater Voltage	6.3	6.3 Volts
Heater Current	0.3	0.3 Ampere
Plate Voltage	100	250 Volts
Grid Voltage§	−3	−9 Volts
Self-Bias Resistor	770	950 Ohms
Plate Current	3.9	9.5 Ma.
Plate Resistance	11000	8500 Ohms
Mutual Conductance	1500	1900 μmhos
Amplification Factor	16.5	16

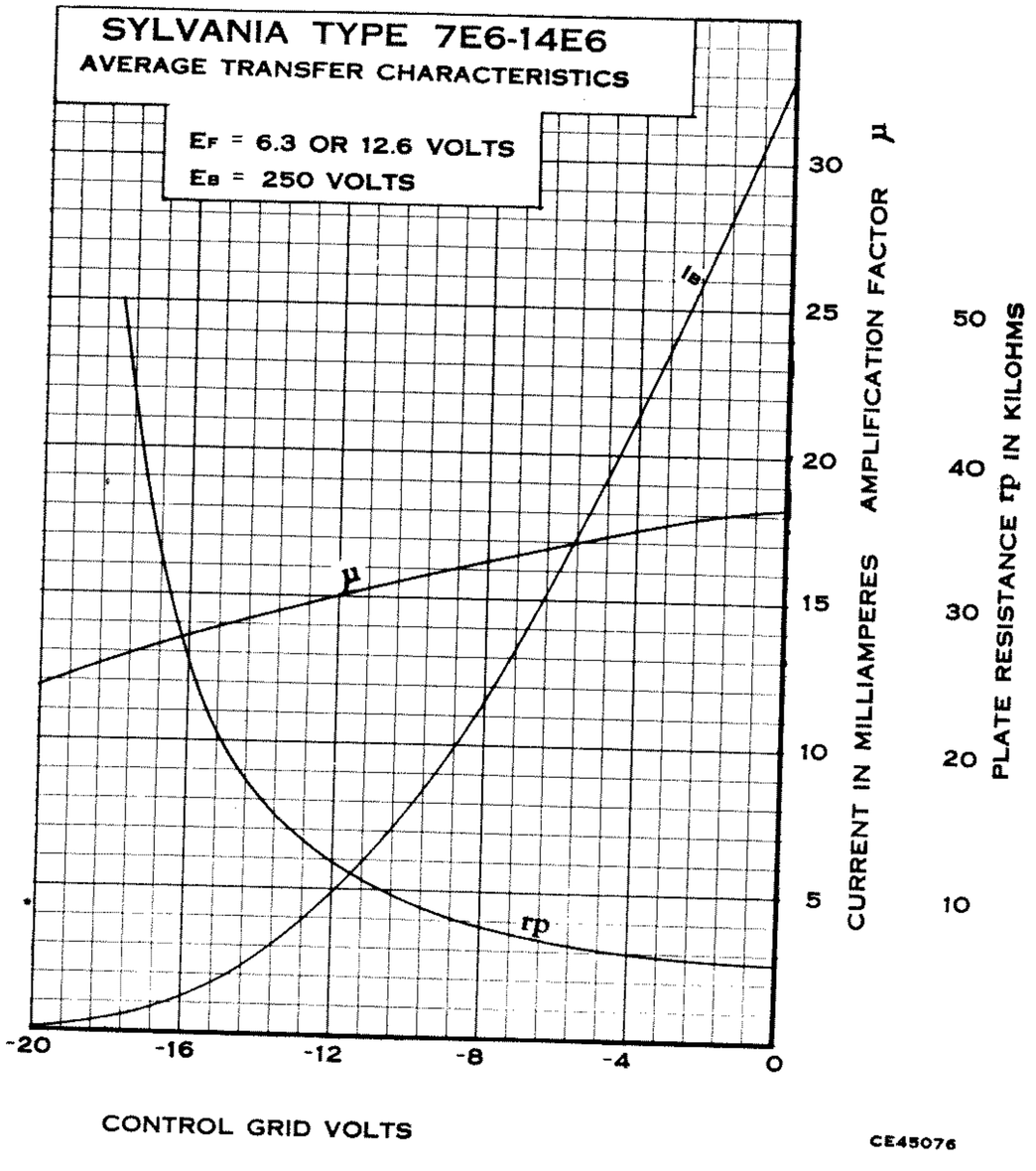
§DC resistance in the grid circuit should not exceed 1.0 megohm under maximum rated conditions.

APPLICATION

Sylvania Type 7E6 is a Lock-In duodiode triode having medium-mu characteristics. It is intended for use in conjunction with transformer coupled circuits although resistance coupling data are given on Page 52. The diode section is the same as that in Type 7B6 and reference should be made to that type for curves.




SYLVANIA TYPE 7E6-14E6
AVERAGE TRANSFER CHARACTERISTICS
EF = 6.3 OR 12.6 VOLTS
EB = 100 VOLTS
rp
μ
Ib
10
8
6
4
2
20
15
10
5
100
80
60
40
20
-10
-8
-6
-4
-2
0
CONTROL GRID VOLTS
PLATE CURRENT IN MILLIAMPERES
AMPLIFICATION FACTOR μ
PLATE RESISTANCE rp IN KILOHMS
CE45075


SYLVANIA TYPE 7E6-14E6
AVERAGE TRANSFER CHARACTERISTICS
EF = 6.3 OR 12.6 VOLTS
EB = 250 VOLTS
μ
Ib
rp
30
25
20
15
10
5
50
40
30
20
10
-20
-16
-12
-8
-4
0
CONTROL GRID VOLTS
CURRENT IN MILLIAMPERES
AMPLIFICATION FACTOR μ
PLATE RESISTANCE rp IN KILOHMS
CE45076

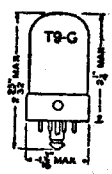


8-AE

Sylvania

TYPE LOKTAL 7E7

DOUBLE DIODE-PENTODE



CARACTERISTIQUES

Tension chauffage (nominale) CA ou CC	7,0 volts
Courant chauffage (nominal)	0,32 ampère
Ampoule	T9-G
Culot — Loktal 8 broches	8-AE
Position de montage	Toutes

Capacités directes interélectrodes :

Grille à plaque	0,005 $\mu\mu$f
Entrée (grille G à toutes électrodes, sauf P et Dp Dp)	4,6 $\mu\mu$f
Sortie (Plaque à toutes électrodes, sauf G et Dp Dp)	9,5 $\mu\mu$f

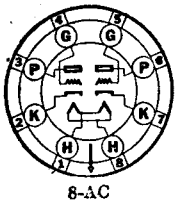
Conditions de fonctionnement et caractéristiques :

Tension chauffage	6,3 volts
Courant chauffage	0,3 ampère
Tension plaque	250 volts max.
Tension écran	100 volts max.
Tension grille	—3 volts
Courant plaque	7,5 ma.
Courant écran	1,6 ma.
Résistance interne	0,7 mégohm
Conductance mutuelle	1,300 μmhos
Tension grille (Conductance mutuelle=2 μmhos)	—42,5 volts

(Voir page 9 pour interprétation conditions limites de fonctionnement.)

APPLICATION

Sylvania type 7E7 est un double diode pentode, sans capuchon de grille, de construction LOKTAL. Ses caractéristiques valent celles du type 6B8G et, en général, ses applications sont les mêmes que celles des autres doubles diodes pentodes à gain élevé. La section pentode sera utilisée classiquement dans les circuits H.F. et M.F. Comme amplificateur B.F., la section pentode peut être utilisée en circuits couplés par résistance pour obtenir un gain élevé. Voir autres applications au type 6B7. En service C.A., le taux de chauffage 7 volts correspond à un secteur 130 volts.

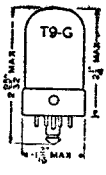


8-AC

Sylvania

TYPE LOKTAL 7F7

AMPLIFICATEUR TRIODES-JUMELLES



CARACTERISTIQUES

Tension chauffage (nominale) CA ou CC	7,0 volts
Courant chauffage (nominal)	0,32 ampère
Ampoule	T9-G
Culot — Loktal 8 broches	8-AC
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A (Chaque triode)

Tension chauffage	6,3 volts
Courant chauffage	0,3 ampère
Tension plaque	250 volts max.
Tension grille	—2 volts
Courant plaque	2,3 ma.
Résistance interne (approx.)	44,000 ohms
Conductance mutuelle	1,600 μmhos
Facteur d'amplification	70

(Voir page 9, interprétation conditions limites fonctionnement.)

APPLICATION

Sylvania type 7F7 est un tube LOKTAL double triode, sans capuchon de grille, conçu spécialement pour utiliser en inverseur de phase ou comme amplificateur de tension. Les plaque, grille et cathode de chaque triode aboutissent séparément au culot, permettant ainsi toutes les applications spéciales. La principale différence entre le type 7F7 et les autres Sylvania doubles triodes (6C8G, 6F8G) consiste dans le plus grand facteur d'amplification de chacune des triodes. En service C.A., le taux de chauffage de 7 volts correspond à un secteur 130 volts.

SYLVANIA

engineering data service

SYLVANIA

7F8W

MECHANICAL DATA

Bulb	T-9
Base	Lockin 8-Pin
Basing	8BW
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS

Shock (Intermittent Service-Abs. Max.)	350 g
Vibration (Continuous Service-Design Center)	2.5 g
Mechanical Resonance	None Below 100 cps

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (Avg.)	6.3 Volts
Heater Voltage (Abs. Max.)	7.0 Volts
Heater Voltage (Design Center)	6.3 Volts
Heater Current (Avg.)	300 Ma
Heater Current (Max.)[1]	325 Ma
Heater Current (Min.)[1]	275 Ma

DIRECT INTERELECTRODE CAPACITANCES

(Each Section — Shielded)[2]

	Min.[1]	Max.[1]	
Grid to Plate	1.2	2.0	μμf
Input	2.1	3.8	μμf
Output	1.3	2.1	μμf
Grid to Grid	.02	.10	μμf
Plate to Plate	0.1	0.4	μμf
Heater to Either Cathode[3]	1.4	3.0	μμf

RATINGS

	Absolute Max.	Design Center	
Plate Voltage	330	300	Volts
Plate Dissipation Each Plate	3.5	3.2	Watts
Total Plate Dissipation (Both Plates)	5.0	4.5	Watts
Positive Control Grid Voltage		0	Volts
Heater-Cathode Voltage	±250	±230	Volts

CHARACTERISTICS AND TYPICAL OPERATION

Class A Amplifier (Each Section)

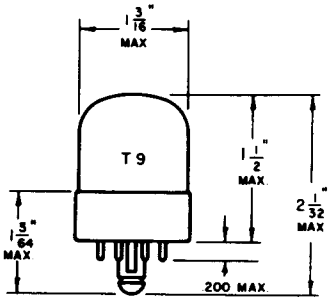
	Min.[1]	Avg.	Max.[1]	
Plate Voltage		250		Volts
Cathode Bias Resistor		200		Ohms
Plate Current	8.0	10.5	14.0	Ma
Transconductance	4500	5200	6800	μmhos
Amplification Factor	40	50	65	
Plate Current at E_c = −9 Volts	1.0		700	μa
Plate Current at E_c = −25 Volts	0		1.0	μa
Heater-Cathode Leakage at ±150 Volts			20	μa
Grid Current			1.5	μa

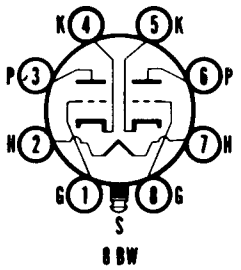
NOTES:

1. *Limits given here are extremes which may be found in production.*
2. *With Standard RTMA Shield No. 308 connected to cathode.*
3. *External shield connected to ground.*

QUICK REFERENCE DATA

Rugged high transconductance double triode designed for use in applications requiring resistance to shock and vibration.





SYLVANIA ELECTRIC PRODUCTS INC.

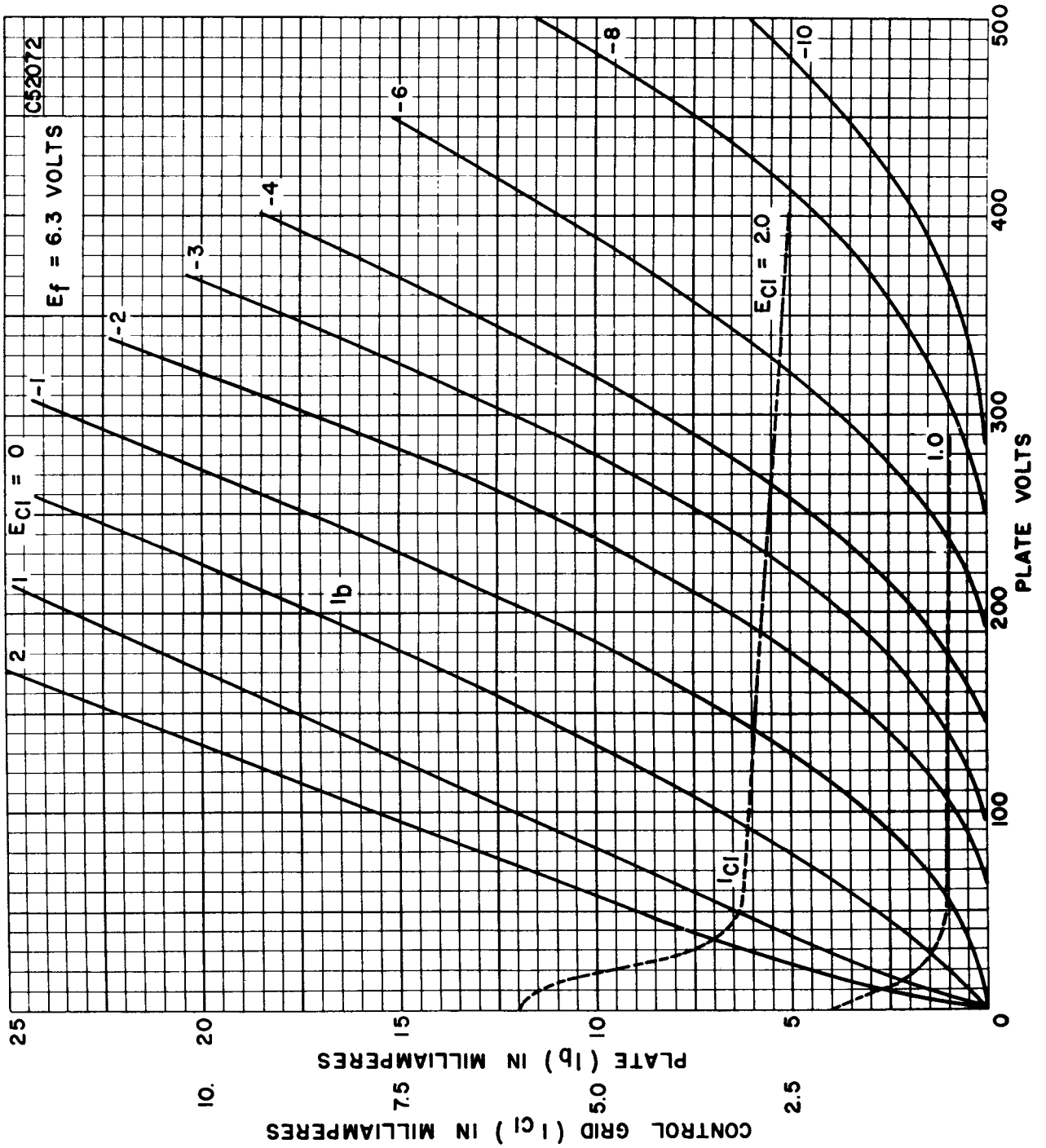
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

SEPTEMBER 1952

SYLVANIA

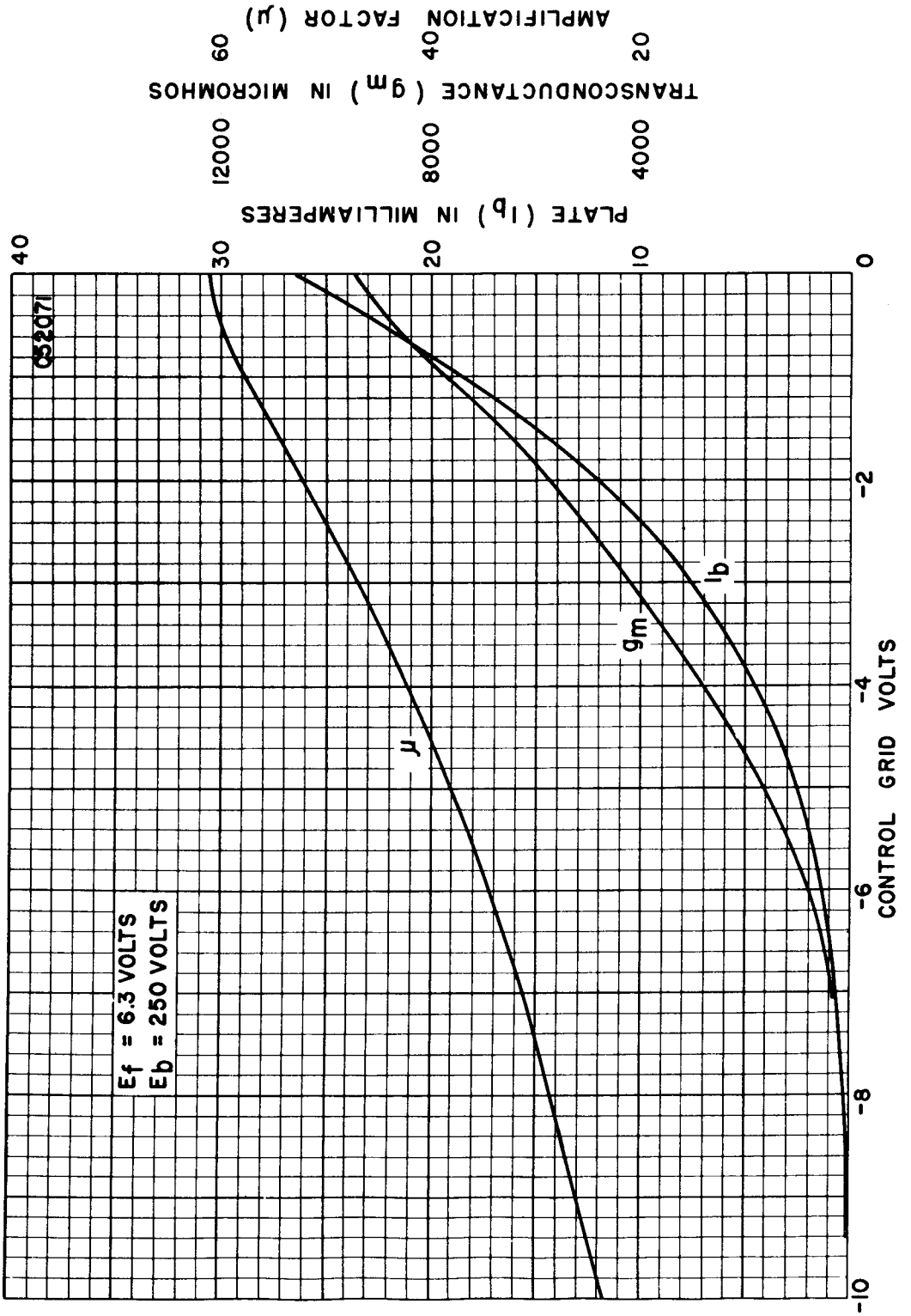
7F8W

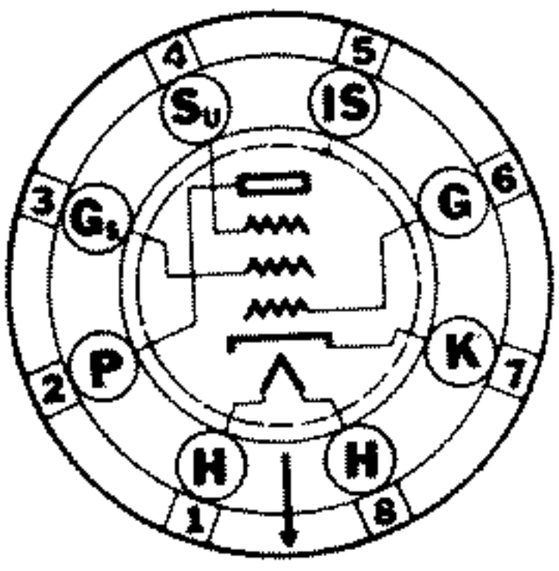
AVERAGE PLATE CHARACTERISTICS



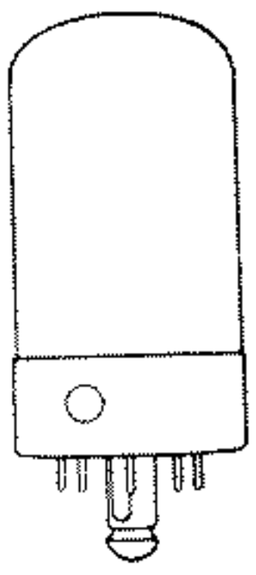
7F8W

AVERAGE TRANSFER CHARACTERISTICS





8V-L-5



Sylvania Type 7H7

SEMI-REMOTE CUT-OFF RF PENTODE

GT EQUIVALENT 6SH7GT

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T9
Maximum Overall Length	$2^{25}/_{32}$"
Maximum Seated Height	$2\,1/4$"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC (Nominal)	7.0 Volts
Heater Current (Nominal)	0.320 Ampere
Maximum Plate Voltage	300 Volts
Maximum Screen Voltage	150 Volts
Maximum Screen Supply Voltage	300 Volts
Maximum Plate Dissipation	2.5 Watts
Maximum Screen Dissipation	0.5 Watt
Minimum External Grid Bias Voltage	0 Volt
Maximum Heater-Cathode Voltage	90 Volts

Direct Interelectrode Capacitances:*

Grid to Plate	0.007 $\mu\mu$f. Max.
Input	8.0 $\mu\mu$f.
Output	7.0 $\mu\mu$f.

*With $1\,5/16$" diameter shield (RMA Std. M8-308) connected to cathode

TYPICAL OPERATION

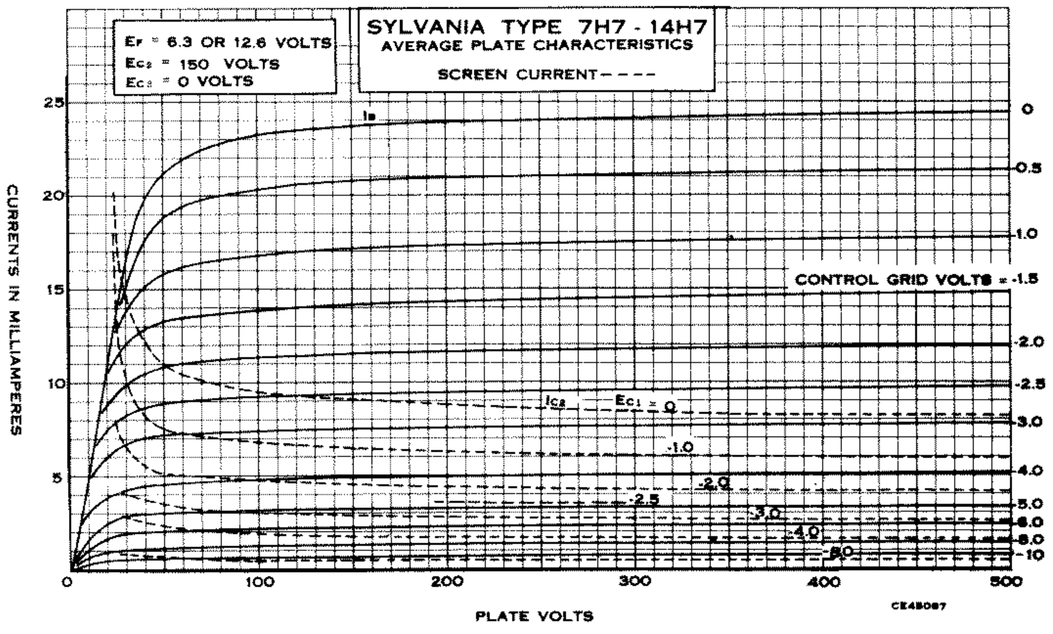
CLASS A_1 AMPLIFIER

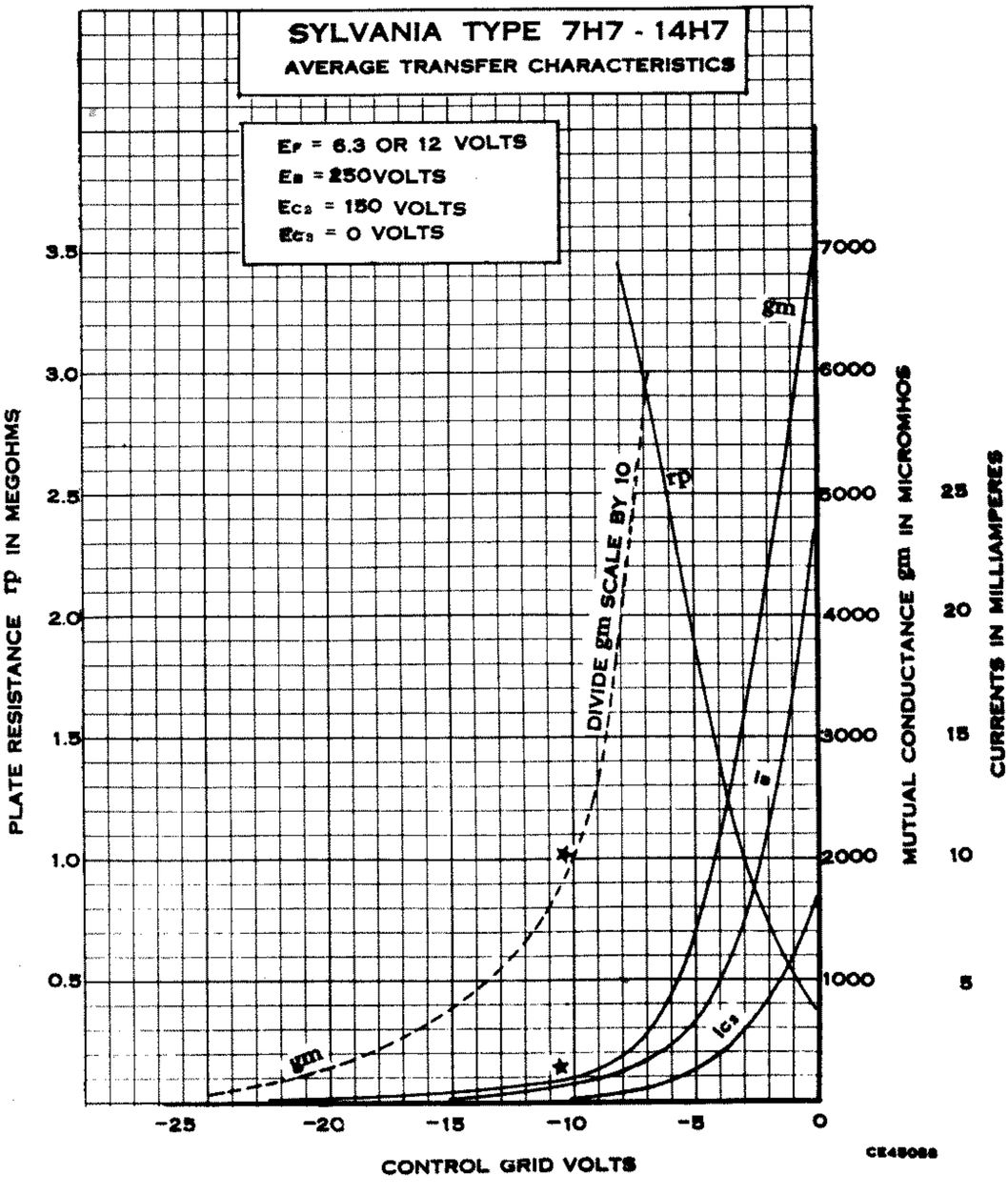
Heater Voltage (AC or DC)	6.3	6.3 Volts
Heater Current	0.300	0.300 Ampere
Plate Voltage	100	250 Volts
Screen Voltage	100	150 Volts
Grid Voltage	−1	..... Volts
Self-Bias Resistor	80	180 Ohms
Suppressor and Internal Shield	Connect to Cathode	
Plate Current	8.2	10.0 Ma.
Screen Current	3.3	3.2 Ma.
Plate Resistance	0.25	0.8 Megohm
Mutual Conductance	4800	4200 μmhos
Grid Voltage for Mutual Conductance of 35 μmhos (Approximate)	−12	−19 Volts

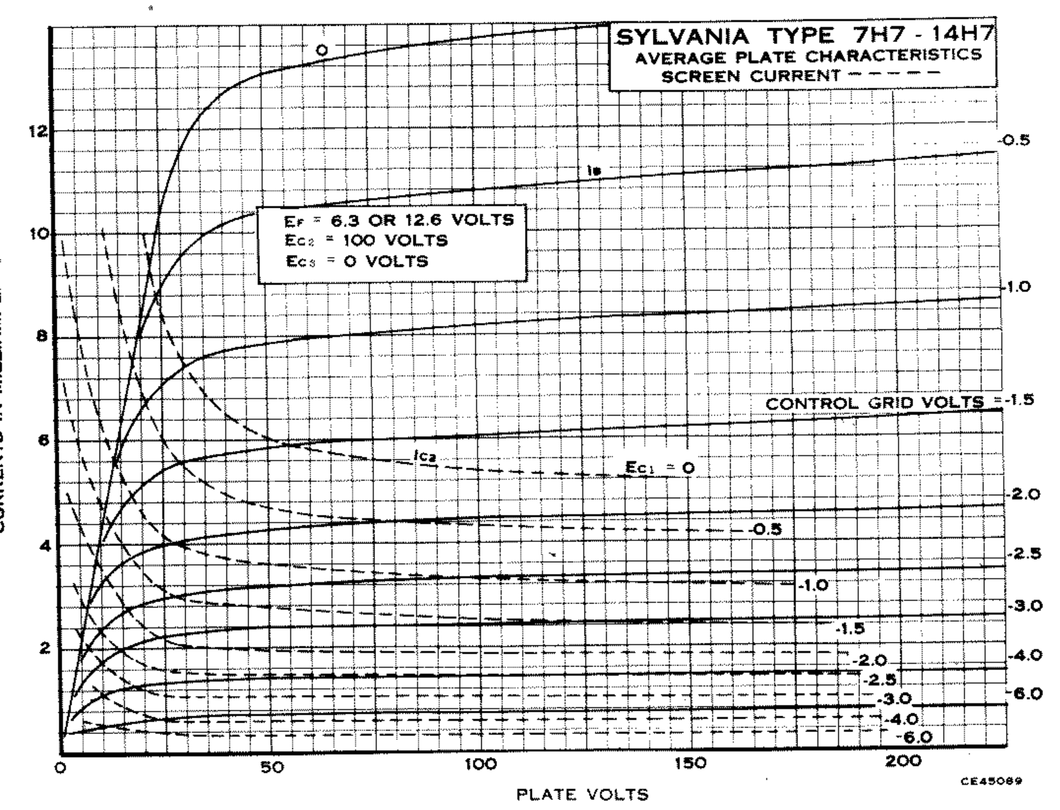
APPLICATION

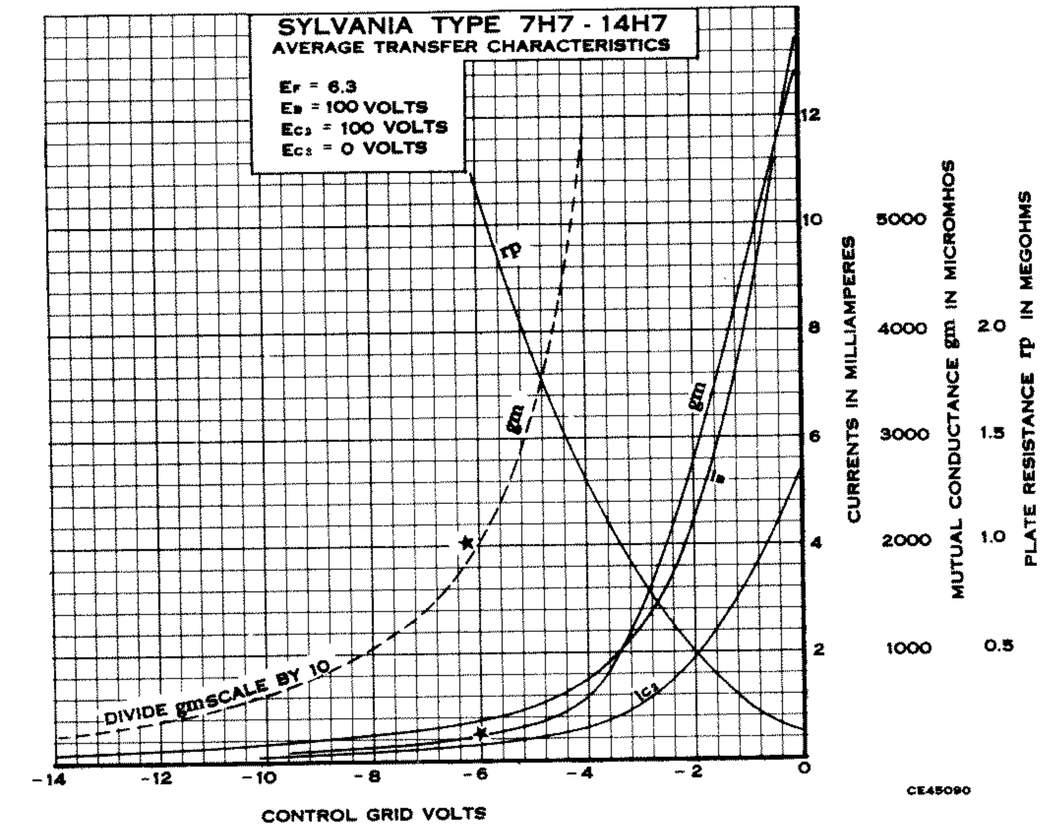
Sylvania Type 7H7 is a semi-remote cut-off pentode suitable for RF or television service. It is similar to Type 6AB7 except for lower heater current and slightly lower mutual conductance. The Lock-In construction provides ruggedness, suitable shielding and short leads so necessary in high-frequency circuits. The high mutual conductance helps to compensate for the low gain associated with high-frequency and wide-band amplifier designs.

7H7 (Cont.)


SYLVANIA TYPE 7H7 - 14H7
AVERAGE PLATE CHARACTERISTICS
SCREEN CURRENT- - - -
Ef = 6.3 OR 12.6 VOLTS
Ec2 = 150 VOLTS
Ec3 = 0 VOLTS
CONTROL GRID VOLTS
PLATE VOLTS
CURRENTS IN MILLIAMPERES
CE45087


SYLVANIA TYPE 7H7 - 14H7
AVERAGE TRANSFER CHARACTERISTICS
Ef = 6.3 OR 12 VOLTS
Eb = 250VOLTS
Ec2 = 150 VOLTS
Ec3 = 0 VOLTS
DIVIDE gm SCALE BY 10
PLATE RESISTANCE rp IN MEGOHMS
MUTUAL CONDUCTANCE gm IN MICROMHOS
CURRENTS IN MILLIAMPERES
CONTROL GRID VOLTS
CE45088


SYLVANIA TYPE 7H7 - 14H7
AVERAGE PLATE CHARACTERISTICS
SCREEN CURRENT - - - - -
EF = 6.3 OR 12.6 VOLTS
Ec2 = 100 VOLTS
Ec3 = 0 VOLTS
CONTROL GRID VOLTS
Ec1 = 0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-4.0
-6.0
Ib
Ic2
CURRENTS IN MILLIAMPERES
PLATE VOLTS
CE45089


SYLVANIA TYPE 7H7 - 14H7
AVERAGE TRANSFER CHARACTERISTICS
EF = 6.3
Eb = 100 VOLTS
Ec2 = 100 VOLTS
Ec3 = 0 VOLTS
rp
gm
Ib
Ic1
DIVIDE gm SCALE BY 10
CURRENTS IN MILLIAMPERES
MUTUAL CONDUCTANCE gm IN MICROMHOS
PLATE RESISTANCE rp IN MEGOHMS
CONTROL GRID VOLTS
CE45090

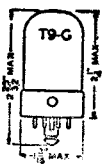


8-AR

Sylvania

TYPE LOKTAL 7J7

CONVERTISSEUR TRIODE-HEXODE



CARACTERISTIQUES

Tension chauffage (nominale) CA ou CC	7,0 volts
Courant chauffage (nominal)	0,32 ampère
Ampoule	T9-G
Culot — Loktal 8 broches	8-AR
Position de montage	Toutes

Capacités directes interélectrodes* :

Grille G à plaque hexode	0,01	$\mu\mu$F max.
Grille G à plaque triode	0,1	$\mu\mu$F max.
Grille G à grille Go	0,2	$\mu\mu$F max.
Grille Go à plaque triode	1,0	$\mu\mu$F
Grille G à toutes électrodes (entrée H.F.) ...	5,5	$\mu\mu$F
Plaque triode à toutes électr. sauf Go (sor. osc.)	2,0	$\mu\mu$F
Grille Go à toutes électrodes, sauf plaque oscillateur (sortie oscillateur)	3,5	$\mu\mu$F
P. hexode à toutes électrodes (sortie mixer) ...	7,5	$\mu\mu$F

*Avec blindage standard du tube.

Conditions de fonctionnement et caractéristiques :

Tension chauffage	6,3 volts
Courant chauffage	0,3 ampère
Tension plaque hexode	250 volts max.
Tension grille hexode	—3 volts
Tension écran hexode	100 volts max.
Courant plaque hexode	1,4 ma.
Courant écran hexode	2,8 ma.
Résistance interne hexode	1,5 mégohm
Conductance de conversion	310 μmhos
Tension plaque triode (oscillateur)**	250 volts max.
Résistance grille triode (oscillateur)	50,000 ohms
Courant plaque triode (oscillateur)...	5,7 ma
Courant grille triode (oscillateur)	0,4 ma.
Conductance conversion à Polar. — 20	2 μmhos

**A travers résistance chutrice 20,000 ohms.

SECTION TRIODE SEULEMENT

Tension plaque	150 volts max.
Tension grille...	—3 volts
Courant plaque	7,5 ma.
Résistance interne	10,400 ohms
Conductance mutuelle (approx.)	1,350 μmhos
Facteur amplification	14

(Voir page 9, pour interprétation conditions limites fonctionnement.)

APPLICATION

Sylvania type 7J7 est un convertisseur loktal composé d'une section triode et d'une section hexode dans une même ampoule. La cathode est commune aux deux sections. Ce tube est essentiellement la combinaison bien connue du triode-oscillateur et détecteur séparé et est similaire au type 6J8G. Type 7J7 assure le couplage réel électronique, puisque la grille de la section triode est connectée à une grille d'injection dans la section modulatrice. La grande résistance interne de ce tube donne une faible impédance de charge rendant possible l'utilisation avantageuse de transformateurs MF à haute efficience.

Comparé à la plupart des autres types convertisseurs existants, type 7J7 a un glissement de fréquence plus bas qui le rend spécialement attrayant. A cause de cette grande stabilité de fréquence il est possible de réduire le filtrage dans la plaque de l'oscillateur sans rencontrer le « battement » provoqué par beaucoup d'autres convertisseurs.

Il est à noter que les deux plaques et les deux grilles écrans de l'hexode fonctionnent au même potentiel CC en utilisant 100 volts. Par conséquent, la résistance chutrice de la grille-écran indispensable avec les convertisseurs précédents, peut être supprimée.

En service CA, le taux de chauffage 7 volts correspond à un secteur de 130 volts.

SYLVANIA

engineering data service

SYLVANIA

7JP4

7JP1, 7JP7

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5.0 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6.0 $\mu\mu$f
Between Vertical Deflecting Plates	3.0 $\mu\mu$f
Between Horizontal Deflecting Plates	2.0 $\mu\mu$f
Either Vertical Deflecting Plate to All Other Electrodes Except Other Vertical Plate	6.0 $\mu\mu$f
Either Horizontal Deflecting Plate to All Other Electrodes Except Other Horizontal Plate	5.0 $\mu\mu$f

MECHANICAL DATA

Minimum Useful Screen Dimension (Diameter)	6 Inches
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14R

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	6,000 Volts dc
Focusing Anode Voltage	2,800 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	200 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Heater Negative with Respect to Cathode	
During Warm-up Period Not to Exceed 15 Seconds	410 Volts dc
After Equipment Warm-up Period	125 Volts dc
Heater Positive with Respect to Cathode	125 Volts dc
Peak Voltage Between High Voltage Anode and Any Deflecting Plates	750 Volts

RECOMMENDED OPERATING CONDITIONS

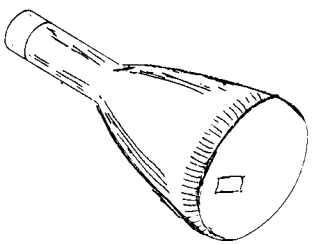
Anode Voltage	6,000 Volts dc
Focusing Anode Voltage	1,620-2,400 Volts dc
Grid No. 1 Voltage Required for Cutoff[1]	-72 to -168 Volts dc
Deflection Factor	
Vertical Plates[2]	216 Volts dc/Inch
Horizontal Plates[3]	177 Volts dc/Inch

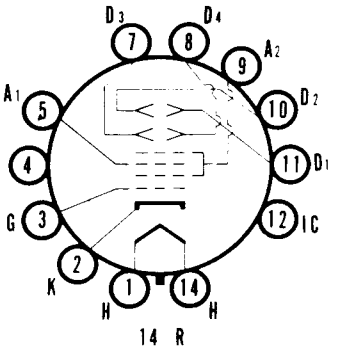
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5.0 Megohms Max.

QUICK REFERENCE DATA

Television Picture Tube
7" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus





SYLVANIA ELECTRIC PRODUCTS INC.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JULY 1953

NOTES:

1. *Visual extinction of undeflected focused spot.*
2. *Pins 10 and 11.*
3. *Pins 7 and 8.*

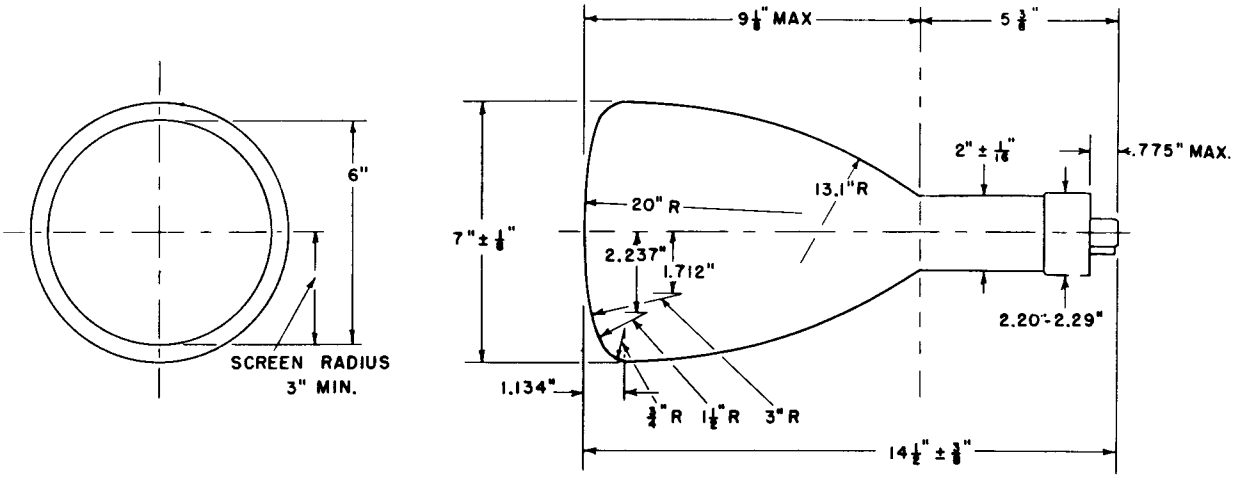


DIAGRAM NOTES:

1. *The screen diameter for Type 7JP7 is 5½ inches.*

7JP1

The Type 7JP1 is identical to the Type 7JP4 except it has a green phosphor.

7JP7

The Type 7JP7 is identical to the Type 7JP4 except it has a blue-white, long persistence phosphor and a screen diameter of 5½ inches.

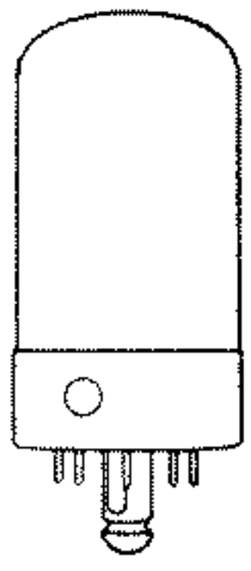
WARNING:

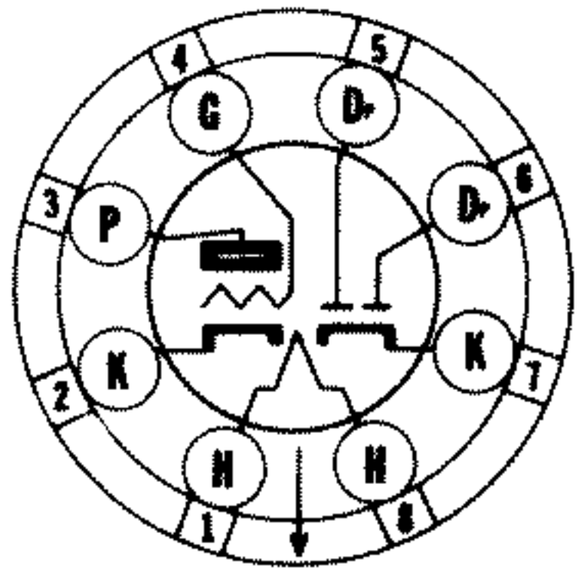
X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

7K7 Sylvania Type

DUODIODE HIGH-MU TRIODE

(Separate Diode Cathode)





8BF-L-7

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T-9
Maximum Overall Length	$2^{25}/_{32}$"
Maximum Seated Height	$2\frac{1}{4}$"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC (Nominal)	7.0 Volts
Heater Current (Nominal)	0.32 Ampere
Maximum Plate Voltage	300 Volts
Maximum Diode Drop for 1.5 Ma. (Per Diode)	10 Volts
Maximum Heater-Cathode Voltage	90 Volts
Maximum Plate Dissipation	1 Watt
Minimum External Grid Bias	0 Volt

Direct Interelectrode Capacitances:*

Grid to Plate	1.7 $\mu\mu$f.
Input	2.4 $\mu\mu$f.
Output	2.0 $\mu\mu$f.
Diode 1 to Grid 1	0.25 $\mu\mu$f. Max.
Diode 2 to Grid 1	0.25 $\mu\mu$f. Max.
Diode Cathode to Diode 1	2.0 $\mu\mu$f. Max.
Diode Cathode to Diode 2	2.0 $\mu\mu$f. Max.

*With $1^{5}/_{16}$" diameter shield (RMA Std. M8-308) connected to cathode.

TYPICAL OPERATION AS AMPLIFIER—CLASS A

Heater Voltage AC or DC	6.3 Volts
Heater Current	0.3 Ampere
Plate Voltage	250 Volts
Grid Voltage	−2.0 Volts
Amplification Factor	70
Plate Resistance (Approximate)	41000 Ohms
Mutual Conductance	1600 μmhos
Plate Current	2.3 Ma.

APPLICATION

Sylvania Type 7K7 is a duodiode high-mu triode which differs from the usual diode triode by having separate cathodes for the diode and triode sections. This permits greater flexibility in circuit design. The characteristics of the triode section are identical to those of one section of Type 7F7. Reference should be made to that type for curves, and resistance coupled amplifier data appears under Type 7F7 on page 53.

SYLVANIA

engineering data service

SYLVANIA
7MP7
7MP*

CHARACTERISTICS

GENERAL DATA

Focusing Method		Magnetic	
Deflection Method		Magnetic	
Deflection Angle (Approx.)		50	Degrees
Types*	**7MP7**	**7MP14**	
Fluorescence	Blue	Purple	
Phosphorescence	Yellow	Orange	
Persistence	Long	Medium-Long	
Faceplate		Clear	

**In addition to the types shown, the 7MP- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Ampere
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5	$\mu\mu$f
Grid No. 1 to All Other Electrodes	6	$\mu\mu$f

MECHANICAL DATA

Minimum Useful Screen Diameter	6	Inches
Bulb	J57½C or J57½D	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duodecal 5-Pin)	B5-57	
Basing	12D	
Weight (Approx.)	3½	Pounds

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	8,800	Volts	dc
Grid No. 2 Voltage	770	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	200	Volts	dc
Positive Bias Value[1]	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode	140	Volts	
Heater Positive with Respect to Cathode	140	Volts	

TYPICAL OPERATING CONDITIONS

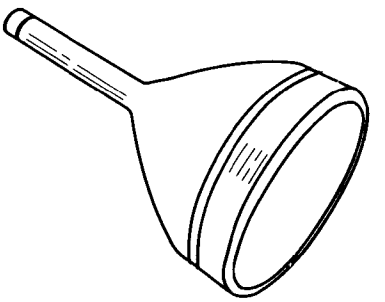
Anode Voltage[2]	4000	7000	Volts	dc
Grid No. 2 Voltage	250	250	Volts	dc
Grid No. 1 Voltage for Cutoff[3]	−27 to −63	−27 to −63	Volts	dc
Focusing Coil Current[4]	.64 + 15%	85 ± 15%	Ma	
Spot Position		See Note 5		

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms Max.

QUICK REFERENCE DATA

Radar Indicator
7" Direct Viewed
Round Glass Type
Magnetic Focus
Magnetic Deflection



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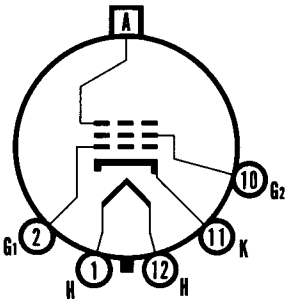


12-D

SYLVANIA ELECTRONIC TUBES
A Division of
SYLVANIA ELECTRIC PRODUCTS, Inc.
PICTURE TUBE
OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

DECEMBER 1958

NOTES:

1. *At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, anode voltage should not be less than 4,000 volts.*
3. *Visual extinction of undeflected focused spot.*
4. *For JETEC Focusing Coil No. 109 positioned with air gap toward faceplate and center line of air gap 2¾ inches from reference line (See Outline Drawing) and anode current of 200 microamperes.*
5. *The center of the undeflected unfocused spot will fall within a circle having a 12 mm radius concentric with the center of the tube face.*

WARNING:

X-ray radiation shielding may be necessary to protect against danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, which ever is less.

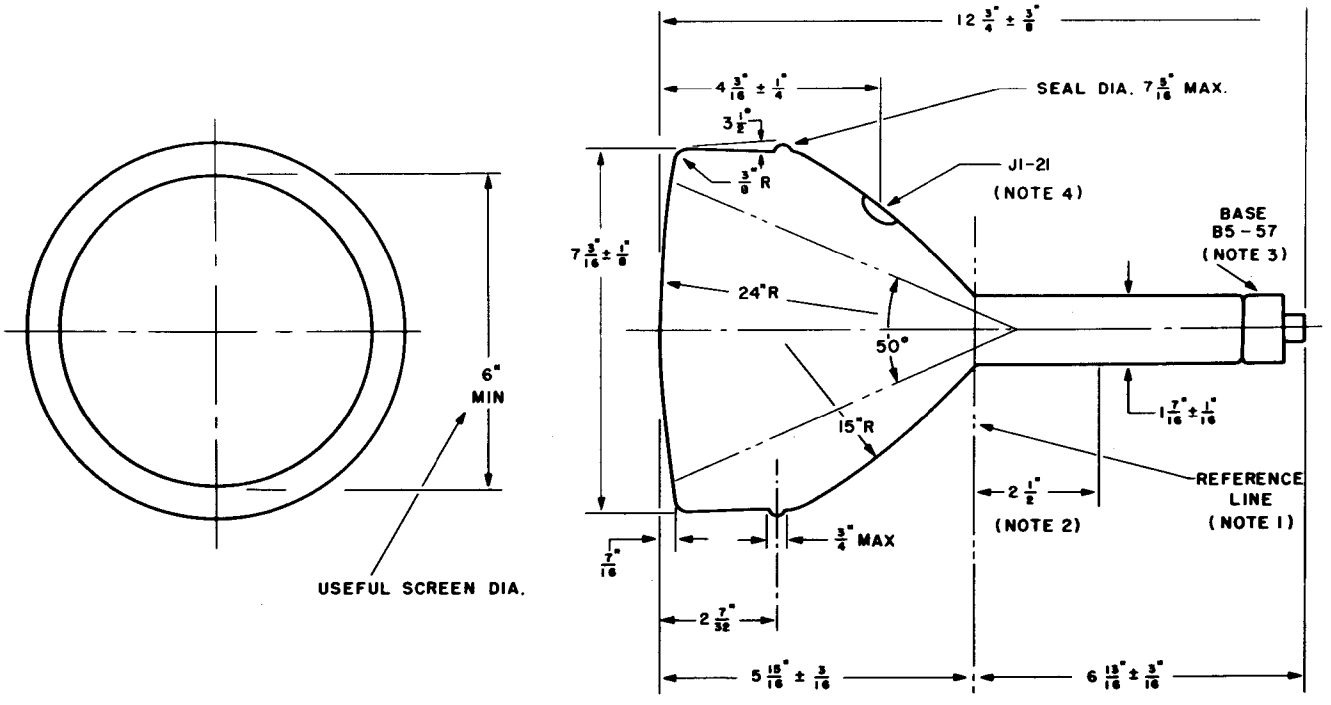
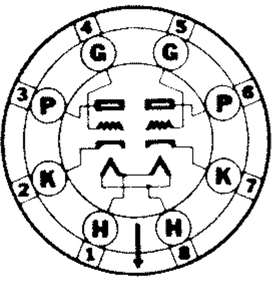


DIAGRAM NOTES:

1. *Reference line is determined by position where reference line gauge (JETEC No. 112) 1.500 inches* $^{+\ .003}_{-\ .000}$ *inches I.D. and 2 inches long will seat on bulb cone.*
2. *Location of deflection yoke must be within this space.*
3. *Socket for this base should not be rigidly mounted: It should have flexible leads and be allowed to move freely. Bottom circumference of base shell will fall within circle concentric with bulb axis and having diameter of 1 7/8 inches.*
4. *The plane through the tube axis and vacant pin position No. 3 may vary from the plane through the tube axis and bulb terminal by an angular tolerance (measured about the tube axis) of ±10 Degrees. Bulb terminal is on the same side as vacant pin position No. 3.*



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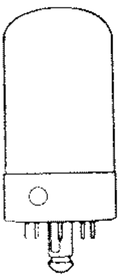


Sylvania Type 7N7

MEDIUM-MU DUOTRIODE

GT EQUIVALENT 6SN7GT

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T-9
Maximum Overall Length	$3\frac{5}{32}$"
Maximum Seated Height	$2\frac{5}{8}$"
Mounting Position	Any

RATINGS

Heater Voltage AC or DC (Nominal)	7.0 Volts
Heater Current (Nominal)	0.640 Ampere
Maximum Plate Voltage	300 Volts
Maximum Plate Dissipation per Section	2.5 Watts
Maximum Heater-Cathode Voltage	90 Volts
Minimum Grid Voltage	0 Volt

Direct Interelectrode Capacitances:*

	T1†		T2†
Grid to Plate	3.0	....	3.0 μμf.
Input	3.4	....	2.9 μμf.
Output	2.0	....	2.4 μμf.
Plate 1 to Plate 2	....	0.34	μμf.
Grid 1 to Grid 2	....	0.40	μμf.
Grid 1 to Plate 2	....	0.08	μμf.
Grid 2 to Plate 1	....	0.06	μμf.

*With $1\frac{5}{16}$" diameter shield (RMA Std. M8-308) connected to cathode.
†Triode No. 1 connected to pins 5, 6 and 7; Triode No. 2 to pins 2, 3 and 4.

TYPICAL OPERATION

CLASS A_1 AMPLIFIER

Heater Voltage (AC or DC)	6.3	6.3 Volts
Heater Current	0.600	0.600 Ampere
Plate Voltage	90	250 Volts
Grid Voltage	0	−8 Volts
Self-Bias Resistor	0	900 Ohms
Plate Current	10.0	9.0 Ma.
Plate Resistance	6700	7700 Ohms
Mutual Conductance	3000	2600 μmhos
Amplification Factor	20	20

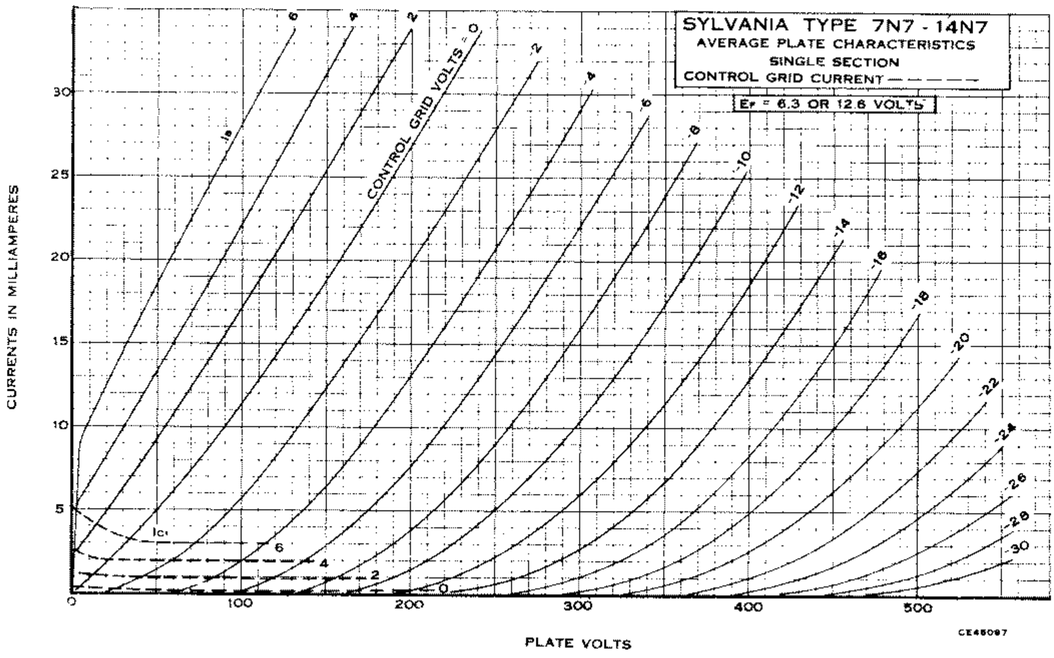
PHASE INVERTER

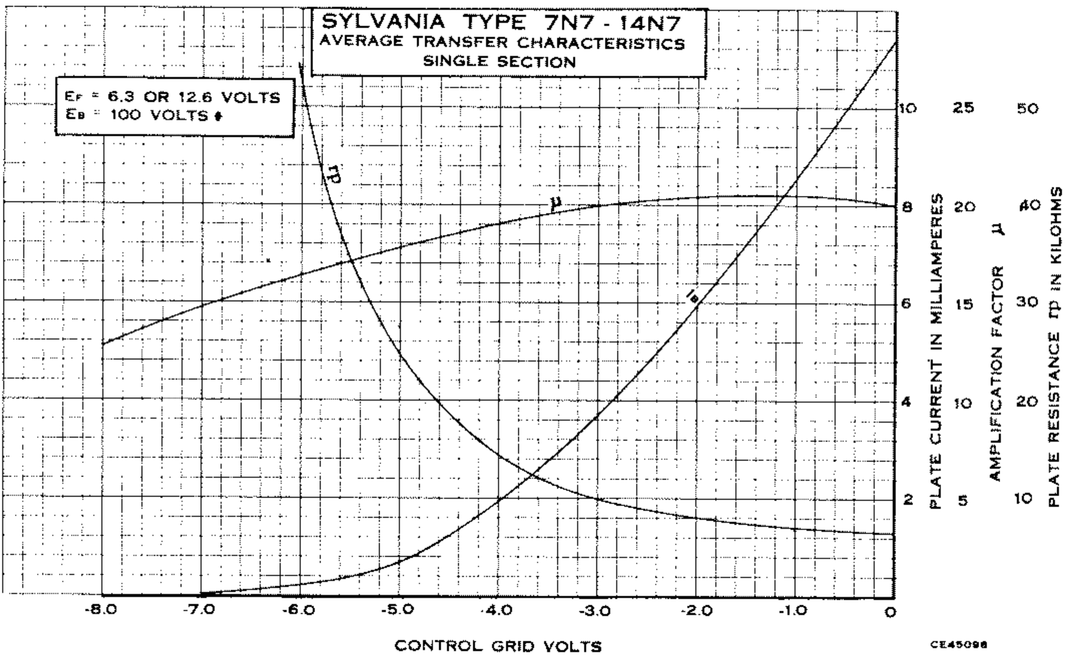
Plate Supply Voltage	100	250 Volts
Grid Voltage	−2.25	−5.5 Volts
Plate Current per Section	1.5	2.4 Ma.
Plate Resistor	30000	50000 Ohms
Self-Bias Resistor	750	1150 Ohms
Maximum Output Voltage (RMS)	20	65 Volts

APPLICATION

Sylvania Type 7N7 is a single-ended double triode with separate cathodes for each section. It is designed for use as a phase inverter or voltage amplifier. The 7N7 is identical to two Type 7A4 tubes and reference is made to that type for curves, and resistance coupled data on page 46. Type 6SN7GT is the octal based equivalent.

7N7 (Cont.)


SYLVANIA TYPE 7N7 - 14N7
AVERAGE PLATE CHARACTERISTICS
SINGLE SECTION
CONTROL GRID CURRENT - - - - -
Ef = 6.3 OR 12.6 VOLTS
CONTROL GRID VOLTS = 0
CURRENTS IN MILLIAMPERES
PLATE VOLTS
CE45097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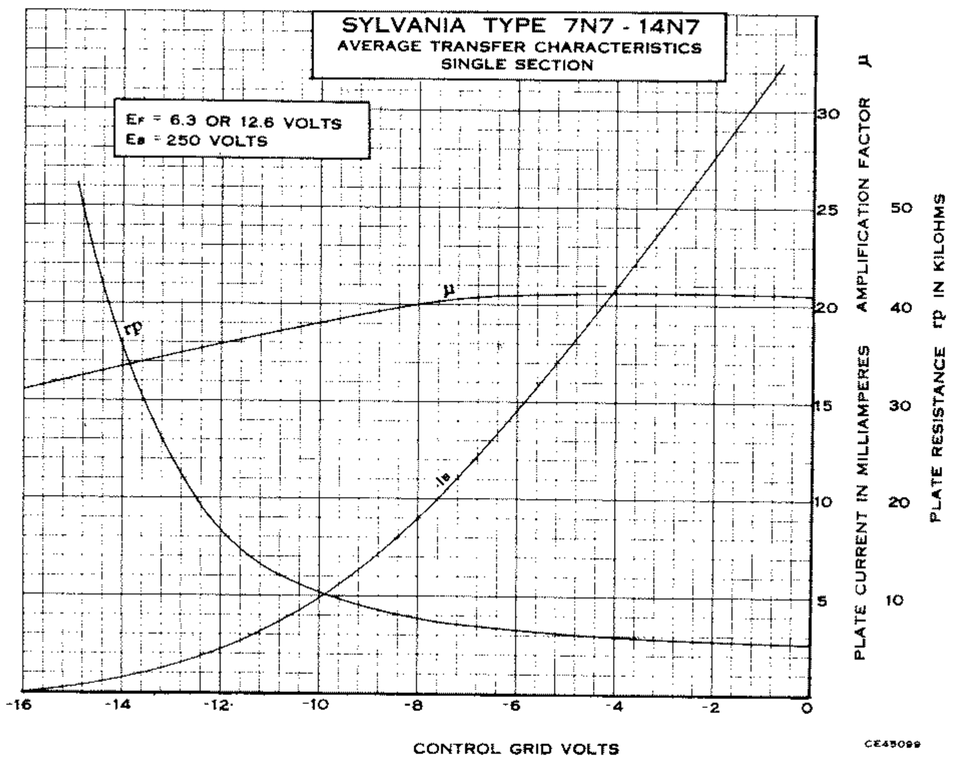
AVERAGE TRANSFER CHARACTERISTICS
SINGLE SECTION
Ef = 6.3 OR 12.6 VOLTS
Eb = 100 VOLTS
rp
μ
Ib
PLATE CURRENT IN MILLIAMPERES
AMPLIFICATION FACTOR μ
PLATE RESISTANCE rp IN KILOHMS
CONTROL GRID VOLTS
CE45098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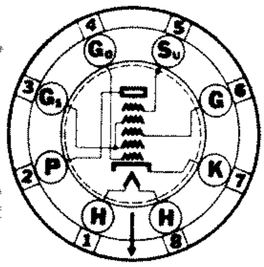
AVERAGE TRANSFER CHARACTERISTICS
SINGLE SECTION
Ef = 6.3 OR 12.6 VOLTS
Eb = 250 VOLTS
rp
μ
Ib
PLATE CURRENT IN MILLIAMPERES
AMPLIFICATION FACTOR μ
PLATE RESISTANCE rp IN KILOHMS
CONTROL GRID VOLTS
CE45099



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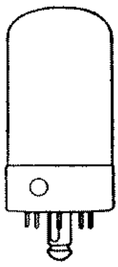


Sylvania Type 7Q7

HEPTODE CONVERTER

GT EQUIVALENT 6SA7GT

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T-9
Maximum Overall Length	$2\frac{25}{32}$"
Maximum Seated Height	$2\frac{1}{4}$"
Mounting Position	Any

RATINGS

Heater Voltage (Nominal) AC or DC	7.0 Volts
Heater Current (Nominal)	0.32 Ampere
Maximum Plate Voltage	300 Volts
Maximum Screen Voltage	100 Volts
Maximum Screen Supply Voltage	300 Volts
Maximum Plate Dissipation	1.0 Watt
Maximum Screen Dissipation	1.0 Watt
Maximum Total Cathode Current	14 Ma.
Minimum Signal-Grid External Bias Voltage (with self-excited oscillator)	0 Volt
Maximum Heater-Cathode Voltage	90 Volts

Direct Interelectrode Capacitances:*

Grid G to Plate	0.20 μμf. Max.
Grid G to Go	0.20 μμf. Max.
Grid Go to Plate	0.15 μμf. Max.
Signal Input	9.0 μμf.
Oscillator Input	7.0 μμf.
Mixer Output	9.0 μμf.
Grid Go to All Except Cathode	5.0 μμf.
Grid Go to Cathode	2.2 μμf.
Cathode to all Except Go	6.0 μμf.

*With $1\frac{5}{16}$" diameter shield (RMA Std. M8-308) connected to cathode.

TYPICAL OPERATION

CONVERTER (SEPARATELY EXCITED)

Heater-Voltage	6.3	6.3 Volts
Heater Current	0.3	0.3 Ampere
Plate Voltage	100	250 Volts
Screen Voltage	100	100 Volts
Control Grid Voltage** (G)	−2	−2 Volts
Self-Bias Resistor	160	160 Ohms
Suppressor Grid and Shield Voltage	0	0 Volt
Oscillator Grid Resistor (Go)	20000	20000 Ohms
Plate Resistance (Approximate)	0.5	1.0 Megohm
Oscillator Grid Current	0.5	0.5 Ma.
Plate Current	3.3	3.5 Ma.
Screen Current (Gs)	8.5	8.5 Ma.
Total Cathode Current	12.3	12.5 Ma.
Conversion Conductance at Ec3 = −2	525	550 μmhos
Conversion Conductance at Ec3 = −6	275	300 μmhos
Conversion Conductance at Ec3 = −10	65	70 μmhos
Conversion Conductance at Ec3 = −35 (Approx.)	2	2 μmhos

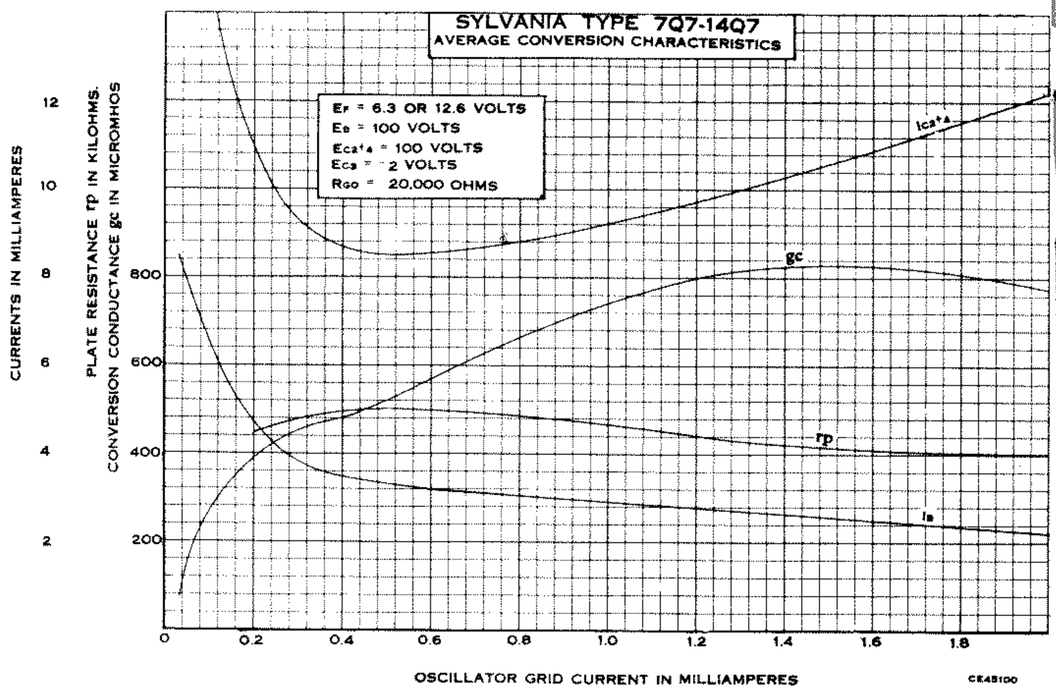
**Characteristics for self excitation are similar to those given for separate excitation except the control grid (Grid G bias voltage is 0 volt).

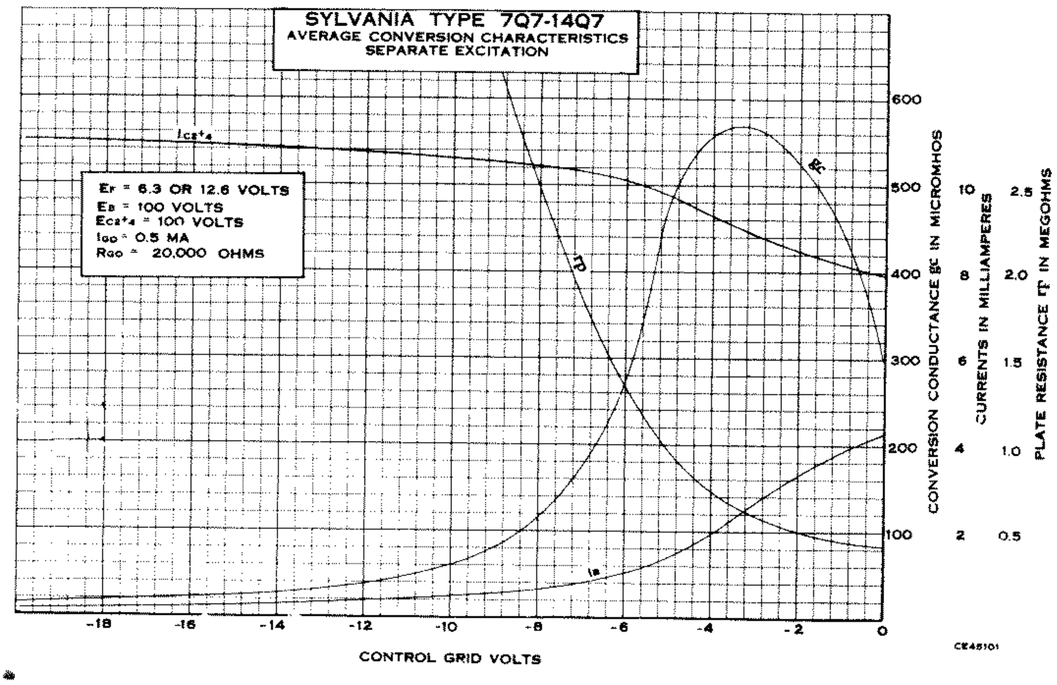
Note: With Grid Gs connected to plate (100 volts) and signal applied to Grid Go (0 volt bias). the Mutual Conductance is 4500 μmhos, plate current 27 Ma. amplification factor 13. Grid G is connected to ground during this test.

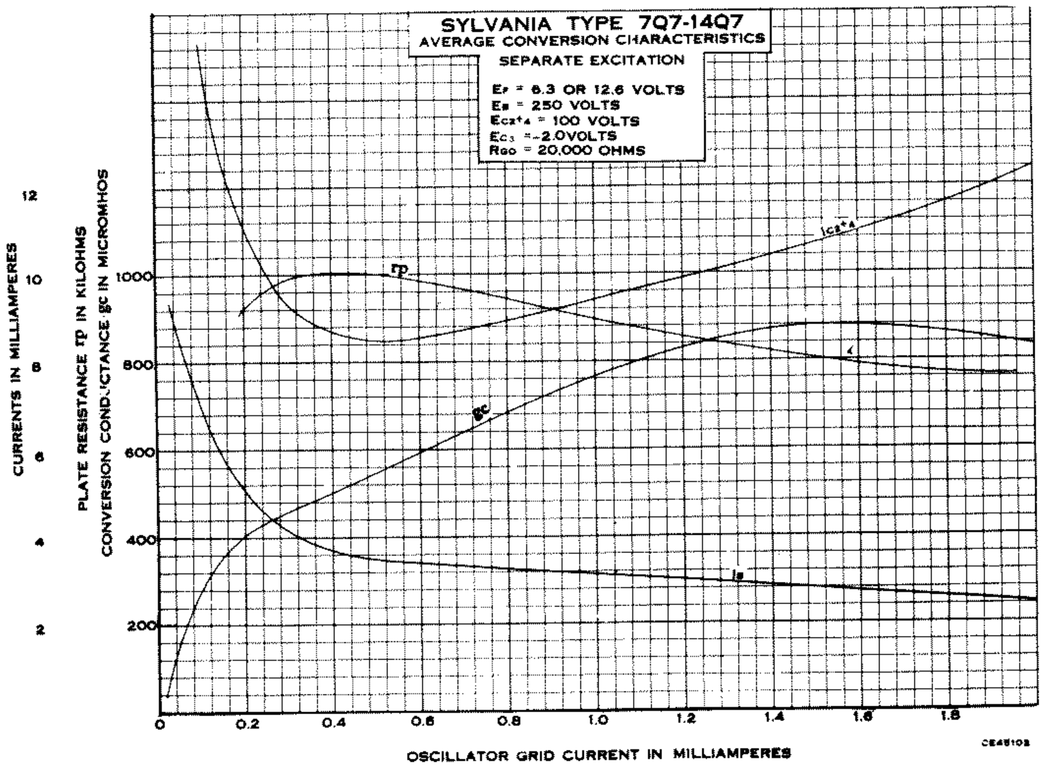
APPLICATION

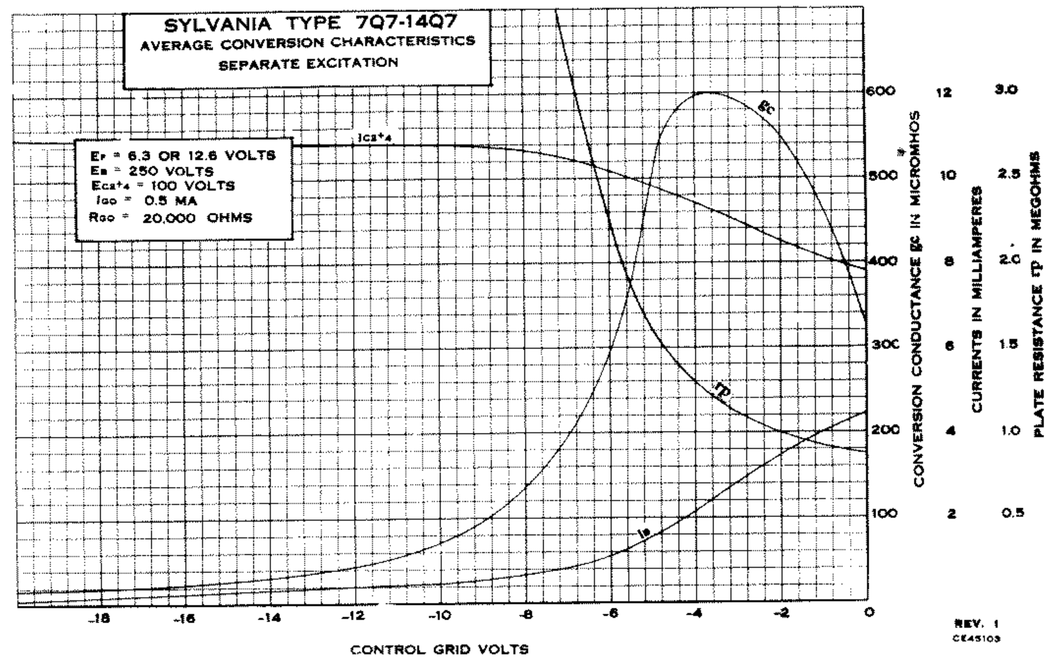
Sylvania Type 7Q7 is a pentagrid converter having electrical characteristics quite similar to those for Type 6SA7. The Lock-In construction embodied in this type provides compactness, suitable shielding and the lock-in feature. For a-c service the 7-volt heater rating corresponds to a 130-volt line condition. It is also the nominal voltage for automotive receiver service. Ratings marked Max. and Min. are design centers for a line voltage of 117 volts. For automotive service the design centers are 90% of the values indicated, using a battery terminal voltage of 6.6 volts.

7Q7 (Cont.)


SYLVANIA TYPE 7Q7-14Q7
AVERAGE CONVERSION CHARACTERISTICS
Ef = 6.3 OR 12.6 VOLTS
Eb = 100 VOLTS
Ec2+4 = 100 VOLTS
Ec3 = -2 VOLTS
Rgo = 20,000 OHMS
Ic2+4
gc
rp
Ib
CURRENTS IN MILLIAMPERES
PLATE RESISTANCE rp IN KILOHMS.
CONVERSION CONDUCTANCE gc IN MICROMHOS
OSCILLATOR GRID CURRENT IN MILLIAMPERES
CE48100


SYLVANIA TYPE 7Q7-14Q7
AVERAGE CONVERSION CHARACTERISTICS
SEPARATE EXCITATION
Ef = 6.3 OR 12.6 VOLTS
Eb = 100 VOLTS
Ec2+4 = 100 VOLTS
Igo = 0.5 MA
Rgo = 20,000 OHMS
Ic2+4
gc
rp
Ib
CONVERSION CONDUCTANCE gc IN MICROMHOS
CURRENTS IN MILLIAMPERES
PLATE RESISTANCE rp IN MEGOHMS
CONTROL GRID VOLTS
CE48101


SYLVANIA TYPE 7Q7-14Q7
AVERAGE CONVERSION CHARACTERISTICS
SEPARATE EXCITATION
Ef = 6.3 OR 12.6 VOLTS
Eb = 250 VOLTS
Ec2+4 = 100 VOLTS
Ec3 = -2.0VOLTS
Rgo = 20,000 OHMS
CURRENTS IN MILLIAMPERES
PLATE RESISTANCE rp IN KILOHMS
CONVERSION CONDUCTANCE gc IN MICROMHOS
rp
gc
Ic2+4
Ib
OSCILLATOR GRID CURRENT IN MILLIAMPERES
CE45102


SYLVANIA TYPE 7Q7-14Q7
AVERAGE CONVERSION CHARACTERISTICS
SEPARATE EXCITATION
Ef = 6.3 OR 12.6 VOLTS
Eb = 250 VOLTS
Ec2+4 = 100 VOLTS
Igo = 0.5 MA
Rgo = 20,000 OHMS
Ic2+4
gc
rp
Ib
CONVERSION CONDUCTANCE gc IN MICROMHOS
CURRENTS IN MILLIAMPERES
PLATE RESISTANCE rp IN MEGOHMS
CONTROL GRID VOLTS
REV. 1
CE45103

SYLVANIA 7UP7 7UP-* 7UP-A*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic	
Deflection Method	Magnetic	
Deflection Angle (Approx.)	53 Degrees	
Types*	7UP7 7UP7A	7UP25
Fluorescence	Blue-White	Orange
Phosphorescence	Yellow	Orange
Persistence	Long	Long
Faceplate	Clear, Spherical	
Screen	Aluminized	

**In addition to the types shown, the 7UP- and 7UP-A can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10 % Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	8.5 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	6 Inches
Bulb	J56R
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Long Medium-Shell Octal)	B8-65
Basing	5AN
Anode Contact Aligns with Pin No. 5	±10 Degrees
Weight	2¾ Pounds

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage[1]	13,200 Volts	dc
Grid No. 2 Voltage	770 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	200 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

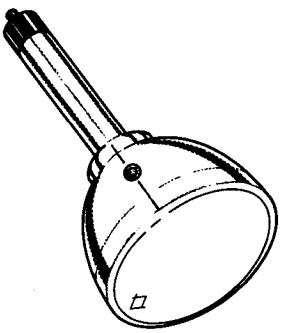
Anode Voltage[2]	7000 Volts	dc
Grid No. 2 Voltage	250 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−25 to −70 Volts	dc
Focusing Coil Current (Approx.)[4]	115 Ma	dc
Line Width[5]		
7UP7, at Ia = 200 μa	0.50 mm	
7UP7A, at Ia = 200 μa	0.28 mm	
7UP25, at Ia = 35 μa	0.20 mm	
Spot Position[6]	12 mm	

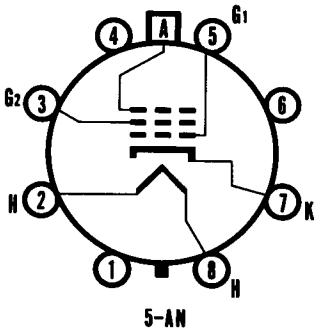
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

7″ Direct Viewed
Round Glass Type
Spherical Faceplate
Aluminized Screen
Magnetic Deflection
Magnetic Focus
No Ion Trap
7UP-A and 7UP25 have high resolution gun.





5-AN

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE
OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
MARCH, 1963

File Under
SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

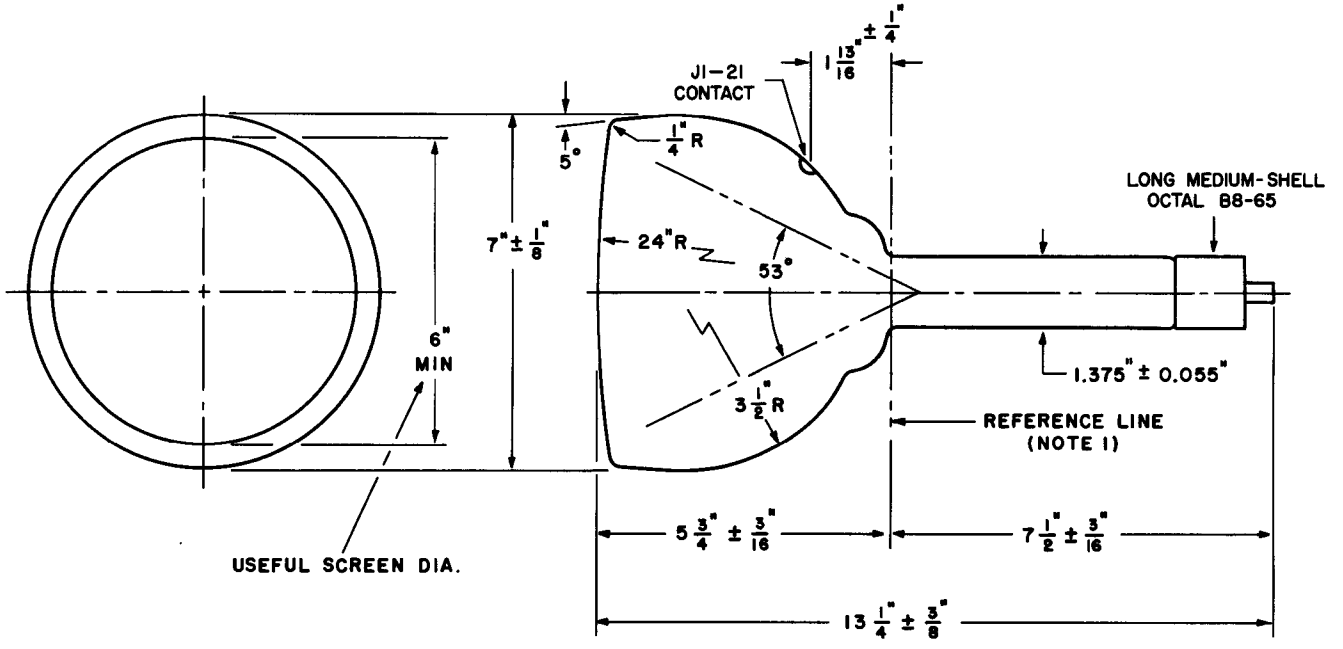
NOTES:

1. *The screen of the 7UP25 may be damaged if the exciting current density exceeds 1.4 μa per square cm.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, anode voltage should not be less than 5,000 volts.*
3. *Visual extinction of undeflected focused spot.*
4. *For JEDEC focusing coil No. 106 with distance from the yoke reference line to center of air gap equal to 2 ¾ inches.*
5. *Measured in accordance with MIL-E-1.*
6. *The center of the undeflected, unfocused spot will fall within a circle having 12 mm radium concentric with the tube face.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE



D59020A

DIAGRAM NOTE:

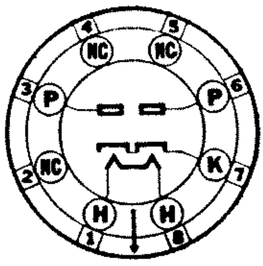
1. *Reference line is determined by the point where a gauge 1.430" $^{+.003"}_{-.000"}$ I.D. and 2" long will stop against the bulb.*

7Y4 Sylvania Type

FULL-WAVE RECTIFIER

GT EQUIVALENT 6X5GT





5AB-L-0

PHYSICAL SPECIFICATIONS

Base	Lock-In 8 Pin
Bulb	T-9
Maximum Overall Length	$2^{35}/_{32}$"
Maximum Seated Height	$2\frac{1}{4}$"
Mounting Position	Any

RATINGS .

Heater Voltage (Nominal) AC or DC	7.0 Volts
Heater Current (Nominal)	0.530 Ampere
Maximum RMS Plate Voltage Condenser Input	325 Volts
Maximum RMS Plate Voltage Choke Input	450 Volts
Maximum Peak Inverse Voltage	1250 Volts
Maximum DC Heater-Cathode Voltage	450 Volts
Maximum Peak Plate Current	180 Ma.
Maximum DC Output Current	70 Ma.
DC Voltage Drop at 70 Ma Per Plate	22 Volts

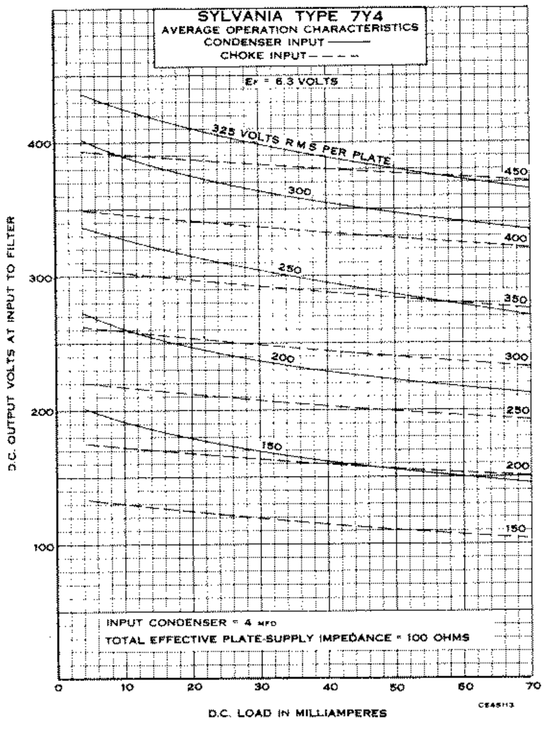
TYPICAL OPERATION

	Condenser Input	Choke Input
Heater Voltage	6.3	6.3 Volts
Heater Current	0.50	0.50 Ampere
RMS Plate Voltage	325	450 Volts
DC Output Current	70	70 Ma.
Plate Supply Impedance* (Minimum per Plate)	150	.... Ohms
Minimum Input Choke Value	....	10 Henrys

*When greater than 40 μfd input filter condenser is used it may be necessary to increase minimum plate supply impedance.

APPLICATION

Sylvania Type 7Y4 is a full-wave cathode heater type rectifier tube of Lock-In construction. It is designed for service in small auto and AC receivers. It is similar to the older 6X5GT and 84 but is smaller physically and is considerably more rugged due to the Lock-In construction. Conventional circuits such as used with the older types, are entirely suitable for use with this tube.

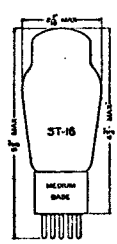




Sylvania

TYPE 10

AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension filament	7,5 volts
Courant filament	1,25 ampère
Ampoule	ST-16
Culot — Moyen 4 broches	4-D
Position de montage	verticale

Capacités directes interélectrodes :

Grille à plaque	7 $\mu\mu$F
Entrée	4 $\mu\mu$F
Sortie	3 $\mu\mu$F

Conditions de fonctionnement et caractéristiques :

Tension filament	7,5	7,5	7,5 volts
Tension plaque	250	350	425 volts
Tension grille*	—23,5	—32	—40 volts
Courant plaque	10	16	18 ma.
Résistance interne	6,000	5,150	5,000 ohms
Conductance mutuelle	1,330	1,550	1,600 μmhos
Coefficient d'amplification	8	8	8
Impédance de charge	13,000	11,000	10,200 ohms
Puissance modulée	0,4	0,9	1,6 watts

* Tension grille mesurée à partir du point milieu du filament.

APPLICATION

Le tube Sylvania est un amplificateur triode de puissance, ayant un coefficient d'amplification de 8. Cette valeur est considérablement plus élevée que la normale pour un tube triode de puissance utilisé en classe A.

Ce tube doit fonctionner avec une tension d'au moins 250 volts et avec une polarisation appropriée. Le type 10 peut être utilisé dans un étage de basse fréquence, seul ou en montage push-pull classe A ou classe B. Dans ce dernier montage, la polarisation sera ajustée de telle sorte que, sans signal d'attaque, le courant plaque soit réduit à une faible valeur.

SYLVANIA

engineering data service

SYLVANIA
10AKP7
10AKP-*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflection Angle (Approx.)	50 Degrees
Phosphor	Aluminized, P7
Fluorescence	Blue-White
Phosphorescence	Yellow
Persistence	Long
Faceplate	Gray Glass
Light Transmittance (Approx.)	76 Percent

* In addition to the type shown, the 10AKP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	8 $\mu\mu$f

MECHANICAL DATA

Minimum Useful Screen Diameter	9 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B5-57
Basing	12D
Bulb	J84C

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	11,000 Volts	dc
Grid No. 2 Voltage	1100 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	200 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Grid No. 1 Drive from Cutoff	65 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

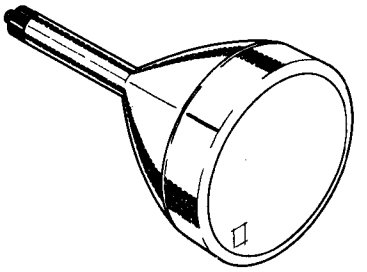
Anode Voltage	8000 Volts	dc
Grid No. 2 Voltage	700 Volts	dc
Grid No. 1 Voltage Required for Cutoff[1]	−35 to −80 Volts	dc
Focusing Coil Current (Approx.)[2]	105 Ma	dc
Linewidth A[3]	.30 mm	Max.
Spot Position (Undeflected)[4]	18 mm	Max.

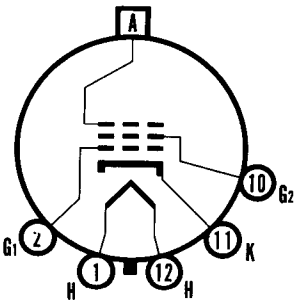
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Radar Indicator Tube
High Resolution
10" Round Glass Type
Spherical Faceplate
Gray Glass
Aluminized Screen
Magnetic Deflection
Magnetic Focus





12-D

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

MAY, 1961

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

NOTES:

1. *Visual extinction of undeflected focused spot.*
2. *For JEDEC focusing coil No. 106 with distance from the yoke reference line to center of air gap equal to 3¼ inches.*
3. *Measured in accordance with Mil-E-1, paragraph 4.12.6.2, at an anode current of 200 μa.*
4. *The center of the undeflected, unfocused spot will fall within a circle of 18 m.m. radius, concentric with the tube face.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

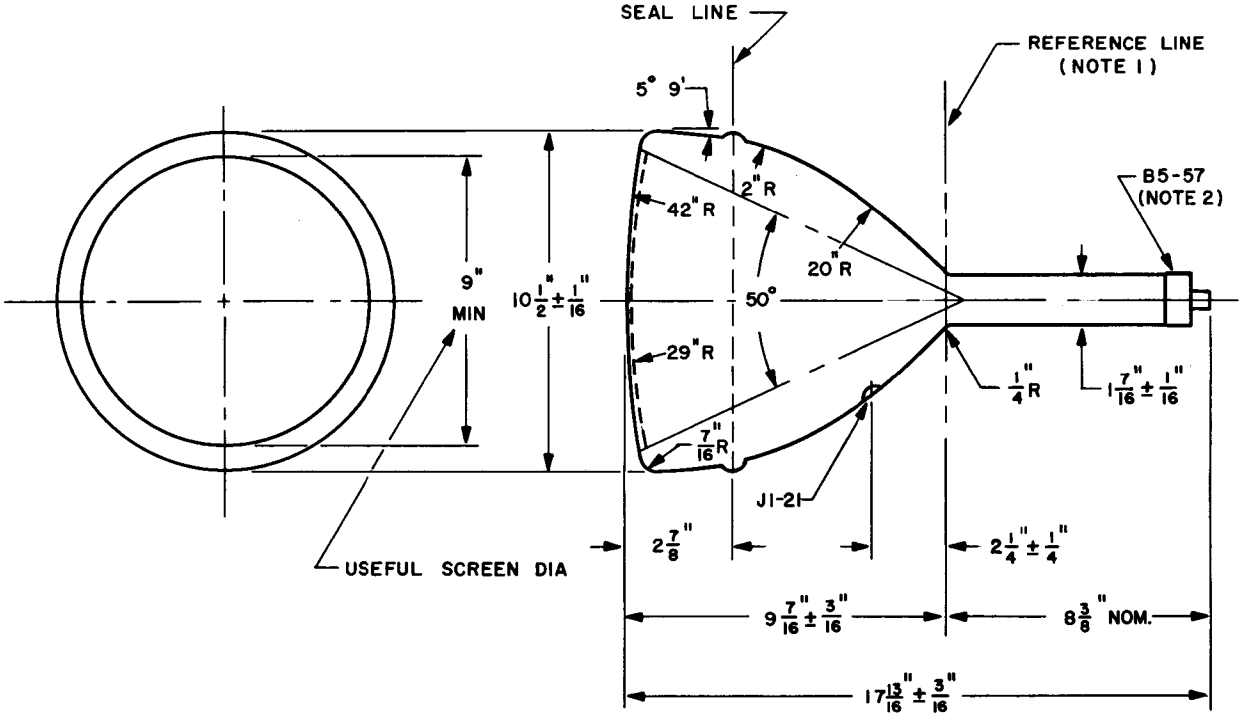


DIAGRAM NOTES:

1. *Reference line is determined by position where JEDEC No. 112 reference line gauge will seat against bulb.*
2. *Anode contact (J1-21) aligns with Vacant Pin Position No. 3 within 10 degrees.*

CHARACTERISTICS

GENERAL DATA

Focusing Method			Magnetic
Deflecting Method			Magnetic
Deflection Angle (Approx.)			50 Degrees
Phosphors*	**Fluorescence**	**Phosphorescence**	**Persistence**
P4	White	—	Medium
P7	Blue	Yellow	Long
P16	Violet	—	Extremely Short
P19	Orange	Orange	Long
P25	Orange	Orange	Long
Faceplate			Gray, Spherical-Aluminized

*In addition to the types shown, the 10ANP– can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.3 ± 10 % Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 pf
Grid No. 1 to All Other Electrodes	6 pf
Grid No. 2 to All Other Electrodes	5 pf

MECHANICAL DATA

Minimum Useful Screen Diameter	9 Inches	
Overall Length	16 Inches	Max.
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base[1]	E9-37	
Basing	9NB	
Bulb Contact Alignment		
Plane of J1-21 cap passes halfway between Pins No. 1 and No. 9	±10 Degrees	
J1-21 Cap on Same Side as Pins No. 1 and No. 9		

RATINGS

MAXIMUM RATINGS (Design Maximum Values)

Anode Voltage	12,000 Volts	dc
Grid No. 2 Voltage	450 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	200 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	0 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	180 Volts	
Heater Positive with Respect to Cathode	180 Volts	

TYPICAL OPERATING CONDITIONS

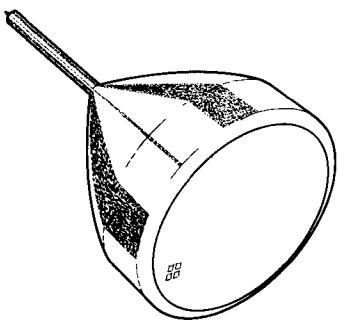
Anode Voltage[2]	9000 Volts	dc
Grid No. 2 Voltage	250 Volts	dc
Grid No. 1 Voltage[3]	−15 to −45 Volts	dc
Focusing Coil Current (Approx.)[6]	40 to 60 Ma	dc
Linewidth A[4]	0.013 Inch	Max.
Spot Position (Undeflected)[5]	½ Inch	
Modulation[4]	40 Volts	Max.

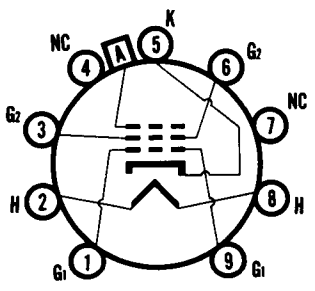
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Special Purpose Tube
10″ Round Glass Type
Spherical Faceplate
Gray Glass
Aluminized Screen
Magnetic Deflection
Magnetic Focus
⅞″ Diameter Neck
Miniature Base
6.3 Volts—300 Ma Heater





9NB

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

JUNE, 1965

File Under

SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

NOTES:

1. *A socket with a center opening to clear the tubulation should be used. Care should be taken in handling the tube to avoid damaging the exposed tubulation and bending the base pins.*
2. *Brilliance and definition decrease with decreasing accelerator voltage. In general, accelerator voltage should not be less than 7000 volts.*
3. *Visual extinction of the undeflected focused spot.*
4. *Measured per MIL-E-1 specification at an anode current of 400 μa.*
5. *The center of the undeflected focused spot will fall within a circle of 1/2-inch radius concentric with the center of the tube face with the tube shielded.*
6. *Focusing coil current measured at an accelerator current of 100 μa, with the center of air gap of JEDEC Focus Coil No. 127, or equivalent, located 2-1/2 inches from reference line.*
7. *The P16, P19, and P25 screens can be permanently damaged if current density is permitted to rise too high. To prevent burning, minimum beam current densities should be employed.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

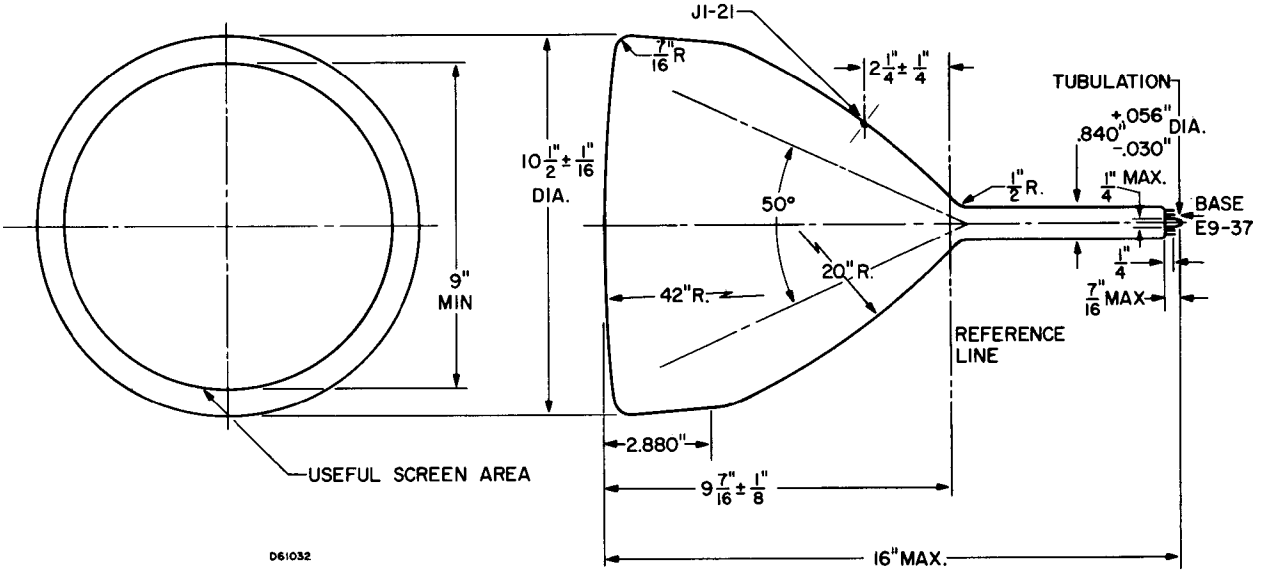
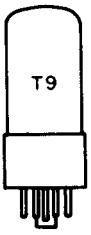
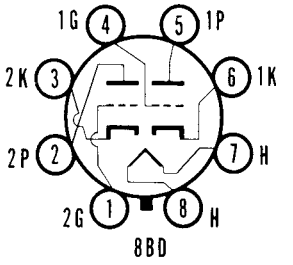


DIAGRAM NOTE:

1. *Reference line is determined by the point where leading edge of JEDEC G-112 reference line gauge (a cylinder 2" long and 1.500" + .003-.000" I.D.) will stop.*



SYLVANIA TYPE 10EG7



MECHANICAL DATA

Bulb	T-9
Base	B8-58, Short Intermediate Shell Octal, 8-Pin
Outline	9-38
Basing	8BD
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	9.7 Volts
Heater Current	600 Ma
Heater Warm-up Time[1]	11 Seconds
Maximum Heater Current Range[2]	560-640 Ma
Heater-Cathode Voltage (Design Maximum Values)[2]	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
D C	100 Volts Max.
Total D C and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section No. 1[5]	Section No. 2[5]
Grid to Plate	4.4	9.5 $\mu\mu$f
Input: g to (h+k)	2.2	7.0 $\mu\mu$f
Output: p to (h+k)	0.6	1.6 $\mu\mu$f

RATINGS (Design Maximum Values)[2]
Vertical Deflection Oscillator and Amplifier[3]

	Section No. 1 Oscillator	Section No. 2 Amplifier
Plate Voltage	330	330 Volts Max.
Peak Positive Pulse Plate Voltage	...	1500 Volts Max.
Peak Negative Pulse Grid Voltage	400	250 Volts Max.
Plate Dissipation[4]	1.5	10 Watts Max.
Average Cathode Current	22	50 Ma Max.
Peak Cathode Current	77	175 Ma Max.
Grid Circuit Resistance		
Self Bias	2.2	2.2 Megohms

AVERAGE CHARACTERISTICS

	Section No. 1[5]	Section No. 2[5]
Plate Voltage	250	150 Volts
Grid No. 1 Voltage	-11	-17.5 Volts
Plate Current	5.5	45 Ma
Transconductance	2000	7500 μmhos
Amplification Factor	17.5	6.0
Plate Resistance (approx.)	8750	800 Ohms
Ec for Ib = 10 μa (approx.)	-20	... Volts
Ec for Ib = 100 μa (approx.)	...	-40 Volts
Ib at Ec = -25 Vdc	...	8 Ma
Ib with Eb = 60 V and Ec = 0 V	...	95 Ma

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

NOTES: (cont'd)

2. Design Maximum Ratings are the limiting values expressed with respect to bogey tubes at which satisfactory tube life can be expected to occur. To obtain satisfactory performance, therefore, the equipment designed must establish the circuit design so that no design-maximum value is exceeded with a bogey tube under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, and environmental conditions.
3. For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Stations; Federal Communications Commission." The duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.
4. In stages operating with grid leak bias, an adequate bias resistor or other suitable means is required to protect the tube in the absence of excitation.
5. Section No. 1 connects to Pins 4, 5 and 6. Section No. 2 connects to Pins 1, 2 and 3.

APPLICATION

The Sylvania Type 10EG7 is a T-9 double triode with dissimilar sections. Section No. 1 is intended for use as a Vertical Deflection Oscillator having medium mu and Section No. 2 is intended for use as a Vertical Deflection Amplifier having low mu. Type 10EG7 is intended for use in television receivers employing series heater strings.

SYLVANIA TECHNICAL DATA

Rel. 619

General Data for Cathode Ray Tubes
JETEC Standard Form
Type 10HP4

DESCRIPTIVE PARAGRAPH

Type 10HP4 is a cathode ray picture tube for use in direct view television receivers. It uses electrostatic focusing and deflection and produces a 6 by 8 inch picture.

GENERAL CHARACTERISTICS

Electrical

Heater Voltage	6.3 ± 10% Volts
Heater Current	.6 ± 10% Amperes
Focusing Method	Electrostatic
Deflecting Method	Electrostatic
Phosphor	P4
Fluorescence	White
Persistence	Medium

Direct Interelectrode Capacitances, Nominal

Cathode to all other electrodes	9.5 uuf.
Grid #1 to all other electrodes	8.5 uuf.
D1 to D2	3.5 uuf.
D3 to D4	2.0 uuf.
D1 to all other electrodes except D2	7.5 uuf.
D2 to all other electrodes except D1	7.5 uuf.
D3 to all other electrodes except D4	6.0 uuf.
D4 to all other electrodes except D3	6.0 uuf.

Mechanical

Overall Length	19 1/4 ± 3/8 Inches
Greatest Diameter of Bulb	10 ± 1/8 Inches
Minimum Useful Screen Diameter	8 3/4 Inches
Base JETEC Designation	B12-37
Basing JETEC Designation	140
Base Alignment 1D2 trace Aligns with Pin # 5 and tube axis	± 10 Degrees
Positive voltage on D1 deflects beam approx. toward Pin #	5
Positive voltage on D3 deflects beam approx. toward Pin #	2

MAXIMUM RATINGS Design Center Values

Anode No. 2 Voltage	5000 Max. Volts DC
Anode No. 1 Voltage	2000 Max. Volts DC
Grid No. 1 Voltage	
Negative Bias Value	-200 Max. Volts DC
Positive Bias Value	0 Max. Volts DC
Positive Peak Value	2 Max. Volts
Peak Heater-Cathode Voltage[1]	
Heater Negative with respect to cathode	125 Max. Volts DC
Heater Positive with respect to cathode	125 Max. Volts DC
Heater Negative with respect to cathode during equipment warm up period not exceeding 15 seconds	410 Max. Volts DC
Peak Voltage between Anode No. 2 and any Deflection Electrode	600 Max. Volts

NOV 10 1947

from RMA release # 619, Nov. 25, 1947

TYPICAL OPERATING CONDITIONS

For Anode No. 2 Voltage of 4000		5000 Volts
Anode No. 1 Voltage	960 to 1440	1200 to 1800 Volts
Grid No. 1 Voltage[2]	-48 to -112	-60 to -140 Volts
Deflection Factors:		
D1 and D2	88 to 120	110 to 150 Volts DC per Inch
D3 and D4	68 to 92	85 to 115 Volts DC per Inch

Anode No. 1 Voltage	24 % to 36 %	of Eb2	Volts
Grid No. 1 Voltage[2]	-1.2 % to -2.8 %	of Eb2	Volts

Anode No. 1 Current for any operating condition -15 to +40 Microamperes

Deflection Factors		
D1 and D2	22 to 30	Volts DC per Inch per Kilovolt of Eb2
D3 and D4	17 to 23	Volts DC per Inch per Kilivolt of Eb2

Spot Position (Undeflected)[5] 20 Max. Millimeters (Square)

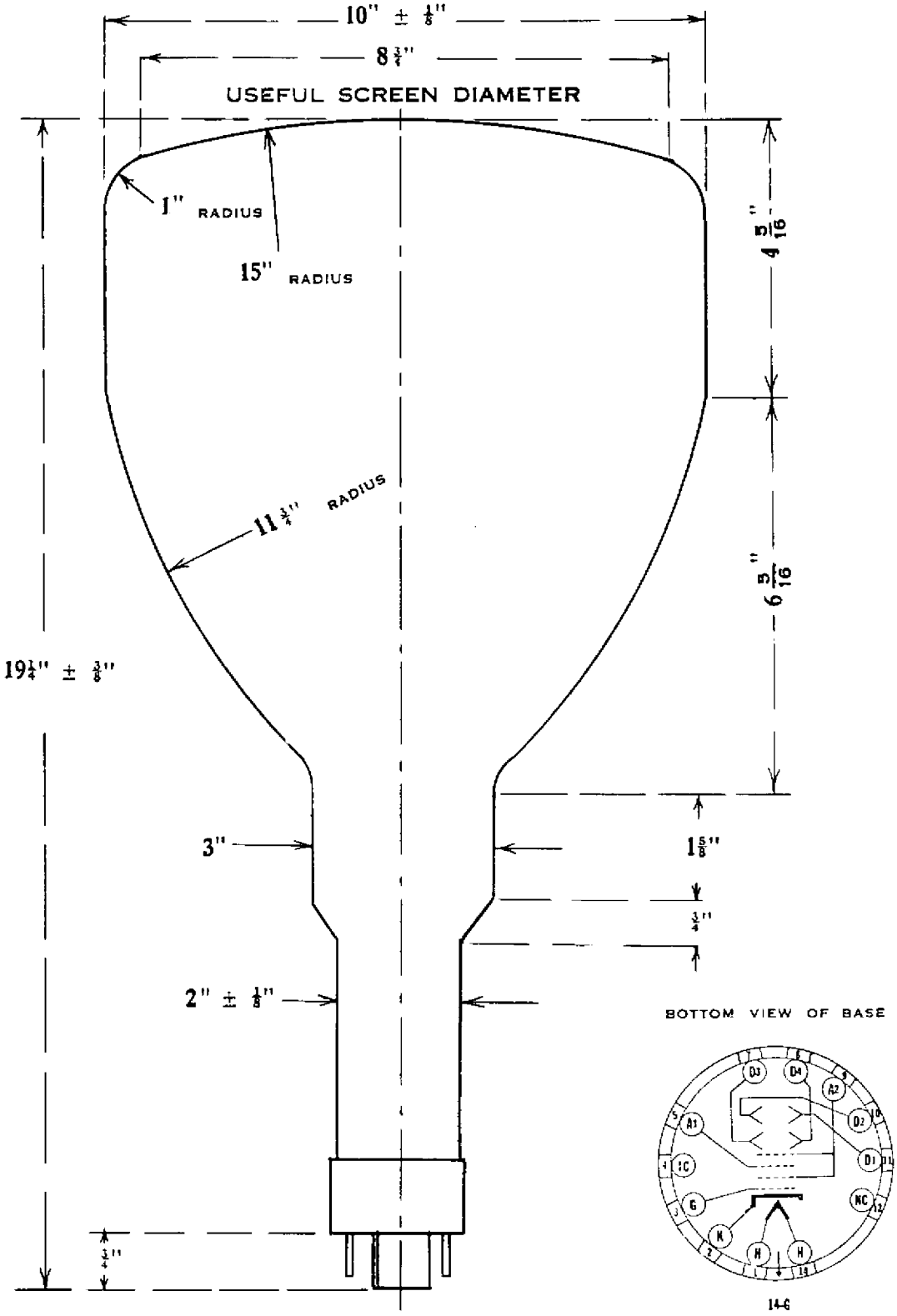
MAXIMUM CIRCUIT VALUES.

Grid No 1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting - Electrode Circuit[4]	5.0 Max. Megohms

CATHODE RAY TUBE CHARACTERISTICS
NOTES

1. Cathode should be returned to one side or to the mid-tap of the heater transformer winding.
2. Visual extinction of undeflected focused spot.
4. It is recommended that the deflecting-electrode-circuit resistances be approximately equal.
5. Connect free deflecting electrodes to second anode.

ESSENTIAL BULB DIMENSIONS



SYLVANIA

engineering data service

SYLVANIA
10KP7*
10KP7A
10KP7B

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflection Angle (Approx.)	50 Degrees

Types*	10KP7 / 10KP7A	10KP7B
Fluorescence	Blue-White	Blue-White
Phosphorescence	Yellow	Yellow
Persistence	Long	Long
Screen	——	Aluminized
Faceplate	Gray Filter Glass	Gray Filter Glass
Light Transmittance (approx.)	77	77

*In addition to the types shown, the 10KP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	8 $\mu\mu$f

MECHANICAL DATA

Minimum Useful Screen Diameter	9 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Bulb	J84C or J84D
Base (Small-Shell Duodecal 5-Pin)	B5-57
Basing	12D
Bulb Contact Aligns with Vacant Pin Position No. 3	±10 Degrees
Weight (approx.)	9 Pounds

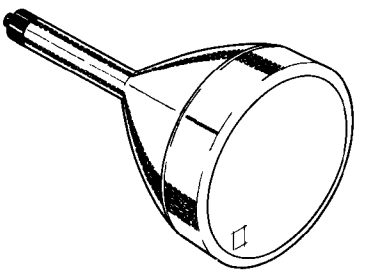
RATINGS

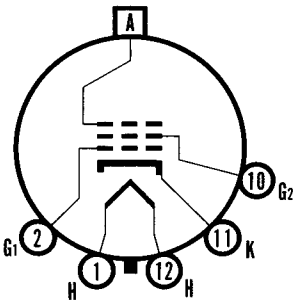
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	
10KP7, 10KP7A	11,000 Volts dc
10KP7B	13,200 Volts dc
Grid No. 2 Voltage	770 Volts dc

QUICK REFERENCE DATA

10" Direct Viewed
Round Glass Type
Spherical, Gray Faceplate
10KP7B, Aluminized Screen
Magnetic Deflection
Magnetic Focus
10KP7A and 10KP7B, High Resolution





12-D

SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

MARCH, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

MAXIMUM RATINGS (Absolute Maximum Values) (Cont'd)

Grid No. 1 Voltage				
Negative Bias Value			200 Volts	dc
Positive Bias Value			0 Volts	dc
Positive Peak Value			2 Volts	
Peak Heater Cathode Voltage				
	10KP7	**10KP7A**	**10KP7B**	
Heater Negative with Respect to Cathode	140	200	Volts	
During Warm-up Period not to Exceed 15 Seconds			450 Volts	
After Equipment Warm-up Period			200 Volts	
Heater Positive with Respect to Cathode	140	200	200 Volts	

TYPICAL OPERATING CONDITIONS

Anode Voltage[1]	9000 Volts	dc
Grid No. 2 Voltage	250 Volts	dc
Grid No. 1 Voltage Required for Cutoff[2]	−27 to −63 Volts	dc
Focusing Coil Current (Approx.)[3]	112 ± 15% Ma	dc
Line Width A[4] (10KP7A and 10KP7B)	0.38 mm	Max.

MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

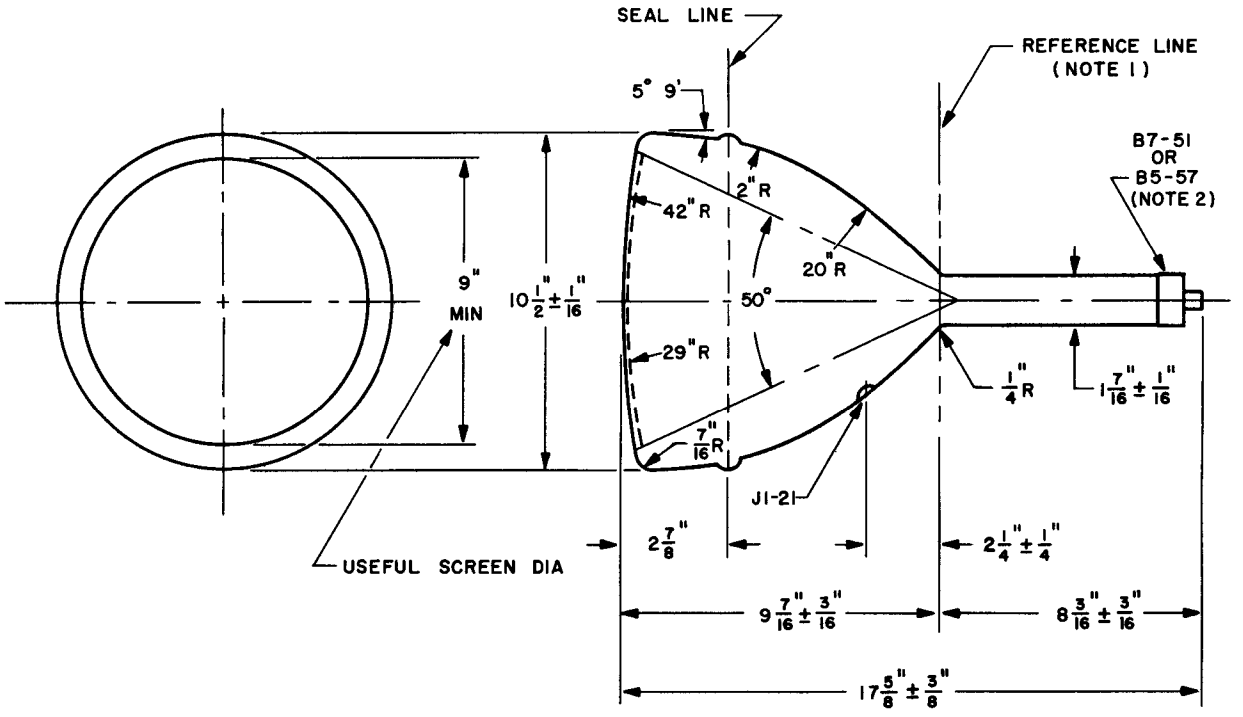
NOTES:

1. *Brilliance and definition decrease with decreasing Anode Voltage. In general, the Anode Voltage should not be less than 7000 volts for Type 10KP7B and not less than 5000 volts for Types 10KP7 and 10KP7A.*
2. *Visual extinction of focused spot.*
3. *For JEDEC focusing coil 106 or equivalent, center of air gap 3¼ inches from Reference Line at an anode current of 200 μa.*
4. *Measured in accordance with MIL-E-1, at an anode current of 200 μa.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE



S58059

DIAGRAM NOTES:

1. *Reference line is determined by the plane of the upper edge of the reference line gauge (JEDEC No. 112) when the gauge is seated on the cone.*
2. *Anode terminal aligns with Pin Position No. 3 ± 10 degrees and is on same side of bulb as Pin Position No. 3.*

from RMA release #788
Oct. 10, 1949

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 10MP4

CATHODE-RAY TUBE

The Type 10MP4 is a ten inch magnetic-focus and magnetic-deflection direct-view picture tube for television applications. This type has an external conductive coating, and it has an electron gun of triode construction to be used with an external ion-trap magnet.

GENERAL DATA

ELECTRICAL

Heater Voltage	6.3 volts
Heater Current	0.6 ± 10% amps
Focusing Method	magnetic
Deflecting Method	magnetic
Deflecting Angle (approx.)	52 degrees
Phosphor	#4
Fluorescence	white
Persistence	medium
Capacitance	
External Conductive Coating to Anode	
Maximum	2,500 $\mu\mu$f
Minimum	500 $\mu\mu$f

MECHANICAL

Overall Length	17 ± 3/8 inches
Greatest Diameter of Bulb	10 1/2 ± 1/16 inches
Minimum Useful Screen Diameter	9 1/8 inches
Bulb Contact	J1-21, Recessed Small Cavity Cap
Base	B5-57, Small Shell Duodecal 5-Pin
Basing	12G
Bulb Contact Alignment with Pin Position #3 (vacant)	±10 degrees

MAXIMUM RATINGS-- *Design Center Values*

Anode Voltage (dc)	10,000 volts
Grid Voltage	
Negative-Bias (dc)	125 volts
Positive-Bias (dc)	0 volts
Positive Peak	2 volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-Up Period (1)	410 volts
After Warm-Up Period	125 volts
Heater Positive with Respect to Cathode	125 volts

(1) *Not to exceed 15 seconds.*

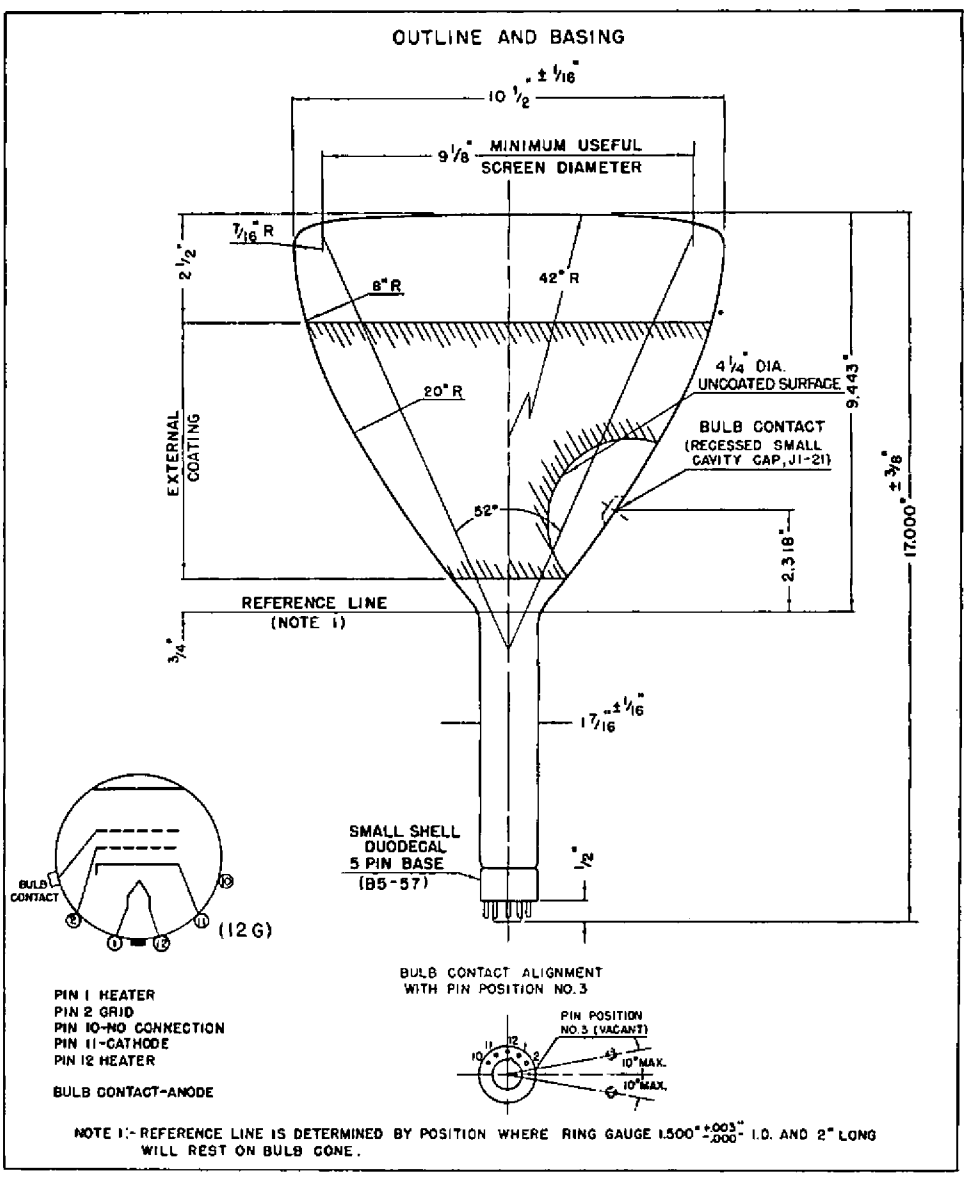
TYPE 10MP4

TYPICAL OPERATING CONDITIONS

Anode Voltage (dc)	9,000	volts
Grid Voltage for Cut-Off (dc)	-27 to -63	volts

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5	megohms



from RMA release #814
Dec. 19, 1949

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 10MP4A

CATHODE-RAY TUBE

The Type 10MP4A is a ten inch magnetic-focus and magnetic-deflection direct-view picture tube for television applications. The face plate is tinted neutral gray. This type has an external conductive coating, and it has an electron gun of triode construction to be used with an external ion-trap magnet.

GENERAL DATA

ELECTRICAL

Heater Voltage	6.3 volts
Heater Current	0.6 ± 10% amps
Focusing Method	magnetic
Deflecting Method	magnetic
Deflecting Angle (approx.)	52 degrees
Phosphor	P4
Fluorescence	white
Persistence	medium
Face Transmittance(1)	66%
Capacitance	
External Conductive Coating to Anode	
Maximum	2,500 μμf
Minimum	500 μμf

MECHANICAL

Overall Length	17 ± 3/8 inches
Greatest Diameter of Bulb	10 1/2 ± 1/16 inches
Minimum Useful Screen Diameter	9 1/8 inches
Bulb Contact	J1-21, Recessed Small Cavity Cap
Base	B5-57, Small Shell Duodecal 5-Pin
Basing	12G
Bulb Contact Alignment with Pin Position #3 (vacant)	±10 degrees

MAXIMUM RATINGS -- *Design Center Values*

Anode Voltage (dc)	10,000 volts
Grid Voltage	
Negative-Bias (dc)	125 volts
Positive-Bias (dc)	0 volts
Positive Peak	2 volts
Peak Heater-Cathode Voltage(2)	±125 volts

(1) With a 7000°K all-sulphide P4 screen as the light source.

(2) A peak heater-cathode voltage of - 410 volts maximum may be applied for not more than 15 seconds during equipment warm-up periods.

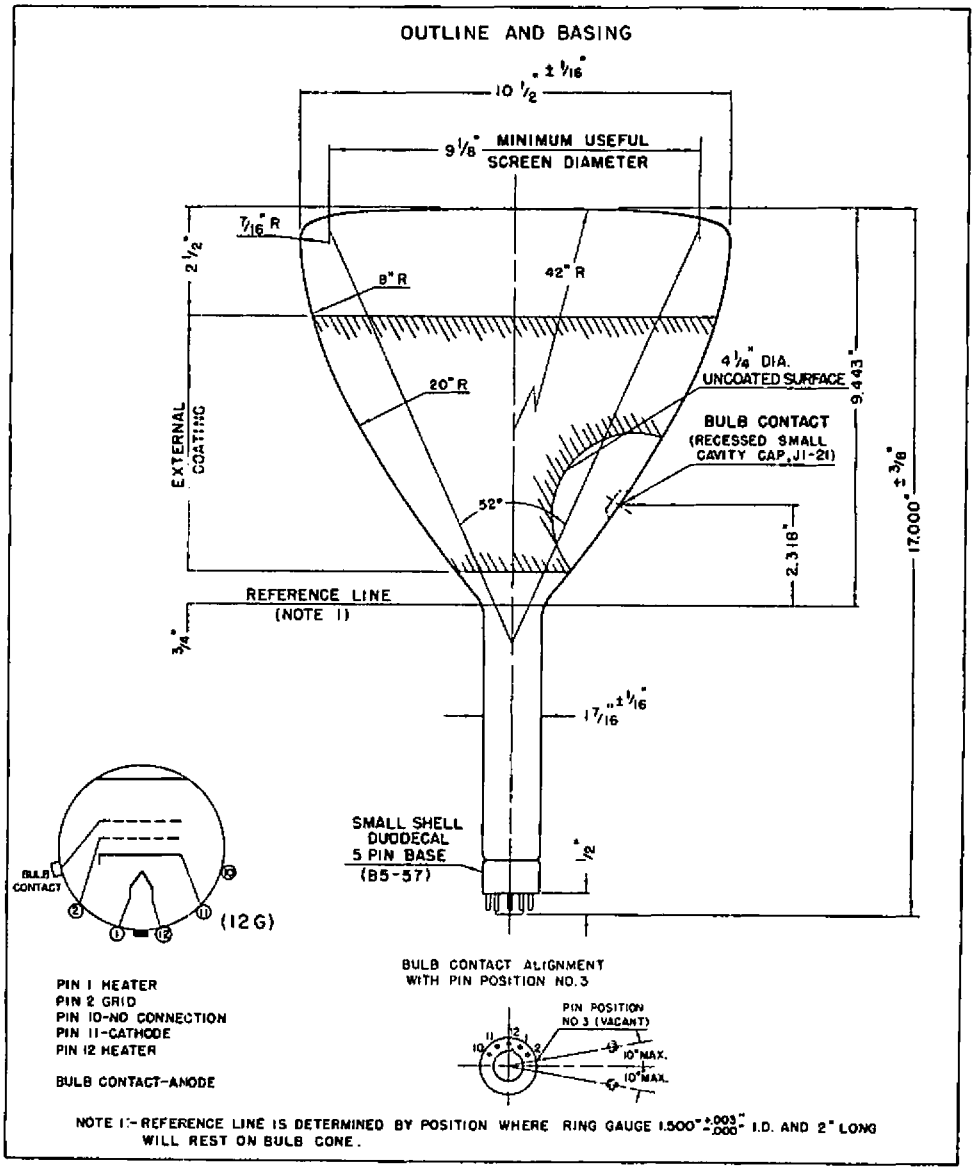
TYPE 10MP4A

TYPICAL OPERATING CONDITIONS

Anode Voltage (dc)	9,000	volts
Grid Voltage for Cut-Off (dc)	-27 to -63	volts

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5	megohms



SYLVANIA

engineering data service

SYLVANIA

10NP11

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflecting Angle (approx.)	52 Degrees
Phosphor	P11
Fluorescence	Blue
Persistence	Short
Faceplate	Gray Filter Glass

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid to All Other Electrodes	6 $\mu\mu$f
External Conductive Coating to Anode	1500 $\mu\mu$f Max.
	500 $\mu\mu$f Min.

MECHANICAL DATA

Minimum Useful Screen Diameter	9⅛ Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12G
Bulb Contact Aligns with Vacant Pin Position No. 3	±30 Degrees

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	25,000 Volts dc
Grid Voltage	
Negative Bias Value	350 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode During Warm-Up Period Not to Exceed 15 Seconds	410 Volts
After Equipment Warm-Up Period	150 Volts
Heater Positive with Respect to Cathode	150 Volts

RECOMMENDED OPERATING CONDITIONS

Anode Voltage	18,000 Volts dc
Grid Voltage[1]	-65 to -125 Volts dc
Focusing Coil Current (approx.)[2]	110 Ma dc

CIRCUIT VALUES

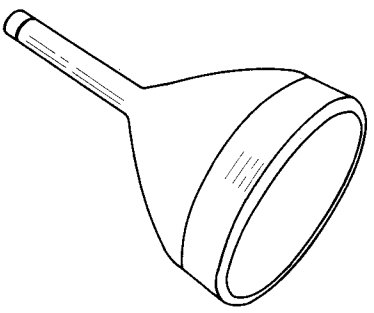
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

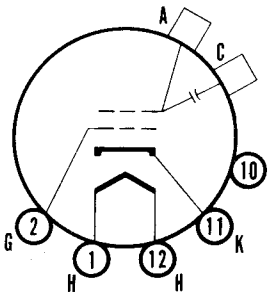
NOTES:

1. *Visual extinction of undeflected focused spot.*
2. *For JETEC focusing 109 or equivalent, three and one quarter inches from reference line.*

QUICK REFERENCE DATA

Special Purpose Tube
10" Video Recording Tube
Round Glass Type
Magnetic Deflection
Magnetic Focus
Gray Filter Glass
Aluminized Screen





12-G

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JULY, 1954

SYLVANIA

10NP11

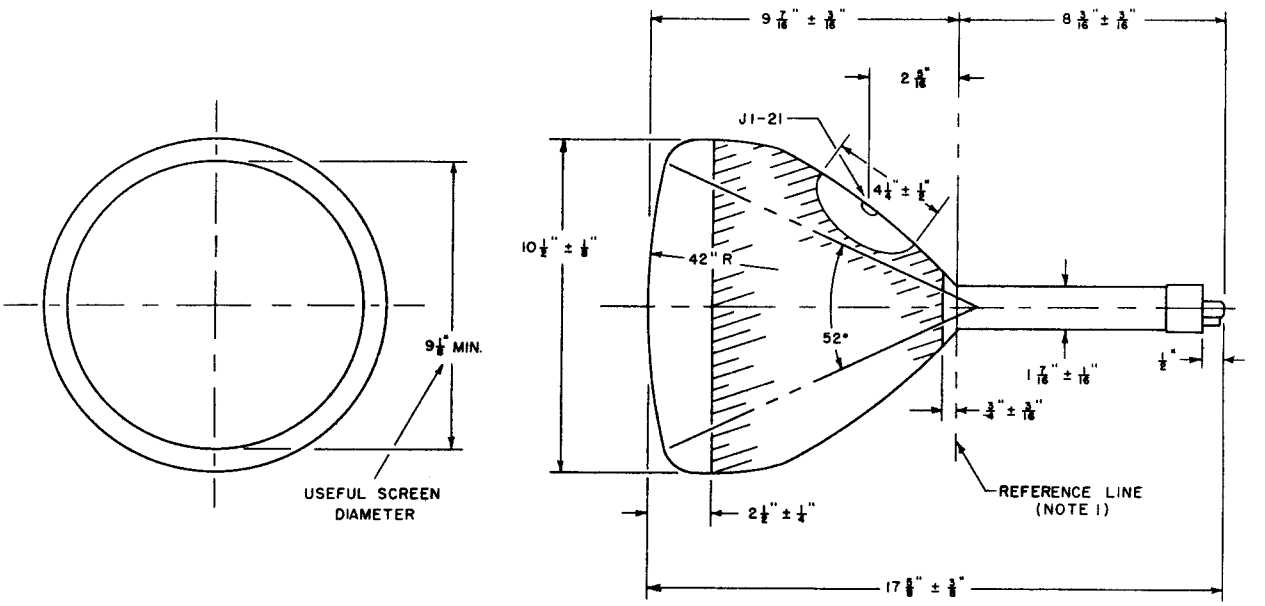


DIAGRAM NOTES:

1. Reference line is determined by position where JETEC reference line gauge No. 112 will rest on the bulb cone.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflecting Method	Magnetic	
Deflection Angle (approx.)	50	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance	76	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current (approx.)	0.6	Ampere
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5	$\mu\mu$f
Grid No. 1 to All Other Electrodes	6	$\mu\mu$f

MECHANICAL DATA

Minimum Useful Screen Diameter	9⅛	Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duodecal 6-Pin)	B6-63	
Basing	12Q	
Bulb Contact Aligns with Pin No. 6	±10	Degrees

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	22,000	Volts	dc
Grid No. 3 Voltage	3300	Volts	
Grid No. 2 Voltage	450	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	140	Volts	dc
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

TYPICAL OPERATING CONDITIONS

Anode Voltage[1]	14,000	Volts	dc
Grid No. 3 Voltage for Focus with I_b=100 μAmps	1640 to 2225	Volts	
Alignment magnet field strength	0 to 8	Gausses	
Grid No. 2 Voltage	200	Volts	dc
Grid No. 1 Voltage Required for Cutoff[2]	−18 to −48	Volts	dc
Grid No. 3 Current at I_b=100 μAmps	25	μa	Max.

CIRCUIT VALUES

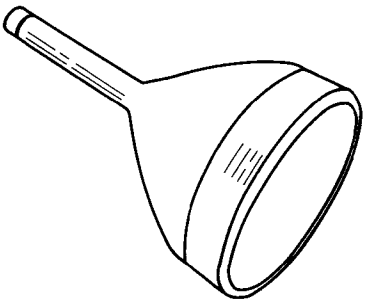
Grid No. 1 Circuit Resistance	1.5	Megohms Max.

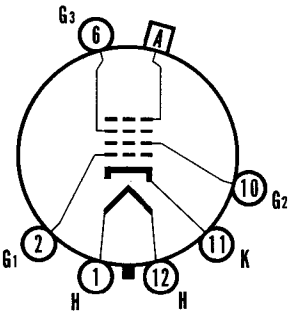
NOTES:

1. *Brilliance and definition decrease with decreasing anode voltage. In general, anode voltage should not be less than 10,000 volts.*
2. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

QUICK REFERENCE DATA

Monitor Tube
10" Direct Viewed
Round Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Magnetic Deflection
No Ion Trap
Acceleration Type
Electrostatic Focus





12-Q

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION

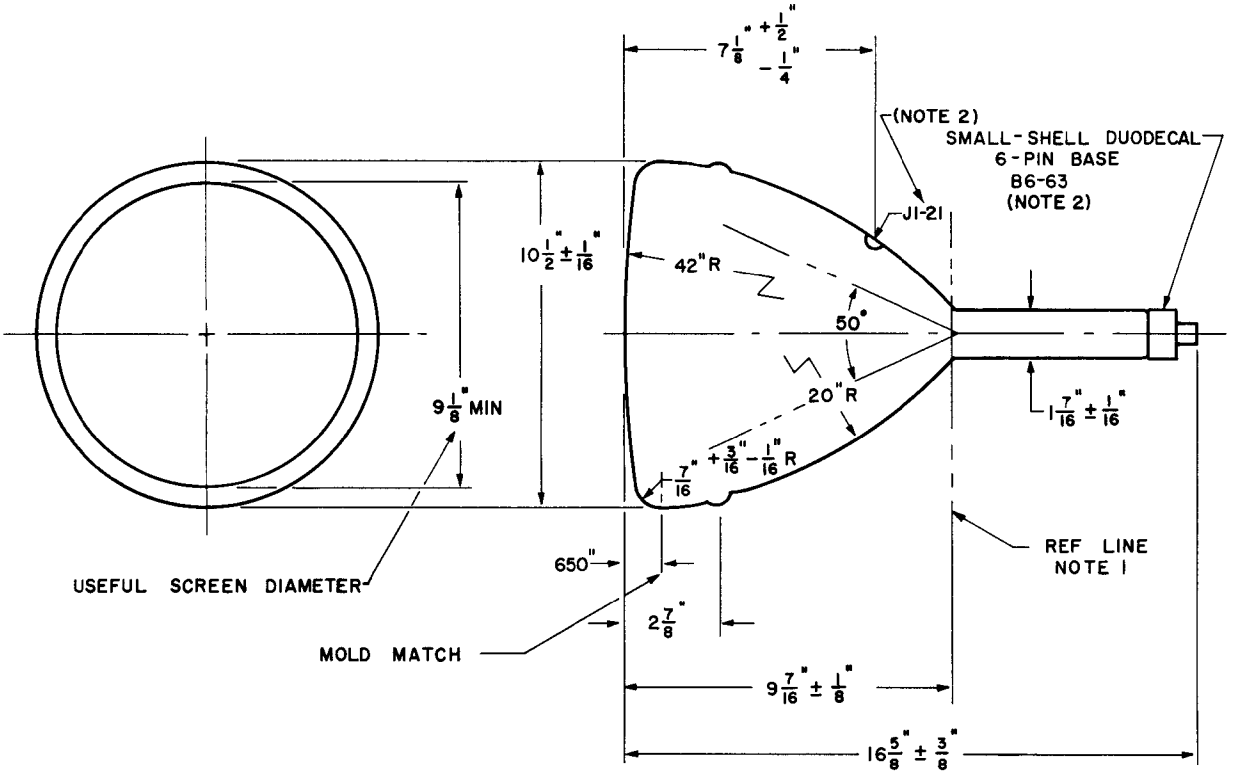
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

APRIL, 1958

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.



S58007

DIAGRAM NOTES:

1. *Reference line is determined by JETEC No. 112 reference line gauge.*
2. *The plane through the tube axis and Pin No. 6 may vary from the plane through the tube axis and bulb terminal by an angular tolerance (measured about the tube axis) of ± 10°. Bulb terminal is on same side as Pin No. 6.*

SYLVANIA

engineering data service

SYLVANIA
10VP15
10VP*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflection Angle (Approx.)	50 Degrees
Phosphor	Aluminized, P15
Fluorescence	Blue-Green
Persistence	Extremely Short
Faceplate	Clear Glass

**In addition to the type shown, the 10VP- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Ampere
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	6	μμf
External Conductive Coating to Anode[1]	2,500	μμf Max.
	500	μμf Min.

MECHANICAL DATA

Minimum Useful Screen Diameter	9⅛ Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12N
Bulb	J84C or J84D
Weight	9 Pounds

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	13,200 Volts	dc
Grid No. 2 Voltage	450 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	140 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Warm-up Period	154 Volts	
Heater Positive with Respect to Cathode	154 Volts	

TYPICAL OPERATING CONDITIONS

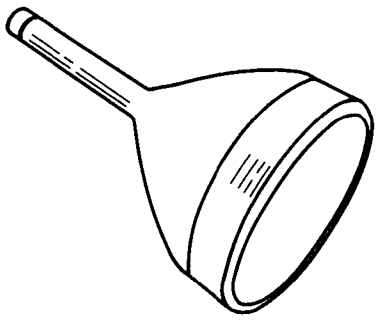
Anode Voltage	11,000 Volts	dc
Grid No. 2 Voltage	250 Volts	dc
Grid No. 1 Voltage Required for Cutoff[2]	−28 to −72 Volts	dc
Focusing Coil Current (Approx.)[3]	110 Ma	dc
Spot Position (Undeflected)	16 mm	Max.

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Flying Spot Scanner
10" Round Glass Type
Spherical Faceplate
Clear Glass
Aluminized Screen
Magnetic Deflection
Magnetic Focus
External Conductive Coating



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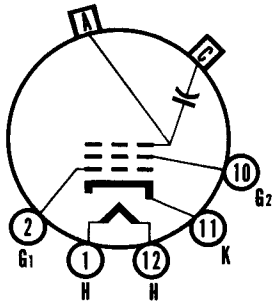


12-N

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

NOVEMBER, 1958

NOTES:

1. *External Conductive Coating must be grounded.*
2. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*
3. *For standard focus coil EIA No. 106 or equivalent, with the combined Grid No. 1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 40 foot-lamberts on a 6 inch by 8 inch picture area. Center of the air gap of the coil to reference line shall be 3¼ inches.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

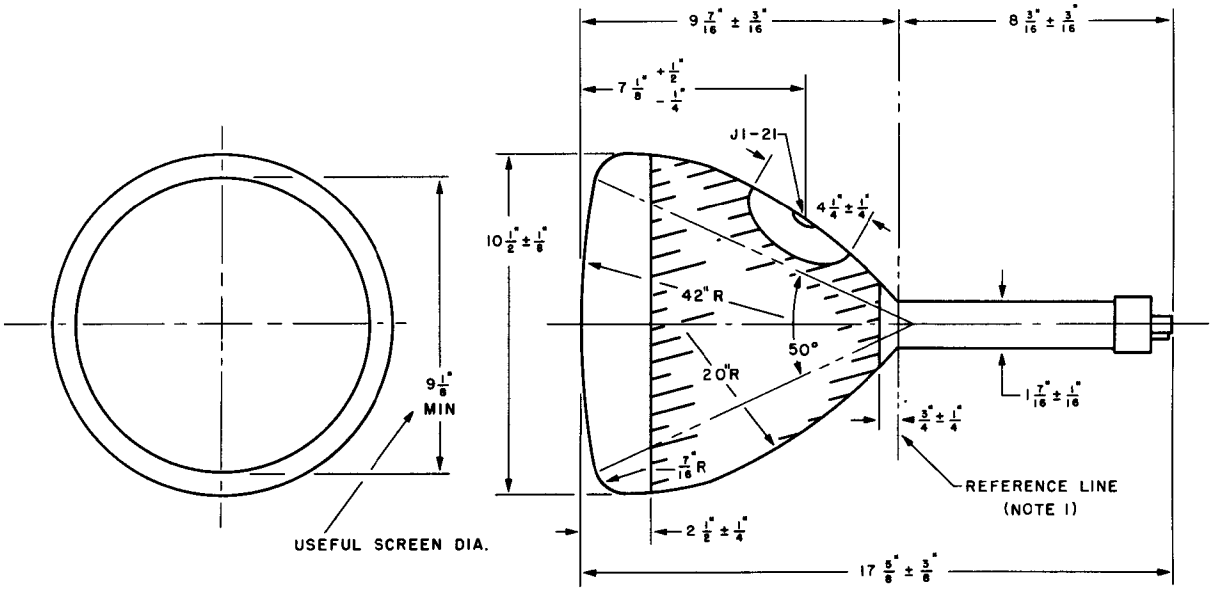


DIAGRAM NOTES:

1. *Reference line is determined by position where JETEC No. 112 reference line gauge will seat against bulb.*
2. *Vacant position Pin No. 3 aligned with anode, contact cap (J1-21) within 30 degrees.*

SYLVANIA

engineering data service

SYLVANIA
10WP7 10WP7A
10WP14 10WP14A
10WP19 10WP19A

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic		
Deflection Method	Magnetic		
Deflection Angle (approx.)	50 Degrees		
Phosphor	P7	P14	P19
Fluorescence	Blue	Purple	Orange
Phosphorescence	Yellow	Yellow	Orange
Persistence	Long	Medium-Long	Long
Faceplate	Gray Filter Glass		
Light Transmittance	76 Percent		

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ±10% Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	·6 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	9 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12M
Bulb Contact Aligns with Vacant Pin Position No. 3	±10 Degrees

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	13,200 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to 1100 Volts	dc
Grid No. 2 Voltage	770 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	200 Volts	dc
Positive Bias Value[1]	0 Volts	dc
Positive Peak Value	0 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	dc
Heater Positive with Respect to Cathode	200 Volts	dc

TYPICAL OPERATING CONDITIONS

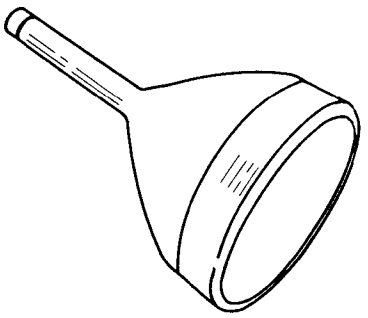
Anode Voltage[2]	10,000 Volts	dc
Grid No. 4 Voltage for Focus[3]	0 to 300 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage for Cutoff[4]	−28 to −72 Volts	dc

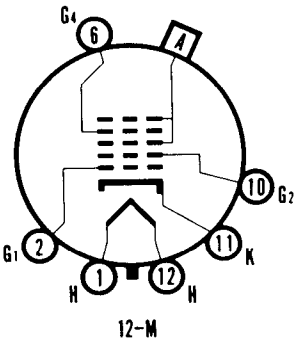
MAXIMUM CIRCUIT VALUE

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Special Purpose Tube
10" Direct Viewed
Round Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus





12-M

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
NOVEMBER, 1957

NOTES:

1. *At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts. The screen of the 10WP19 can be permanently damaged should the current density be permitted to rise too high. To prevent burning, minimum beam current densities should be employed.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, anode voltage should not be less than 7,000 volts.*
3. *With E_{g1} adjusted for Ib = 100 microamperes, E_{g4} is adjusted for best overall focus of a 6" x 8" raster pattern.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require that those values be about 5 volts more negative.*

10WP7A, 10WP14A, 10WP19A

These types are identical to the 10WP7, 10WP14, and 10WP19, respectively, except that they employ aluminized screens.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

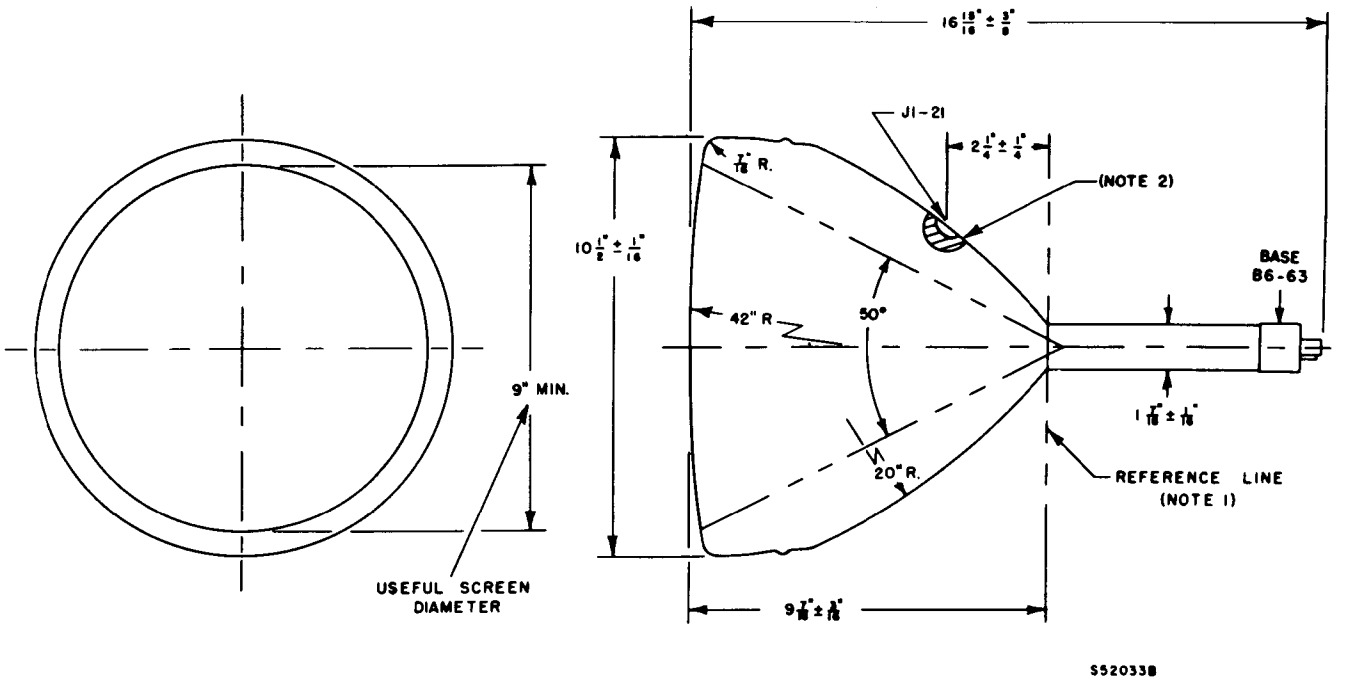


DIAGRAM NOTES:

1. *Reference line is the point where a 1.500 $^{+.003}_{-.000}$ diameter ring gauge 2 inches long, will stop against bulb.*
2. *Anti-Corona coating 1-1/2 inch min. radius concentric with contact. Do not handle tube by the part of the bulb having the anti-corona coating.*

A Technical Publication of

SYLVANIA ELECTRIC
PRODUCTS INC.

EMPORIUM, PA.



SYLVANIA

engineering data service

SYLVANIA
8CP1
8CP*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic

Types*	*Fluorescence*	*Phosphorescence*	*Persistence*
8CP1	Green	—	Medium
8CP2	Blue-Green	Green	Long
8CP4	White	—	Medium
8CP5	Blue	—	Veryshort
8CP7	Blue	Yellow	Long
8CP11	Blue	—	Short

**In addition to the types shown, the 8CP- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Amperes
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	10 μμf
Grid No. 1 to All Other Electrodes	8 μμf
Between Deflecting Plates 1-2[1]	4 μμf
Between Deflecting Plates 3-4[1]	2 μμf
Deflecting Plate 1 to All Other Electrodes Except DP2	8 μμf
Deflecting Plate 2 to All Other Electrodes Except DP1	8 μμf
Deflecting Plate 3 to All Other Electrodes Except DP4	6 μμf
Deflecting Plate 4 to All Other Electrodes Except DP3	6 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	7½ Inches
Bulb Contact (Recessed Small Ball)	J1-22
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14J
Base alignment D1-D2 trace aligns with Pin No. 5 and No. 12	±10 Degrees
Positive voltage on D1 deflects beam toward Pin No. 5	
Positive voltage on D3 deflects beam toward Pin No. 2	

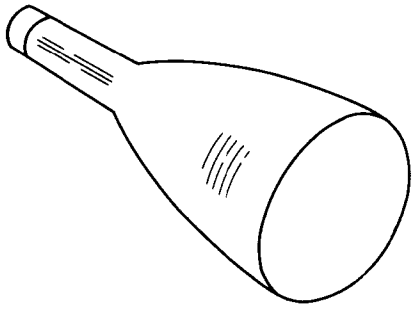
RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 3 Voltage	6,600 Volts	dc
Anode No. 2 Voltage	6,600 Volts	dc
Ratio of Anode No. 3 Voltage to Anode No. 2 Voltage	2.3:1 Volts	dc
Anode No. 1 Voltage	2,750 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	220 Volts	dc
Positive Bias Value	0	
Positive Peak Value	2 Volts	
Peak Heater Cathode Voltage		
Heater Negative with Respect to Cathode	140 Volts	
Heater Positive with Respect to Cathode	140 Volts	
Peak Voltage Between Anode No. 2 And Any Deflecting Plate	550 Volts	

QUICK REFERENCE DATA

Special Purpose Tube
8" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Post Deflection Accelerator



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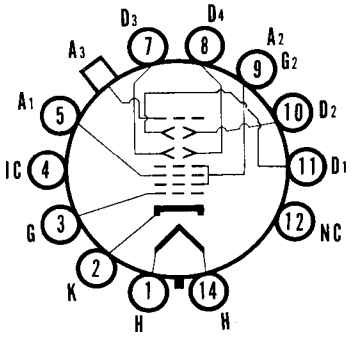


14-J

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

NOVEMBER, 1958

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage	4,000 Volts dc
Anode No. 2 Voltage	2,000 Volts dc
Anode No. 1 Voltage	540 to 800 Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	−24 to −56 Volts dc
Deflection Factor	
Deflecting Plates 1-2	58 to 81 Volts dc/Inch
Deflecting Plates 3-4	49 to 68 Volts dc/Inch

CIRCUIT VALUES

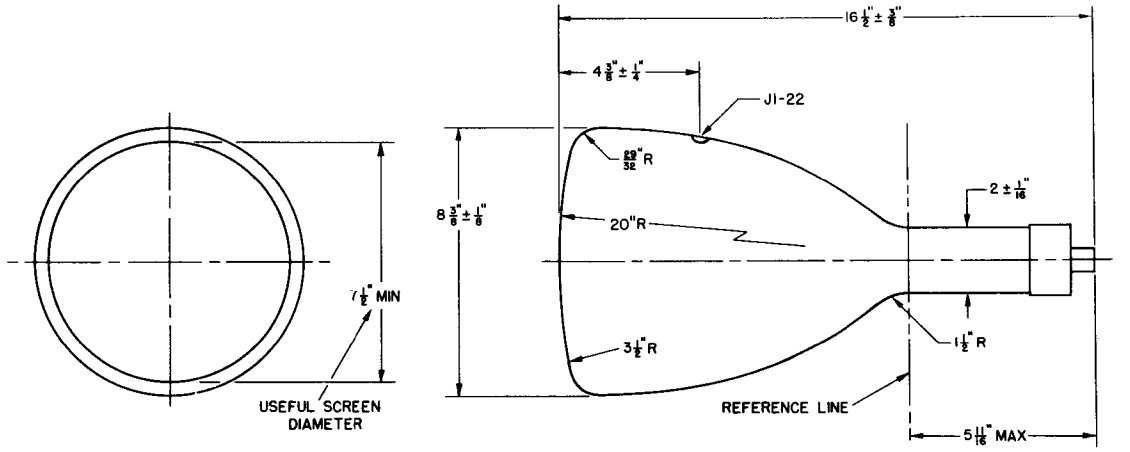
Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5.0 Megohms Max.

NOTES:

1. *Deflecting Plate 1 is Pin No. 11*
   Deflecting Plate 2 is Pin No. 10
   Deflecting Plate 3 is Pin No. 7
   Deflecting Plate 4 is Pin No. 8
2. *Visual extinction of undeflected spot.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.



CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Vertical	68 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	80 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5% Ampere	
Direct Interelectrode Capacitance (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[1]	350 μμf	Max.
	250 μμf	Min.
Ion Trap Magnet	External, Single Field	

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	7-3/16 x 5⅜ Inches
Minimum Useful Screen Area	35.5 Sq. Inches
Neck Length	6½ ± 3/16 Inches
Overall Length	10-7/16 ± 5/16 Inches
Bulb	J67½A
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-158
Basing	12AB
Weight (Approx.)	3 Pounds

RATINGS

MAXIMUM RATINGS (Design Maximum Values)

Grid Drive Service[2]

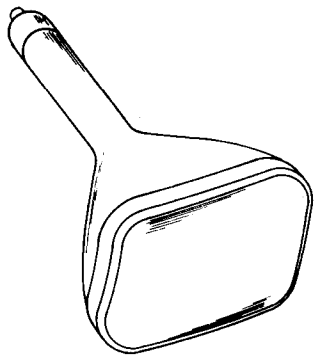
Anode Voltage	8800 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +550 Volts	dc
Grid No. 2 Voltage	330 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	110 Volts	dc
Negative Peak Value	145 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	

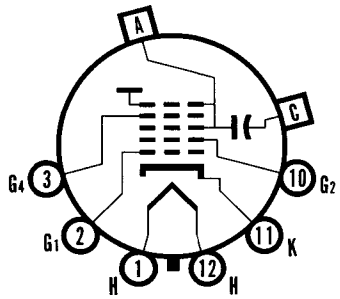
Cathode Drive Service[4]

Anode Voltage	8800 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +550 Volts	dc
Grid No. 2 Voltage	440 Volts	dc
Cathode Voltage		
Positive Peak Value	145 Volts	
Positive Bias Value	110 Volts	dc
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
8" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Electrostatic Focus
90° Magnetic Deflection
Single Field Ion Trap
External Conductive Coating





12-AB

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JUNE, 1961

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS

Grid Drive Service[2]

Anode Voltage	6,000	8,000 Volts	dc
Grid No. 4 Voltage for Focus	+15 to +315	+60 to +360 Volts	dc
Grid No. 2 Voltage	150	200 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−13 to −35	−17 to −46 Volts	dc
Ion Trap Magnet Strength (Min.)[5]	31	36 Gausses	

Cathode Drive Service[4]

Anode Voltage	6,000	8,000 Volts	
Grid No. 4 Voltage for Focus	+15 to +315	+60 to +360 Volts	
Grid No. 2 Voltage	150	200 Volts	
Cathode Voltage Required for Cutoff[3]	+14 to +30	+17 to +39 Volts	
Ion Trap Magnet Strength (Min.)[5]	31	36 Gausses	

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *External conductive coating must be grounded.*
2. *Voltages are positive with respect to cathode unless indicated otherwise.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts greater.*
4. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
5. *For JEDEC Ion Trap No. 117 or equivalent located with the trailing edge of the pole pieces located over the gap between Grid No. 1 and Grid No. 2 and rotated to give maximum brightness.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

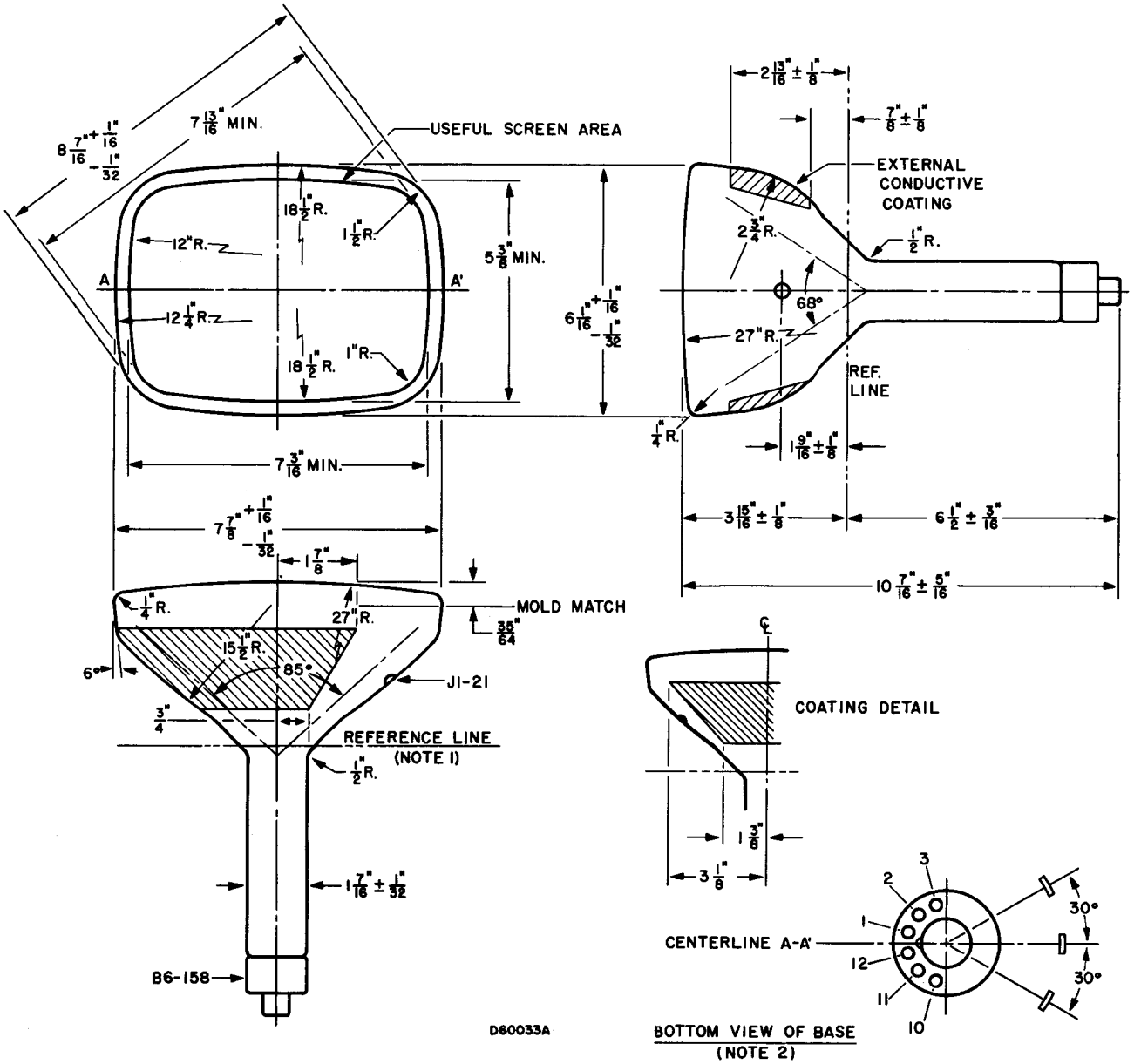


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 116 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin Position No. 6 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact (J1-21).*

SYLVANIA

engineering data service

SYLVANIA

8FP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Vertical	68 Degrees
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	80 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 5% Ampere
Heater Warm-up time[1]	11 Seconds
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	7-3/16 x 5-3/8 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12D
Weight (approx.)	2¼ Pounds

RATINGS

MAXIMUM RATINGS (Absolute-Maximum Values)

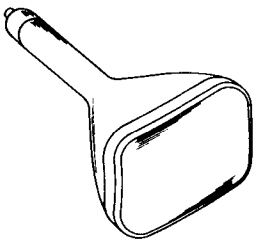
Anode Voltage	19,800 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

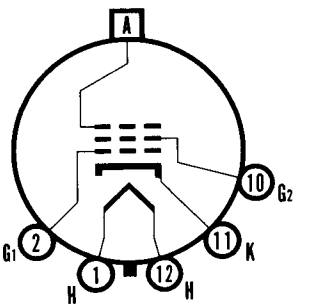
TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts	dc
Grid No. 2 (and Grid No. 4) Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[2]	−35 to −72 Volts	dc
Focusing Coil Current[3]	125 ± 15% Ma	dc
Ion Trap Magnet Current (Average)[4]	30 Ma	dc
Field Strength of PM Ion Trap Magnet[5]	33 Gausses	Min.

QUICK REFERENCE DATA

Monitor Tube
8" Rectangular, All Glass
Magnetic Focusing
Ion Trap
90° Magnetic Deflection
Gray Filter Glass
Aluminized Screen





12-D

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JULY, 1958

CIRCUIT VALUES

Grid No. 1 Circuit Resistance . . . . . 1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*
3. *For JETEC Focusing Coil No. 109 or equivalent, located with center of air gap 3" from reference line, bias adjusted for 20 ft. L on a 7-3/16" x 5-3/8" picture area, sharply focused at center of screen.*
4. *For JETEC Ion Trap Magnet No. 117, with pole pieces centered over Grid No. 2 on mount and rotated for maximum brightness.*
5. *For typical PM ion trap magnet with field strength tolerance of ±3 gausses.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

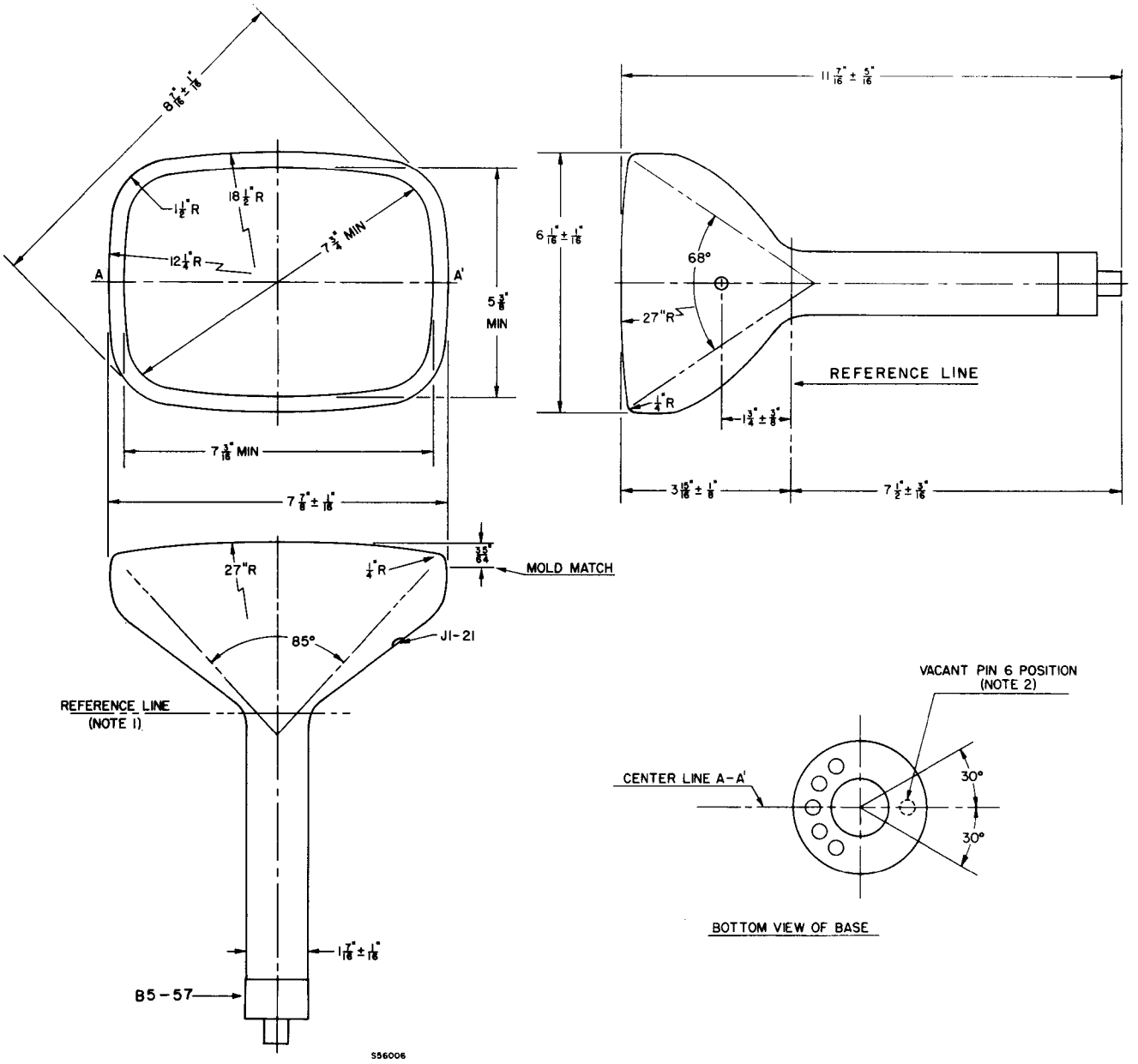


DIAGRAM NOTES:

1. *Reference line is determined by the plan C-C' of the reference line gauge (JETEC No. 116) when the gauge is seated against the glass cone.*
2. *Anode contact aligns with vacant pin position No. 6 ±30 degrees.*

A Technical Publication of
SYLVANIA ELECTRIC
PRODUCTS INC.
EMPORIUM, PA.



CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angles (Approx.)	
Vertical	68 Degrees
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	80 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.60 ± 10% Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6.5 $\mu\mu$f

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	7 3/16 x 5 3/8 Inches
Nominal Overall Length	11 15/16 Inches
Nominal Neck Length	8 Inches
Area	35.5 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12M

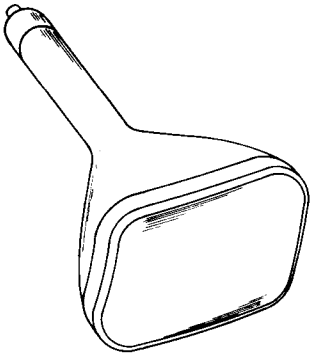
RATINGS

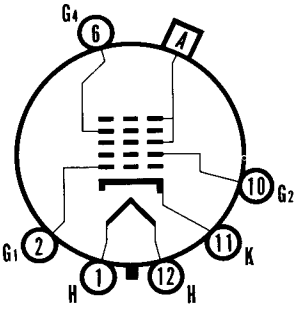
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	18,000 Volts	dc
Grid No. 4 (Focusing Electrode) Voltage	800 Volts	dc
Grid No. 2 Voltage	700 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	180 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Monitor Tube
8" Rectangular, All Glass
Electrostatic Focus
No Ion Trap
90° Magnetic Deflection
Gray Filter Glass
Aluminized Screen
High Resolution





12-M

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JULY, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[1]	−35 to −72 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohm Max.

NOTE:

1. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

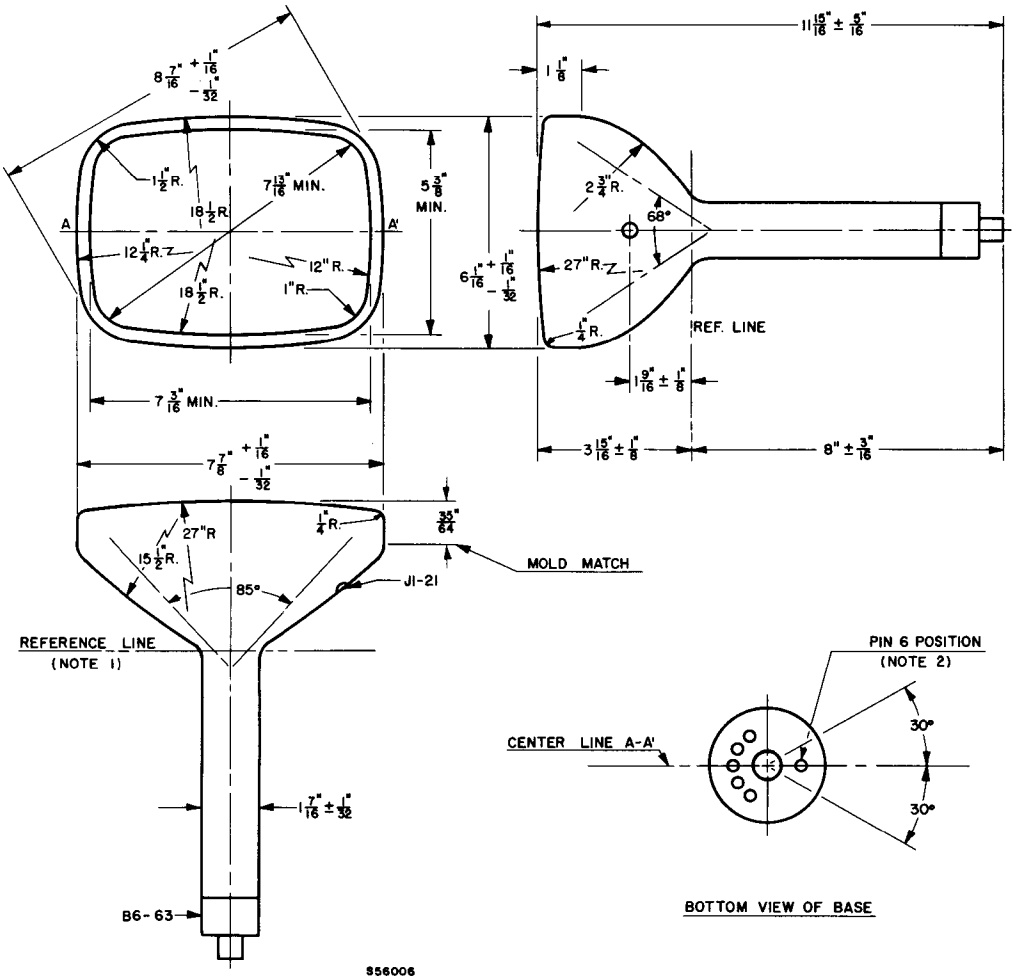


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of JEDEC No. 116 reference line gauge when the gauge is seated against the bulb.*
2. *Base Pine No. 6 aligns with horizontal centerline within 30° and is on same side as anode contact (J1-21).*

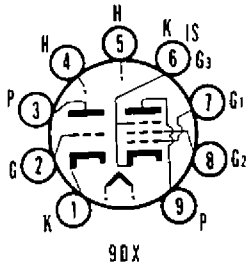
from JEDEC release #4188D, Nov. 4, 1968

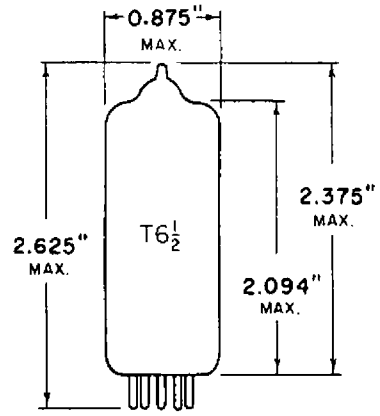
SYLVANIA

RECEIVING TUBES

Video and General Purpose Amplifier
8KR8

- MEDIUM MU TRIODE
- SHARP CUTOFF PENTODE
- MINIATURE CONSTRUCTION
- T-6 1/2 ENVELOPE
- 9 PIN BASE





DESCRIPTION

The Sylvania Type 8KR8 features a sharp cutoff pentode in combination with a medium mu triode in a T-6 1/2 envelope. The pentode section has a Gm of 20,000 and is designed for video amplifier service. The triode section is designed as a general purpose amplifier to be used as a voltage amplifier, sync separator or sound IF amplifier.

MECHANICAL DATA

Envelope	T-6 1/2
Base	E9-1
Outline	6-3
Maximum Diameter	0.875 Inches
Maximum Seated Height	2.375 Inches
Maximum Overall Length	2.625 Inches
Cathode	Coated Unipotential
Operating Position	Any
Basing	9DX

Terminal Connections:

Pin No.1 - Cathode, Triode Section
Pin No.2 - Grid, Triode Section
Pin No.3 - Plate, Triode Section
Pin No.4 - Heater
Pin No.5 - Heater
Pin No.6 - Cathode, Internal Shield, Grid No.3, Pentode Section
Pin No.7 - Grid No.1 Pentode Section
Pin No.8 - Grid No.2 Pentode Section
Pin No.9 - Plate, Pentode Section

ELECTRICAL DATA

Heater Characteristics and Ratings (Design Maximum Rating System) (4)

Heater Circuit	Series	Circuit (1)
Heater Current (3) (1)	0.600 ± 0.040	Amp
Heater Voltage (5)	8.0	Volts
Heater Warm-up Time (2)	11	Seconds
Maximum Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
Total DC and Peak	200	Volts
Heater Positive with Respect to Cathode		
DC	100	Volts
Total DC and Peak	200	Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section			
Grid to Plate	2.6	pf	
Input: g to (h +Tk + Pk, g3, I.S.)	4.2	pf	
Output: p to (h + Tk + Pk, g3, I.S.)	3.0	pf	
Pentode Section			
Grid No.1 to Plate	0.075	pf	Max.
Input: g1 to (h + Pk, g3, I.S. + g2)	13	pf	
Output: p to (h + Pk, g3, I.S. +g2)	4.4	pf	

RATINGS (Design Maximum Values) (4)

	Triode Section	Pentode Section	
Plate Voltage	330	330	Volts
Grid No.2 Supply Voltage	-	330	Volts Max.
Grid No.2 Voltage	See Rating Chart		
Positive Grid No.1 Voltage	0	0	Volt Max.
Plate Dissipation	2.0	5.0	Watts Max.
Grid No.2 Dissipation			
Up to 150 Volts	-	1.1	Watts Max.
150 to 300 Volts	See Rating Chart		
Grid No.1 Circuit Resistance			
Fixed Bias	0.5	0.01	Meg. Max.
Cathode Bias	1.0	0.01	Meg. Max.

NOTE: Control grid to cathode spacing of the pentode section of these types are of such low order of magnitude as to preclude the use of voltage between these elements of more than 50 volts dc or peak ac in commercial tube checkers and shorts indicating devices, particularly where mechanical excitation of the tube is employed.

AVERAGE CHARACTERISTICS AND TYPICAL OPERATION

	Triode Section	Pentode Section		
Plate Voltage	125	35	200	Volts
Grid No.1 Voltage	-	0	-	Volts
Grid No.2 Voltage	-	100	100	Volts
Cathode Bias Resistor	68	-	82	Ohms
Plate Current	15	54	19.5	Ma
Grid No.2 Current	-	13.5	3.0	Ma
Transconductance	10,400	-	20,000	μmhos
Amplification Factor	46	-	-	
Plate Resistance (approx.)	4400		60,000	Ohms
Ec1 for Ib = 100 μa (approx.)	-		-6.3	Volts
Ec1 for Ib = 10 μa (approx.)	-8		-	Volts

NOTES:

(1) Operated with the heater in series with the heaters of other tubes having the same bogey heater current.

(2) Heater warm-up time is defined as the time required for the voltage to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

(3) The equipment designer should design the equipment so that heater current is centered at the specified bogey value, with heater supply variations restricted to maintain heater current within the specified tolerance.

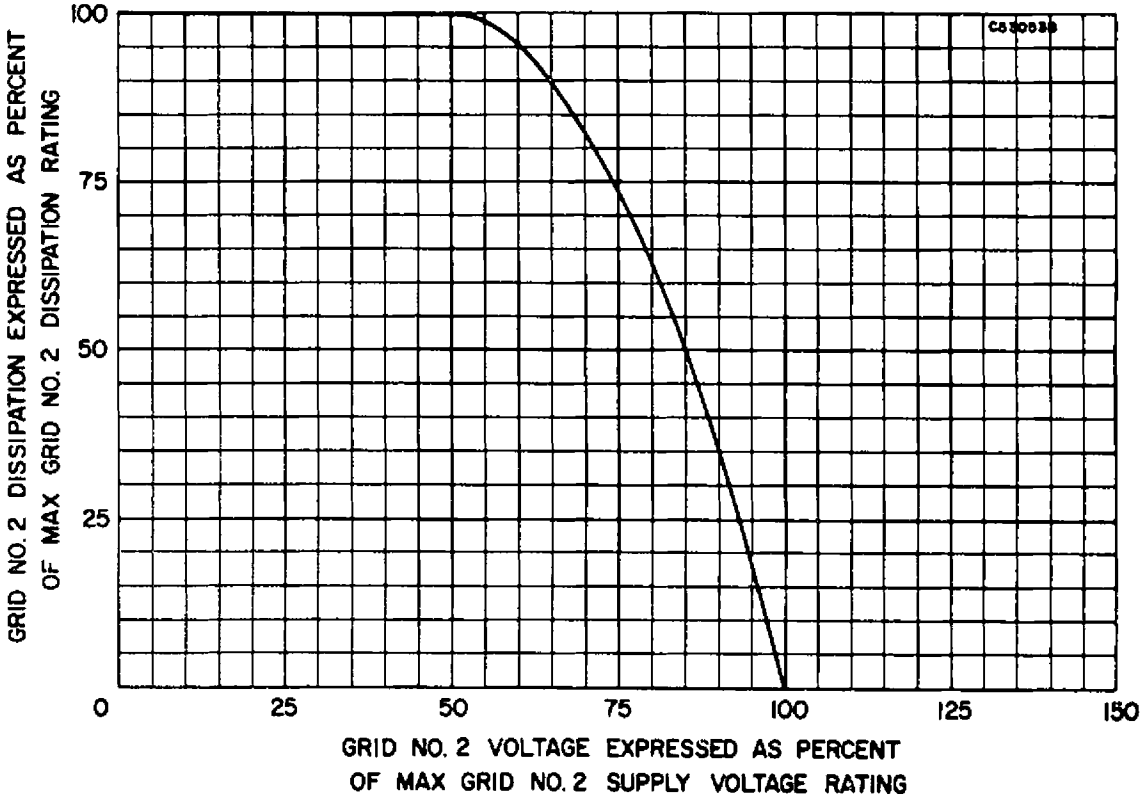
(4) Design Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron tube of a specified type as defined by the published data, and should not be exceeded under the worst probable conditions.

The tube manufacturer chooses these values to provide acceptable serviceability of the tube, making allowance for the effects of changes in operating conditions due to variations in the characteristics of the tube under consideration.

The equipment manufacturer should design so that initially and throughout life no design maximum value for the intended service is exceeded with a bogey tube under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all other electron devices in the equipment.

(5) Heater voltage for a bogey tube at If = 0.600 amperes.

RATING CHART



SYLVANIA

engineering data service 8LP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angles (Approx.)	
Vertical	87 Degrees
Horizontal	105 Degrees
Diagonal	110 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	80 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.30 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	4 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	400 μμf	Max.
	200 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	5⅞ Inches
Width	7½ Inches
Diagonal	7⅞ Inches
Area	39 Sq. Inches
Bulb	C67½ Exp. 2 or Equivalent
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-185
Basing	7FA
Weight (Approx.)	2 Pounds

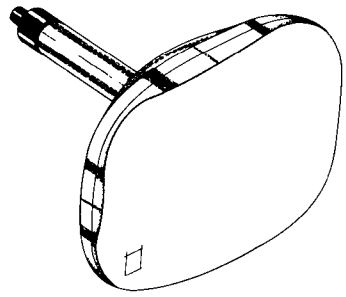
RATINGS

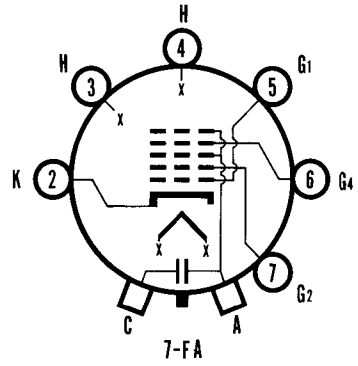
MAXIMUM RATINGS (Design Maximum Values)

Anode Voltage	20,000 Volts	dc
Grid No. 4 (Focusing Electrode)		
Voltage	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc

QUICK REFERENCE DATA

Television Picture Tube
8" Rectangular, All Glass
Electrostatic Focus
No Ion Trap
110° Magnetic Deflection
Gray Filter Glass
Aluminized Screen
External Conductive Coating
6.3 Volt, 0.30 Amp. Heater





7-FA

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK
Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
MARCH, 1960

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) (Cont'd.)

Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohm Max.

NOTES:

1. *Heater Warm-up Time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

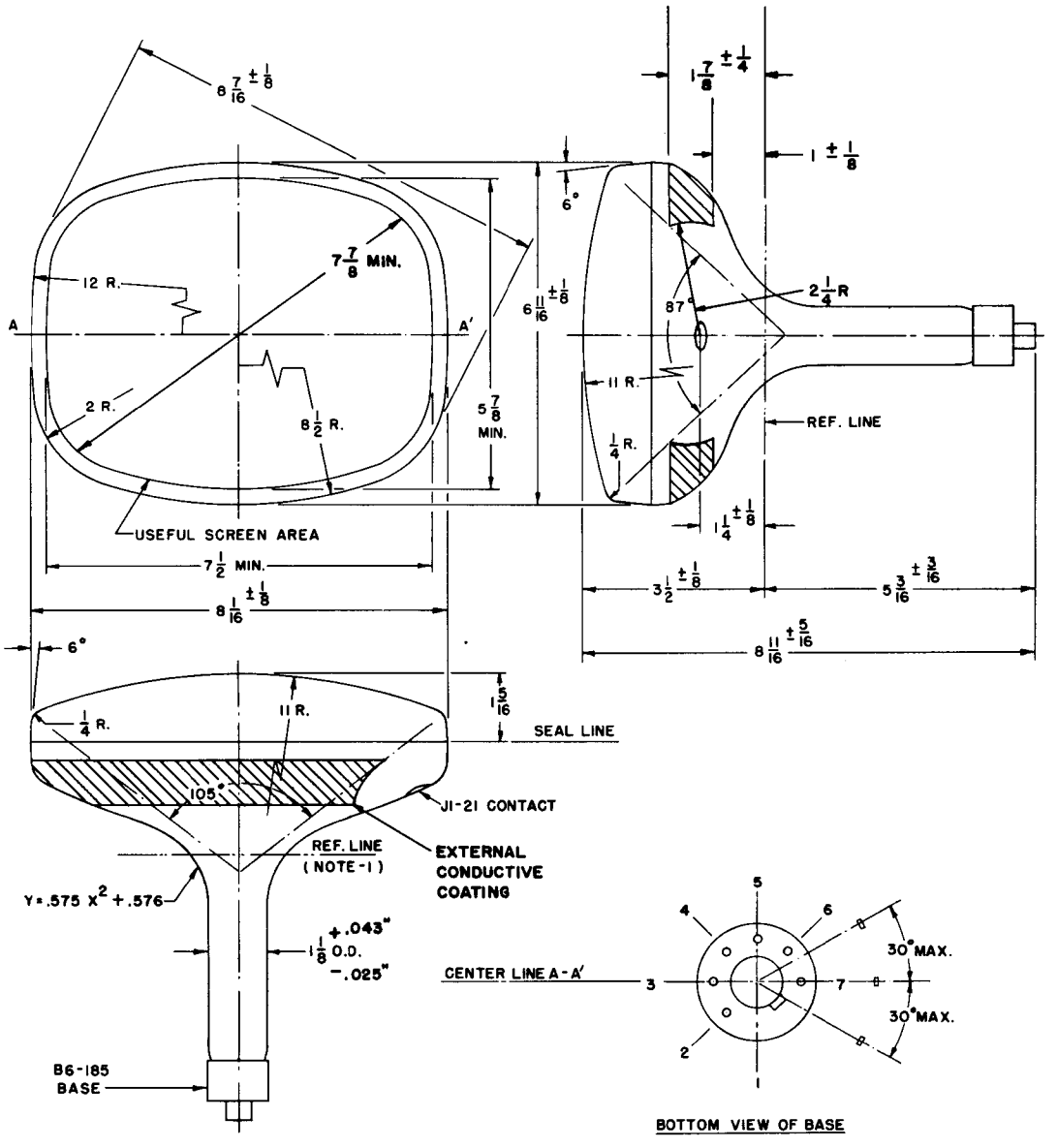


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of JEDEC No. 126 reference line gauge when the gauge is seated against the bulb.*
2. *Base Pin No. 7 aligns with horizontal centerline within 30° and is on same side as anode contact (J1-21).*
3. *Dimensions are in inches.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angles (Approx.)	
Vertical	68 Degrees
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance of Faceplate and Cover Plate (Approx.)	60 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.60 ± 10 % Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 pf
Grid No. 1 to All Other Electrodes	6 pf

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	5 3/8 Inches
Width	7 3/16 Inches
Diagonal	7 3/4 Inches
Area	36 Sq. Inches
Nominal Overall Length	9 15/16 Inches
Nominal Neck Length	5 13/16 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12M

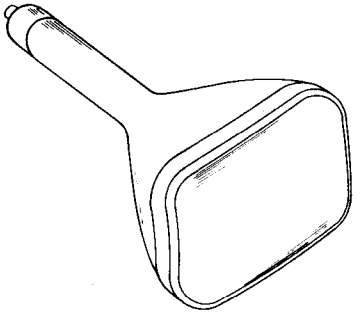
RATINGS

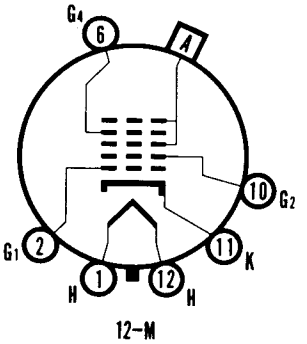
MAXIMUM RATINGS (Design Maximum Values)

Anode Voltage	18,000 Volts	dc
Grid No. 4 (Focusing Electrode) Voltage		
Positive Value	1100 Volts	dc
Negative Value	550 Volts	dc
Grid No. 2 Voltage	200 to 550 Volts	dc
Grid No. 1 Voltage		
Negative Peak Value	220 Volts	
Negative Bias Value	155 Volts	dc
Positive Bias Value	0 Volt	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode		
AC and DC	200 Volts	
DC	100 Volts	

QUICK REFERENCE DATA

Television Monitor Tube
8" Rectangular, All Glass
Electrostatic Focus
No Ion Trap
90° Magnetic Deflection
Gray Filter Glass
Aluminized Screen
High Resolution
Integral Implosion Cover Plate





12-M

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

MAY, 1965

PAGE 1 OF 2

File Under

SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[1]	−28 to −72 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTE:

1. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

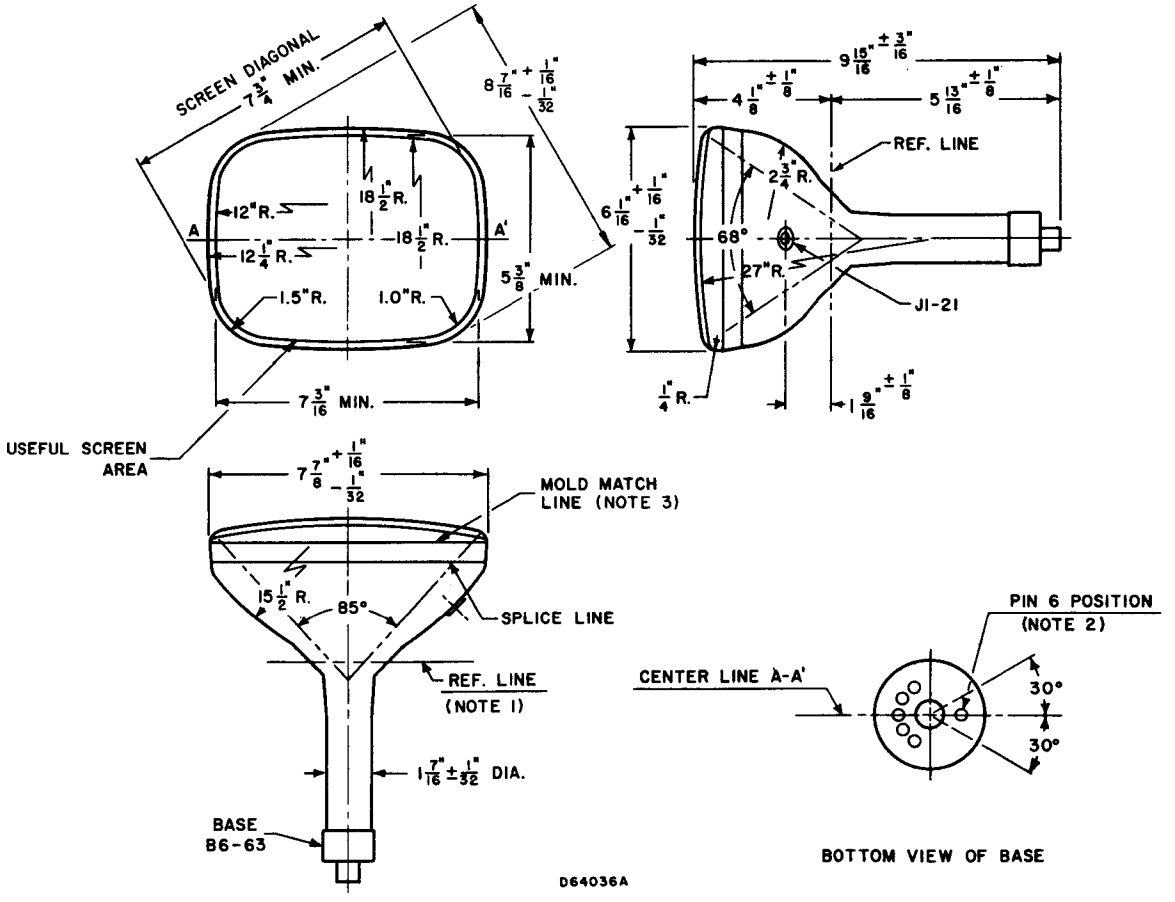


DIAGRAM NOTES:

1. *Reference line is determined by the plane of C-C' of JEDEC No. 116 reference line gauge when the gauge is seated against the bulb.*
2. *Base Pin No. 6 aligns with horizontal centerline within ±30° and is on same side as anode contact (J1-21).*
3. *The maximum radial displacement of the periphery of the coverplate from its exact centered position on the neck axis is .040 Inches.*

engineering data service 8XP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Self Focusing (Electrostatic)	
Deflecting Method	Magnetic	
Deflection Angles (approx.)		
Vertical	68	Degrees
Horizontal	85	Degrees
Diagonal	90	Degrees
Phosphor	P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	80	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current (approx.)	0.6	Ampere
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	6	μμf

MECHANICAL DATA

Minimum Useful Screen Dimensions	7-3/16 x 5⅜	Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duodecal 5-Pin)	B5-57	
Basing	12S	

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	22,000	Volts dc
Grid No. 2 (and Grid No. 4) Voltage	550	Volts dc
Grid No. 1 Voltage		
Negative Bias Value	155	Volts dc
Negative Peak Value	220	Volts
Positive Bias Value	0	Volts dc
Positive Peak Value	2	Volts
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450	Volts
After Equipment Warm-up Period	200	Volts
Heater Positive with Respect to Cathode	200	Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000	Volts dc
Grid No. 2 (and Grid No. 4) Voltage	300	Volts dc
Grid No. 1 Voltage Required for Cutoff[1]	−28 to −72	Volts dc

CIRCUIT VALUES

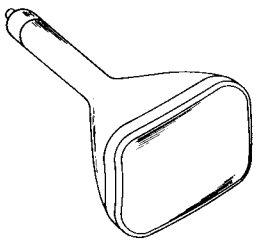
Grid No. 1 Circuit Resistance	1.5	Megohms Max.

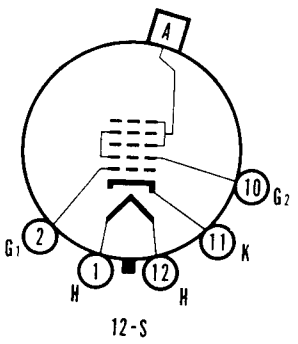
NOTE:

1. *Visual extinction of raster.*

QUICK REFERENCE DATA

Receiver Check Tube
8″ Rectangular, All Glass
Self Focusing (Electrostatic)
No Ion Trap
Magnetic Deflection
Gray Filter Glass





12-S

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
APRIL 1956

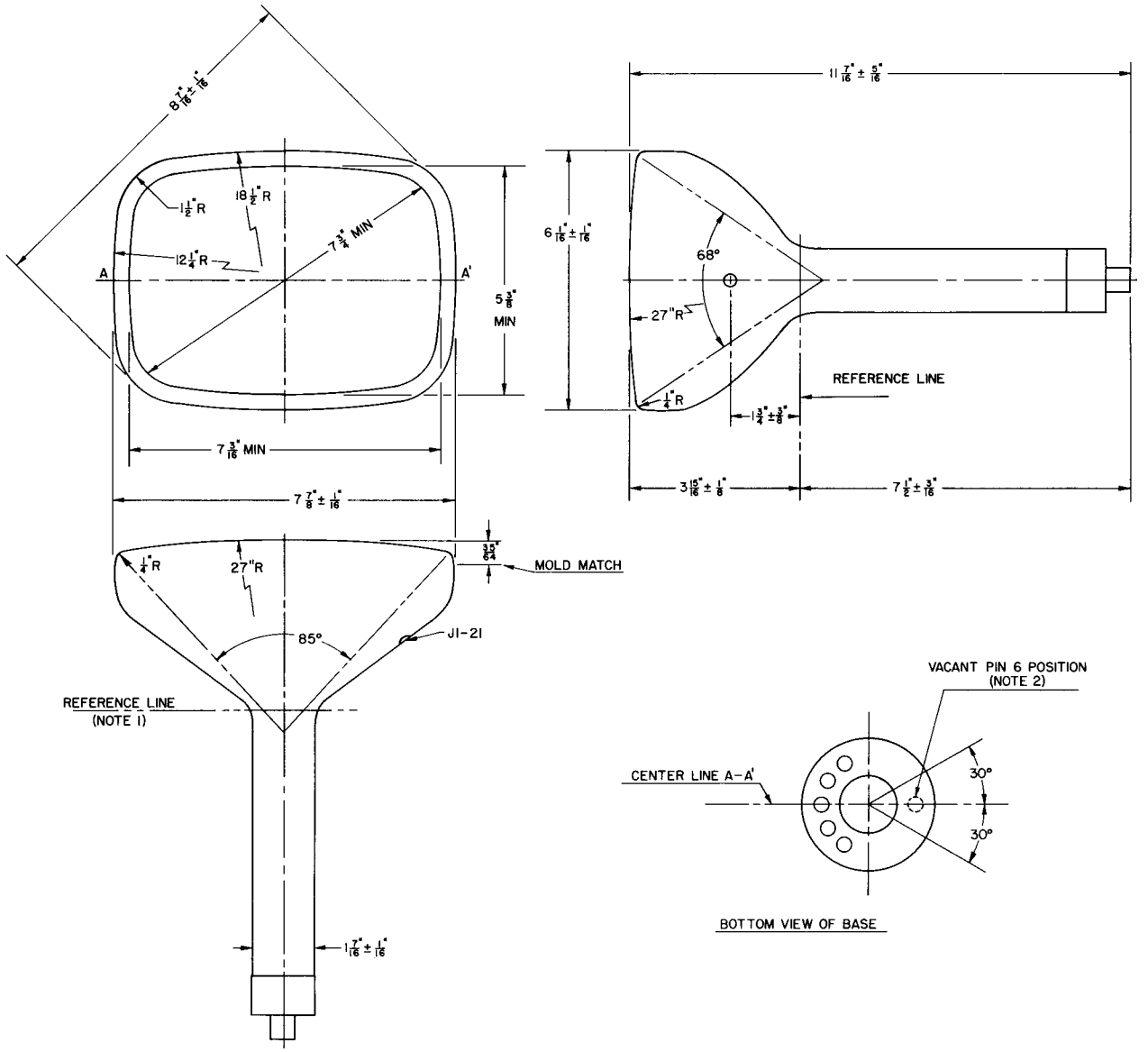


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone.*

2. *Anode contact aligns with vacant pin position No. 6 ±30 degrees.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

SYLVANIA

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8YP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Self Focusing (Electrostatic)	
Deflecting Method	Magnetic	
Deflection Angles (approx.)		
Vertical	87	Degrees
Horizontal	105	Degrees
Diagonal	110	Degrees
Phosphor	P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	80	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current (approx.)	0.6	Ampere
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	4	$\mu\mu$f
Grid No. 1 to All Other Electrodes	6	$\mu\mu$f

MECHANICAL DATA

Minimum Useful Screen Dimensions	7½ x 5⅞	Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B6-185	
Basing	7FG	
Weight (approx.)	2	Pounds

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	22,000	Volts	dc
Grid No. 2 (and Grid No. 4) Voltage	550	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	155	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000	Volts	dc
Grid No. 2 (and Grid No. 4) Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff[1]	−35 to −72	Volts	dc

CIRCUIT VALUES

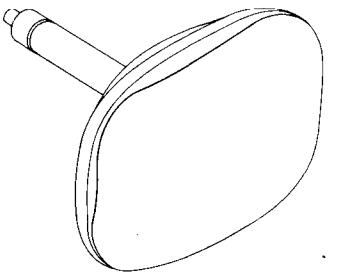
Grid No. 1 Circuit Resistance	1.5	Megohms Max.

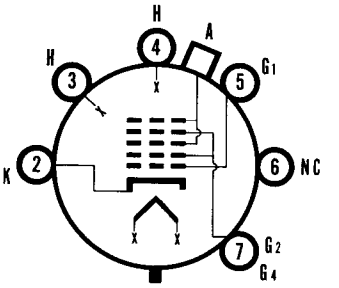
NOTE:

1. *Visual extinction of raster.*

QUICK REFERENCE DATA

Receiver Check Tube
8″ Rectangular, All Glass
Self Focusing
(Electrostatic)
No Ion Trap
110° Magnetic Deflection
Gray Filter Glass





7-FG

SYLVANIA ELECTRIC PRODUCTS INC.

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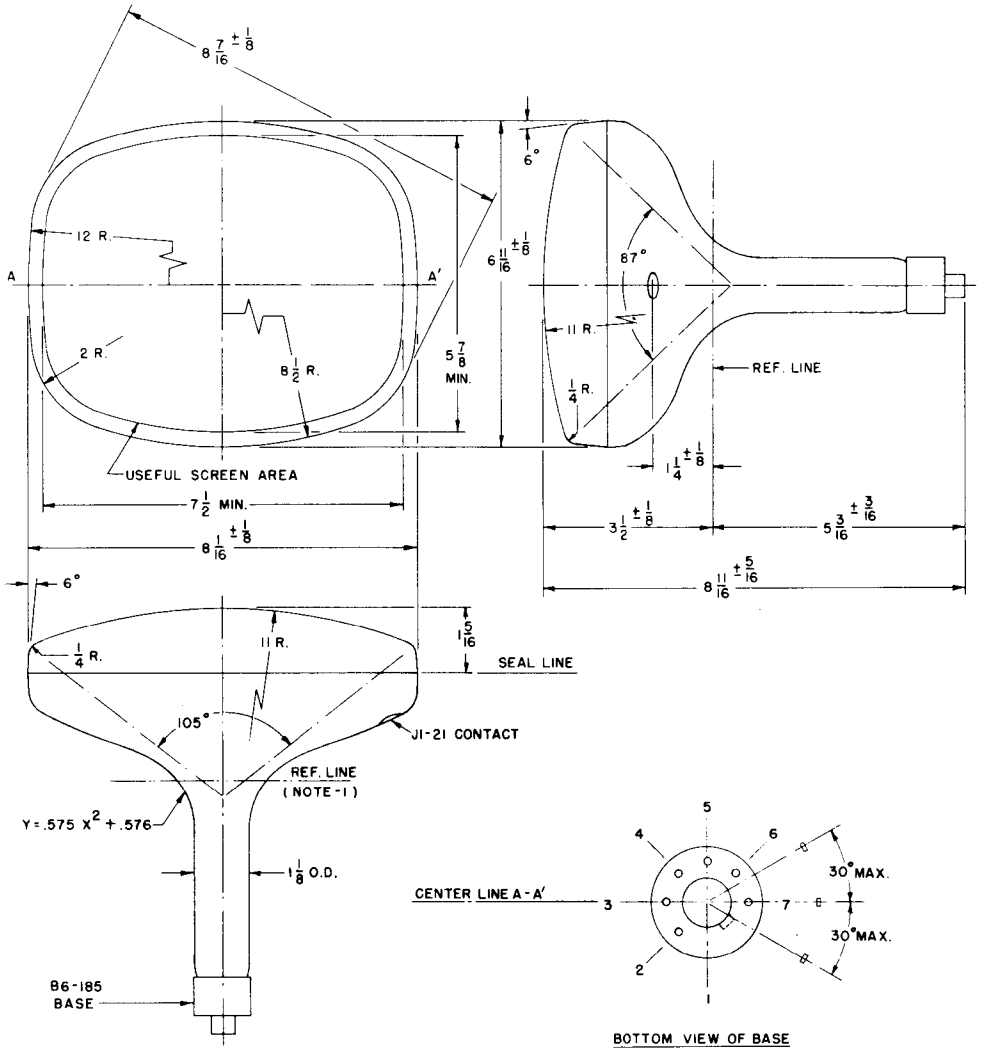


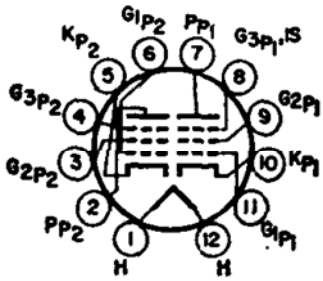
DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of JETEC No. 126 reference line gauge when the gauge is seated against the bulb.*
2. *Base Pin No. 7 aligns with horizontal centerline within 30° and is on same side as anode contact (J1-21).*
3. *Dimensions are in inches.*

MAXIMUM CIRCUIT VALUES			
Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5	0.5	megohm
For cathode-bias operation	0.5	1	megohm

* Grid No.2 to Grid No.1.

9AU7 Refer to type 12AU7A.



12FU

9BJ11 BEAM POWER TUBE—SHARP-CUTOFF PENTODE

Duodecar type used in two-stage video-if-amplifier in television receivers. Pentode unit is used as the input stage and beam power unit as the output stage. Outlines section, 8B; requires duodecar 12-contact socket.

Heater Voltage (ac/dc)	9.6	volts
Heater Current	0.45	ampere
Heater Warm-up Time (Average)	11	seconds
Heater-Cathode Voltage:		
Peak value	±200 max	volts
Average value	100 max	volts
Direct Interelectrode Capacitances:		
Pentode Unit:		
Grid No.1 to Plate	0.008	pF
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, Grid No.3 of Beam Power Unit, and Internal Shield	9.5	pF
Plate to Cathode, Heater, Grid No.2, Grid No.3, Grid No.3 of Beam Power Unit, and Internal Shield	3.4	pF
Beam Power Unit:		
Grid No.1 to Plate	0.016	pF
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	8.5	pF
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	3	pF

Class A_1 Amplifier

MAXIMUM RATINGS (Design-Maximum Values)	Pentode Unit	Beam Power Unit	
Plate Voltage	160	160	volts
Grid-No.3 (Suppressor-Grid) Voltage:			
Positive-bias value	10	0	volts
Negative-bias value	50	—	volts
Grid-No.2 (Screen-Grid) Voltage	160	160	volts
Grid-No.1 (Control-Grid) Voltage, Positive-bias value	0	0	volts
Plate Dissipation	2.8	2.2	watts
Grid-No.2 Input	1.25	0.55	watts
CHARACTERISTICS			
Plate Supply Voltage	110	125	volts
Grid No.3	Connected to cathode at socket		
Grid-No.2 Voltage	110	125	volts
Grid-No.1 Resistor	0.1	—	megohm
Cathode-Bias Resistor	—	120	ohms
Plate Resistance (Approx.)	40000	40000	ohms
Transconductance	7500	9600	μmhos
Plate Current	5.8	8.5	mA
Grid-No.2 Input	6.8	2.5	mA
Grid-No.1 Voltage (Approx.) for plate current of 20 μA	—3	—4.5	volts
MAXIMUM CIRCUIT VALUES			
Grid-No.1-Circuit Resistance	0.1	—	megohm
Grid-No.3-Circuit Resistance	1.5	—	megohm

9BR7 Refer to chart at end of section.

9CL8 Refer to chart at end of section.

9EA8 Refer to type 6EA8.

9GV8 Refer to chart at end of section.

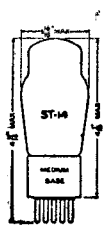
9GV8/XCL85 Refer to type 6GV8/EL500.



Sylvania

TYPE 12A

DETECTEUR AMPLIFICATEUR



CARACTERISTIQUES

Tension filament CA ou CC	5,0 volts
Courant filament	0,25 ampère
Ampoule	ST 14
Culot — Moyen 4 broches	4-D
Position de montage	Verticale

Capacités directes interélectrodes :

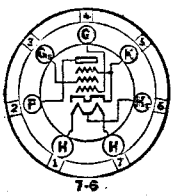
Grille à plaque	8,5 $\mu\mu$f
Entrée	4,0 $\mu\mu$f
Sortie	2,0 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension filament	5,0	5,0	5,0 volts
Tension plaque	90	135	180 volts
Tension grille	—4,5	—9	—13,5 volts
Courant plaque	5,0	6,2	7,7 ma.
Résistance interne	5.400	5.100	4.700 ohms
Conductance mutuelle	1.575	1.650	1.800 μmhos
Coefficient d'amplification	8,5	8,5	8,5
Impédance de charge	5.000	9.000	10.650 ohms
Puissance modulée	0,035	0,13	0,285 watt

APPLICATION

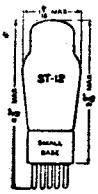
Sylvania 12A est destiné à être utilisé là où un tube de résistance interne plus faible que celle du tube O1A est désiré. Il peut être utilisé comme détecteur et amplificateur H.F. ou B.F. Ce vieux type n'est plus utilisé actuellement que pour le remplacement.



Sylvania

TYPE 12A5

AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3	12,6 volts
Courant de chauffage	0,6	0,3 ampère
Ampoule		ST-12
Culot — Petit modèle 7 broches		7-F
Position de montage		Toutes

Conditions limites de fonctionnement. (Voir page 9) :

AMPLIFICATEUR CLASSE A1.

Tension chauffage CA ou CC	12,6 ou 6,3 volts
Courant chauffage	0,3 ou 0,6 ampère
Tension plaque	180 volts max.
Tension écran	180 volts max.
Dissipation plaque	8,25 watts max.
Dissipation écran	2,5 watts max.

Conditions de fonctionnement et caractéristiques :

Tension plaque	100	180 volts
Tension écran	100	180 volts
Tension grille	—15	—25 volts
Tension pointe signal B. F.	15	25 volts
Courant plaque (signal zéro)	17	45 ma.
Courant plaque (signal max.)	19	48 ma.
Courant écran (signal zéro)	3	8 ma.
Courant écran (signal max.)	6	14 ma.
Résistance interne (approx.)	50.000	35.000 ohms
Conductance mutuelle	1.700	2.400 µmhos
Impédance de charge	4.500	3.300 ohms
Puissance modulée	0,8	3,4 watts
Distorsion harmonique totale	12	11 pour cent

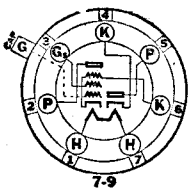
APPLICATION

Sylvania 12A5 est un tube pentode à deux usages. Les valeurs de la tension de chauffage et de la puissance modulée, lorsqu'il fonctionne avec une source de 115 volts, sont intermédiaires entre celles des types 38 et 43. Dans les récepteurs universels, les filaments sont connectés en série et absorbent 12,6 volts 0,3 ampère. Pour l'usage sur récepteurs C.A. ou automobile, les filaments sont connectés en parallèle et prennent 0,6 ampère sous 6,3 volts.

Avec une source de tension plaque de 200 volts, une puissance modulée de 2,7 watts peut être obtenue, le courant

cathodique étant de 44 ma. Dans le cas du récepteur pour automobile, où l'économie de courant est une question primordiale, l'impédance de charge et la polarisation sont quelque peu augmentées; la puissance modulée est alors 2,2 watts avec un courant de cathode de 36 ma. seulement. Les valeurs recommandées pour l'impédance de charge sont indiquées au tableau des conditions de fonctionnement et caractéristiques.

Dans tous les cas, on recommande de maintenir la résistance C.C. dans le circuit de grille en dessous de 500.000 ohms. Cependant, si le tube est polarisé automatiquement, cette valeur peut atteindre au maximum 1 mégohm.

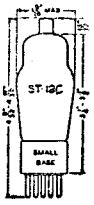


7-9

Sylvania

TYPE 12A7

REDRESSEUR ET PENTODE



CARACTERISTIQUES

Tension de chauffage CA ou CC	12,6 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12C
Culot	7-K
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

SECTION REDRESSEUSE

Tension de chauffage	12,6 volts
Tension alternative efficace par plaque	125 volts max.
Courant redressé	30 ma. max.
Chute de tension dans le tube (à 60 ma.)	15 volts

NOTE : Pour courbe de redressement, voir fin volume.

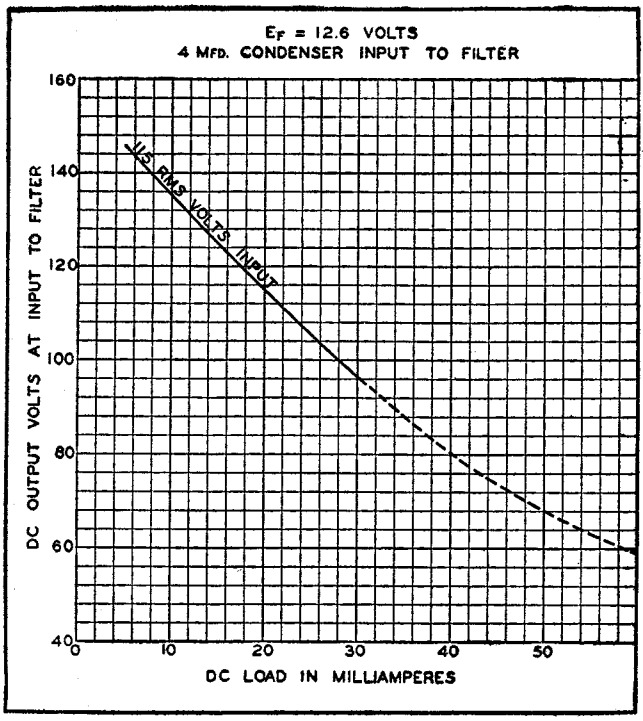
SECTION PENTODE

Tension de chauffage	12,6 volts
Tension plaque	135 volts
Tension grille	—13,5 volts
Tension écran	135 volts
Courant plaque	9,0 ma.
Résistance interne	102,000 ohms
Conductance mutuelle	975 μmhos
Coefficient d'amplification	100
Impédance de charge	13,500 ohms
Puissance modulée	0,55 watt

APPLICATION

Le tube Sylvania 12A7 est constitué par une section pentode et une section redresseuse enfermées dans une même ampoule.

Le principal usage de ce tube est rencontré dans les petits récepteurs universels, où la question d'encombrement est primordiale. La tension plaque étant relativement basse, la puissance modulée de la pentode n'est pas élevée; il faut noter également que le courant redressé par la section redresseuse est limité à 30 milliampères.


E_F = 12.6 VOLTS
4 MFD. CONDENSER INPUT TO FILTER
160
140
120
100
80
60
40
0
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20
30
40
50
1/2 RMS VOLTS INPUT
DC OUTPUT VOLTS AT INPUT TO FILTER
DC LOAD IN MILLIAMPERES

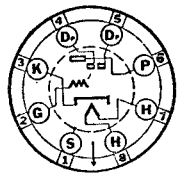










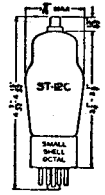


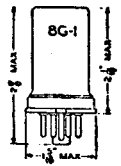


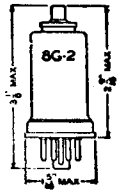


Série Sylvania Types 12, 6 Volts 150 Milliampères

Type	CLASSE	Culot Types	Ampoule	FONCTIONS	Mêmes caractéristiques et applicat. que type Sylvania: (sauf tension et courant chauffage)
12A8G	Heptode	8-A	ST-12C	Convertisseur	6A8G excepté capacités interelectrodes.
12C8G	Double Diode-Pentode	8-E	8G-2	Amplificateur Détect. et Av c.	6B8 excepté capacités interélectrodes.
12K7G	Pentode	7-R	ST-12C	Amplificateur	6K7G excepté capacités interélectrodes.
12Q7G	Double Double Triode	7-V	ST-12C	Détecteur	6Q7G excepté capacités interélectrodes.
12SA7	Heptode	8-R	8G-1	Convertisseur	6SA7 (« Single-ended »).
12SC7	Double-Triode	8-S	8G-1	Inverseur de Phase	6SC7 (« Single-ended »).
12SJ7	Pentode	8-N	8G-1	Détecteur Amplificateur	6SJ7 (« Single-ended »).
12SK7	Pentode	8-N	8G-1	Amplificateur	6SK7 (« Single-ended »).
12SQ7	Double Diode-Triode	8-Q	8G-1	Détecteur	6SQ7 (« Single-ended »).







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SYLVANIA
12ABP7 12ABP7A
12ABP14
12ABP14A
12ABP19
12ABP19A

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic		
Deflection Method	Magnetic		
Deflection Angle (approx.)	55 Degrees		
Phosphor	P7	P14	P19
Fluorescence	Blue	Purple	Orange
Phosphorescence	Yellow	Yellow	Orange
Persistence	Long	Medium-Long	Long
Faceplate	Gray Filter Glass		
Light Transmittance	74 Percent		

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ±10% Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	11 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12M
Bulb Contact Aligns with Vacant Pin Position No. 3	±10 Degrees

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	13,200 Volts dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to 1100 Volts dc
Grid No. 2 Voltage	770 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	200 Volts dc
Positive Bias Value[1]	0 Volts dc
Positive Peak Value	0 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	200 Volts dc
Heater Positive with Respect to Cathode	200 Volts dc

TYPICAL OPERATING CONDITIONS

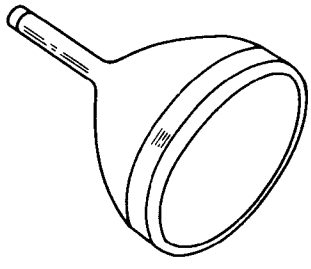
Anode Voltage[2]	10,000 Volts dc
Grid No. 4 Voltage for Focus[3]	0 to 300 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage for Cutoff[4]	-28 to -72 Volts dc
Alignment Magnet Field Strength[5]	0 to 4 Gausses

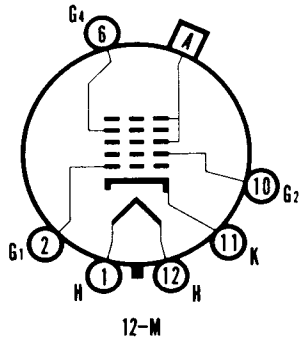
MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Special Purpose Tube
12" Direct Viewed
Round Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus





12-M

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SENECA FALLS, NEW YORK

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EMPORIUM, PENNSYLVANIA
NOVEMBER, 1957

NOTES:

1. *At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts. The screen of the 12ABP19 can be permanently damaged should the current density be permitted to rise too high. To prevent burning, minimum beam current densities should be employed.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, anode voltage should not be less than 8,000 volts.*
3. *With E_{g1} adjusted for Ib = 100 microamperes, E_{g4} is adjusted for best overall focus of a 7-1/2" x 10" raster pattern.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*
5. *For optimum quality of the focused spot, use of a beam alignment magnet is recommended. It should be an adjustable magnet of the specified strength, located approximately 5 1/16" from the reference line.*

12ABP7A, 12ABP14A, 12ABP19A

These types are identical to the 12ABP7, 12ABP14, 12ABP19 respectively, except that they employ aluminized screens.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the Manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

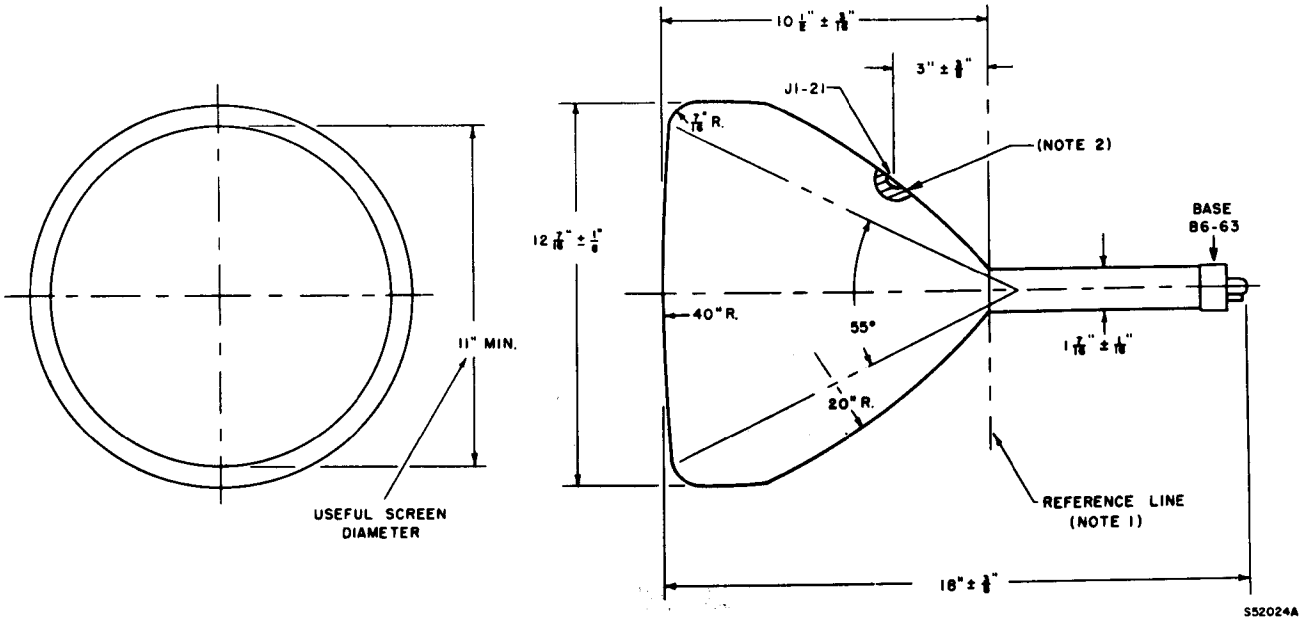

DIAGRAM NOTES:

1. *Reference line is the point where a 1.500* $^{+.003}_{-.000}$ *diameter ring gauge 2 inches long, will stop.*
2. *Anti-corona Coating 1-1/2" minimum radius concentric with contact. Do not handle tube by the part of the bulb having the anti-corona coating.*

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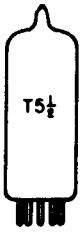
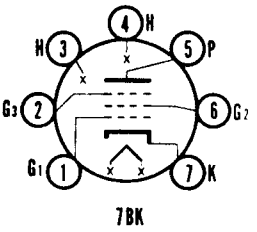


SYLVANIA TYPE 12AC6

Remote Cutoff Pentode



7BK

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7BK
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	12.6 Volts
Heater Current	150 Ma
Heater-Cathode Voltage (Design Center Values)	
Heater Negative with Respect to Cathode	30 Volts Max.
Heater Positive with Respect to Cathode	30 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[2]	Unshielded
Grid No. 1 to Plate	.004	.005 μμf
Input	4.3	4.3 μμf
Output	5.0	5.0 μμf

RATINGS (Design Center Values)

Plate Voltage	30 Volts Max.
Grid No. 2 Voltage	30 Volts Max.
Cathode Current	20 Ma Max.
Grid No. 1 Circuit Resistance	10 Megohms Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier

Plate Voltage	12.6 Volts
Grid No. 3 Voltage (Connected to Cathode at Socket)	0 Volts
Grid No. 2 Voltage	12.6 Volts
Grid No. 1 Voltage[3]	
Grid No. 1 Resistor	2.2 Megohms
Plate Current	550 μa
Grid No. 2 Current	200 μa
Transconductance[4]	730 μmhos
Plate Resistance (approx.)	0.5 Megohm
Grid No. 1 Voltage for Gm = 10 μmhos (approx.), Ec3 = 0	-5.2 Volts
Grid No. 3 Voltage for Gm = 10 μmhos (approx.), Ec1 = 0	-3.7 Volts

NOTES:

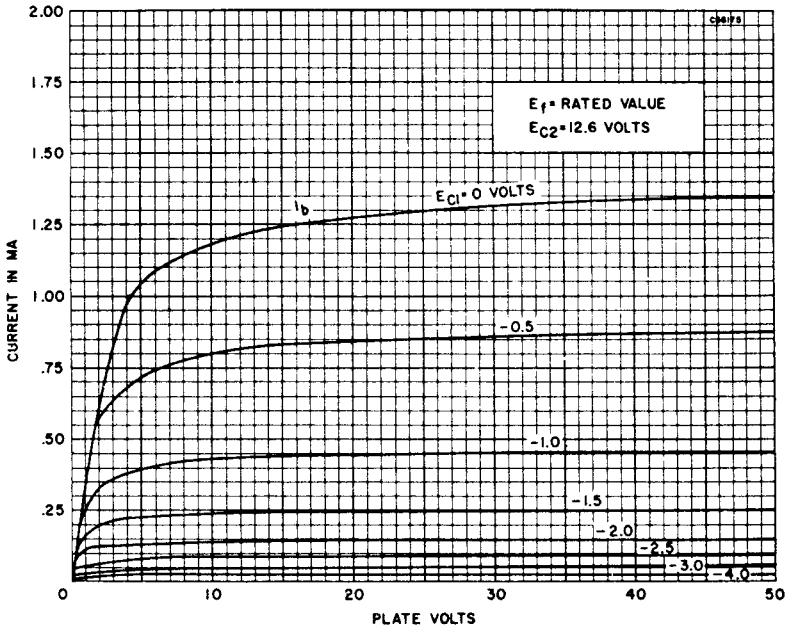
1. This tube is intended for use in automobile radios operated from a nominal 12 volt battery. Design of the tube is such that the heater will operate satisfactorily over the range 10.0 volts to 15.9 volts, and that the maximum ratings provide a safety factor for the wide voltage variation encountered with this type of supply.
2. Shield No. 316.
3. Average contact potential is developed across the specified resistor.
4. Measured from Grid No. 1 to plate.

APPLICATION NOTES

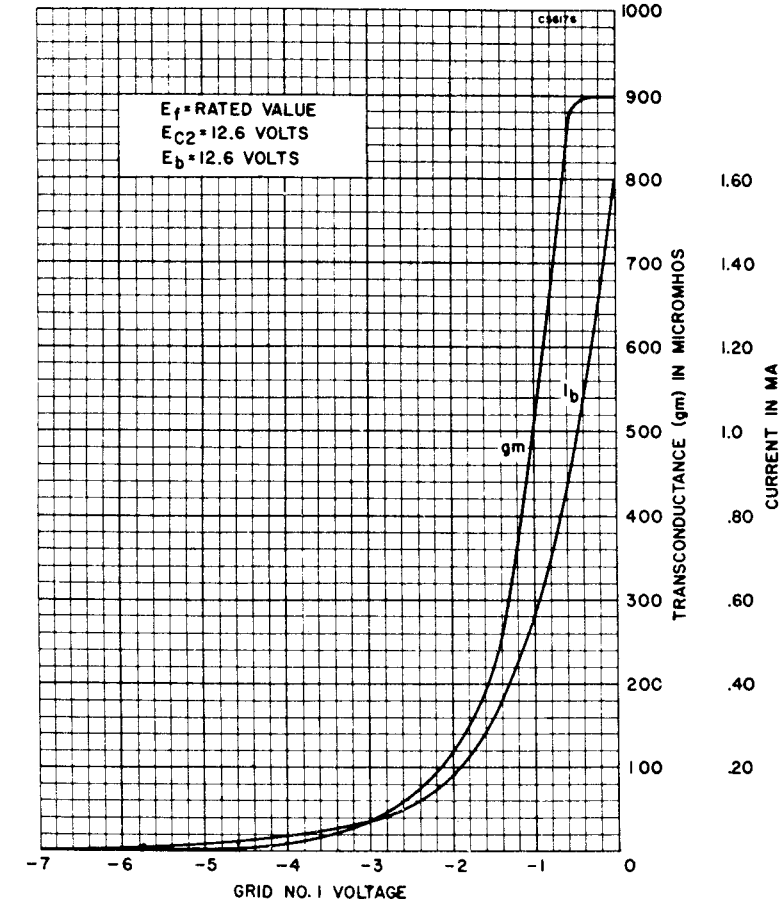
The Sylvania Type 12AC6 is a miniature remote cutoff pentode intended for use as an RF or IF amplifier.
It is designed for operation where the heater, plate and screen voltages are supplied directly from a 12 volt automotive storage battery.

SYLVANIA TYPE 12AC6 (Cont'd)

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA

engineering data service

SYLVANIA

12AD7

The Sylvania Type 12AD7 is a High Mu Double triode rigorously controlled to provide hum and microphonic free operation in low level audio preamplifier service.

MECHANICAL DATA

Bulb	T-6 ½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9A
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Series	Parallel	
Heater Voltage (ac or dc)	12.6	6.3 Volts	
Heater Current	225	450 Ma	
Heater-Cathode Voltage (Design Center Values)			
Heater Negative with Respect to Cathode			
Total DC and Peak	200	200 Volts	Max.
Heater Positive with Respect to Cathode			
DC	100	100 Volts	Max.
Total DC and Peak	200	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Approx.)[1]

	Shielded[2]		Unshielded		
	Triode No. 1	Triode No. 2	Triode No. 1	Triode No. 2	
Grid to Plate	1.8	1.8	1.8	1.8	μμf
Input: g to (h+k+i.s.+e.s.)	1.7	1.7	1.6	1.6	μμf
Output: p to (h+k+i.s.+e.s.)	1.6	1.9	0.50	0.45	μμf

RATINGS (Design Center Values) Each Section

Plate Voltage	300 Volts	Max.
Plate Dissipation	1.0 Watt	Max.
Positive DC Grid Voltage	0 Volts	Max.
Negative DC Grid Voltage	50 Volts	Max.

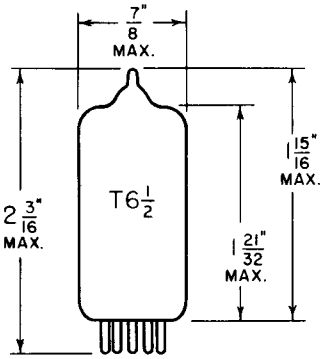
CHARACTERISTICS AND TYPICAL OPERATION

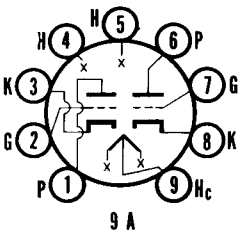
Class A_1 Amplifier—Each Section

Plate Voltage	250 Volts
Grid Voltage	−2 Volts
Plate Current	1.25 Ma
Plate Resistance	62500 Ohms
Transconductance	1600 μmhos
Amplification Factor	100

QUICK REFERENCE DATA

The Sylvania Type 12AD7 is a miniature, non-microphonic, high Mu double triode for audio preamplifier use. The 12AD7 features a specified maximum hum output level.





9 A

SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JULY 1956

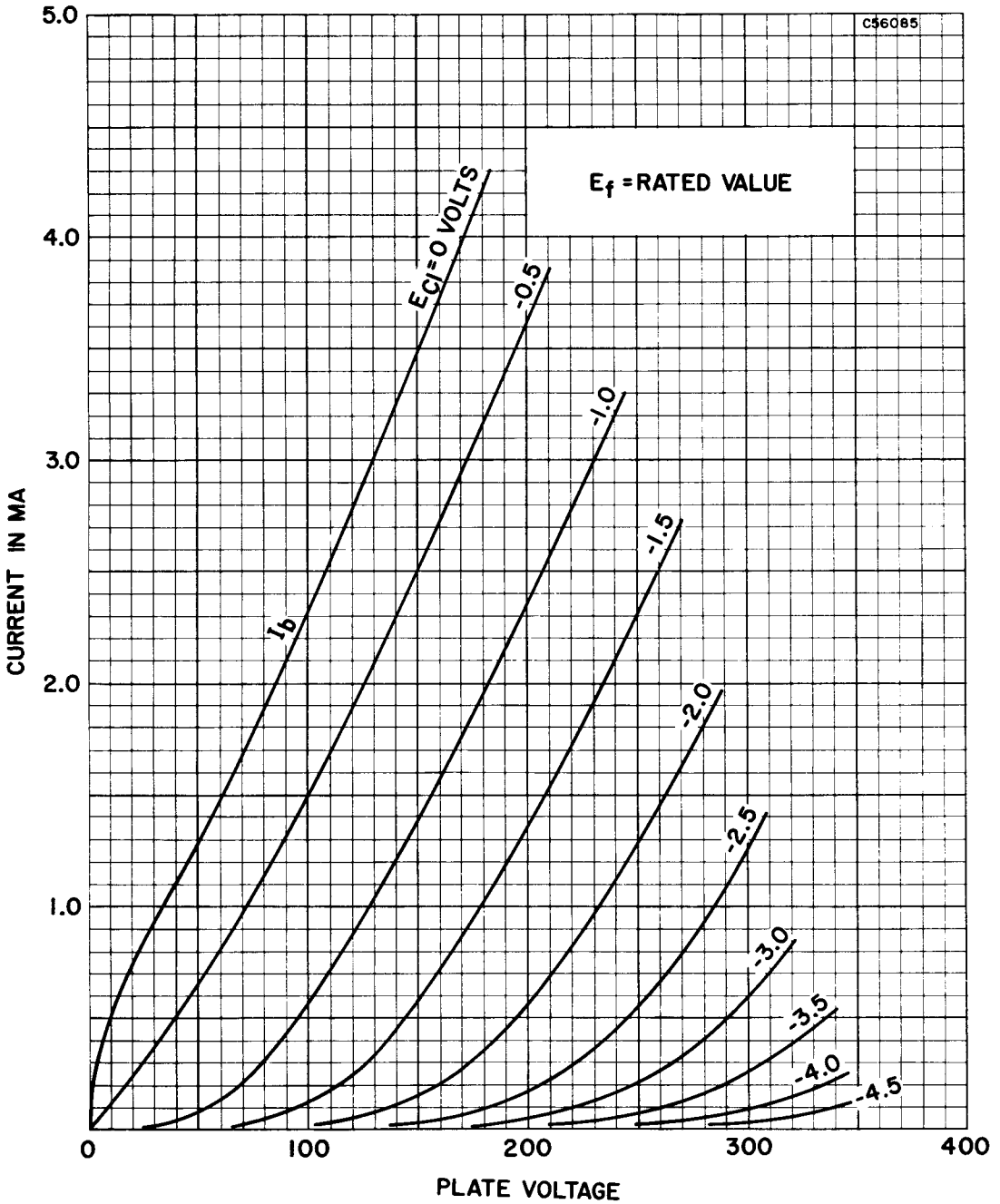
Resistance Coupled Amplifier—Each Section

Heater Voltage[3]	6.3 Volts
Plate Supply Voltage	250 Volts
Unbypassed Cathode Resistance	3300 Ohms
Grid Circuit Resistance	470000 Ohms
Plate Load Resistance	270000 Ohms
RMS Hum Level at Plate, Max.	3.0 Millivolts

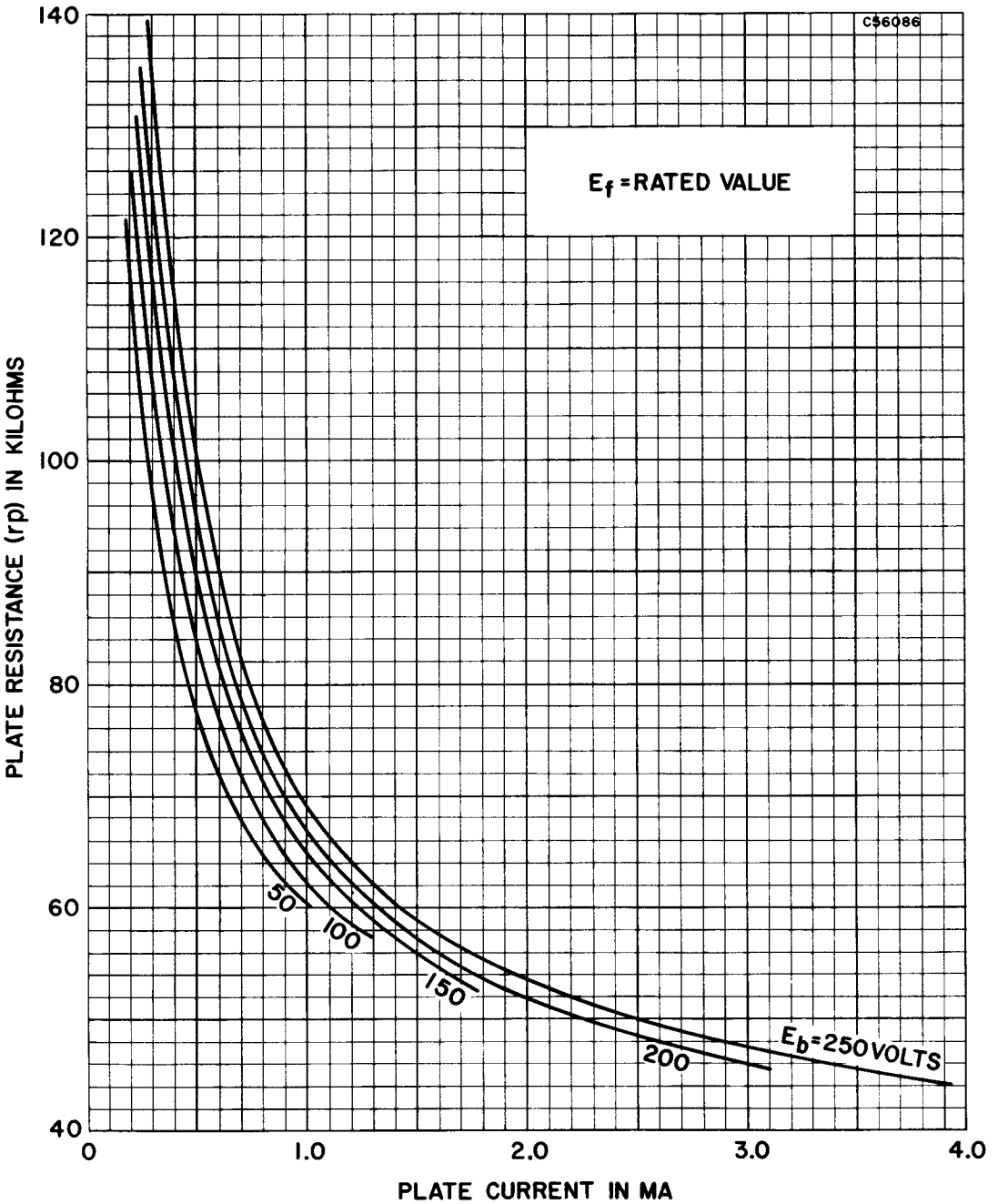
NOTES:

1. *Section No. 1 connects to Pins 6, 7 and 8.*
   Section No. 2 connects to Pins 1, 2 and 3.
2. *Shield No. 315.*
3. *The heater sections are operated in parallel from a 6.3 volt supply balanced to ground.*

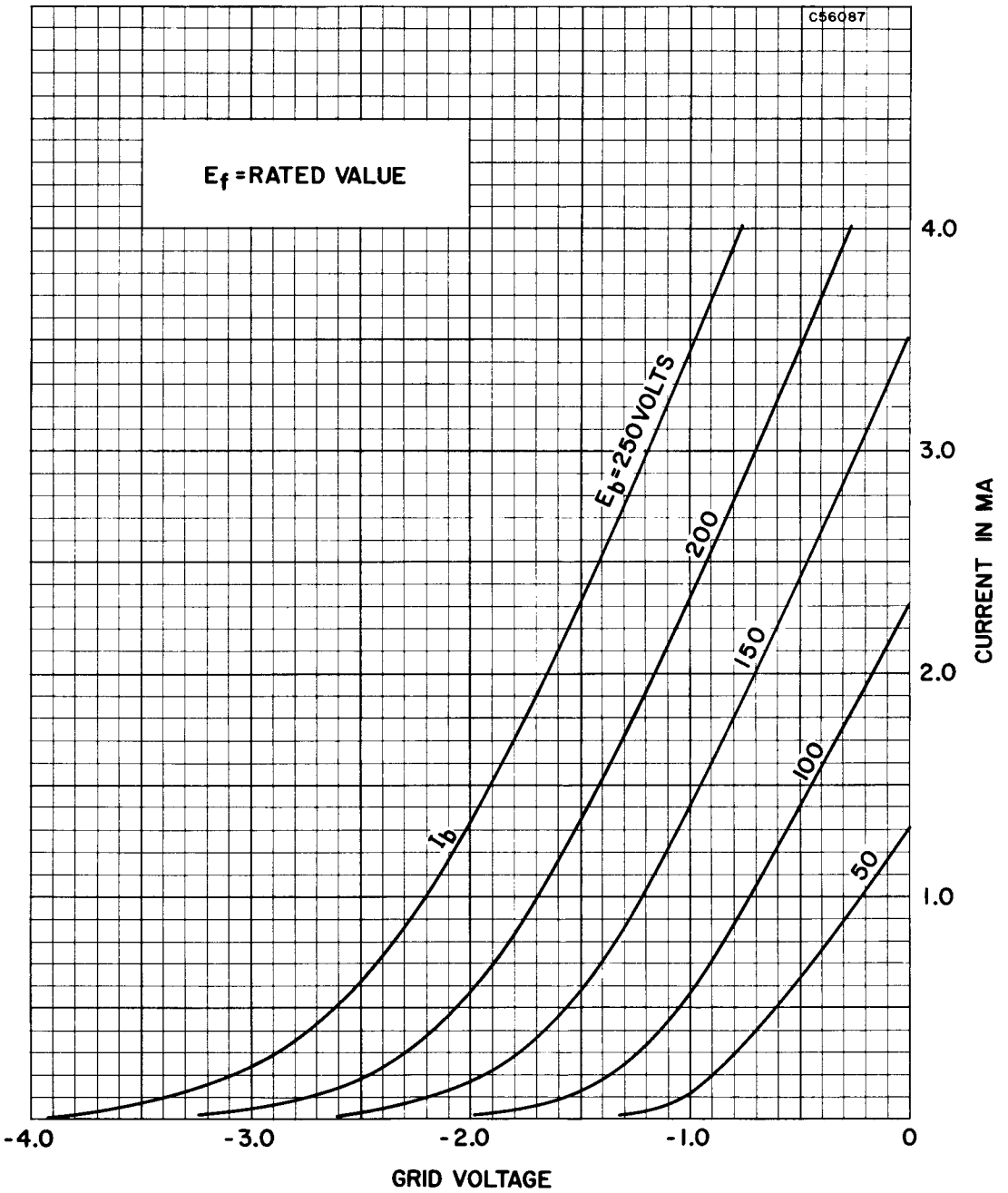
AVERAGE PLATE CHARACTERISTICS



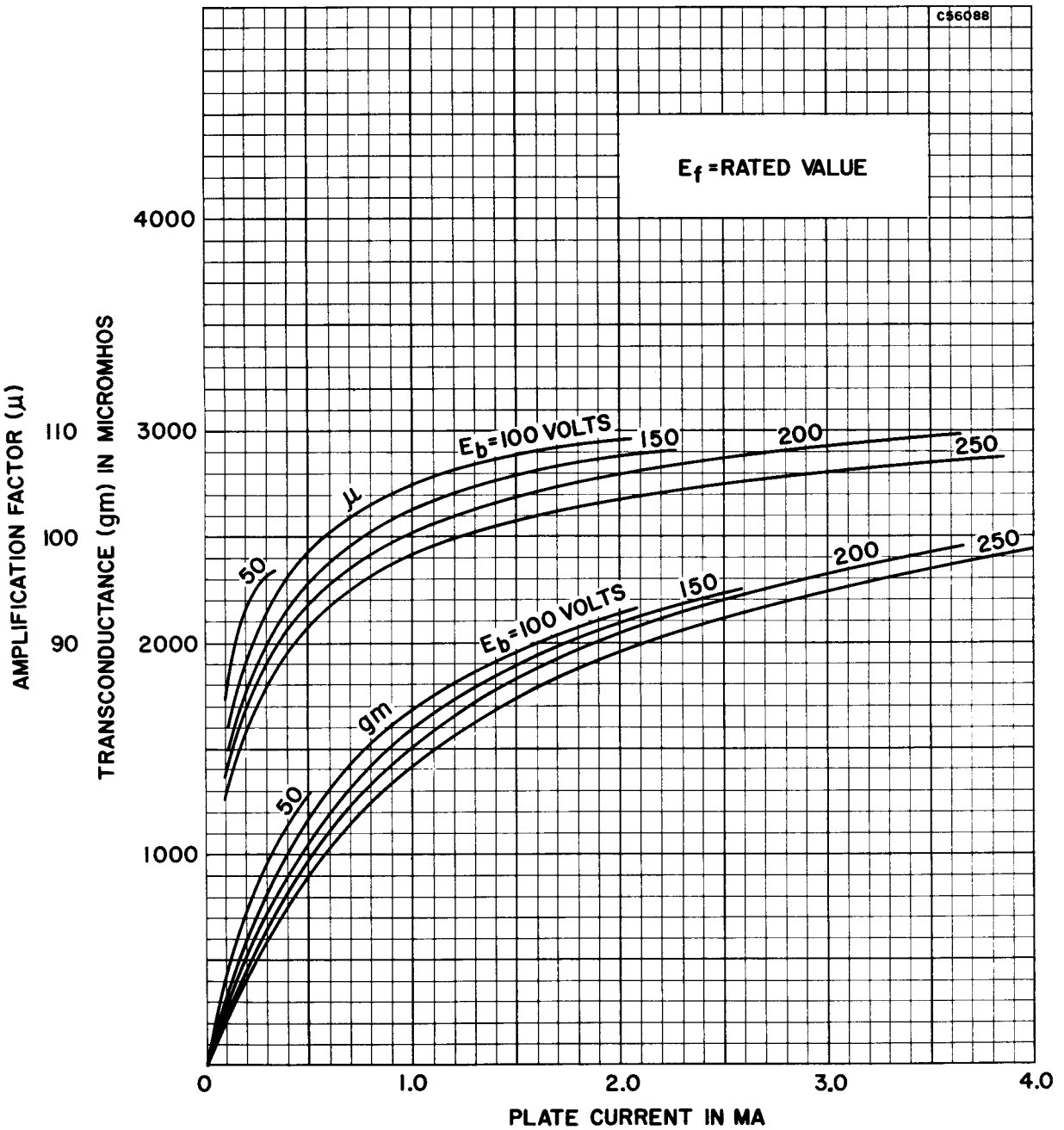
AVERAGE TRANSFER CHARACTERISTICS

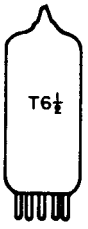


AVERAGE TRANSFER CHARACTERISTICS



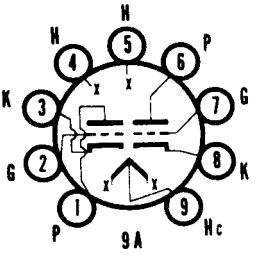
AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPE 12AE7

DISSIMILAR DUO TRIODE



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9A
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	12.6 Volts
Heater Current	450 Ma

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section No. 1[2]	Section No. 2
Grid to Plate	3.9	3.4 μμf
Input: g to (h+k)	4.7	4.2 μμf
Output: p to (h+k)	0.75	0.85 μμf

CHARACTERISTICS AND TYPICAL OPERATION

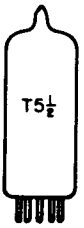
Class A1 Amplifier	Section No. 1[2]	Section No. 2
Plate Voltage	12.6	12.6 Volts
Grid Voltage[3]		
Grid Resistor	1.5	1.0 Megohms
Plate Current	1.9	7.5 Ma
Transconductance	4000	6500 μmhos
Amplification Factor	13	6.4
Plate Resistance (Approx.)	3250	985 Ohms

NOTES:

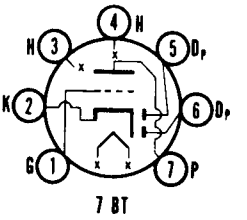
1. This tube is intended for use in automobile radios operated from a nominal 12 volt battery. Design of the tube is such that the heater will operate satisfactorily over the range of 10.0 volts to 15.9 volts, and that the maximum ratings provide a safety factor for the wide voltage variation encountered with this type of supply.
2. Section No. 1 connects to pins 6, 7 and 8. Section No. 2 connects to pins 1, 2 and 3.
3. Average contact potential bias developed across specified grid resistor.

APPLICATION

The Sylvania Type 12AE7 is a miniature double triode with dissimilar sections. It is designed for operation where the heater and plate voltages are supplied directly from an automotive storage battery. Section No. 1 is a medium-mu triode designed for general purpose application. Section No. 2 is a low-mu triode suitable for use as a transistor power amplifier driver.



SYLVANIA TYPE 12AJ6



MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7BT
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	12.6 Volts
Heater Current	150 Ma
Heater-Cathode Voltage (Design-Center Values)	
Heater Negative with Respect to Cathode	30 Volts Max.
Heater Positive with Respect to Cathode	30 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	2.0 μμf
Input: g to (h + k)	2.2 μμf
Output: p to (h + k)	0.8 μμf
Diode to Diode	0.9 μμf

RATINGS (Design-Center Values)

Plate Voltage	30 Volts Max.
Cathode Current	20 Ma Max.
Grid Circuit Resistance	10 Megohms Max.
Average Diode Current	1.0 Ma Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier

Plate Voltage	12.6 Volts
Grid Voltage	0 Volts
Plate Current	750 μa
Transconductance	1200 μmhos
Amplification Factor	55
Plate Resistance	45,000 Ohms
Average Diode Current with 10 Volts Applied (Each Diode)[2]	2.0 Ma

Resistance Coupled Amplifier

Plate Supply Voltage	12.6 Volts
Grid Voltage[3]	
Grid Resistor	1.0 Megohm
Plate Load Resistor	1.0 Megohm
Input Capacitor	0.02 μf
Output Capacitor	0.01 μf
Grid Resistor of Following Stage	2.0 Megohms
Voltage Gain at 400 CPS[4]	16

NOTES:

1. This tube is intended for use in automobile radios operated from a nominal 12 volt battery. Design of the tube is such that the heater will operate satisfactorily over the range 10.0 volts to 15.9 volts, and that the maximum ratings provide a safety factor for the wide voltage variation encountered with this type of supply.
2. Test condition only.
3. Average contact potential developed across specified grid resistor.
4. Measured at an output voltage of 1.0 volt RMS.

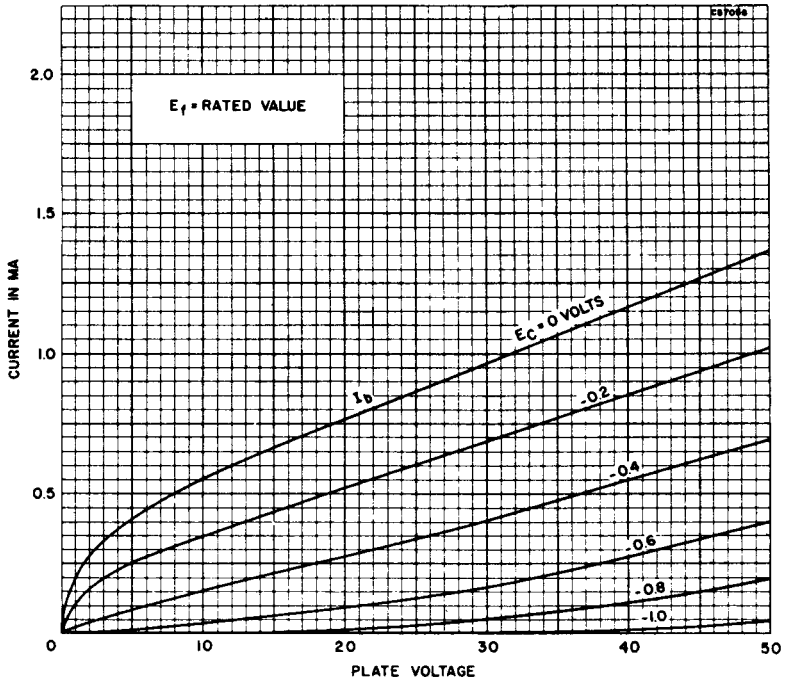
APPLICATION NOTES

The Sylvania Type 12AJ6 is a miniature double diode, high-mu triode intended for use as a second detector audio amplifier.

It is designed for operation where the heater and plate voltages are supplied directly from a 12-volt automotive storage battery.

SYLVANIA TYPE 12AJ6 (Cont'd)

AVERAGE PLATE CHARACTERISTICS



ADVANCE DATA

MECHANICAL DATA

Bulb	T-6 1/2
Base	E9-1, Miniature Button 9-Pin
Outline	6-3
Basing	9GS
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage [1]	12.6	Volts
Heater Current	550	Ma
Heater-Cathode Voltage (Design Center Values)		
Heater Negative with Respect to Cathode	30	Volts
Heater Positive with Respect to Cathode	30	Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section		
Grid to Plate	5.7	µµf
Input: g to (k + h)	1.8	µµf
Output: p to (k + h)	0.4	µµf
Tetrode Section		
Grid No. 2 to Plate	14	µµf
Input: g2 to (g1 + k + h)	13	µµf
Output: p to (g1 + k + h)	1.6	µµf
Coupling: (tetrode g2 to triode g1)	0.01	µµf Max.

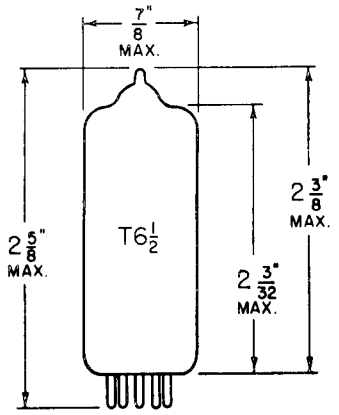
RATINGS (Design Center Values)

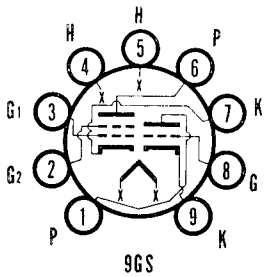
	Triode Section	Tetrode Section		
Plate Voltage	30	30	Volts	Max.
Positive Grid No. 1 Voltage, Abs. Max. (Space Charge Grid)		16	Volts	Max.
Negative Grid No. 2 Voltage		20	Volts	Max.
Cathode Current	20		Ma	Max.
Grid Circuit Resistance	10		Megohms	Max.
Grid No. 2 Circuit Resistance		10	Megohms	Max.

QUICK REFERENCE DATA

The Sylvania Type 12AL8 is a medium mu triode and space-charge grid tetrode with independent cathodes. The triode section is intended for use as a voltage amplifier and the tetrode section is intended for use as an audio power amplifier driver.

It is designed for operation where the heater, plate and screen voltages are obtained directly from a 12 volt automotive storage battery.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

October 2, 1957-R1

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier

	Triode Section	Tetrode Section	
Plate Voltage	12.6	12.6	Volts
Grid No. 1 Voltage (Space-Charge Grid)		12.6	Volts
Grid Voltage [2]	-0.9	0.5 [3]	Volts
Plate Current	0.5	40	Ma
Grid No. 1 Current (Space-Charge Grid)		75	Ma
Transconductance	1000	15000 [4]	µmhos
Amplification Factor	13	7.2 [4]	
Plate Resistance	13000	480	Ohms

Resistance-Coupled Cascaded Amplifier (See Circuit)

	Triode Section	Tetrode Section	
Plate Voltage		12.6	Volts
Plate Supply Voltage	12.6		Volts
Grid No. 1 Voltage (Space-Charge Grid)		12.6	Volts
Grid Resistor [2]	2.2	2.2	Megohms
Grid Blocking Capacitor	0.1	0.1	µf
AF Grid Voltage	0.18		Volts
Plate Current		8.0 [5]	Ma
Grid No. 1 Current (Space-Charge Grid)		75	Ma
Load Resistance	330K	800	Ohms
Power Output		40	Mw
Total Harmonic Distortion		10	Percent

NOTES:

1. This tube is intended for use in automobile radios operated from a nominal 12 volt battery. Design of the tube is such that the heater will operate satisfactorily over the range 10.0 volts to 15.9 volts, and that the maximum ratings provide a safety factor for the wide voltage variation encountered with this type of supply.

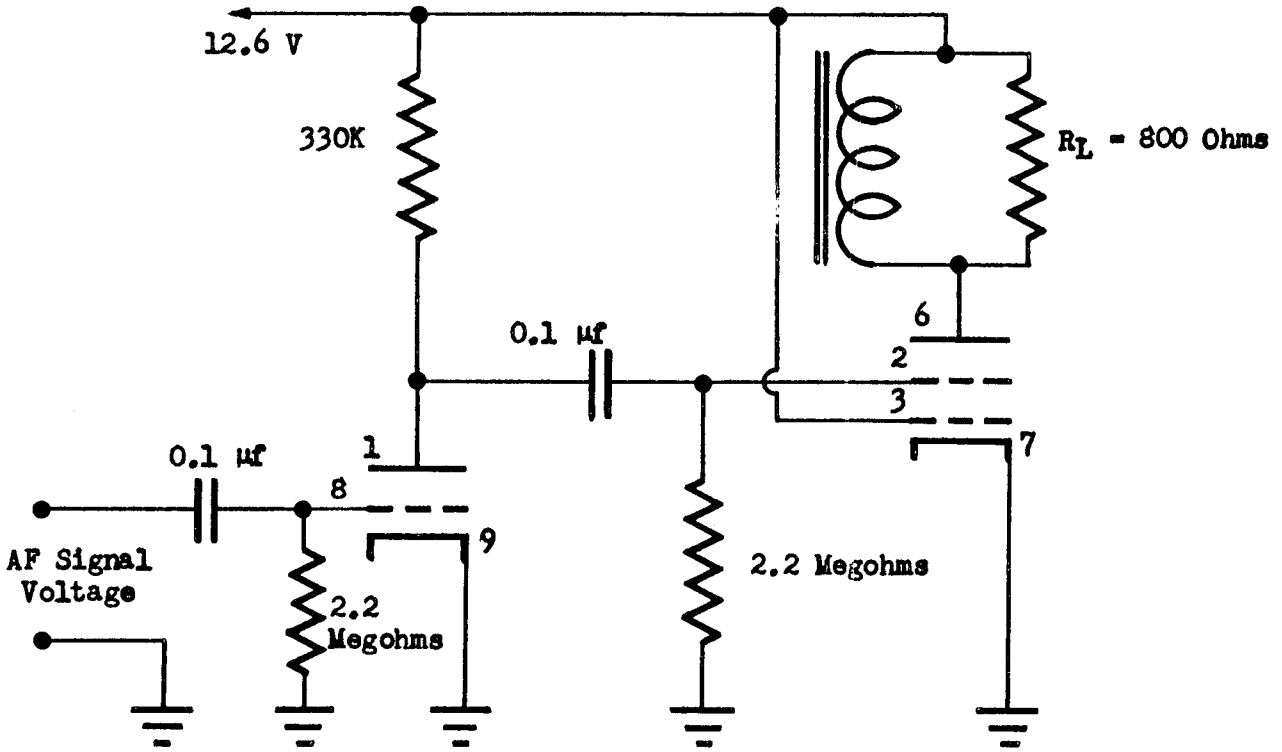
2. Average contact potential developed across a 2.2 megohms resistor.

3. Grid No. 2 being the control grid.

4. From Grid No. 2 to plate.

5. Zero-signal plate current is approximately 40 ma.

RESISTANCE COUPLED CASCADED AMPLIFIER CIRCUIT



CHARACTERISTICS

GENERAL DATA

Focusing Method			Electrostatic	
Deflecting Method			Electrostatic	
Phosphor*	P7	P14	P19	P25
Fluorescence	Blue-White	Purple	Orange	Orange
Phosphorescence	Yellow	Orange	Orange	Orange
Persistence	Long	Med. Long	Long	Long
Faceplate			Gray Filter Glass	

* In addition to the screens shown, the 12ANP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Ampere
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	6.0	pf
Grid No. 1 to All Other Electrodes	8.0	pf
Between Deflecting Plates 1-2	5.0	pf
Between Deflecting Plates 3-4	3.0	pf
Deflecting Plate 1 to All Other Electrodes	14.5	pf
Deflecting Plate 2 to All Other Electrodes	13.0	pf
Deflecting Plate 3 to All Other Electrodes	6.2	pf
Deflecting Plate 4 to All Other Electrodes	6.5	pf

MECHANICAL DATA

Minimum Useful Screen Diameter	11	Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-22	
Neck Contacts (Small Ball Caps)	J1-25	
Base (Medium Shell Diheptal 12-Pin)	B12-37	
Basing	14AW	
J1-22 Contact Aligns with Trace D3-D4	±10	Degrees
J1-22 Contact Aligns with Pin No. 11	±10	Degrees
Neck Contact (A2) Aligns with Trace D1-D2	±10	Degrees
Positive Voltage on D1 Deflects Beam Approx. Away From A2		
Positive Voltage on D3 Deflects Beam Approx. Away From Post Accelerator Button		

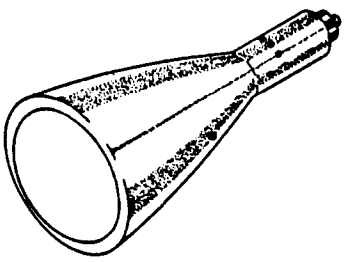
RATINGS

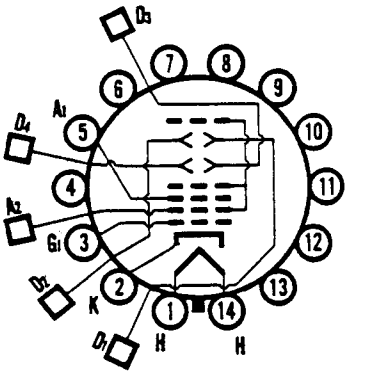
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Input[1]	6	Watts
Anode No. 3 Voltage	16,000	Volts dc
Anode No. 2 Voltage	8,000	Volts dc
Anode No. 1 Voltage	3,000	Volts dc
Grid No. 1 Voltage		
Negative Bias Value	300	Volts dc
Positive Bias Value	0	Volts dc

QUICK REFERENCE DATA

Oscilloscope Tube
12" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Post Deflection Accelera
tion
Aluminized Screen





14AW

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

May 5, 1965

MAXIMUM RATINGS (Absolute Maximum Values) (Cont'd)

Positive Peak Value	2	Volts
Peak-Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	180	Volts
Heater Positive with Respect to Cathode	180	Volts
Peak Voltage Between Anode No. 2 and Any Deflecting Plate	1500	Volts
Ratio (Post Accelerator Voltage to Anode Voltage)	2:5	

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage	9700	Volts dc
Anode No. 2 Voltage	6100	Volts dc
Anode No. 1 Voltage for Focus	1510 to 2225	Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	-135 to -202	Volts dc
Deflection Factors[3]		
Deflecting Plates 1-2	100 to 150	Volts dc/Inch
Deflecting Plates 3-4	100 to 150	Volts dc/Inch
Modulation[4]	45	Volts Max.
Line Width "A"[4]	.5	mm
Line Width "B"[4]	.75	mm
Focus Electrode Current[4]	-25 to +25	μa
Spot Position, Undeflected	Within 20 mm Square	
Angle Between D1-D2 Trace and D3-D4 Trace	90 ± 1	Degree

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	2.0	Megohms Max.
Resistance in Any Deflection Plate Circuit	5.0	Megohms Max.

NOTES:

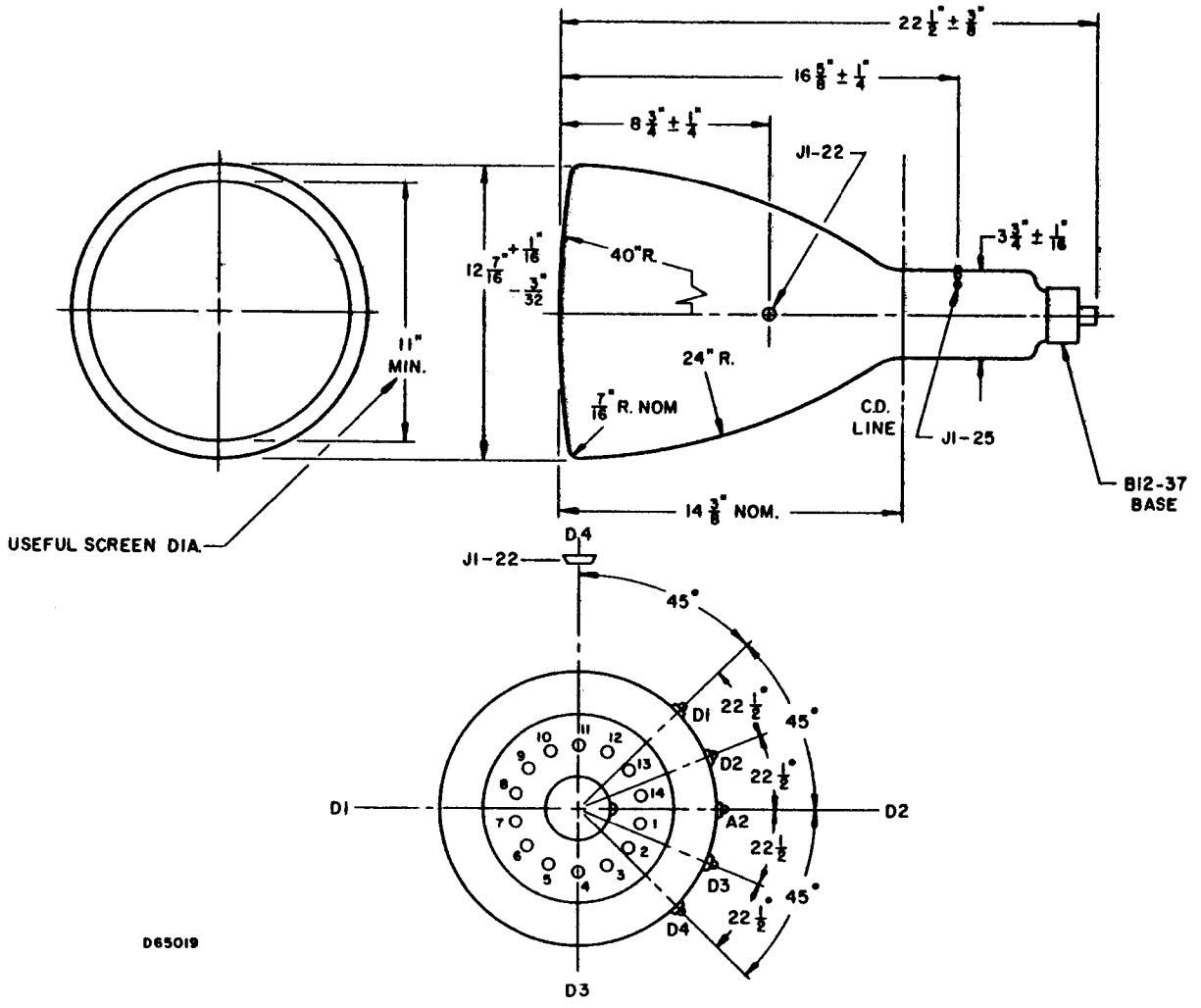
1. Anode input equals the product of Anode No. 2 voltage and average Anode No. 2 current.

2. For visual extinction of undeflected focused spot.

3. Deflection plates 1 and 2 are nearer the screen.

4. Measured in accordance with MIL-E-1 specification at a post accelerator current (IA3) equal to 25 μa.

OUTLINE



BOTTOM VIEW OF BASE

ADVANCE DATA

The following tube types feature controlled heater warm-up time for operation in 150 Ma series heater strings. They are otherwise identical to their adjacently listed counterparts.

Type No.	Approximate Heater Warm-Up Time (Secs.)*	Counterpart	Counterpart Release No.
12AT6A	17	12AT6	446
12AU6A	17	12AU6	547
12AV6A	17	12AV6	627
12BA6A	17	12BA6	446
12BE6A	17	12BE6	446
12BN6A	17	12BN6	786
14GT8A	17	14GT8	2660
17C9A	17	17C9	3004
19CL8B	17	19CL8A	2501
19EA8A	17	19EA8	2501
19T8A	17	19T8	583
35C5A	17	35C5	636
35EH5A	17	35EH5	2557
35W4A	17	35W4	446
50C5A	17	50C5	636
50EH5A	17	50EH5	2204

NOTES:

* Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.

from JEDEC release #3300, June 12, 1961

May 16, 1961

146 (10.58)

SYLVANIA ELECTRIC PRODUCTS INC.
RECEIVING TUBE OPERATIONS, EMPORIUM, PENNSYLVANIA

SYLVANIA

engineering data service

SYLVANIA
12AX7
6AX7

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9A
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6AX7	12AX7	
Heater Voltage Series/Parallel	6.3/3.15	12.6/6.3	Volts
Heater Current Series/Parallel	300/600	150/300	Ma
Heater Warm-up Time[1 & 4]	11		Seconds
Heater-Cathode Voltage (Design Center Values)			
Heater Negative with Respect to Cathode			
Total DC and Peak	200	200	Volts Max.
Heater Positive with Respect to Cathode			
DC	100	100	Volts Max.
Total DC and Peak	200	200	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

	Section 1[2]		Section 2[2]		
	Shielded[3]	Unshielded	Shielded[3]	Unshielded	
Grid to Plate	1.7	1.7	1.7	1.7	μμf
Input (g to h+k)	1.8	1.6	1.8	1.6	μμf
Output (p to h+k)	1.9	0.46	1.9	0.34	μμf

RATINGS (Design Center Values) Each Section

Plate Voltage	300	Volts Max.
Plate Dissipation	1.0	Watt Max.
Positive DC Grid Voltage	0	Volts Max.
Negative DC Grid Voltage	-50	Volts Max.

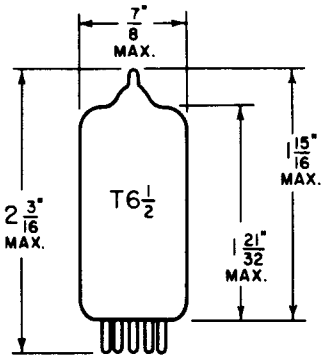
CHARACTERISTICS AND TYPICAL OPERATION

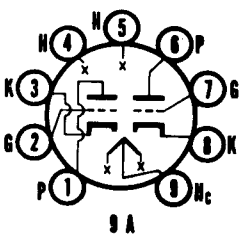
Class A_1 Amplifier — Each Section

Plate Voltage	100	250	Volts
Grid Voltage	-1	-2	Volts
Plate Current	0.5	1.2	Ma
Plate Resistance	80,000	62,500	Ohms
Transconductance	1250	1600	μmhos
Amplification Factor	100	100	

QUICK REFERENCE DATA

The Sylvania Type 12AX7 is a miniature high-mu twin triode having separate cathodes. It is designed for service as an audio voltage amplifier or phase inverter. The center tapped heater of the Type 12AX7 permits operation on 12.6 or 6.3 volts. The 12AX7 is identical to the 6AX7 except for heater characteristics. The 6AX7 employs a 600 Ma heater and controlled heater warm-up time for use in series string television receivers.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

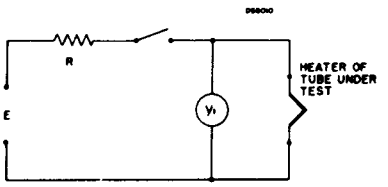
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

SEPTEMBER 1955

NOTES:

1. *Heater Warm-up Time is defined as the time required in the circuit shown below for the voltage across the heater terminals to increase from zero to the heater test voltage (V1). The conditions used in conjunction with the test circuit depend upon the rated heater voltage and current of the tube under test.*

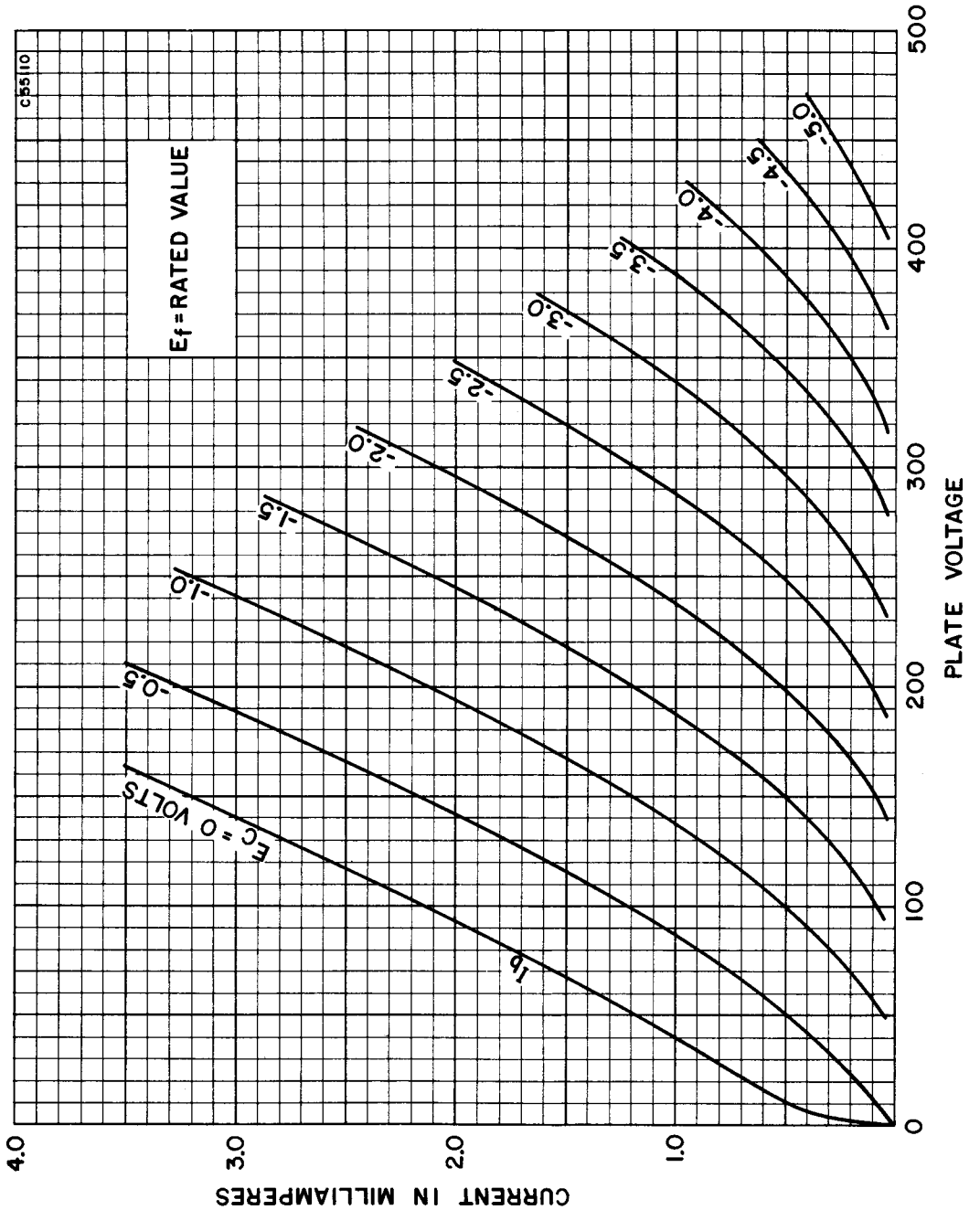
   For this type: E = 12.5 Volts, R = 15.8 Ohms, V1 = 2.5 Volts.



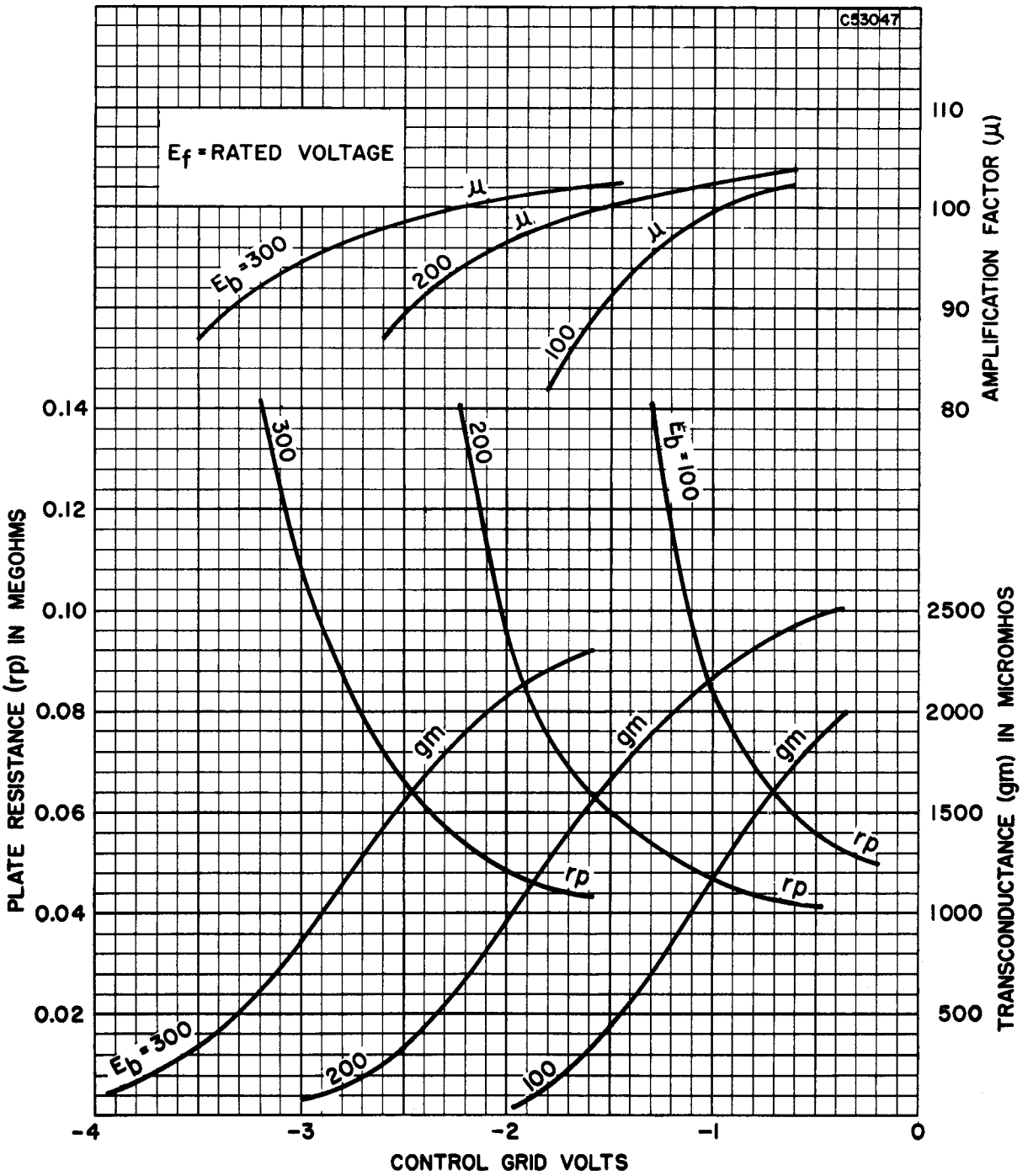
E — Applied Voltage, RMS or DC
R — Total Series Resistance
V1 — Heater Test Voltage, RMS or DC (80% Rated Heater Voltage)

2. *Section No. 1 connects to Pins 6, 7 and 8.*
   Section No. 2 connects to Pins 1, 2 and 3.
3. *External shield No. 315 connected to cathode of section under test.*
4. *Controlled Heater Warm-up Time applies to parallel connection only.*

AVERAGE PLATE CHARACTERISTICS
EACH SECTION



AVERAGE TRANSFER CHARACTERISTICS
EACH SECTION



SYLVANIA engineering data service

SYLVANIA

12AXP-*

CHARACTERISTICS

GENERAL DATA

Focusing Method			Electrostatic	
Deflecting Method			Electrostatic	
Phosphor*	P1	P2	P7	P11
Fluorescence	Green	Green	White	Blue
Phosphorescence	Green	Green	Yellow	—
Persistence	Medium	Medium	Long	Short
Faceplate			Gray Filter Glass	

*In addition to the screens shown, the 12AXP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10 % Amperes
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	10 pf
Grid No. 1 to All Other Electrodes	8 pf
Between Deflecting Plates 1-2	4 pf
Between Deflecting Plates 3-4	2 pf
Deflecting Plate 1 to All Other Electrodes Except D2	8 pf
Deflecting Plate 2 to All Other Electrodes Except D1	8 pf
Deflecting Plate 3 to All Other Electrodes Except D4	6 pf
Deflecting Plate 4 to All Other Electrodes Except D3	6 pf

MECHANICAL DATA

Minimum Useful Screen Diameter	11 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14J
Weight (Approx.)	12 Pounds
J1-21 Contact Aligns with Trace D1-D2	±10 Degrees
J1-21 Contact Aligns with Pin No. 5	±10 Degrees
Positive Voltage on D1 Deflects Beam Approx. Toward Pin No. 5	
Positive Voltage on D3 Deflects Beam Approx. Toward Pin No. 1	
Bulb	C99½ Exp. 28, or Equivalent

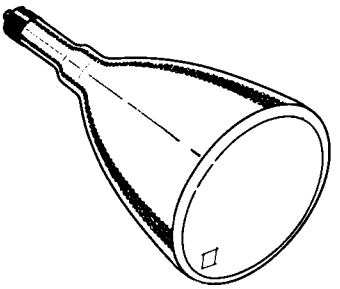
RATINGS

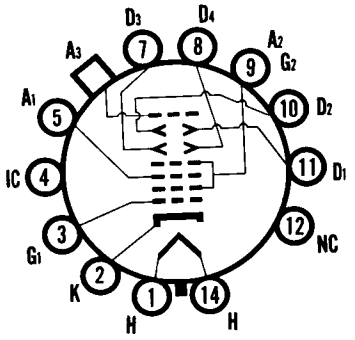
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Input[1]	6 Watts	
Anode No. 3 Voltage	12,000 Volts	dc
Anode No. 2 Voltage	6000 Volts	dc
Anode No. 1 Voltage	2500 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	200 Volts	dc
Positive Bias Value	0 Volt	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	
Peak Voltage Between Anode No. 2 and Any Deflecting Plate	750 Volts	
Ratio (Post Accelerator Voltage to Anode Voltage)	2.3:1	

QUICK REFERENCE DATA

Oscilloscope Tube
12" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Post Deflection Acceleration





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SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

MARCH, 1965

PAGE 1 OF 2

File Under

SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage	10,000 Volts	dc
Anode No. 2 Voltage	5000 Volts	dc
Anode No. 1 Voltage for Focus	1300 to 2200 Volts	dc
Grid No. 1 Voltage Required for Cutoff[2]	−60 to −100 Volts	dc
Deflection Factors[3]		
Deflecting Plates 1-2	105 to 145 Volts	dc/Inch
Deflecting Plates 3-4	80 to 115 Volts	dc/Inch
Modulation[4]	30 Volts	Max.
Line Width "A"[4]	.5 mm	
Focus Electrode Current[4]	−15 to +10 μa	dc
Spot Position, Undeflected	Within 30 mm Square	
Angle Between D1-D2 Trace and D3-D4 Trace	90 ± 2 Degrees	
Useful Scan (Centered on Tube Face)[5]	9¾ x 9¾ Inches	Min.

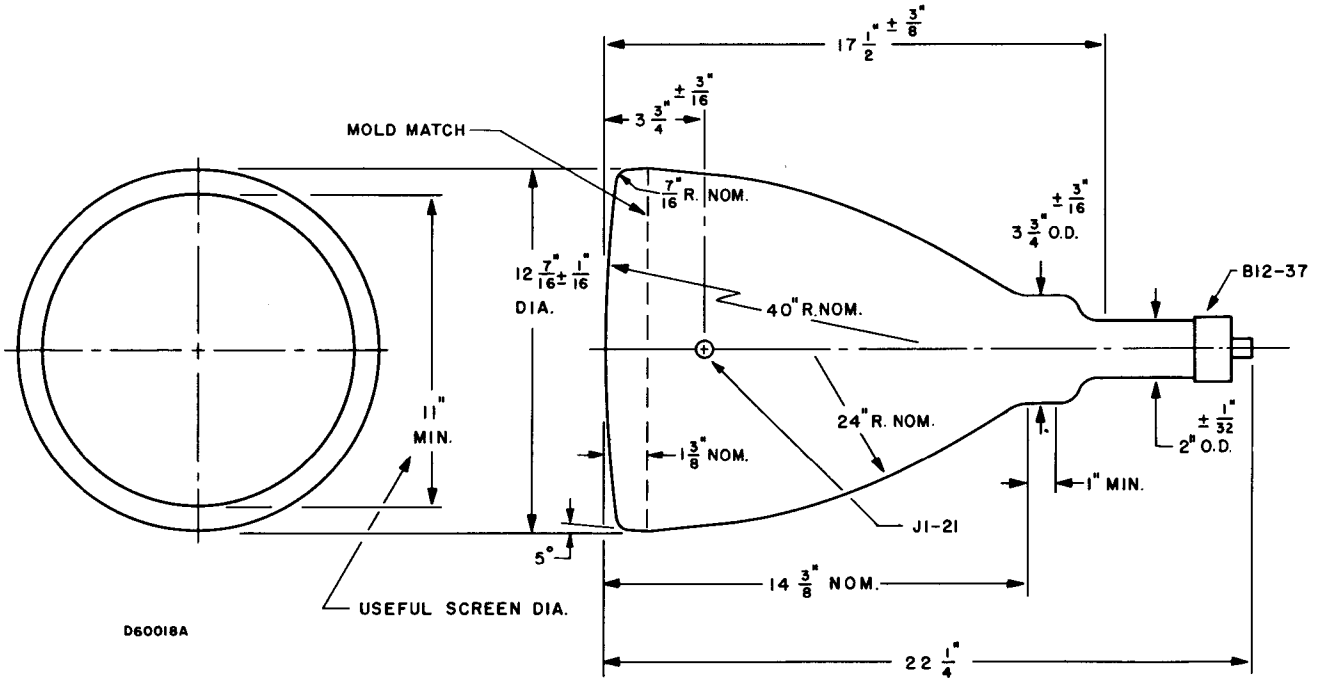
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Resistance in Any Deflection Plate Circuit	5.0 Megohms Max.

NOTES:

1. *Anode input equals the product of Anode No. 2 voltage and average anode No. 2 current.*
2. *For visual extinction of undeflected focused spot.*
3. *Deflection plates 1 and 2 are nearer the screen.*
4. *Measured in accordance with MIL-E-1 specification at a post accelerator current (IA3) equal to 25 μa.*
5. *At EA3 = EA2, the entire useful screen area can be scanned.*

OUTLINE



SYLVANIA ELECTRIC

RMA Registration Data

TYPE 12BK6

DOUBLE - DIODE TRIODE

MECHANICAL DATA

Style	miniature
Cathode	coated, unipotential
Bulb	T-5 1/2
Base	E7-1, miniature button 7-pin
Outline	5-3
Maximum Diameter	3/4 inch
Maximum Overall Length	2 5/8 inches
Maximum Seated Height	2 3/8 inches
Basing	7BT-0-2

Pin Connections:

Pin 1 .. grid	Pin 5 .. #2 diode plate
Pin 2 .. cathode, diode shield	Pin 6 .. #1 diode plate
Pin 3 .. heater	Pin 7 .. triode plate
Pin 4 .. heater	

Mounting Position ..... any

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES

	without shield	*with shield*(1)	
#2 Diode Input: #2p to (h+k+i.s.)	1.0	1.0	μμf
#1 Diode Input: #1p to (h+k+i.s.)	1.0	1.0	μμf
#1 Diode Plate to Grid, maximum	.013	.01	μμf

RATINGS -- *Design Center Values*

Heater Voltage (ac or dc)	12.6	volts
Maximum Heater-Cathode Voltage	90	volts
Maximum Plate Voltage (dc)	300	volts
Maximum Positive Grid Voltage (dc)	0	volts
Maximum Continuous Diode Current (each plate)	1.0	milliamp

CHARACTERISTICS

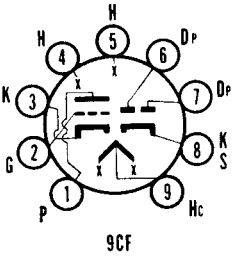
Heater Voltage	12.6	12.6	volts
Heater Current	150	150	milliamps
Plate Voltage (dc)	100	250	volts
Grid Voltage (dc)	-1	-2	volts
Plate Resistance	80,000	62,500	ohms
Plate Current	0.5	1.2	milliamps
Transconductance	1,250	1,600	micromhos
Amplification Factor	100	100	
Diode Current, at 10 volts dc (each plate)			
Minimum		1.5	milliamps
Average		4.0	milliamps

(1) External shield #316 connected to Pin 2.



SYLVANIA TYPE 12BR7

DUO DIODE TRIODE



9CF

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9CF
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage Series/Parallel	12.6/6.3 Volts
Heater Current	225/450 Ma
Heater-Cathode Voltage (Design Center Values)	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
D C	100 Volts Max.
Total D C and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[1]

Triode Grid to Plate	1.9 μμf
Triode Input	2.8 μμf
Triode Output	1.0 μμf
Diode Input (Each Diode)	2.0 μμf

RATINGS (Design Center Values)

Plate Voltage (Triode)	300 Volts Max.
Plate Dissipation (Triode)	2.5 Watts Max.
Peak Inverse Diode Voltage	300 Volts Max.
Peak Diode Current	60 Ma Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A[1] Amplifier

Plate Voltage	100	250 Volts
Cathode Bias Resistor	270	200 Ohms
Amplification Factor	60	60
Plate Resistance (approx.)	15,000	10,900 Ohms
Transconductance	4000	5500 μmhos
Plate Current	3.7	10 Ma
Grid Voltage (approx.) for i_b = 10 μa	-5	-12 Volts
Average Diode Current, Each Diode with 5.0 Volts D C Applied		17 Ma

NOTE:

1. Shield No. 315.

APPLICATION

The Sylvania Type 12BR7 is a miniature high mu triode duo diode intended for application in monochrome and color television receivers.

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 12BT6

DOUBLE - DIODE TRIODE

MECHANICAL DATA

Style	miniature
Cathode	coated, unipotential
Bulb	T-5 1/2
Base	E7-1, miniature button 7-pin
Outline	5-3
Maximum Diameter	3/4 inch
Maximum Overall Length	2 5/8 inches
Maximum Seated Height	2 3/8 inches
Basing	7BT-0-2

Pin Connections:

Pin 1 .. grid	Pin 5 .. #2 diode plate
Pin 2 .. cathode, diode shield	Pin 6 .. #1 diode plate
Pin 3 .. heater	Pin 7 .. triode plate
Pin 4 .. heater	

Mounting Position ..... any

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES

	without shield	*with shield*(1)	
#2 Diode Input: #2p to (h+k+i.s.)	1.0	1.0	μμf
#1 Diode Input: #1p to (h+k+i.s.)	1.0	1.0	μμf
#1 Diode Plate to Grid, maximum	.013	.01	μμf

RATINGS -- *Design Center Values*

Heater Voltage (ac or dc)	12.6	volts
Maximum Heater-Cathode Voltage	90	volts
Maximum Plate Voltage (dc)	300	volts
Maximum Positive Grid Voltage (dc)	0	volts
Maximum Continuous Diode Current (each plate)..	1.0	milliamp

CHARACTERISTICS

Heater Voltage	12.6	12.6	volts
Heater Current	150	150	milliamps
Plate Voltage (dc)	100	250	volts
Grid Voltage (dc)	-1	-3	volts
Plate Resistance	54,000	58,000	ohms
Plate Current	0.8	1.0	milliamp
Transconductance	1,300	1,200	micromhos
Amplification Factor	70	70	
Diode Current, at 10 volts dc (each plate)			
Minimum		1.5	milliamps
Average		4.0	milliamps

(1) External shield #316 connected to Pin 2.

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 12BU6

DOUBLE - DIODE TRIODE

MECHANICAL DATA

Style	miniature
Cathode	coated, unipotential
Bulb	T-5 1/2
Base	E7-1, miniature button 7-pin
Outline	5-3
Maximum Diameter	3/4 inch
Maximum Overall Length	2 5/8 inches
Maximum Seated Height	2 3/8 inches
Basing	7BT-0-2

Pin Connections:

Pin 1 .. grid	Pin 5 .. #2 diode plate
Pin 2 .. cathode, diode shield	Pin 6 .. #1 diode plate
Pin 3 .. heater	Pin 7 .. triode plate
Pin 4 .. heater	

Mounting Position ..... any

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES

	without shield	*with shield*(1)	
#2 Diode Input: #2p to (h+k+i.s.) ...	1.0	1.0	μμf
#1 Diode Input: #1p to (h+k+i.s.) ...	1.0	1.0	μμf
#1 Diode Plate to Grid, maximum	.013	.01	μμf

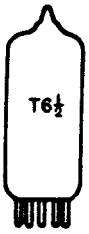
RATINGS -- *Design Center Values*

Heater Voltage (ac or dc)	12.6	volts
Maximum Heater-Cathode Voltage	90	volts
Maximum Plate Voltage (dc)	300	volts
Maximum Positive Grid Voltage (dc)	0	volts
Maximum Continuous Diode Current (each plate)..	1.0	milliamp

CHARACTERISTICS AND TYPICAL OPERATION

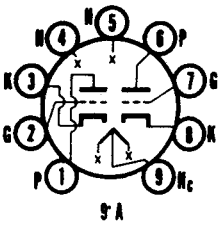
Heater Voltage	12.6	volts
Heater Current	150	milliamps
Plate Voltage (dc)	250	volts
Grid Voltage (dc)	-9	volts
Plate Current	9.5	milliamps
Plate Resistance	8,500	ohms
Transconductance	1,900	micromhos
Amplification Factor	16	
Load Resistance	10,000	ohms
Total Harmonic Distortion	6.5	percent
Power Output	300	milliwatts
Diode Current, at 10 volts dc (each plate)		
Minimum	1.5	milliamps
Average	4.0	milliamps

(1) External shield #316 connected to Pin 2.



SYLVANIA TYPE 12BZ7

HIGH-MU TWIN TRIODE



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-3
Basing	9A
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage Series/Parallel	12.6/6.3 Volts
Heater Current Series/Parallel	300/600 Ma
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	180 Volts Max.
Heater Positive with Respect to Cathode	180 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section 1	Section 2
Grid to Plate	2.5	2.5 μμf
Input	6.5	6.5 μμf
Output	0.7	0.55 μμf
Plate to Plate	1.3	μμf

MAXIMUM RATINGS (Design Center Values) Each Section

Plate Voltage	300 Volts
Plate Dissipation	1.5 Watts
Positive D C Grid Voltage	0 Volts
Negative D C Grid Voltage	50 Volts
Grid No. 1 Circuit Resistance[1]	5.0 Megohms

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier—Each Section

Plate Voltage	250 Volts
Grid Voltage	-2 Volts
Plate Current	2.5 Ma
Plate Resistance	31,800 Ohms
Transconductance	3200 μmhos
Amplification Factor	100

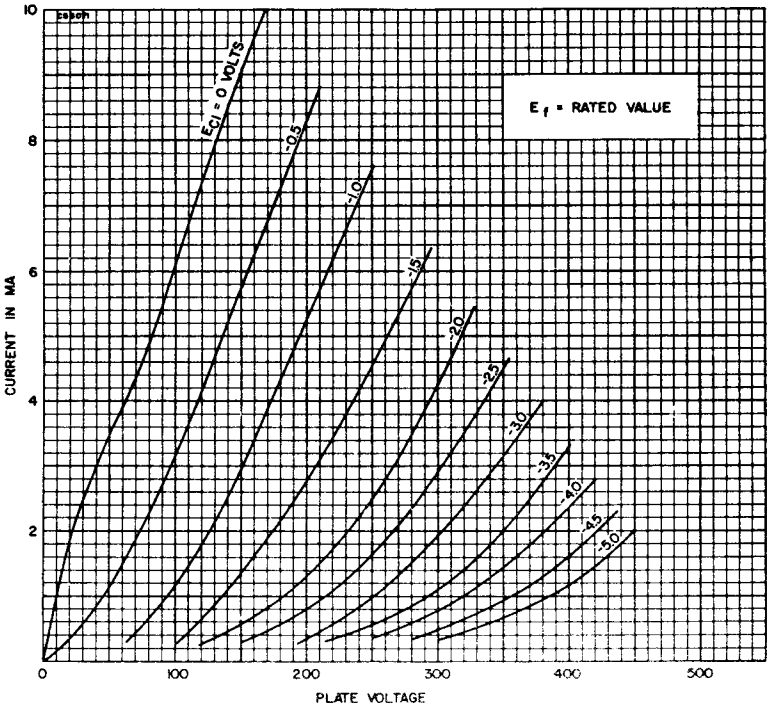
NOTES:

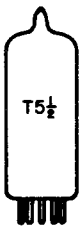
1. Maximum Value that can be used where Grid No. 1 bias is developed by means of contact potential.

APPLICATION

The Sylvania Type 12BZ7 is a miniature high mu twin triode designed primarily for use as a sync separator and sync amplifier in television receivers. It is also useful in clipping circuits and as a general purpose audio amplifier.

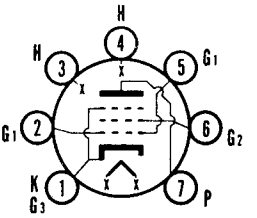
AVERAGE PLATE CHARACTERISTICS





SYLVANIA TYPE 12CN5

SHARP CUTOFF PENTODE



7CV

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-3
Basing	7CV
Cathode	Coated Unipotential
Mounting Position	Any

12CN5 (Cont'd)

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	12.6 Volts
Heater Current	450 Ma
Heater-Cathode Voltage (Design Center Values)	
Heater Negative with Respect to Cathode	16 Volts Max.
Heater Positive with Respect to Cathode	16 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded	Unshielded
Grid No. 1 to Plate	0.2	0.25 μμf Max.

MAXIMUM RATINGS (Design Center Values)

Plate Voltage	16 Volts
Grid No. 2 Voltage	16 Volts
Positive Grid No. 1 Voltage	0 Volts
Grid No. 1 Circuit Resistance	2.2 Megohms

CHARACTERISTICS AND TYPICAL OPERATION

Plate Voltage	12.6 Volts
Grid No. 2 Voltage	12.6 Volts
Grid No. 1 Voltage[2]	
Grid No. 1 Resistor	2.2 Megohms
Plate Current	4.5 Ma
Grid No. 2 Current	0.35 Ma
Transconductance	3800 μmhos
Plate Resistance (approx.)	40,000 Ohms

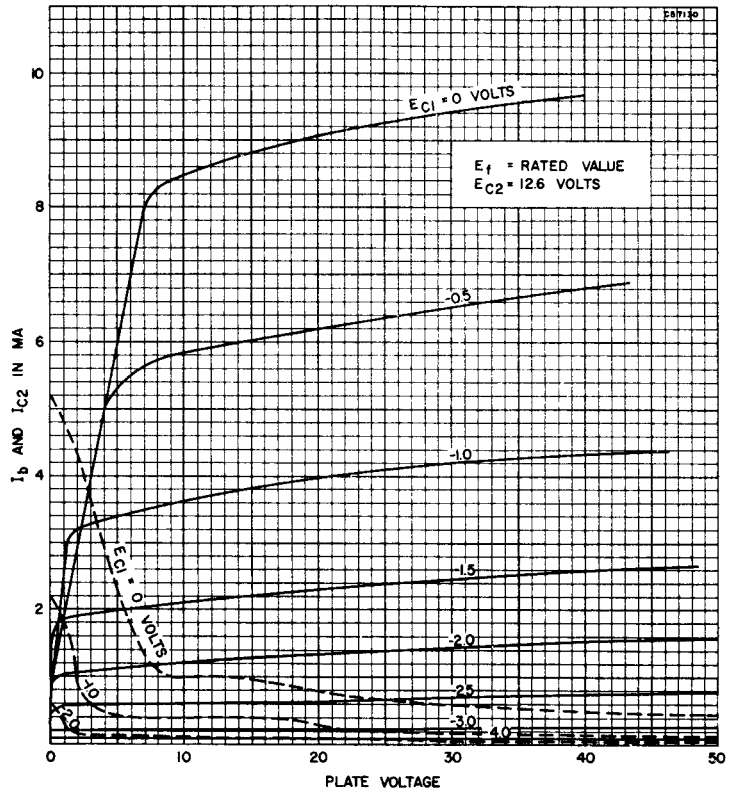
NOTES:

1. This tube is intended for use in automobile radios operated from a nominal 12-volt battery. Design of the tube is such that the heater will operate satisfactorily over the range 10.0 volts to 15.9 volts, and that the maximum ratings provide a safety factor for the wide voltage variation encountered with this type of supply.
2. Average contact potential bias developed across the specified grid resistor.

APPLICATION

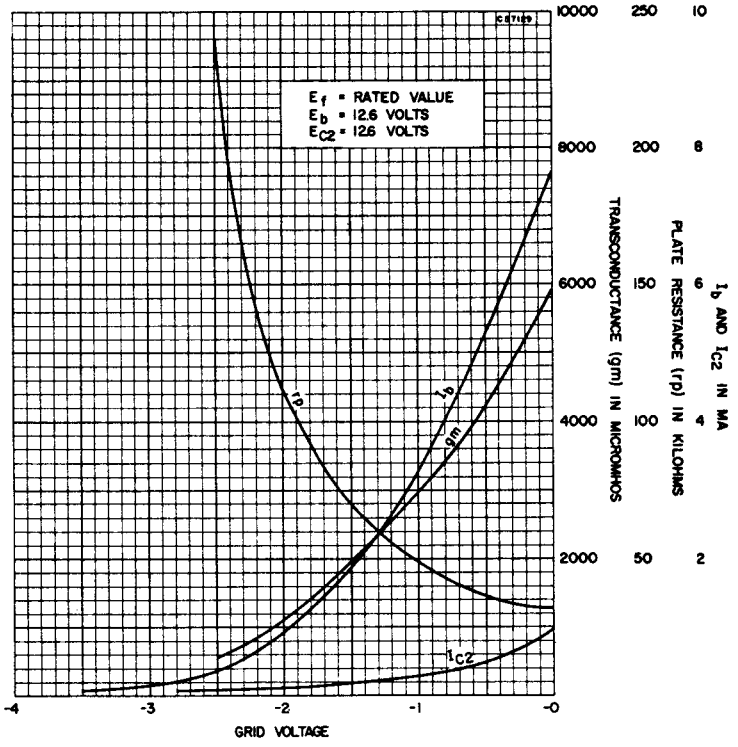
The Sylvania Type 12CN5 is a miniature sharp-cutoff pentode intended for use as an I F amplifier in automobile radio receivers. It is designed primarily to operate where the heater, plate, and screen voltages are obtained directly from a 12-volt automotive storage battery.

AVERAGE PLATE CHARACTERISTICS



12CN5 (Cont'd)

AVERAGE TRANSFER CHARACTERISTICS



ADVANCE DATA

MECHANICAL DATA

Bulb	T-5 1/2
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7BK
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage [1]	12.6	Volts	
Heater Current	200	Ma	
Heater Cathode Voltage (Design Maximum Values)[2]			
Heater Negative with Respect to Cathode	30	Volts	Max.
Heater Positive with Respect to Cathode	30	Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.18	$\mu\mu$f	Max.
Input: g1 to (h + k + g2 + g3)	8.5	$\mu\mu$f	
Output: p to (h + k + g2 + g3)	4.0	$\mu\mu$f	

RATINGS (Design Maximum Values)[2]

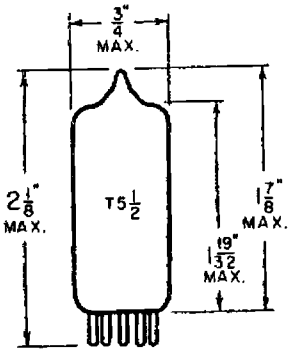
Plate Voltage	33	Volts
Grid No. 2 Voltage	33	Volts
Positive DC Grid No. 1 Voltage	0	Volts
Grid No. 1 Circuit Resistance	10	Megohms

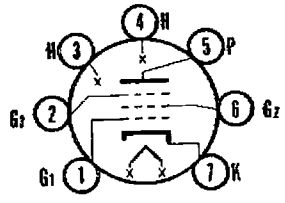
CHARACTERISTICS AND TYPICAL OPERATION

Plate Voltage	12.6	Volts
Grid No. 2 Voltage	12.6	Volts
Grid No. 1 Voltage	0	Volts
Plate Current	1.6	Ma
Screen Current	0.4	Ma
Transconductance	3250	μmhos
Plate Resistance (approx.)	140000	Ohms
Grid No. 1 Resistor	2.2	Megohms
Grid No. 1 Voltage for Ib = 10 μa	-3.0	Volts

QUICK REFERENCE DATA

The Sylvania Type 12CY6 is a miniature sharp cutoff pentode intended for use as an rf amplifier. It is designed for operation where the heater, plate and screen voltages are supplied directly from a 12 volt automotive storage battery.





7 BK

SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

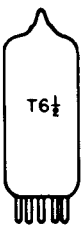
November 6, 1956

from JETEC release #1789, Nov. 19, 1956

NOTES:

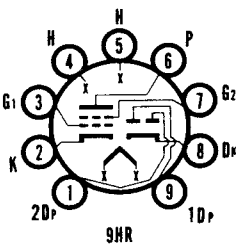
1. This tube is intended for use in automobile radios operated from a nominal 12 volt battery. Design of the tube is such that the heater will operate satisfactorily over the range 10.0 volts to 15.9 volts, and that the maximum ratings provide a safety factor for the wide voltage variation encountered in this type of supply.

2. Design-Maximum Ratings are the limiting values expressed with respect to bogey tubes at which satisfactory tube life can be expected to occur. To obtain satisfactory circuit performance, the equipment designer must establish the circuit design so that no design-maximum value is exceeded with a bogey tube under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, and environmental conditions.



SYLVANIA TYPE 12DL8

DUO DIODE
SPACE-CHARGE GRID TETRODE



9HR

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-3
Basing	9HR
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS[1]

Heater Voltage	12.6 Volts
Heater Current	0.55 Amp.
Heater Cathode Voltage (Design Center Values)	
Heater Negative with Respect to Cathode	30
Heater Positive with Respect to Cathode	30

DIRECT INTERELECTRODE CAPACITANCES

Tetrode Section

Grid No. 2 to Plate	14 μμf
Input: g2 to (g1+k+h)	12 μμf
Output: p to (g1+k+h)	1.3 μμf

Diode Section

Input: Dp1 to (k+h)	1.6 μμf
Input: Dp2 to (k+h)	1.6 μμf
Diode Plate No. 1 to Diode Plate 2	.03 μμf
Coupling: (Diode Plate No. 1 to Tetrode Grid No. 2)	.02 μμf Max.
(Diode Plate No. 2 to Tetrode Grid No. 2)	.006 μμf Max.

12DL8 (Cont'd)

MAXIMUM RATINGS (Design Center Values—Except as Noted)

Plate Voltage	30 Volts
Positive Grid No. 1 Voltage (Abs. Max.)	16 Volts
Negative Grid No. 2 Voltage	20 Volts
Grid No. 2 Circuit Resistance	10 Megohms
Average Diode Current	5 Ma

CHARACTERISTICS

Class A1 Amplifier

Plate Voltage	12.6 Volts
Grid No. 1 (Space-Charge Grid) Voltage	12.6 Volts
Grid No. 2 (Control Grid) Voltage[2]	−0.5 Volts
Plate Current	40 Ma
Grid No. 1 (Space-Charge Grid) Current	75 Ma
Transconductance[3]	15000 μmhos
Amplification Factor[3]	7.2
Plate Resistance	480 Ohms
Diode Current with 10.0 Volts DC Applied (Each Diode)	3 Ma

TYPICAL OPERATION

Class A1 Amplifier

Plate Voltage	12.6 Volts
Grid No. 1 (Space-Charge Grid) Voltage	12.6 Volts
Grid No. 2 (Control Grid) Voltage[4]	−2.0 Volts
Peak AF Grid No. 2 Voltage	2.5 Volts
AF Signal Source Resistance	100000 Ohms
Plate Current[5] (Signal Applied)	8.0 Ma
Grid No. 1 (Space-Charge Grid) Current	75 Ma
Load Resistance	800 Ohms
Power Output	40 mw
Total Harmonic Distortion (Max.)	10 Percent

NOTES:

1. This tube is intended for use in automobile radios operated from a nominal 12-volt battery. Design of the tube is such that the heater will operate satisfactorily over the range 10.0 volts to 15.9 volts, and that the maximum ratings provide a safety factor for the wide voltage variation encountered with this type of supply.
2. Average contact potential developed across a 2.2 megohm resistor.
3. Measured from Grid No. 2 to Plate.
4. Bias voltage is developed across a 2.2 megohm resistor by means of Grid No. 2 rectification (obtained when applying the special signal voltage) and contact potential.
5. With no signal applied to Grid No. 2 and bias developed solely by contact potential, the plate current is 40 ma. (approx.).

APPLICATION

The Sylvania Type 12DL8 has a combined duo-diode and space-charge grid tetrode contained in a miniature envelope.

The diode section is intended for AVC or detector applications and the tetrode section is intended for use as a power amplifier driver.

It is designed primarily to operate where the heater plate and space-charge grid voltages are obtained directly from a 12-volt automotive storage battery.

SYLVANIA

engineering data service

SYLVANIA
12DP7A*
12DP7C

CHARACTERISTICS

GENERAL DATA

Focusing Method		Magnetic	
Deflection Method		Magnetic	
Deflection Angle (Approx.)		50	Degrees
Types*	12DP7A	12DP7C	
Fluorescence	Blue-White	Blue-White	
Phosphorescence	Yellow	Yellow	
Persistence	Long	Long	
Faceplate	Clear or Gray	Gray	
Light Transmittance (approx.)			
Gray Faceplate	75	75	Percent
Screen	——	Aluminized	

*In addition to the types shown, the 12DP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Ampere
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	8	μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	10	Inches
Bulb	J96S or Equivalent	
Bulb Contact (Medium Cap)	C1-5	
Base		
12DP7A (Long Medium Shell Octal 5 or 8-Pin	B5-80 or B8-65	
12DP7C (Long Medium Shell 8-Pin)	B8-65	
Basing	5AN	
Bulb Contact Alignment		
Anode Contact Aligns with Pin No. 5	±10	Degrees
Weight (Approx.)	8½	Pounds

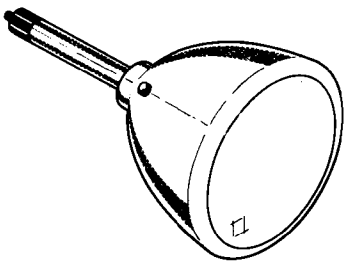
RATINGS

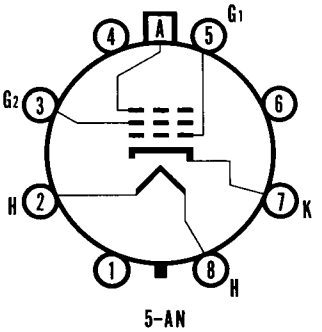
MAXIMUM RATINGS (Absolute Maximum Values)

	12DP7A	12DP7C		
Anode Voltage	11,000	13,200	Volts	dc
Grid No. 2 Voltage	770	770	Volts	dc
Grid No. 1 Voltage				
Negative Bias Value	200	200	Volts	dc
Positive Bias Value	0	0	Volts	dc
Positive Peak Value	2	2	Volts	
Peak Heater-Cathode Voltage				
Heater Negative with Respect to Cathode	140	200	Volts	
Heater Positive with Respect to Cathode	140	200	Volts	

QUICK REFERENCE DATA

12" Direct Viewed
Round Glass Type
Magnetic Deflection
Magnetic Focus
Gray Filter Glass Faceplate
Spherical Faceplate
12DP7C — Aluminized





5-AN

SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

MARCH, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode Voltage[1]	4,000	Volts	dc
Grid No. 2 Voltage	250	Volts	dc
Grid No. 1 Voltage Required for Cutoff[2]	−25 to −70	Volts	dc
Focusing Coil Current (approx.)[3]	75 to 102	Ma	dc
Line Width A, (12DP7C)[4]	0.50	mm	Max.

CIRCUIT VALUES

Grid No. 1 Resistance	1.5	Megohms	Max.

NOTES:

1. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 4,000 volts.*
2. *Visual extinction of undeflected focused spot.*
3. *For JEDEC focusing coil No. 106 or equivalent with distance from the yoke reference line to center of air gap equal to 4⅛ inches.*
4. *Measured in accordance with MIL-E-1, at an anode current of 200 μa.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

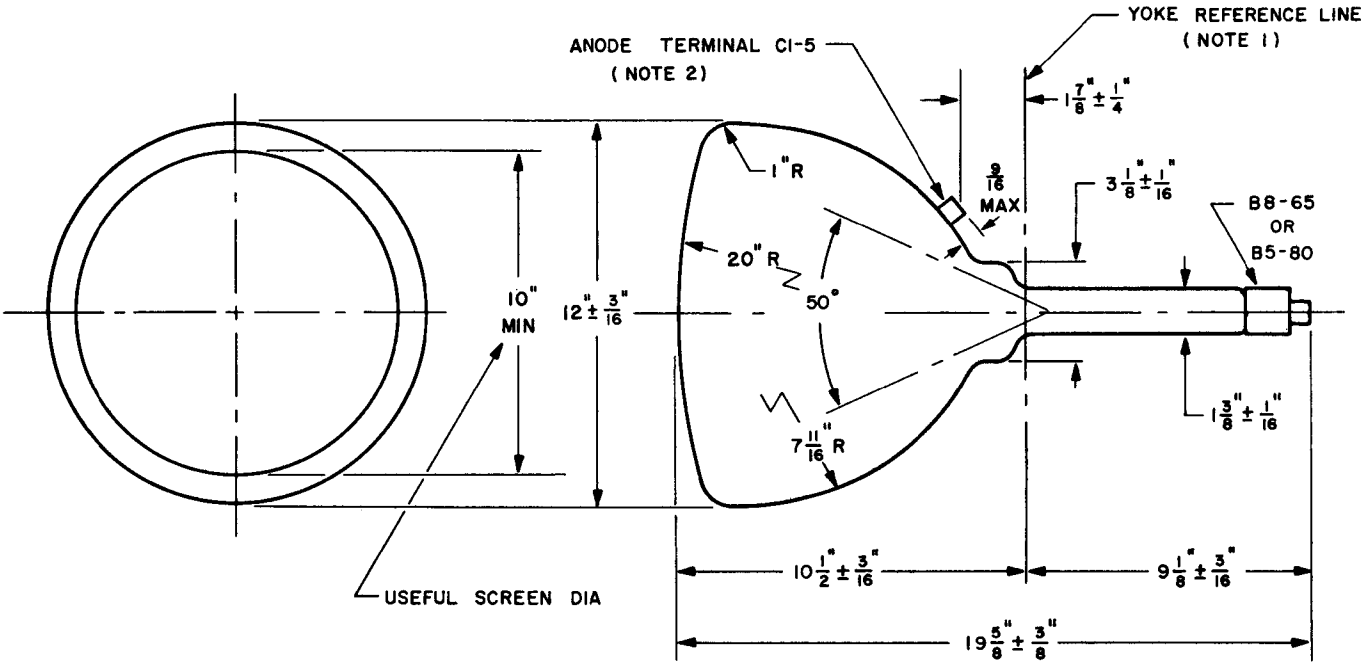
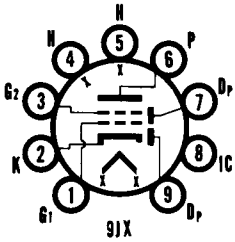


DIAGRAM NOTES:

1. *Reference line is determined by the plane of the upper edge of the reference line gauge (JEDEC No. 112) when the gauge is resting on the cone.*
2. *Anode Terminal aligns with Pin No. 5 ± 10 degrees and is on same side as Pin No. 5.*



SYLVANIA TYPE 12DU7



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9J X
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	12.6 Volts
Heater Current	250 Ma
Heater-Cathode Voltage (Design Maximum Values)[2]	
Heater Negative with Respect to Cathode	16 Volts
Heater Positive with Respect to Cathode	16 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Tetrode Section

Grid No. 1 to Plate	0.6 μμf
Input: g1 to (h+Tk+g2)	11 μμf
Output: p to (h+Tk+g2)	3.6 μμf
Grid No. 1 to Diode Plate No. 1	0.22 μμf Max.
Grid No. 1 to Diode Plate No. 2	0.12 μμf Max.

MAXIMUM RATINGS (Design Maximum Values)[2]

Plate Voltage	16 Volts
Grid No. 2 Voltage	16 Volts
Grid No. 1 Resistance	10 Megohms
Average Diode Current (Each Diode)	1.0 Ma

CHARACTERISTICS AND TYPICAL OPERATING CONDITIONS

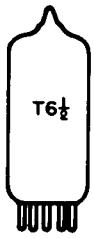
Plate Voltage	12.6 Volts
Grid No. 2 Voltage	12.6 Volts
Grid No. 1 Resistor[3]	2.2 Megohms
AF Grid Voltage (RMS)	1.6 Volts
Plate Current	12 Ma
Grid No. 2 Current	1.5 Ma
Transconductance	6200 μmhos
Plate Resistance (approx.)	6000 Ohms
Load Resistance	2700 Ohms
Maximum Signal Power Output	25 Mw
Total Harmonic Distortion	10 Percent
Average Diode Current with 10 Volts D C Applied, Each Diode	1.3 Ma

NOTES:

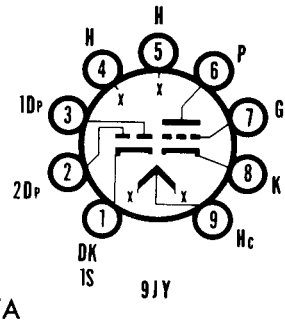
1. This tube is intended for use in automobile radios operated from a nominal 12 volt battery. Design of the tube is such that the heater will operate satisfactorily over the range 10.0 volts to 15.9 volts, and that the maximum ratings provide a safety factor for the wide voltage variation encountered with this type of supply.
2. Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.
3. Average contact potential bias developed across specified grid resistor.

APPLICATION

Type 12DU7 is a miniature duo-diode tetrode designed for use as a combined detector, AVC rectifier and audio power amplifier driver.
It is designed for operation where the heater, plate and Grid No. 2 voltages are obtained directly from a 12 volt automotive storage battery.



SYLVANIA TYPE 12DV7



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9JY
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	12.6 Volts
Heater Current	150 Ma
Heater-Cathode Voltage (Design Maximum Values)[2]	
Heater Negative with Respect to Cathode	16 Volts
Heater Positive with Respect to Cathode	16 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	1.6 μμf
Input: g to (h + Tk)	1.3 μμf
Output: p to (h + Tk)	0.38 μμf
Diode Plate No. 1 to Grid	0.005 μμf Max.
Diode Plate No. 2 to Grid	0.005 μμf Max.
Diode Plate No. 1 to Diode Plate No. 2	0.17 μμf Max.

MAXIMUM RATINGS (Design Maximum Values)[2]

Plate Voltage	16 Volts
Cathode Current	20 Ma
Grid Circuit Resistance	10 Megohms
Average Diode Current, Each Diode	1.0 Ma

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier

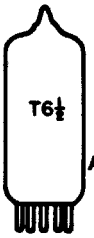
Plate Voltage	12.6 Volts
Grid Voltage[3]	
Grid Resistor	2.2 Megohms
Plate Current	400 μa
Transconductance	750 μmhos
Amplification Factor	14
Plate Resistance	19,000 Ohms
EC for Ib = 10 μa (approx.)	−2 Volts
Average Diode Current with 10 Volts Applied (Each Diode)[4]	1.3 Ma

NOTES:

1. This tube is intended for use in automobile radios operated from a nominal 12 volt battery. Design of the tube is such that the heater will operate satisfactorily over the range 10.0 volts to 15.9 volts, and that the maximum ratings provide a safety factor for the wide voltage variation encountered with this type of supply.
2. Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.
3. Average contact potential bias developed across specified grid resistor.
4. Test condition only.

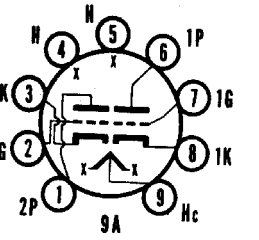
APPLICATION

The Sylvania Type 12DV7 is a miniature double diode, medium mu triode intended for use as a second detector audio amplifier.
It is designed for operation where the heater and plate voltages are supplied directly from a 12 volt automotive storage battery.



SYLVANIA TYPE 12DW7

AF AMPLIFIER AND PHASE INVERTER



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9A
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage Series/Parallel	12.6/6.3 Volts
Heater Current Series/Parallel	150/300 Ma
Heater-Cathode Voltage (Design Maximum Values)	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
D C	100 Volts Max.
Total D C and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

	Section No. 1[1]		Section No. 2[1]	
	Shielded[2]	Unshielded	Shielded[2]	Unshielded
Grid to Plate	1.7	1.7	1.5	1.5 μμf
Input: g to (h+k)	1.8	1.6	1.8	1.7 μμf
Output: p to (h+k)	2.0	0.44	2.4	0.4 μμf

RATINGS (Design Maximum System)

	Section No. 1	Section No. 2	
Plate Voltage	330	330	Volts Max.
Plate Dissipation	1.2	3.3	Watts Max.
Cathode Current	...	22	Ma Max.
Positive D C Grid Voltage	0	...	Volts Max.
Negative D C Grid Voltage	55	...	Volts Max.
Grid Circuit Resistance			
Fixed Bias		0.25	Megohm Max.
Self Bias		1.0	Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier	Section No. 1		Section No. 2	
Plate Voltage	100	250	100	250 Volts
Grid Voltage	−1	−2	0	−8.5 Volts
Plate Current	0.5	1.2	11.8	10.5 Ma
Transconductance	1250	1600	3100	2200 μmhos
Amplification Factor	100	100	20	17
Plate Resistance	80,000	62,500	6500	7700 Ohms
Ec1 for Ib = 10 μamps				−24 Volts

NOTES:

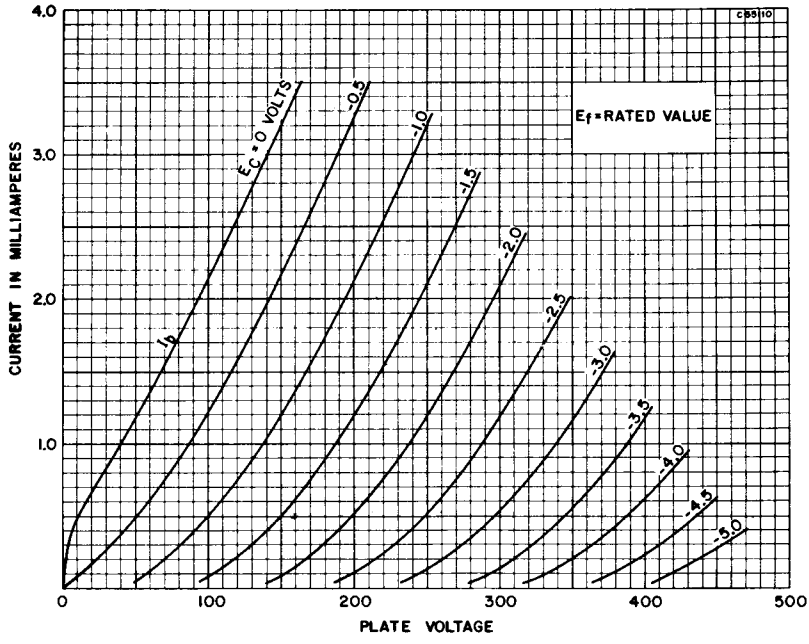
1. Section No. 1 connects to Pins 6, 7 and 8.
   Section No. 2 connects to Pins 1, 2 and 3.
2. External shield No. 315 connected to cathode of section under test.

APPLICATION

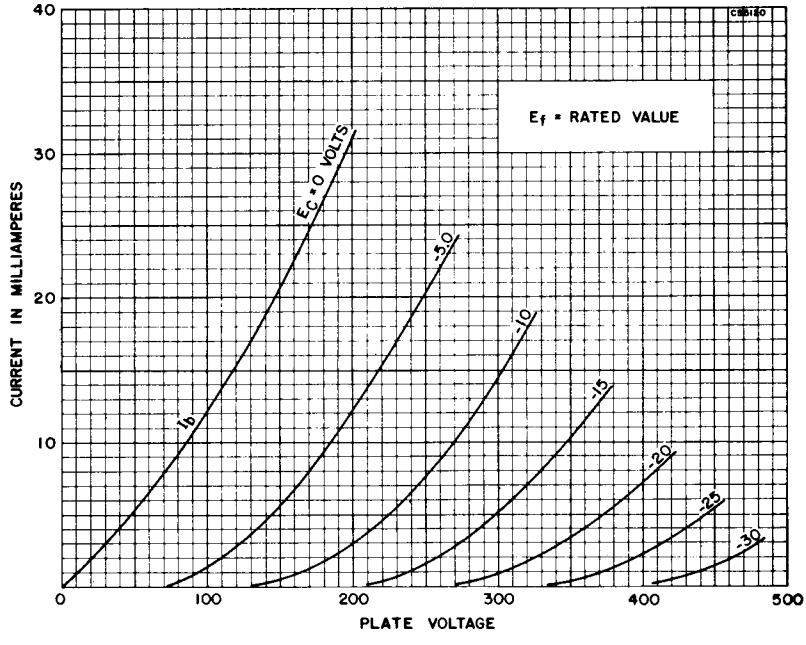
The Sylvania Type 12DW7 contains two dissimilar triodes. The high mu triode is similar to Type 12AX7 and the medium mu triode is similar to Type 12AU7. Type 12DW7 is especially suitable for applications requiring a high gain voltage amplifier and a cathodyne type phase-inverter.

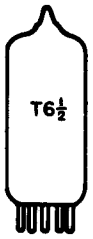
SYLVANIA TYPE 12DW7 (Cont'd)

AVERAGE PLATE CHARACTERISTICS
(Section No. 1)

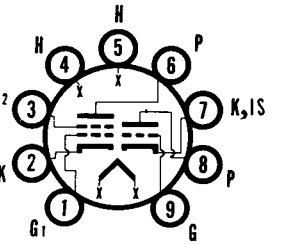


AVERAGE PLATE CHARACTERISTICS
(Section No.2)





SYLVANIA TYPE 12DY8



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9JD
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	12.6 Volts
Heater Current	350 Ma
Maximum Heater-Cathode Voltage	16 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Triode Section	Tetrode Section
Grid to Plate	1.5	0.74 μμf
Input	2.0	11 μμf
Output	2.0	3.0 μμf

MAXIMUM RATINGS (Design-Maximum Values)[2]

	Triode Section	Tetrode Section
Plate Voltage	16	16 Volts
Grid No. 2 Voltage	..	16 Volts
Grid No. 1 Resistance	10	10 Megohms

CHARACTERISTICS AND TYPICAL OPERATION

	Triode Section	Tetrode Section
Plate Voltage	12.6	12.6 Volts
Grid No. 2 Voltage		12.6 Volts
Grid No. 1 Voltage	0	(Note 3) Volts
Grid No. 1 Resistor		2.2 Megohms
Plate Current	1.2	14 Ma
Grid No. 2 Current		2 Ma
Transconductance	2000	6000 μmhos
Amplification Factor	20	
Plate Resistance (approx.)	10,000	5000 Ohms
Ec for Ib = 10 μAdc (approx.)	-2.0	Volts
Ec for Ib = 20 μAdc (approx.)		-9.0 Volts

TYPICAL OPERATION

Tetrode Section—Relay Service

Heater Voltage	10.0	15.0 Volts
Plate Supply Voltage	10.0	15.0 Volts
Grid No. 2 Voltage	10.0	15.0 Volts
Grid No. 1 Voltage	(Note 3)	-6.0 Volts
Grid No. 1 Resistor	10	0 Megohms
Plate Load Resistor	700	700 Ohms
Plate Current	5.0 Min.	3.0 Ma Max.

NOTES:

1. This tube is intended to be used in automotive service from a nominal 12 volt battery source. The heater is therefore designed to operate over the 10.0 to 15.9 voltage range encountered in this service. The maximum ratings of the tube provide for an adequate safety factor such that the tube will withstand the wide variation in supply voltages.
2. Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.
3. Contact potential bias developed across specified grid resistor.

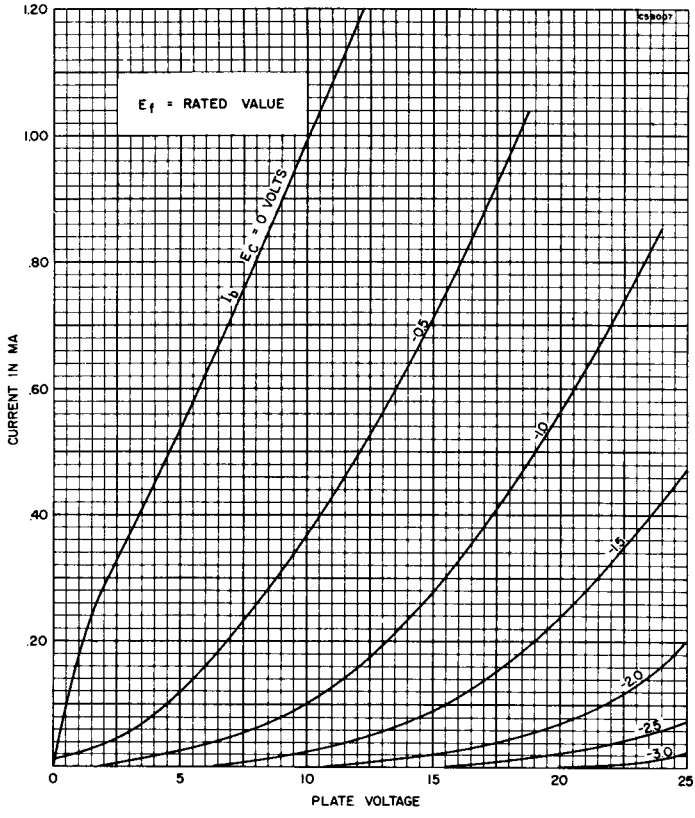
APPLICATION

The Sylvania Type 12DY8 is a double section tube featuring a tetrode which is designed and controlled for relay service in "signal-seeker" applications; and a general purpose sharp-cutoff triode.
The 12DY8 is intended for operation where the heater, plate and screen voltages are obtained directly from a 12-volt automotive electrical system.

SYLVANIA ELECTRONIC TUBES

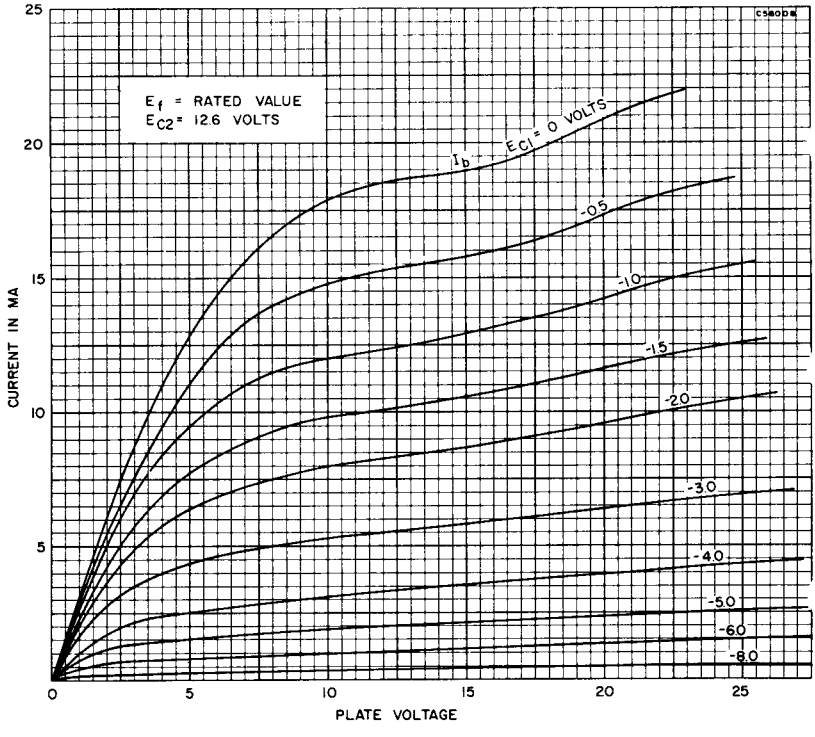
AVERAGE PLATE CHARACTERISTICS

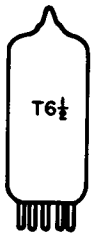
(Triode Section)



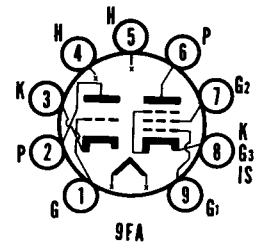
AVERAGE PLATE CHARACTERISTICS

(Tetrode Section)





SYLVANIA TYPE 12EC8



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9FA
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	12.6 Volts
Heater Current	225 Ma
Heater-Cathode Voltage (Design Maximum System)	
Heater Negative with Respect to Cathode	16 Volts Max.
Heater Positive with Respect to Cathode	16 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section

Grid to Plate	1.7 μμf
Input: g to (h+k)	2.6 μμf
Output: p to (h+k)	0.4 μμf
Heater to Cathode	2.6 μμf

Pentode Section

Grid No. 1 to Plate	0.02 μμf Max.
Input: g1 to (h+k+g2+g3+I.S.)	4.6 μμf
Output: p to (h+k+g2+g3+I.S.)	2.6 μμf
Heater to Cathode	2.6 μμf

MAXIMUM RATINGS (Design-Maximum System)[2]

	Triode Section	Pentode Section
Plate Voltage	16	16 Volts
Grid No. 2 Voltage	..	16 Volts
Grid No. 1 Circuit Resistance	1.0	1.0 Megohm

CHARACTERISTICS AND TYPICAL OPERATION

	Triode Section	Pentode Section
Plate Voltage	12.6	12.6 Volts
Grid No. 2 Voltage	....	12.6 Volts
Grid No. 1 Voltage	0	0 Volts
Grid No. 1 Resistor	4700	33,000 Ohms
Plate Current	2.4	0.66 Ma
Grid No. 2 Current	....	0.28 Ma
Transconductance	4700	2000 μmhos
Amplification Factor	25	....
Plate Resistance (approx.)	6000	750,000 Ohms
Ec1 for Ib = 10 μa (approx.)	-2.2	-1.6 Volts

NOTES:

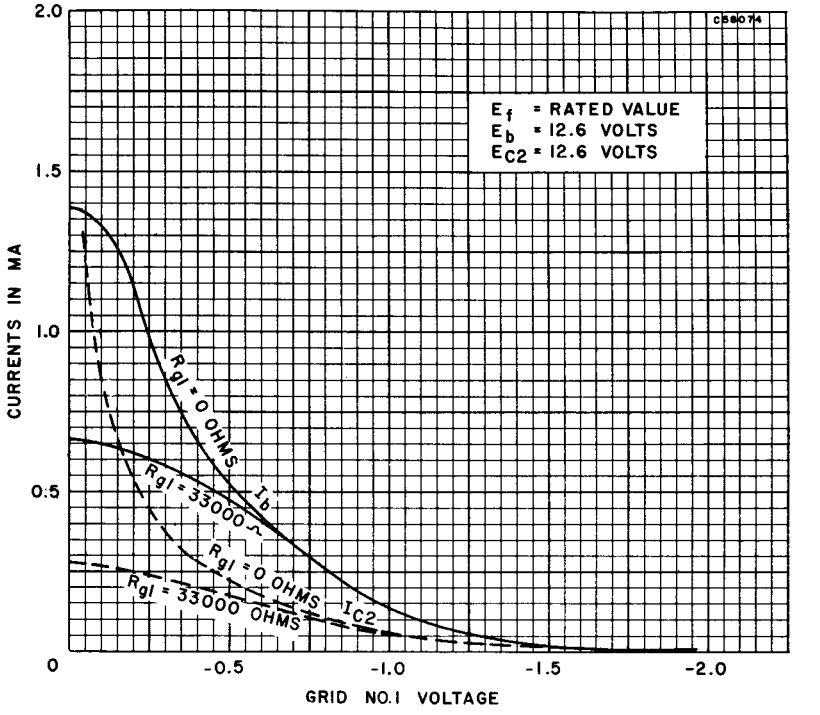
1. This tube is intended for use in automobile radios operated from a nominal 12 volt battery. Design of the tube is such that the heater will operate satisfactorily over the range 10.0 volts to 15.9 volts, and that the maximum ratings provide a safety factor for the wide voltage variation encountered in this type of supply.
2. Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.

APPLICATION

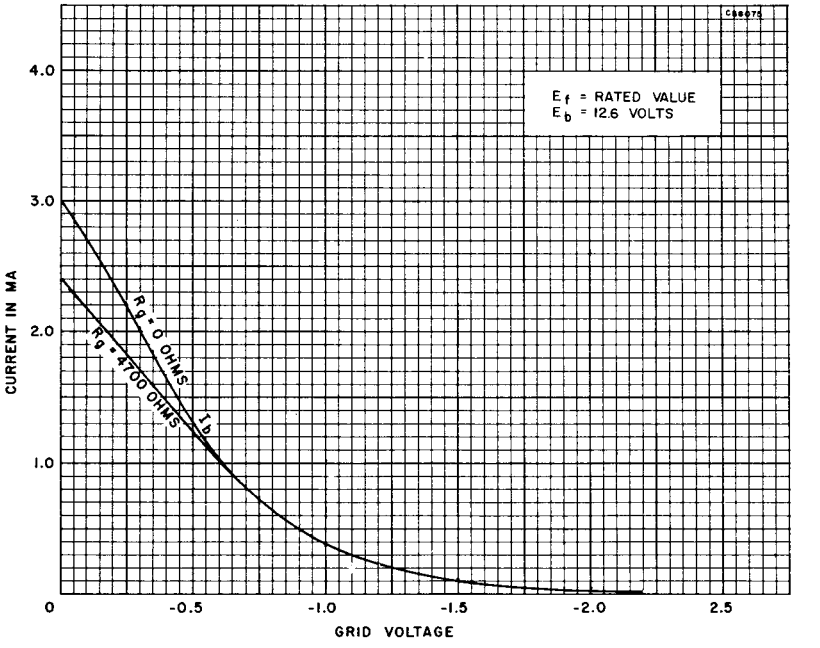
The Sylvania Type 12EC8 has a medium mu triode and sharp cutoff pentode contained in one envelope. It is intended for use as a combined VHF oscillator and mixer. It is designed for operation where the heater, Grid No. 2 and plate potentials are supplied directly from a 12 volt automotive battery.

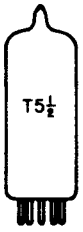
SYLVANIA TYPE 12EC8 (Cont'd)

AVERAGE TRANSFER CHARACTERISTICS
(Pentode Section)



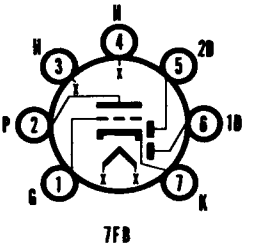
AVERAGE TRANSFER CHARACTERISTICS
(Triode Section)





SYLVANIA TYPE 12EL6

DOUBLE DIODE
HIGH MU TRIODE



7FB

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5–2
Basing	7FB
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	12.6 Volts
Heater Current	150 Ma
Heater-Cathode Voltage (Design Center Values)	
Heater Negative with Respect to Cathode	30 Volts Max.
Heater Positive with Respect to Cathode	30 Volts Max.

12EL6 (Cont'd)

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	1.8 μμf
Input: g to (h + k)	2.2 μμf
Output: p to (h + k)	1.0 μμf
Diode Plateto Diode Plate	1.0 μμf

MAXIMUM RATINGS (Design Center Values)

Plate Voltage	30 Volts
Cathode Current	20 Ma
Grid Circuit Resistance	10 Megohms
Average Diode Current	1.0 Ma

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier

Plate Voltage	12.6 Volts
Grid Voltage	0 Volts
Plate Current	750 μa
Transconductance	1200 μmhos
Amplification Factor	55
Plate Resistance	45,000 Ohms
Average Diode Current with 10 Volts Applied (Each Diode)[2]	2.0 Ma

Resistance Coupled Amplifier

Plate Supply Voltage	12.6 Volts
Grid Voltage[3]	
Grid Resistor	1.0 Megohm
Plate Load Resistor	1.0 Megohm
Input Capacitor	0.02 μf
Output Capacitor	0.01 μf
Grid Resistor of Following Stage	2.0 Megohms
Voltage Gain at 400 CPS[4]	16

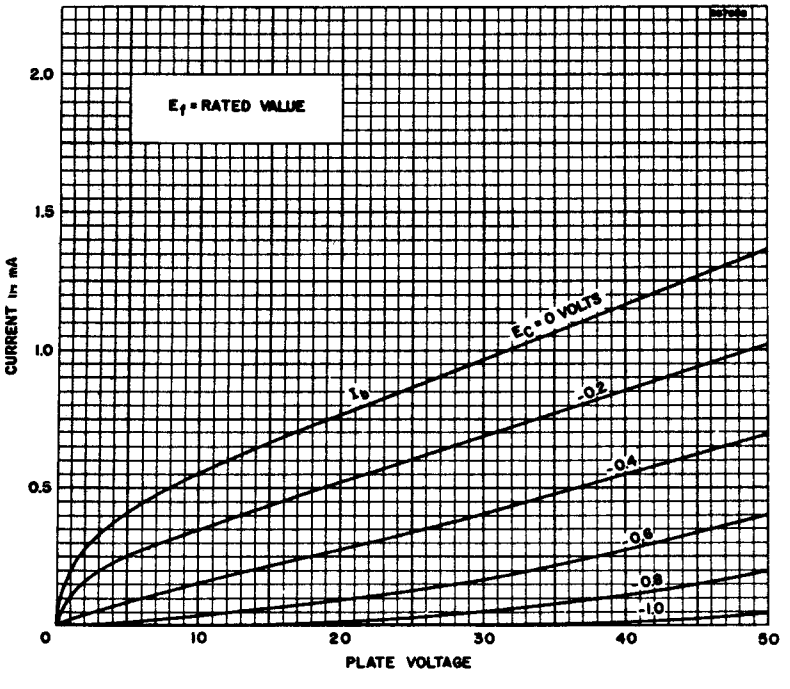
NOTES:

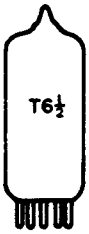
1. This tube is intended for use in automobile radios operated from a nominal 12 volt battery. Design of the tube is such that the heater will operate satisfactorily over the range 10.0 volts to 15.9 volts, and that the maximum ratings provide a safety factor for the wide voltage variation encountered with this type of supply.
2. Test condition only.
3. Contact potential bias developed across specified grid resistor.
4. Measured at an output voltage of 1.0 volt RMS.

APPLICATION

The Sylvania Type 12EL6 is a miniature double diode, high mu triode intended for use as a second detector audio amplifier.
It is designed for operation where the heater and plate voltages are supplied directly from a 12 volt automotive storage battery.

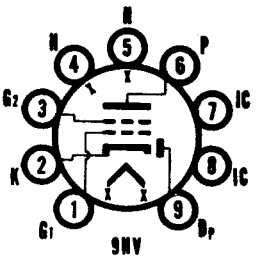
AVERAGE PLATE CHARACTERISTICS





SYLVANIA TYPE 12EM6

DIODE-TETRODE



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-3
Basing	9HV
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	12.6 Volts
Heater Current	500 Ma
Heater-Cathode Voltage (Design Center Values)	
Heater Positive with Respect to Cathode	30 Volts Max.
Heater Negative with Respect to Cathode	30 Volts Max.

MAXIMUM RATINGS (Design Center Values)

Plate Voltage	30 Volts
Grid No. 2 Voltage	30 Volts
Plate Dissipation	0.5 Watts
Grid No. 1 Resistance	15 Megohms
Average Diode Current	10 Ma.

CHARACTERISTICS

Class A_1 Amplifier

Plate Voltage	12.6 Volts
Grid No. 2 Voltage	12.6 Volts
Grid No. 1 Voltage[2]	
Grid No. 1 Resistor	2.2 Megohms
Plate Current	6.0 Ma
Grid No. 2 Current	1.0 Ma
Transconductance	5000 μmhos
Plate Resistance (approx.)	4000 Ohms
Average Diode Current at 10 Volts D C	1.0 Ma

TYPICAL OPERATION

Plate Voltage	12.6 Volts
Grid No. 2 Voltage	12.6 Volts
Grid No. 1 Voltage[3]	
AF Grid No. 1 Voltage (RMS)	1.0 Volts
AF Signal Source Resistance	200,000 Ohms
Plate Current[4] (Signal Applied)	2.5 Ma
Load Resistance	3500 Ohms
Power Output	10 Mw
Total Harmonic Distortion	10 Percent

NOTES:

1. This tube is intended for use in automobile radios operated from a nominal 12 volt battery. Design of the tube is such that the heater will operate satisfactorily over the range 10.0 volts to 15.9 volts, and that the maximum ratings provide a safety factor for the wide voltage variation encountered with this type of supply.
2. Contact potential bias developed across a 2.2 megohm resistor.
3. Bias voltage is developed across a 15 megohm resistor by means of Grid No. 1 rectification (obtained when applying the specified signal voltage) and contact potential.
4. With no signal applied to Grid No. 1 and bias developed solely by contact potential, the plate current is 6.0 ma.

APPLICATION

The Sylvania Type 12EM6 is a miniature diode-tetrode designed for use in automobile receivers. The diode section is intended for use as a detector while the tetrode section is designed to be used as a power amplifier driver. It is designed for operation where the heater, plate and screen voltages are supplied directly from a 12 volt automotive storage battery.

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12F8

MECHANICAL DATA

Bulb	T-6 ½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9FH
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	12.6 Volts	
Heater Current	150 Ma	
Heater-Cathode Voltage (Design Center Values)		
Heater Negative with Respect to Cathode	30 Volts	Max.
Heater Positive with Respect to Cathode	30 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES

Grid to Plate	0.06 μμf
Input	4.5 μμf
Output	3.0 μμf
Diode to Diode	0.3 μμf

RATINGS (Design Center Values)

Plate Voltage	30 Volts	Max.
Grid No. 2 Voltage	30 Volts	Max.
Positive DC Grid No. 1 Voltage	0 Volts	Max.
Grid No. 1 Circuit Resistance	10 Megohms	Max.
Average Diode Current	1.0 Ma	Max.

CHARACTERISTICS AND TYPICAL OPERATION

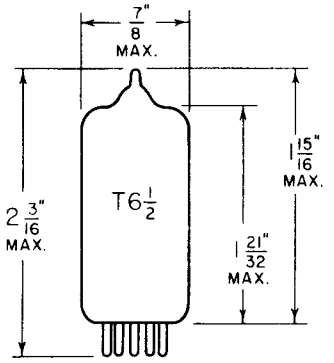
Plate Voltage	12.6 Volts
Grid No. 2 Voltage	12.6 Volts
Grid No. 1 Voltage	0 Volts
Plate Resistance (approx.)	0.33 Megohm
Transconductance	1000 μmhos
Plate Current	1.0 Ma
Grid No. 2 Current	0.38 Ma
Grid No. 1 Voltage (approx.) for gm = 10 μmhos	−5 Volts
Average Diode Current with 10 Volts DC Applied	2 Ma

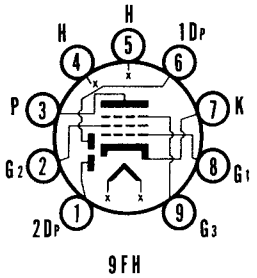
NOTE:

1. *This tube is intended to be used in automotive service from a nominal 12 volt battery source. The heater is therefore designed to operate over the 10.0 to 15.9 voltage range encountered in this service. The maximum ratings of the tube provide for an adequate factor such that the tube will withstand the wide variation in supply voltages.*

QUICK REFERENCE DATA

The Sylvania Type 12F8 is a double detector diode and remote cutoff pentode with a common cathode. The pentode was designed for service as an AF voltage amplifier where the potentials are obtained from a 12 volt automobile storage battery.





9FH

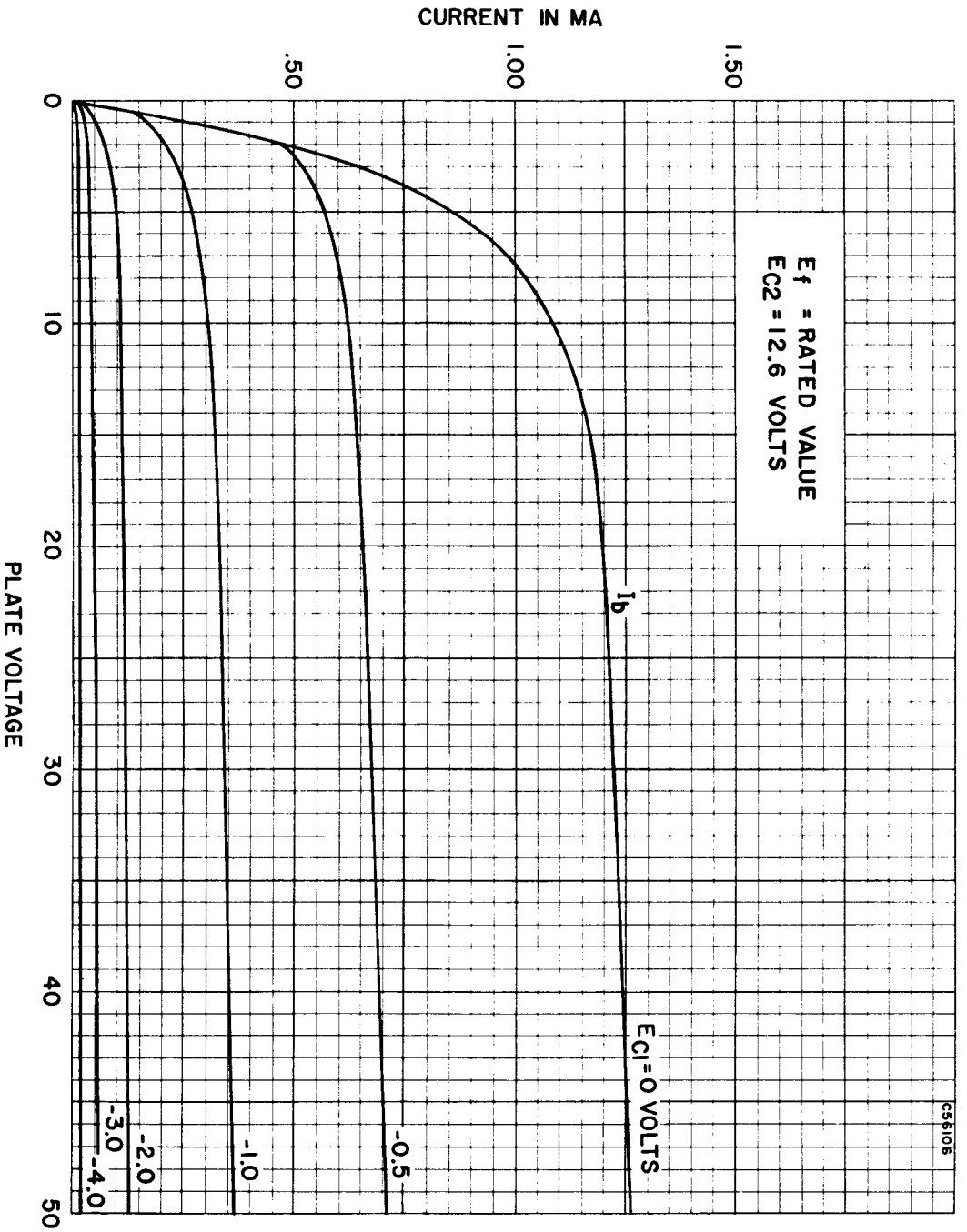
SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

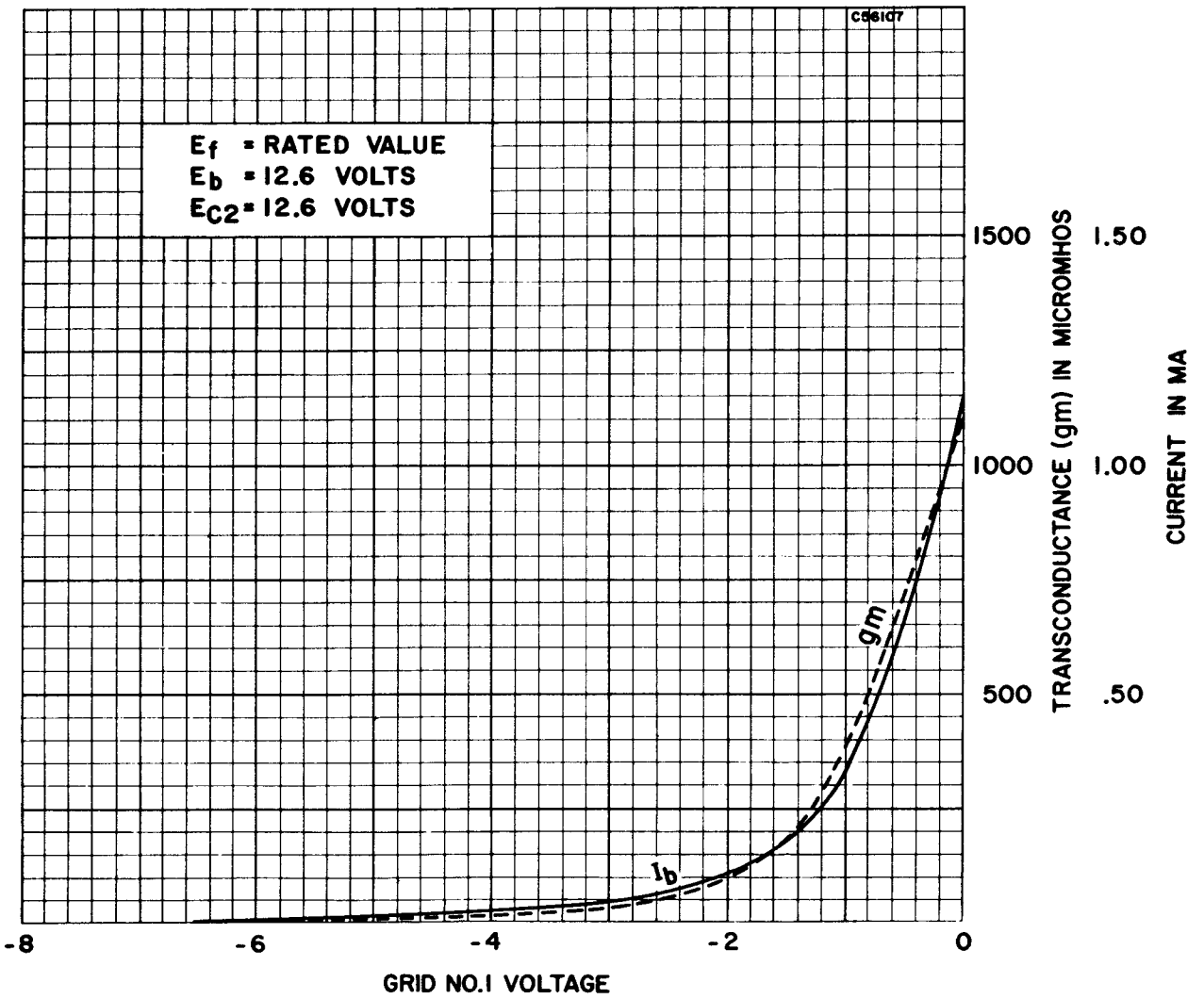
Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

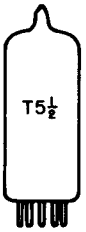
JULY 1956

AVERAGE PLATE CHARACTERISTICS

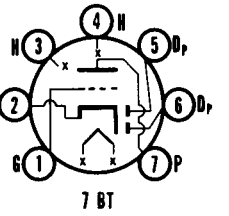


AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPE 12FK6



MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7BT
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	12.6 Volts
Heater Current	150 Ma
Heater-Cathode Voltage (Design Maximum Values)[2]	
Heater Positive with Respect to Cathode	16 Volts
Heater Negative with Respect to Cathode	16 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	1.6 $\mu\mu$f
Input: g to (h + k)	1.8 $\mu\mu$f
Output: p to (h + k)	0.7 $\mu\mu$f
Diode Plate No. 1 to Diode Plate No. 2	0.9 $\mu\mu$f

MAXIMUM RATINGS (Design Maximum Values)[2]

Plate Voltage	16 Volts
Grid Voltage	
Positive Value	0 Volts
Negative Value	16 Volts
Diode Current (Each Section)	1.0 Ma
Grid Circuit Resistance	10 Megohms

CHARACTERISTICS AND TYPICAL OPERATION

Plate Voltage	12.6 Volts
Grid Supply Voltage	0 Volts
Grid Resistor (Bypassed)	2.2 Megohms
Plate Current	1.3 Ma
Transconductance	1200 μmhos
Amplification Factor	7.4
Plate Resistance (approx.)	6200 Ohms
Plate Current (approx.) for Ec1 = −3 Volts	.08 Ma
Diode Current with 10 Volts DC Applied Each Diode	2 Ma

NOTES:

1. This tube is intended for use in automobile radios operated from a nominal 12 volt battery. Design of the tube is such that the heater will operate satisfactorily over the range 10.0 volts to 15.9 volts, and the maximum ratings provide a safety factor for the wide voltage variation encountered with this supply.
2. Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.

APPLICATION

The Sylvania Type 12FK6 is a miniature twin diode, low-mu triode intended for use as a combined detector, AVC rectifier and AF amplifier.
It is designed for operation where the heater, grid, and plate voltages are obtained directly from a 12 volt automotive storage battery.

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12G4

MECHANICAL DATA

Bulb	T-5½
Base	Miniature Button 7-Pin
Basing	6BG
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	12.6 Volts
Heater Current	150 Ma

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[1]	Unshielded
Grid to Plate	3.4	3.4 μμf
Input	2.6	2.4 μμf
Output	3.2	0.9 μμf

RATINGS (Design Center Values)

Plate Voltage	300 Volts Max.
Plate Dissipation	2.5 Watts Max.
Heater-Cathode Voltage	90 Volts Max.

CHARACTERISTICS AND TYPICAL OPERATION

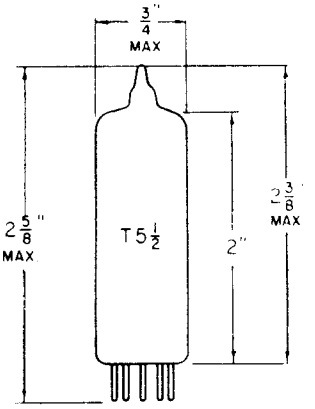
Plate Voltage	90	250 Volts
Grid Voltage	0	−8 Volts
Plate Current	10	9 Ma
Transconductance	3000	2600 μmhos
Plate Resistance	6700	7700 Ohms
Amplification Factor	20	20
Grid Voltage (approx.) For I_b = 10 μa	−7	−18 Volts

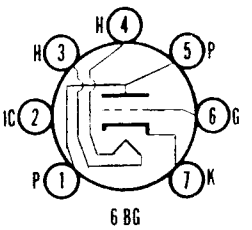
NOTE:

1. With shield No. 316 connected to cathode.

QUICK REFERENCE DATA

The Sylvania Type 12G4 is a miniature, general purpose, medium mu triode. Except for heater voltage, the type 12G4 is similar to one section of a type 6SN7GT.





6 BG

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RADIO TUBE DIVISION

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JANUARY 1954

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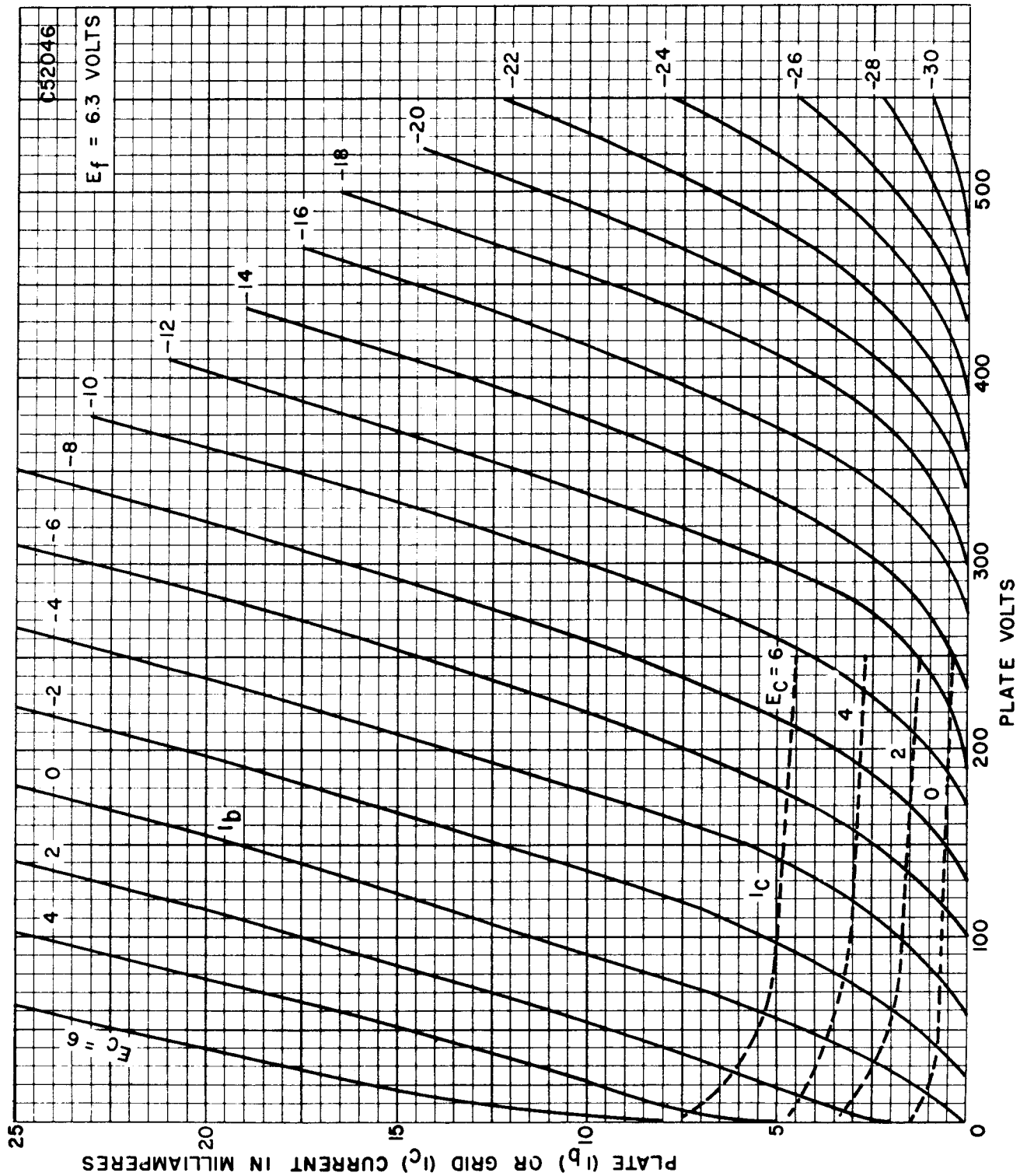
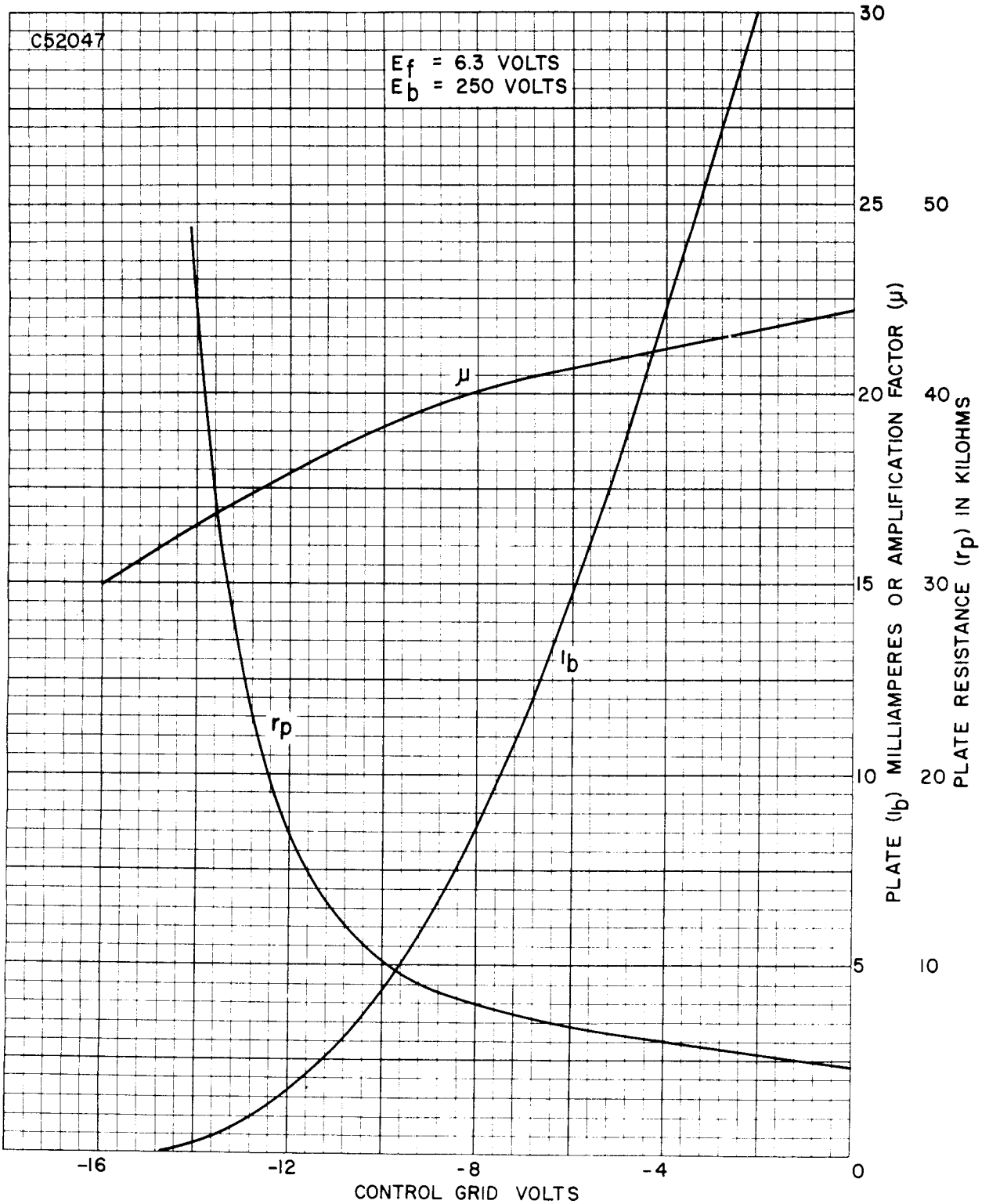
12G4

AVERAGE PLATE CHARACTERISTICS



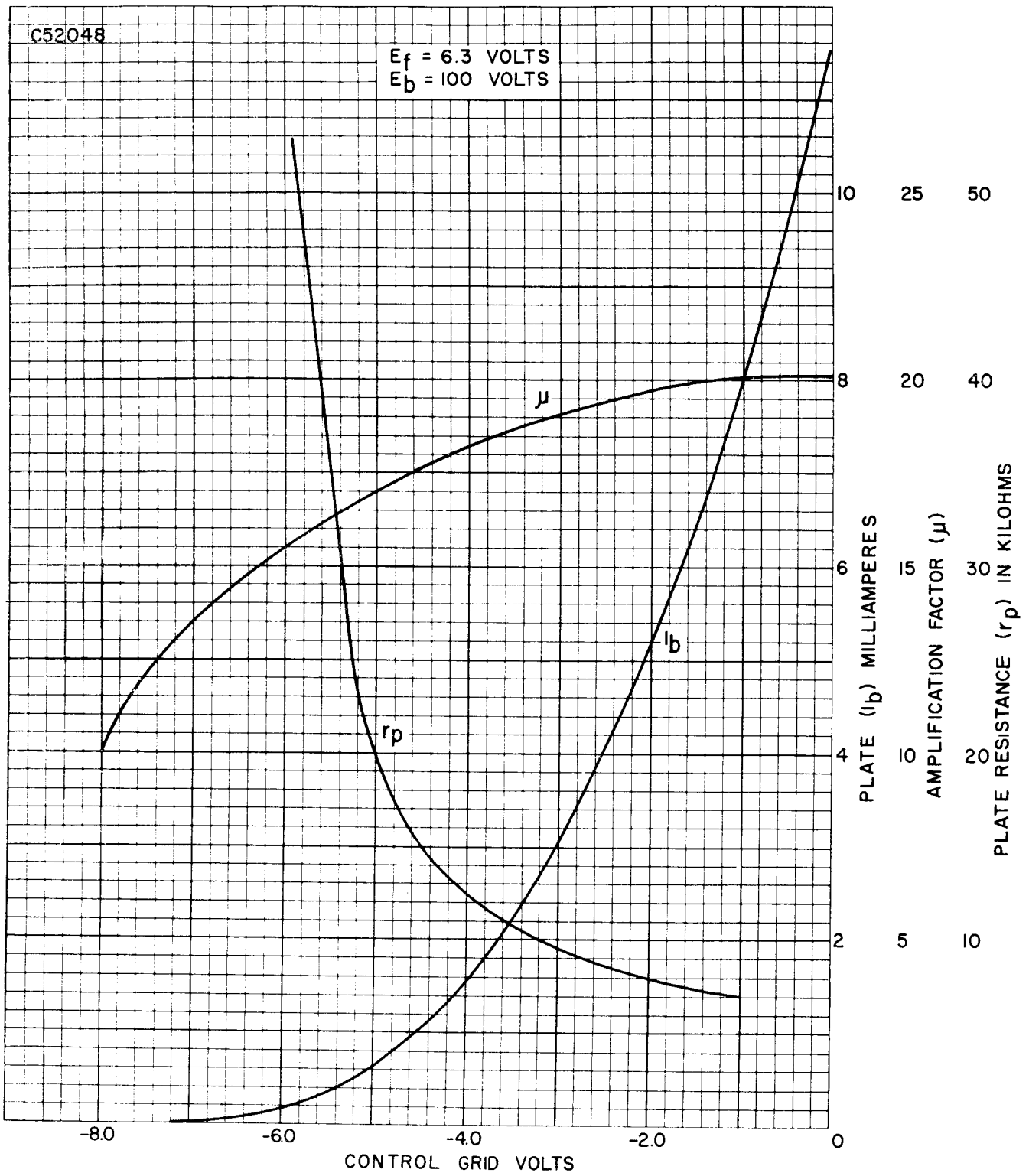
AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA

12G4

AVERAGE TRANSFER CHARACTERISTICS



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12H4

MECHANICAL DATA

Bulb	T-5½
Base	Miniature Button 7-Pin
Basing	7DW
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	Series/Parallel	12.6/6.3 Volts
Heater Current	Series/Parallel	150/300 Ma

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[1]	Unshielded
Grid to Plate	3.4	3.4 μμf
Input	2.6	2.4 μμf
Output	3.2	0.9 μμf

RATINGS (Design Center Values)

Plate Voltage	300 Volts	Max.
Plate Dissipation	2.5 Watts	Max.
Heater-Cathode Voltage	90 Volts	Max.

CHARACTERISTICS AND TYPICAL OPERATION

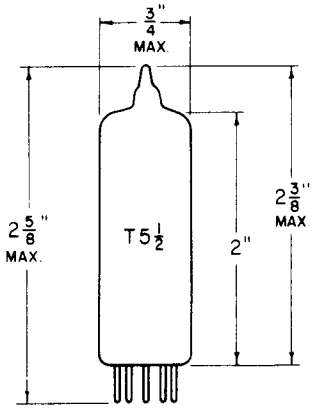
Plate Voltage	90	250 Volts
Grid Voltage	0	−8 Volts
Plate Current	10	9 Ma
Transconductance	3000	2600 μmhos
Plate Resistance	6700	7700 Ohms
Amplification Factor	20	20
Grid Voltage (approx.) For I_b = 10 μa	−7	−18 Volts

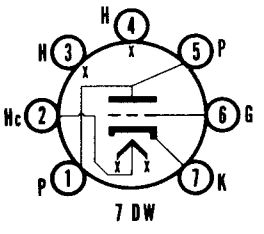
NOTE:

1. With shield No. 316 connected to cathode.

QUICK REFERENCE DATA

The Sylvania Type 12H4 is a miniature, general purpose, medium mu triode. Except for basing and heater operation, the Type 12H4 is identical to the Type 12G4. It is also similar to one section of a Type 12SN7GT.



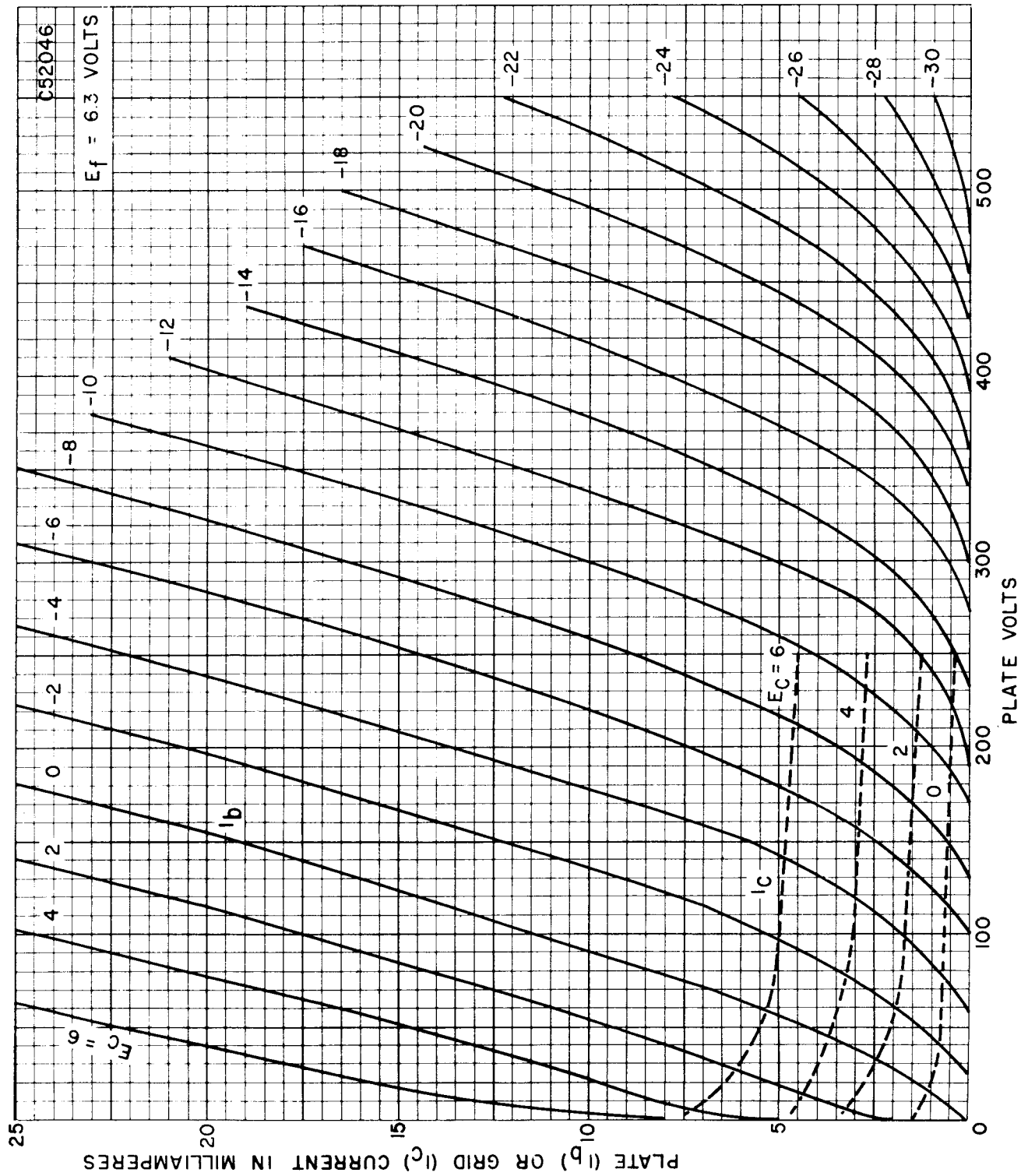


SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JANUARY 1954

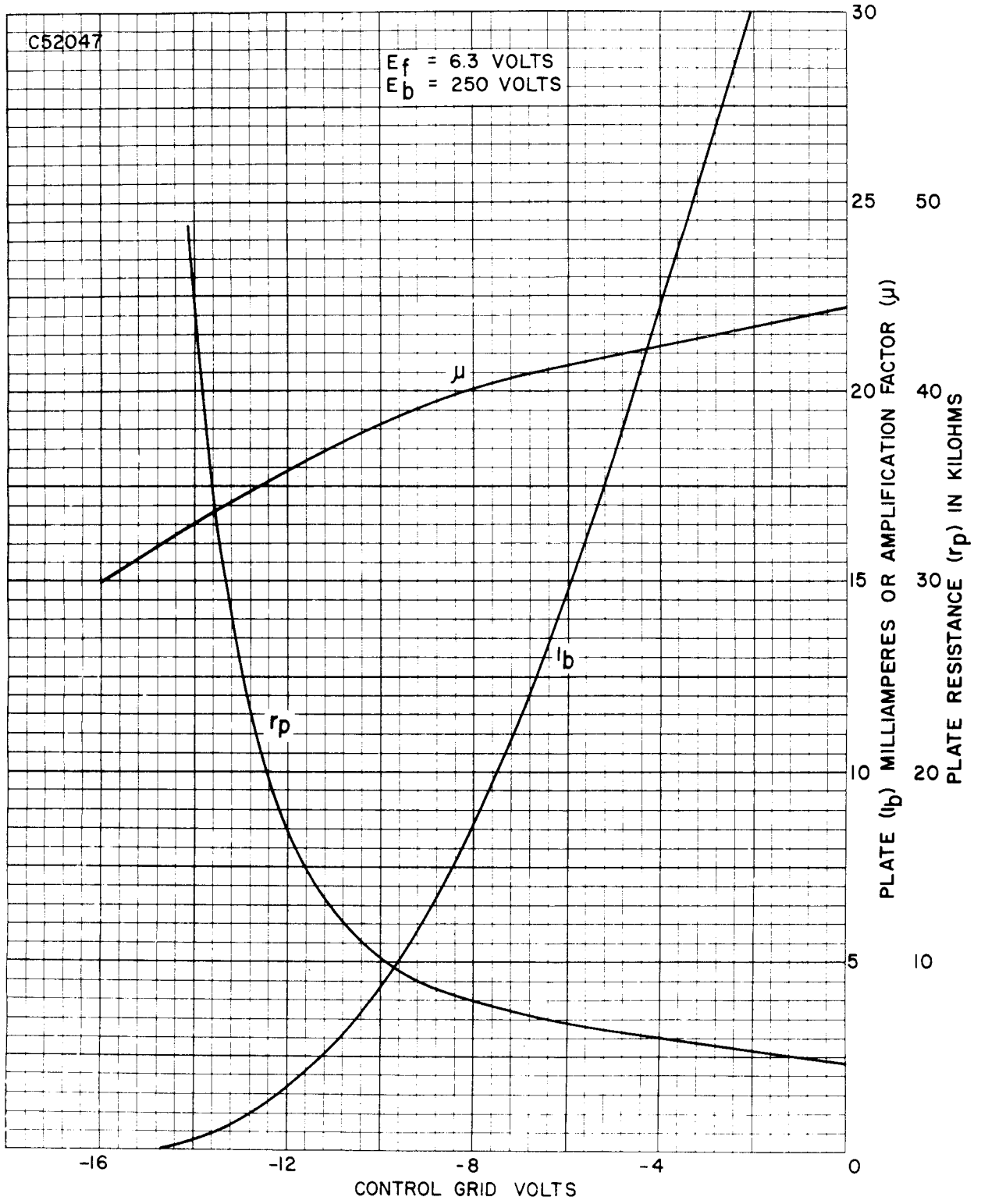
SYLVANIA

12H4

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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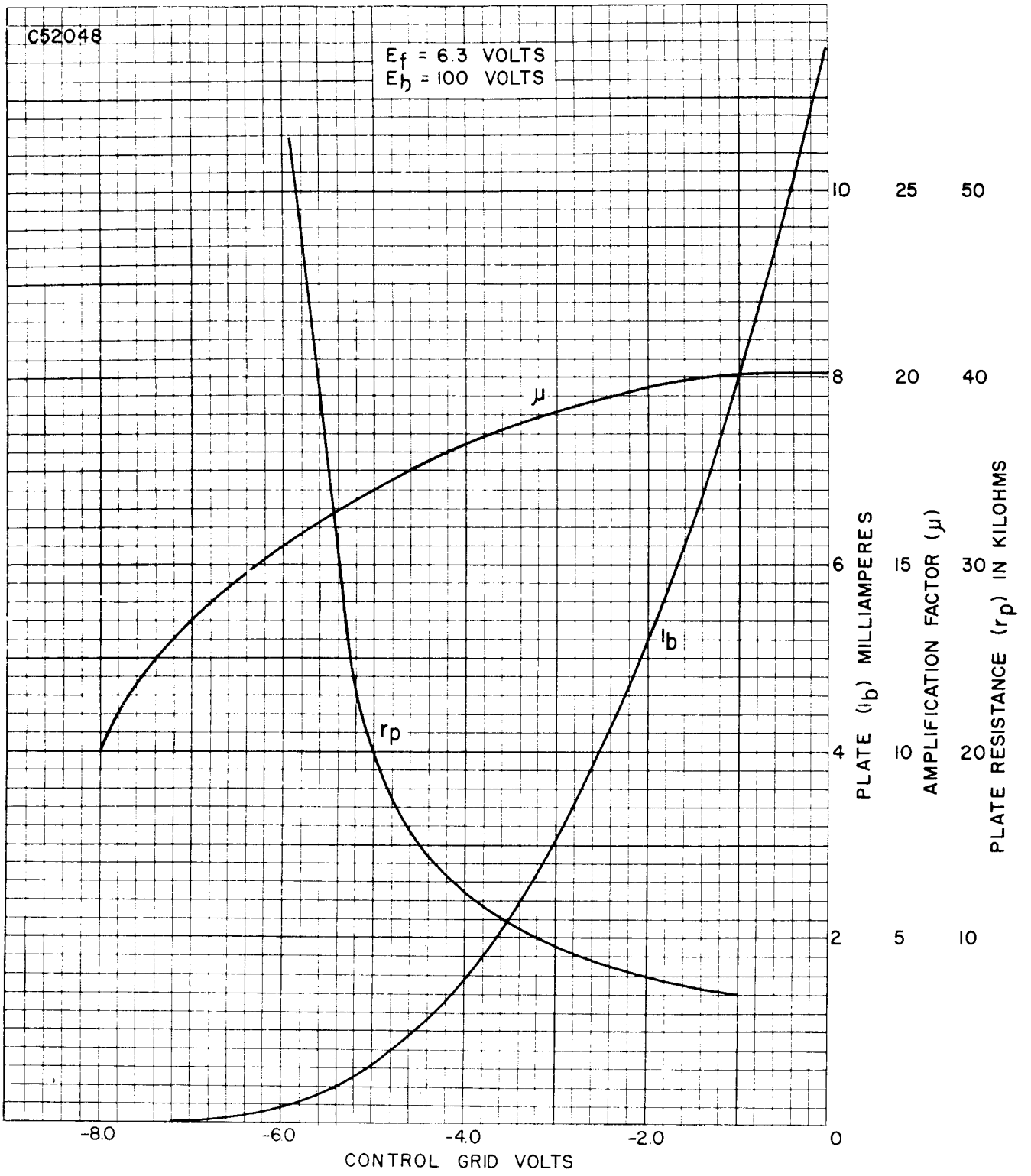
12H4

AVERAGE TRANSFER CHARACTERISTICS



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12K5

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-3
Basing	7EK
Cathode	Coated Unipotential
Mounting Position	Any

HEATER CHARACTERISTICS

Heater Voltage[1]	12.6 Volts
Heater Current	450 Ma
Heater-Cathode Voltage (Design Center Values)	
Heater Negative with Respect to Cathode	
Total DC and Peak	30 Volts Max.
Heater Positive with Respect to Cathode	
Total DC and Peak	30 Volts Max.

RATINGS (Design Center Values—except as noted)

Plate Voltage	30 Volts Max.
Positive Grid No. 1 Voltage	16 Volts Abs. Max.
Grid No. 1 Supply Voltage	30 Volts Max.
Negative Grid No. 2 Voltage	−20 Volts Max.
Grid No. 2 Circuit Resistance	2.2 Megohms Max.

CHARACTERISTICS

Plate Voltage	12.6 Volts
Grid No. 2 (Control Grid) Voltage	−2.0 Volts
Grid No. 1 (Space-charge Grid) Voltage	+12.6 Volts
Plate Current	8.0 Ma
Grid No. 1 (Space-charge Grid) Current	85.0 Ma
Plate Resistance	800 Ohms
Amplification Factor (Grid No. 2 to Plate)	5.6
Transconductance (Grid No. 2 to Plate)	7000 μmhos

TYPICAL OPERATION

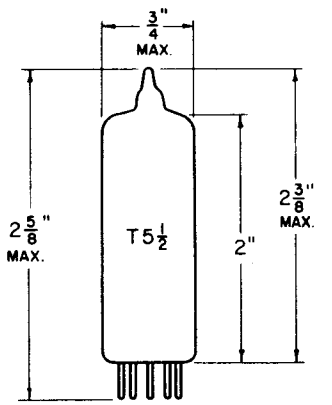
Plate Voltage	12.6 Volts
Grid No. 2 (Control Grid) Voltage[2]	−2.0 Volts
Grid No. 1 (Space-charge Grid) Voltage	+12.6 Volts
Peak AF Grid No. 2 Voltage	2.5 Volts
AF Signal Source Resistance	100000 Ohms
Load Resistance	800 Ohms
Plate Current	8.0 Ma
Grid No. 1 (Space-charge Grid) Current	85 Ma
Power Output	35 Mw
Total Harmonic Distortion	10 Percent

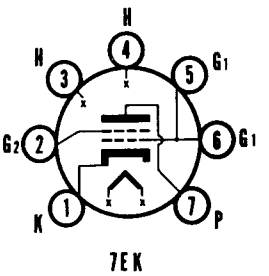
NOTES:

1. *When used in automotive service from a 12-volt source, under no circumstances should the heater voltage be less than 10.0 volts or more than 15.9 volts. These extreme variations in heater voltage may be tolerated for short periods; however, operation at or near these absolute limits in heater voltage necessarily involves sacrifice in performance at low heater voltage and in life expectancy at high heater voltage.*
2. *Obtained by Grid No. 2 rectification in which case the zero signal plate current is approximately 35 Ma.*

QUICK REFERENCE DATA

The Sylvania Type 12K5 is a tetrode designed for space-charge operation. It is intended for service as a power amplifier driver where the potentials are obtained directly from a 12 volt automobile battery.





7EK

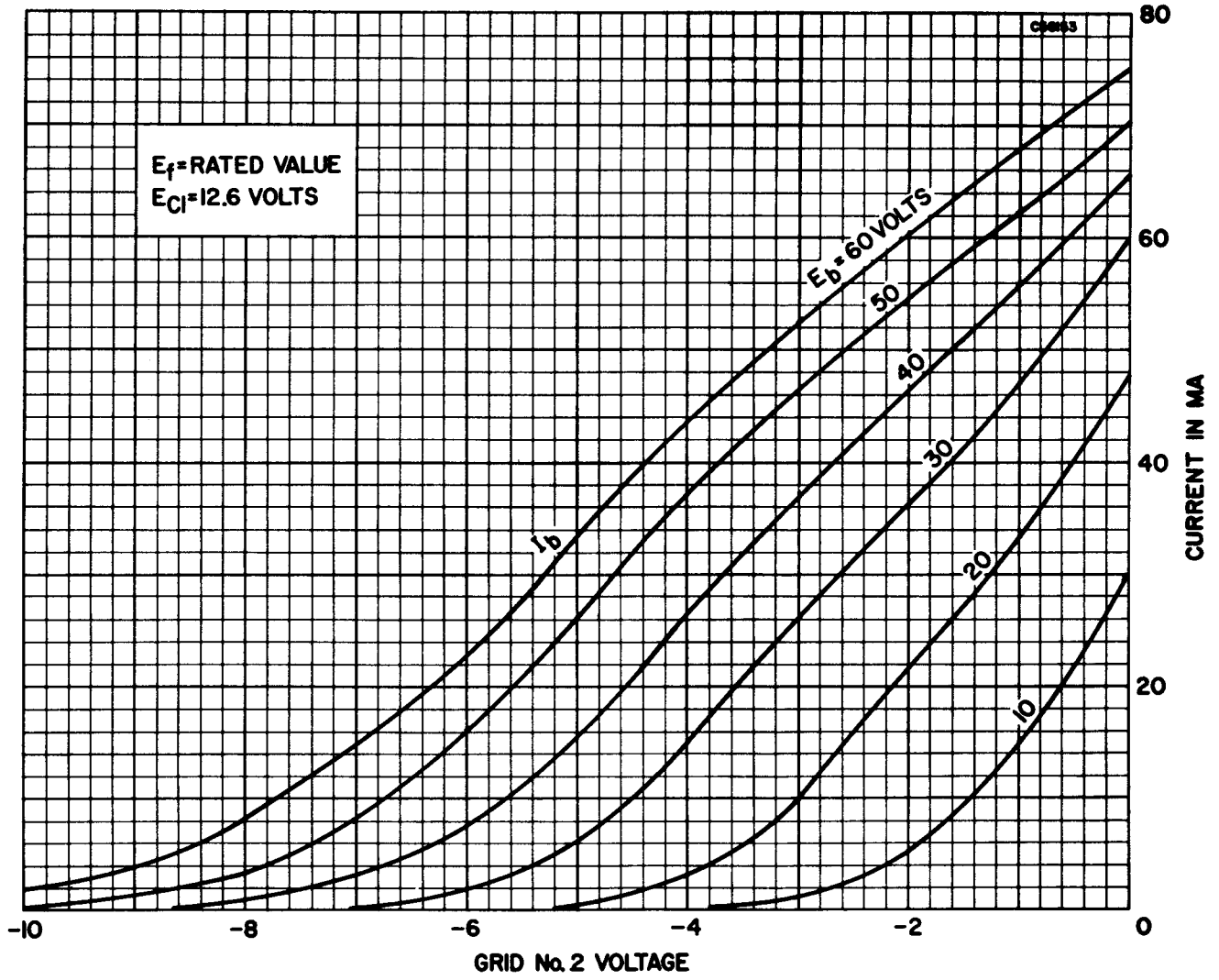
SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

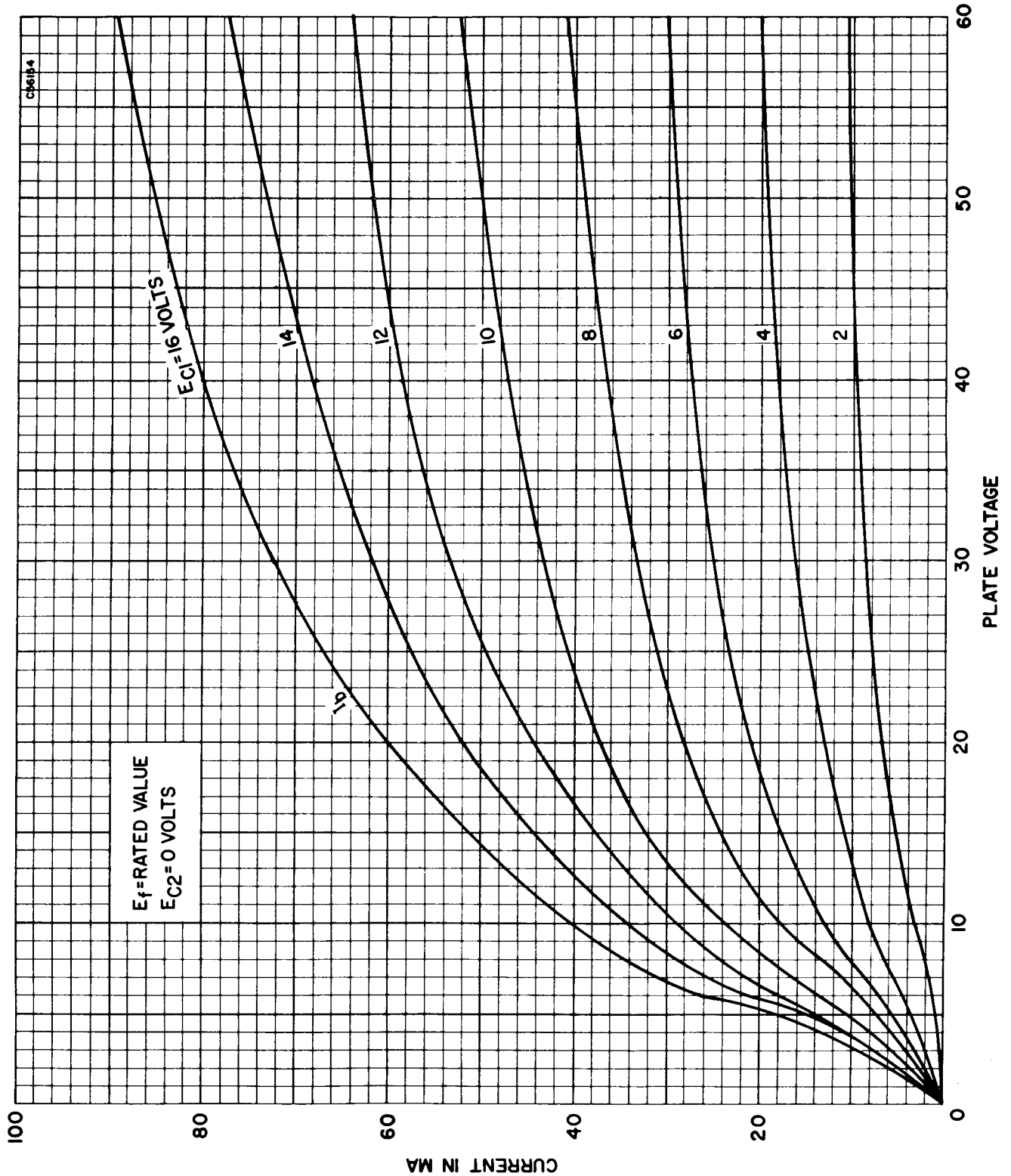
Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

DEC. 1956

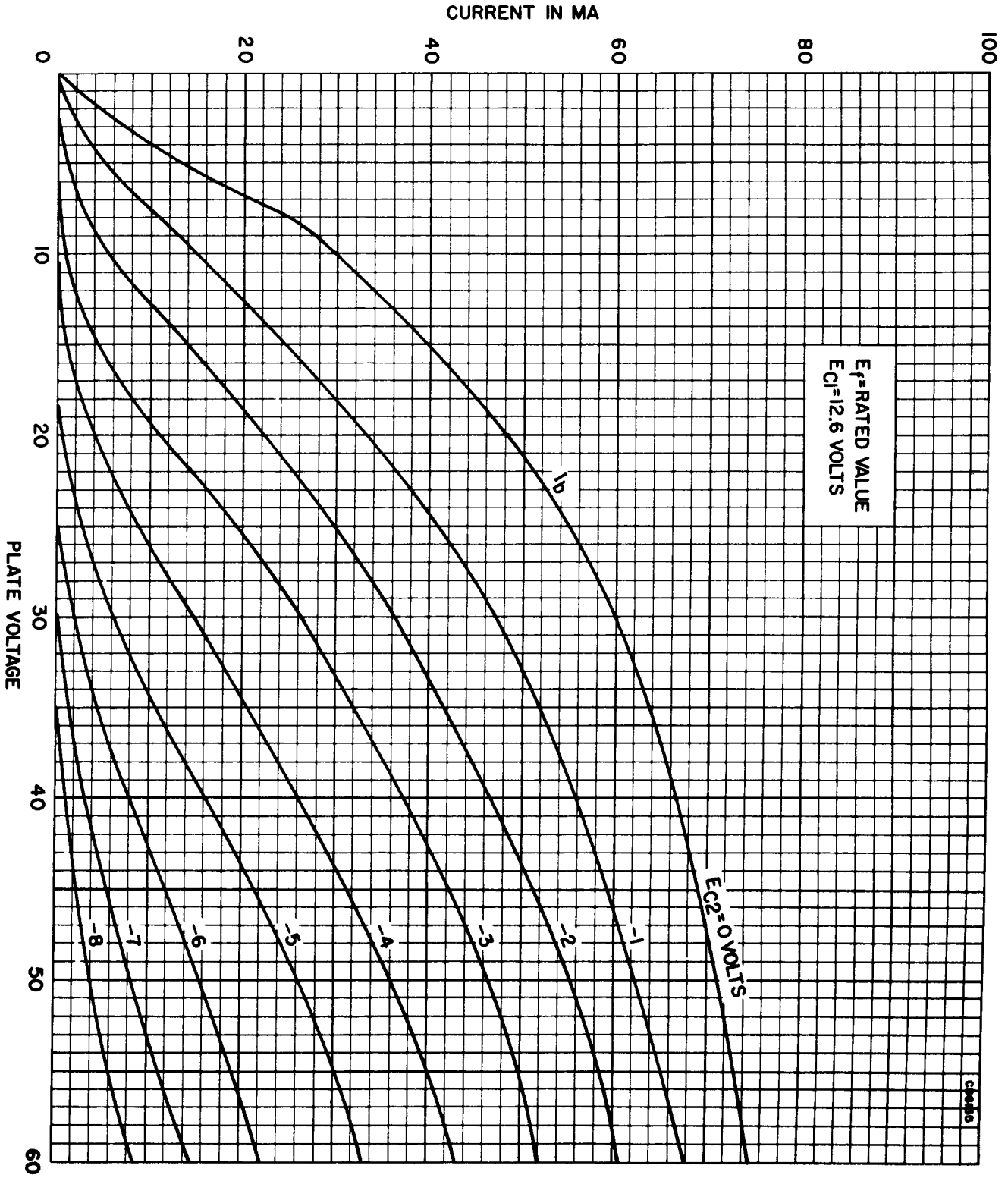
AVERAGE TRANSFER CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



SYLVANIA

engineering data service

SYLVANIA
12KP4A
12KP-A*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angle (Approx.)	54 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Transmittance (Approx.)	74 Percent

**In addition to the types shown, the 12KP-A can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Ampere
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	6	μμf
External Conductive Coating to Anode[1]	2500	μμf Max.
	500	μμf Min.

MECHANICAL DATA

Minimum Useful Screen Diameter	11¼ Inches
Bulb	J99½A or J99½B
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12N
Weight (Approx.)	12½ Pounds

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	13,200 Volts	dc
Grid No. 2 Voltage	450 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	140 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	154 Volts	
Heater Positive with Respect to Cathode	154 Volts	

TYPICAL OPERATING CONDITIONS

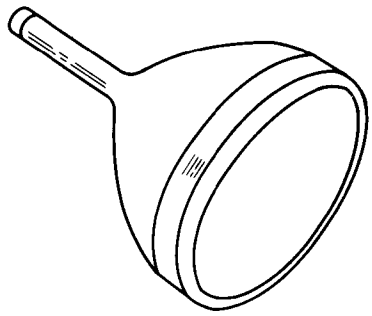
Anode Voltage[2]	12,000 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−33 to −77 Volts	dc
Focusing Coil Current (Approx.)[4]	135 Ma	dc
Spot Position	See Note 5	

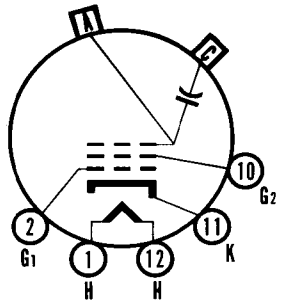
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Video Monitor Tube
12″ Direct Viewed
Round Glass Type
Magnetic Deflection
Magnetic Focus
External Conductive Coating
Gray Filter Glass Faceplate
Aluminized Screen





12-N

SYLVANIA ELECTRONIC TUBES
A Division of
SYLVANIA ELECTRIC PRODUCTS, Inc.
PICTURE TUBE
OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

DECEMBER 1958

NOTES:

1. *External conductive coating must be grounded.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 9,000 volts.*
3. *Visual extinction of undeflected focused spot.*
4. *For JETEC Focusing Coil No. 106 positioned with center line of air gap 3¼ inches from reference line (See Outline Drawing). The indicated current is for condition with combined Grid No. 1 bias voltage and video signal voltage adjusted to produce a highlight brightness of 35 foot-lamberts on a 10½" x 7¾" picture area, and sharply focused at the center of the screen.*
5. *The center of the undeflected, unfocused spot will fall within a circle having 20 mm radius concentric with the center of the tube face.*

WARNING:

X-ray radiation shielding may be necessary to protect against danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

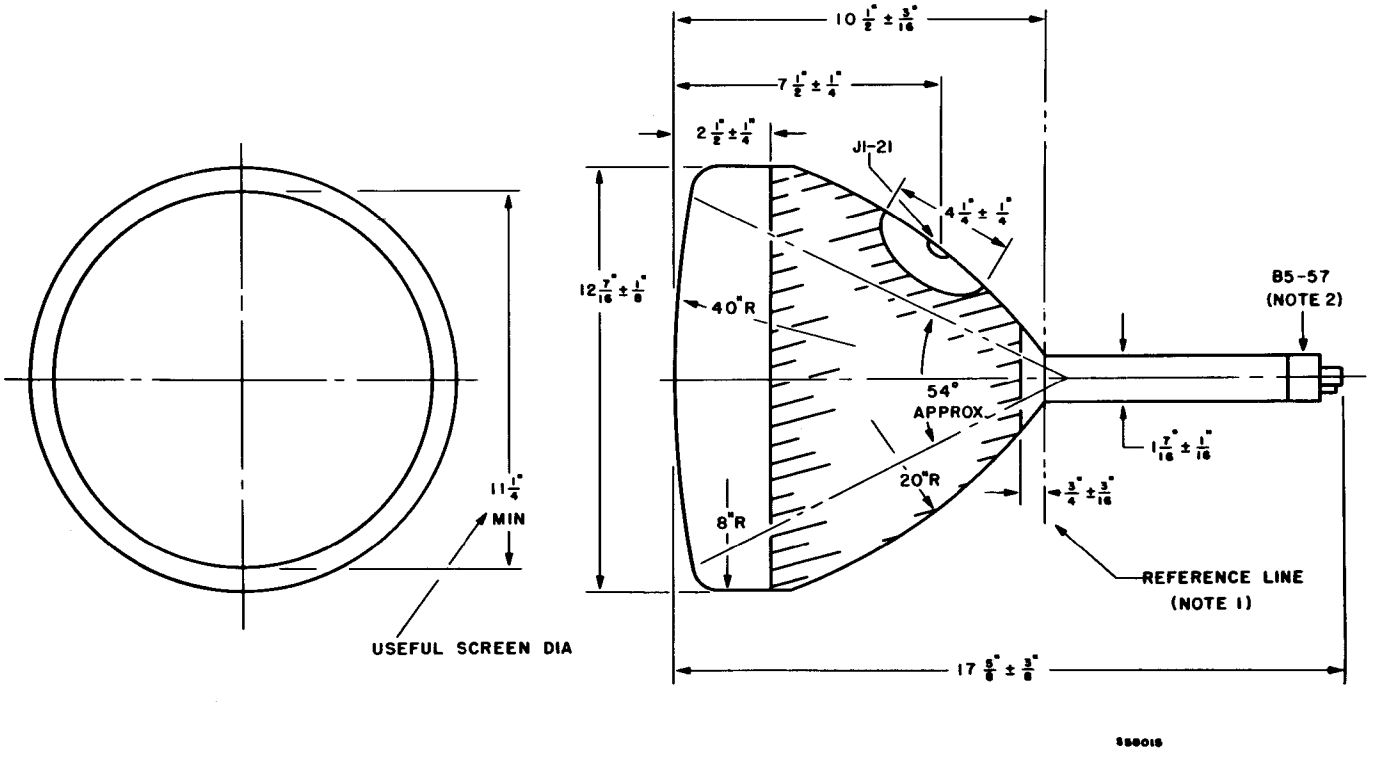


DIAGRAM NOTES:

1. *Reference line is determined by plane of upper edge of JETEC No. 112 reference line gauge, when the gauge is seated against the bulb.*
2. *Vacant pin position No. 3 aligns with anode contact cap (J1-21) within 30 degrees.*

SYLVANIA

engineering data service

SYLVANIA
12LP4
12LP4A

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflecting Angle (approx.)	54 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
External Conductive Coating to Anode[1]	3000 $\mu\mu$f Max.
	750 $\mu\mu$f Min.
Ion Trap Magnet	External, Double Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions (Diameter)	11 Inches
Bulb Contact Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12N
Bulb Contact Aligns with Vacant Pin Position No. 3	±10 Degrees

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	12,000 Volts dc
Grid No. 2 Voltage	410 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Heater Negative with Respect to Cathode	
During Warm-up Period Not to Exceed 15 Seconds	410 Volts dc
After Equipment Warm-up Period	140 Volts dc
Heater Positive with Respect to Cathode	140 Volts dc

RECOMMENDED OPERATING CONDITIONS

Anode Voltage	11,000 Volts dc
Grid No. 2 Voltage	250 Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	-27 to -63 Volts dc
Focusing Coil Current (approx.)[3]	110 Ma dc
Ion Trap Magnet Strength (approx.)	35 Gausses

CIRCUIT VALUES

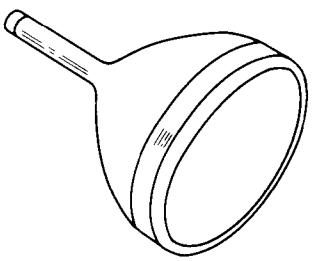
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

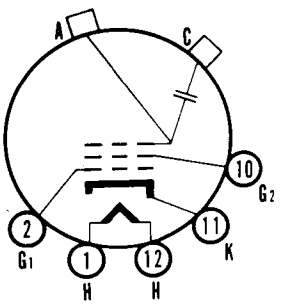
NOTES:

1. *External conductive coating must be grounded.*
2. *Visual extinction of undeflected focused spot.*
3. *For RTMA focusing coil 106 or equivalent three and one quarter inches from reference line, bias adjusted to 20 foot lamberts on a 7½ x 10 inch picture area sharply focused at center of screen.*

QUICK REFERENCE DATA

Television Picture Tube
12" Direct Viewed
Round Glass Type
Magnetic Deflection
Magnetic Focus
Double Field Ion Trap
External Conductive Coating
(12LP4A has gray filter glass faceplate)





12-N

SYLVANIA ELECTRIC PRODUCTS INC.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JULY 1953

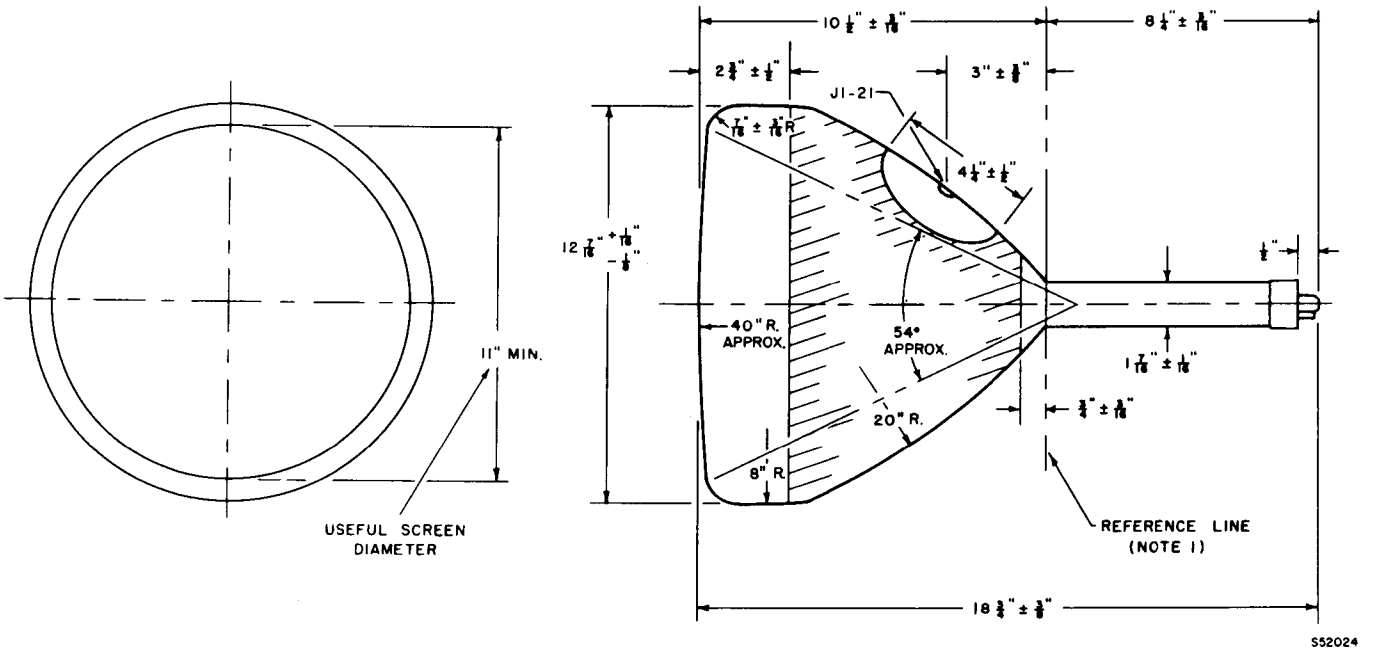


DIAGRAM NOTES:

1. *Reference line is determined by the plane of the upper edge of the reference line gauge (RTMA No. 112) when the gauge is resting on the glass cone.*

12LP4A

The Sylvania Type 12LP4A is identical to Type 12LP4 except for having the gray filter glass faceplate.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

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engineering data service

SYLVANIA

12LP4C

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflecting Angle (approx.)	54 Degrees
Phosphor	Aluminized, P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Transmittance (approx.)	74 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (±10%)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6 μμf
External Conductive Coating to Anode[1]	3000 μμf Max.
	750 μμf Min.
Ion Trap Magnet	External, Double Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions (Diameter)	11 Inches
Bulb Contact Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12N
Bulb Contact Aligns with Vacant Pin Position No. 3	±10 Degrees

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	12,000 Volts dc
Grid No. 2 Voltage	410 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period Not to Exceed 15 Seconds	410 Volts
After Equipment Warm-up Period	140 Volts
Heater Positive with Respect to Cathode	140 Volts

RECOMMENDED OPERATING CONDITIONS

Anode Voltage	11,000 Volts dc
Grid No. 2 Voltage	250 Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	-27 to -63 Volts dc
Focusing Coil Current (approx.)[3]	110 Ma dc
Ion Trap Magnet Strength (approx.)	35 Gausses

CIRCUIT VALUES

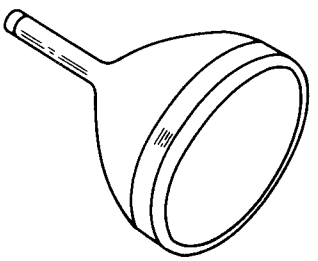
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

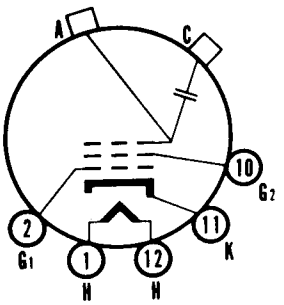
NOTES:

1. *External conductive coating must be grounded.*
2. *Visual extinction of undeflected focused spot.*
3. *For JETEC focusing coil 106 or equivalent three and one quarter inches from reference line, bias adjusted to 20 foot lamberts on a 7½ x 10 inch picture area sharply focused at center of screen.*

QUICK REFERENCE DATA

Television Picture Tube
12" Direct Viewed
Round Glass Type
Magnetic Deflection
Magnetic Focus
Double Field Ion Trap
External Conductive Coating
Gray filter glass faceplate
Aluminized Screen





12-N

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

MAY 14, 1954

SYLVANIA

12LP4C

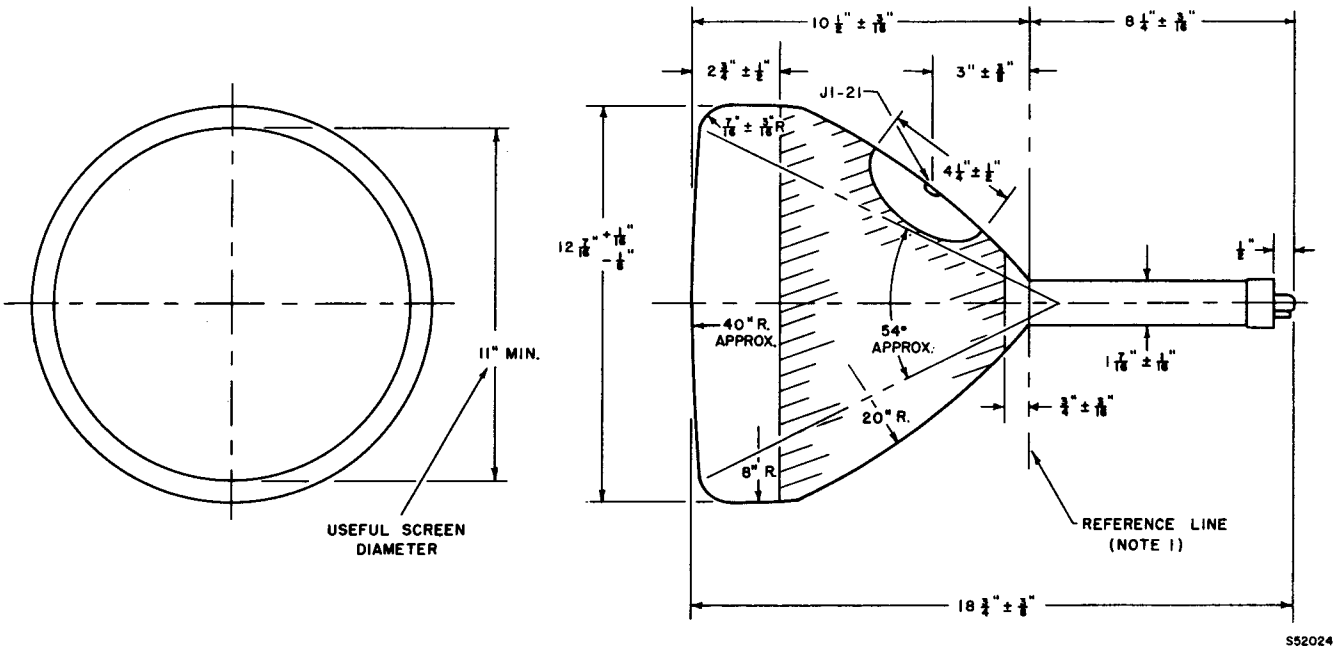


DIAGRAM NOTES:

1. *Reference line is determined by the plane of the upper edge of the reference line gauge (JETEC No. 112) when the gauge is resting on the glass cone.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

SYLVANIA

engineering data service

SYLVANIA
12SP7
12SP7B
12SP7D

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic	
Deflection Method	Magnetic	
Deflection Angle (Approx.)	54	Degrees
Phosphor	P7	
Fluorescence	Blue-White	
Phosphorescence	Yellow	
Persistence	Long	
Faceplate	Gray Filter Glass	
Light Transmittance (Approx.)	74	Percent

In addition to the type shown the 12SP- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Ampere
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes — 12SP7D	8	μμf
Grid No. 1 to All Other Electrodes — 12SP7, 12SP7B	6	μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	11	Inches
Bulb	J99½A or Equivalent	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Dudecal 5-Pin)	B5-57	
Basing	12D	

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

	12SP7	12SP7B	12SP7D		
Anode Voltage	11,000	11,000	15,000	Volts	dc
Grid No. 2 Voltage	450	550	770	Volts	dc
Grid No. 1 Voltage					
Negative Bias Value	140	140	200	Volts	dc
Positive Bias Value	0	0	0	Volts	dc
Positive Peak Value	2	2	2	Volts	
Peak Heater-Cathode Voltage					
Heater Negative with Respect to Cathode	150	200	200	Volts	
Heater Positive with Respect to Cathode	150	200	200	Volts	

TYPICAL OPERATING CONDITIONS

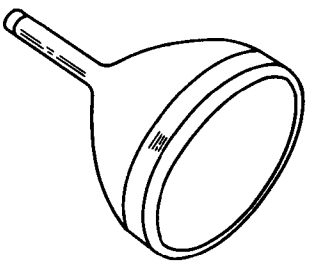
Anode Voltage[1]	9000	Volts	dc
Grid No. 2 Voltage	250	Volts	dc
Grid No. 1 Voltage Required for Cutoff[2]	-27 to -63	Volts	dc
Focusing Coil Current (Approx.)[3]	110	Ma	dc
Line Width A[4] — 12SP7D Only	0.38	MM	Max.
Spot Position[4]	20	MM	Max.

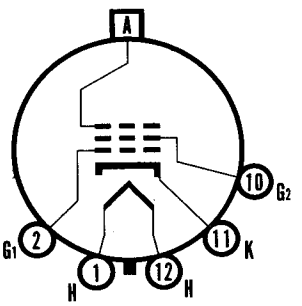
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms Max.

QUICK REFERENCE DATA

Radar Indicator Tube
12" Direct Viewed
Round Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Magnetic Focus
Aluminized Screen
(12SP7B - 12SP7D)
Non-Aluminized (12SP7)





12-D

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JUNE, 1961

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

NOTES:

1. *Brightness and focus quality decrease with decreasing anode voltage. In general, the anode voltage should not be less than 4000 volts.*
2. *For visual extinction of undeflected focused spot.*
3. *For RETMA focusing coil No. 106 with distance from the yoke reference line to center of air gap equal to 3¼ inches.*
4. *Measured by compressed raster method of an anode current at 200 micro-amperes.*
5. *The center of the undeflected, unfocused spot will fall within a circle of 20 mm radius concentric with the tube face.*

WARNING:

X-Ray radiation shielding may be necessary to protect against possible dange of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

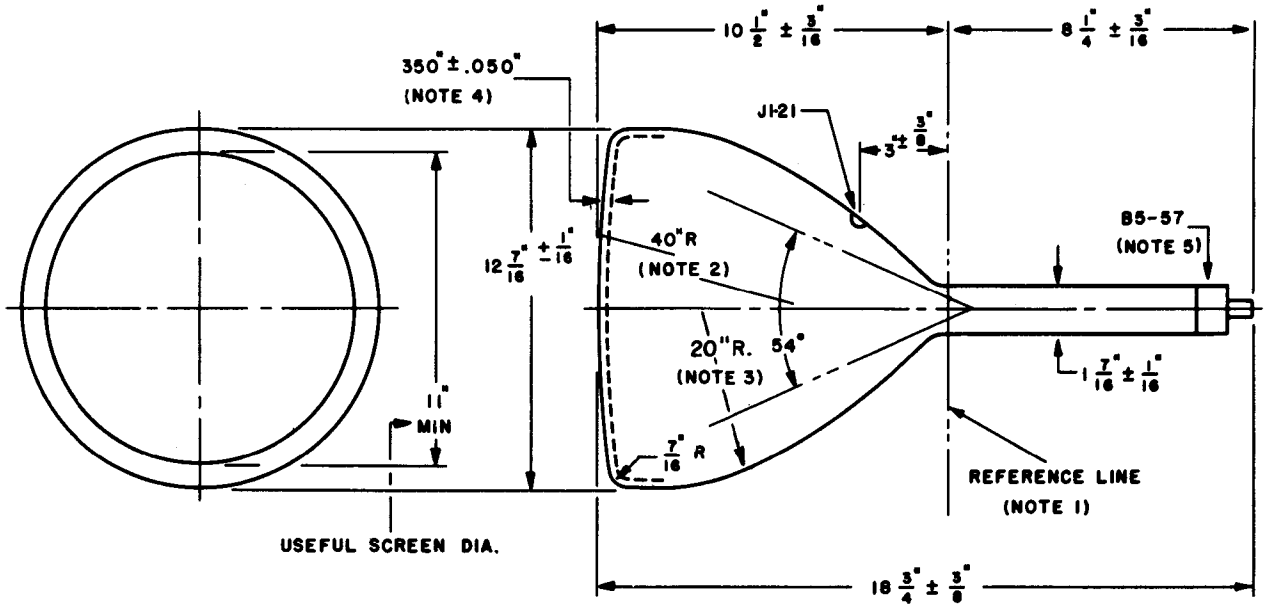
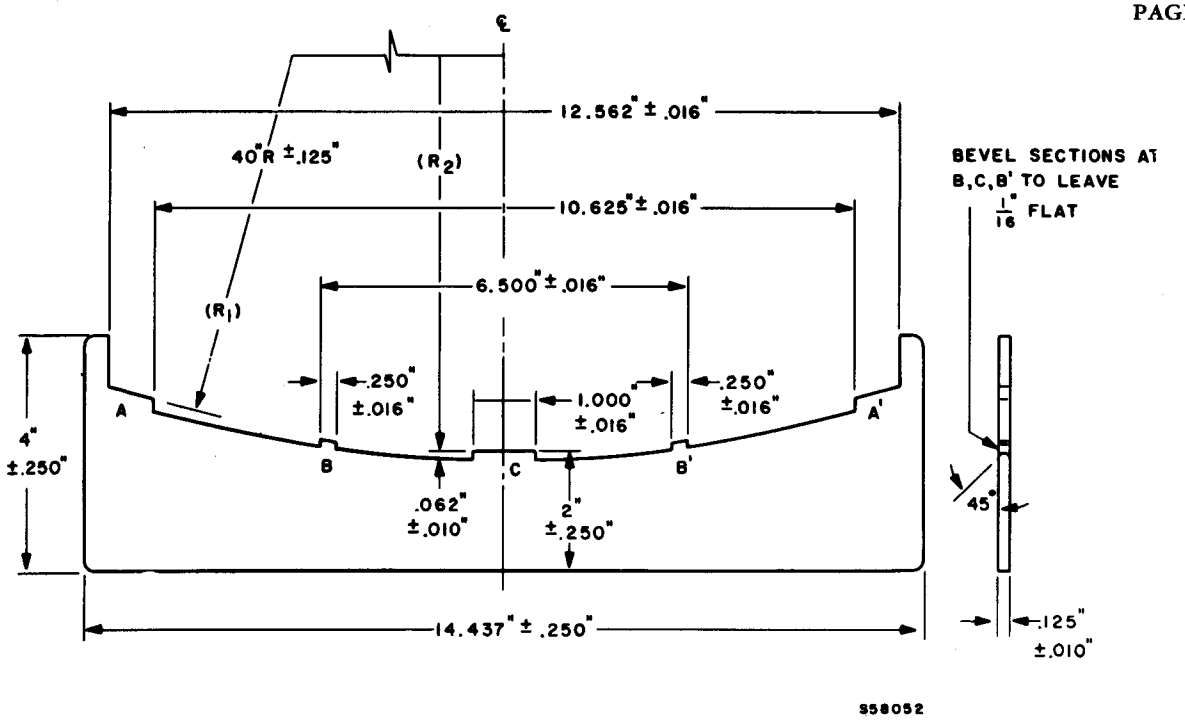


DIAGRAM NOTES:

1. *Reference line is determined by the plane of the upper edge of the reference line gauge (JEDEC No. 112) when the gauge is seated against the glass cone.*
2. *To meet requirements of faceplate contour gauge shown. (12SP7D only)*
3. *To meet requirements of bulb contour gauge shown. (12SP7D only)*
4. *Faceplate thickness over entire useful screen area. (12SP7D only)*
5. *Base Pin Position No. 3 aligns with anode Contact (J1-21), within 10 degrees.*

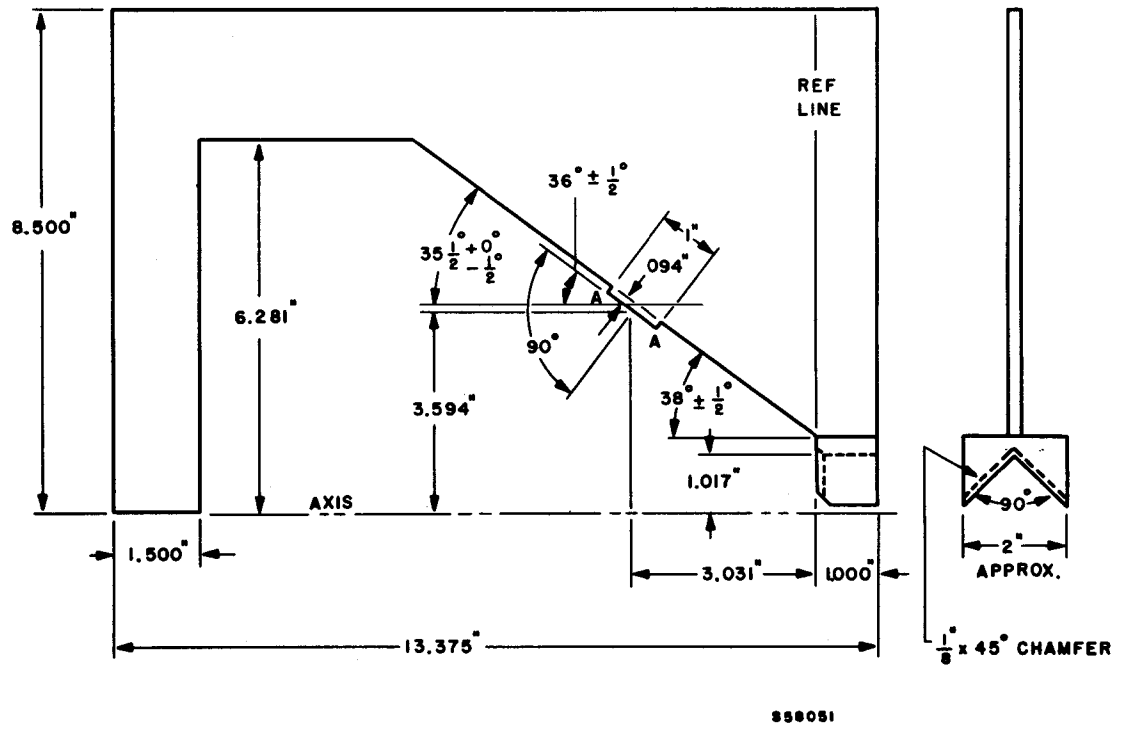
FACEPLATE CONTOUR GAUGE
(12SP7D — Only)



R2 shall be equal to the Absolute Value of R1 + .050" ± .002" / .000"

The contour of the Bulb Face shall be checked with this Gauge at two orientations approximately 90 degrees apart. The gap between the bulb face and gauge points B, B¹, or C shall not exceed 0.100", and the bulb shall seat on steps A and A¹.

BULB CONTOUR GAUGE
(12SP7D — Only)



With the Bulb Neck seated in V-Blocks, the bulb shall rest on flat A-A.

MECHANICAL DATA

Bulb	T-6 ½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9A
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	12.6 Volts	
Heater Current	150 Ma	
Heater-Cathode Voltage (Design Center Values)		
Heater Positive with Respect to Cathode	30 Volts	Max.
Heater Negative with Respect to Cathode	30 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES

	Section 1[2]		Section 2	
	Shielded[3]	Unshielded	Shielded	Unshielded
Grid to Plate	1.5	1.5	1.5	1.5 μμf
Input: g to (h+k)	1.8	1.6	1.8	1.6 μμf
Output: p to (h+k)	2.0	0.4	2.0	0.32 μμf

RATINGS (Design Center Values)

Plate Voltage	30 Volts	Max.
Cathode Current	15 Ma	Max.
Grid Circuit Resistance		
Fixed Bias	0.25 Megohm	Max.
Cathode Bias	1.0 Megohm	Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier—Each Section

Plate Voltage	12.6 Volts
Grid Voltage	0 Volts
Plate Current	1.0 Ma
Transconductance	1600 μmhos
Amplification Factor	20
Plate Resistance (Approx.)	12,500 Ohms
Grid Voltage for Ib = 10 μa (Approx.)	-1.5 Volts

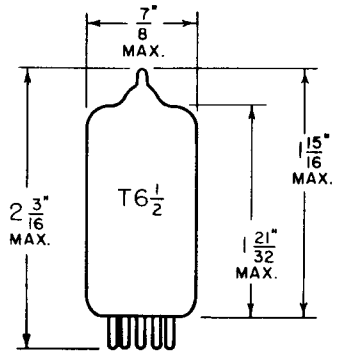
NOTES:

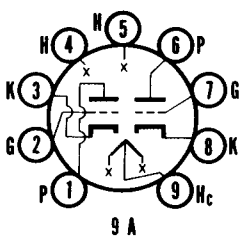
1. *This tube is intended for use in automobile radios operated from a nominal 12 volt battery. Design of the tube is such that the heater will operate satisfactorily over the range 10.0 volts to 15.9 volts, and that the maximum ratings provide a safety factor for the wide voltage variation encountered with this type of supply.*
2. *Section 1 connects to pins 6, 7 and 8. Section 2 connects to pins 1, 2 and 3.*
3. *External shield No. 315 connected to cathode of section under test.*

QUICK REFERENCE DATA

The Sylvania Type 12U7 is a general purpose, medium mu, dual triode, having separate cathodes for each section.

It is designed for operation where the heater and plate voltages are supplied directly from a 12 volt automotive storage battery.



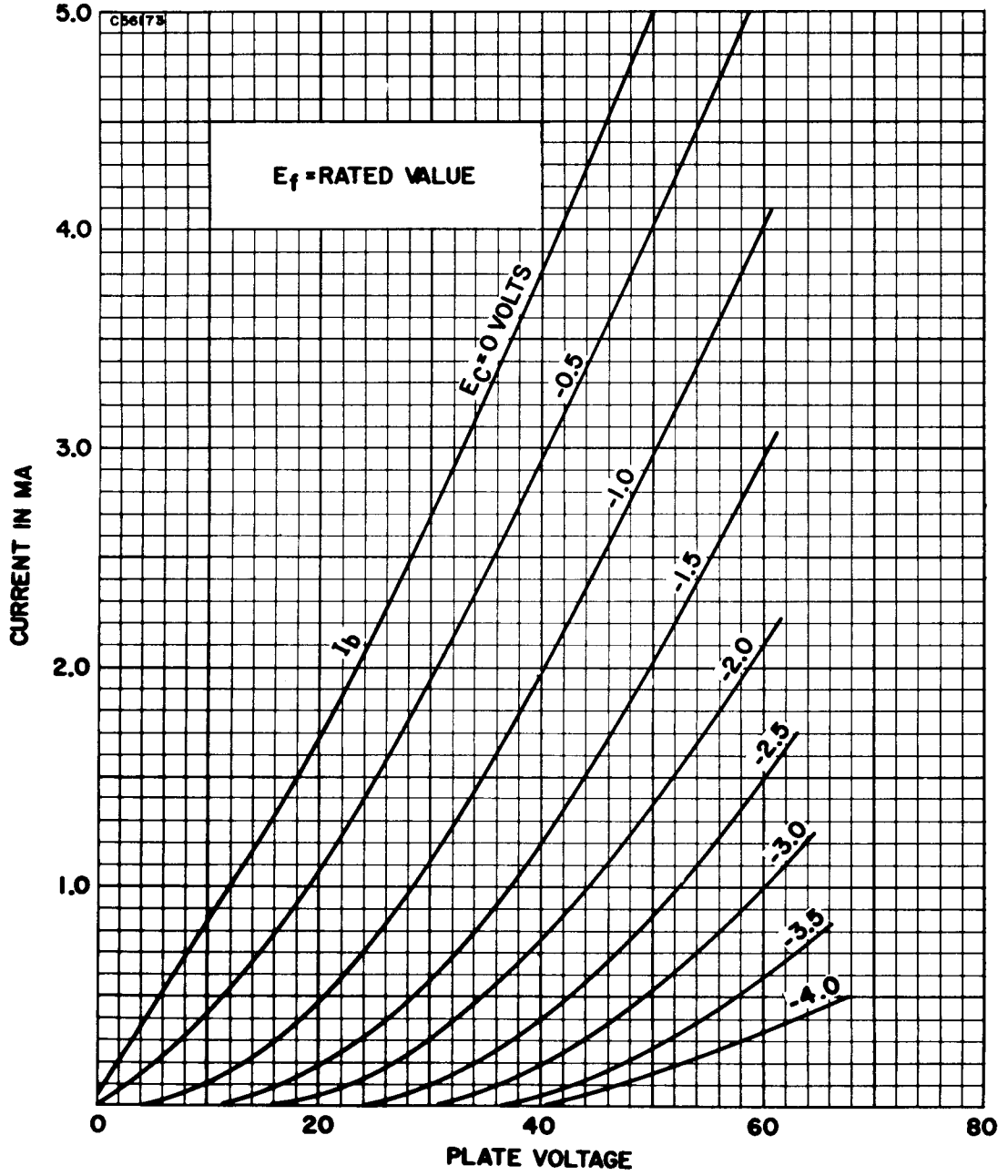


9 A

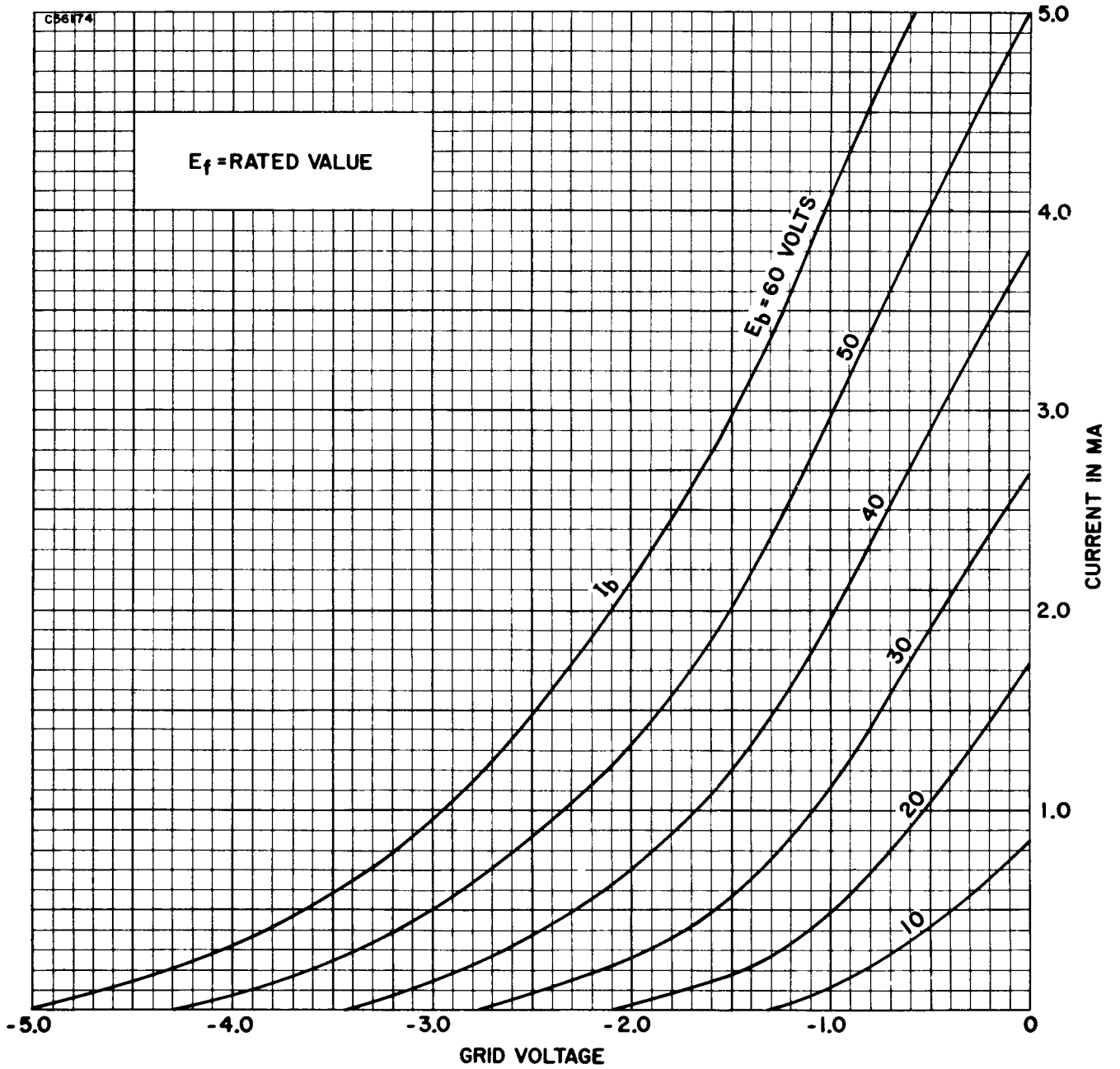
SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
FEBRUARY, 1957

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



from RMA release #788
Oct. 10, 1949

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 12VP4

CATHODE-RAY TUBE

The Type 12VP4 is a twelve inch magnetic-focus and magnetic-deflection direct-view picture tube for television applications. This type has an external conductive coating, and it has an electron gun of triode construction to be used with an external ion-trap magnet.

GENERAL DATA

ELECTRICAL

Heater Voltage	6.3 volts
Heater Current	0.6 ± 10% amps
Focusing Method	magnetic
Deflecting Method	magnetic
Deflecting Angle (approx.)	55 degrees
Phosphor	#4
Fluorescence	white
Persistence	medium
Capacitance	
External Conductive Coating to Anode	
Maximum	3,000 μμf
Minimum	750 μμf

MECHANICAL

Overall Length	18 ± 3/8 inches
Greatest Diameter of Bulb	12 7/16 $^{+\ 1/16}_{-\ 1/8}$ inches
Minimum Useful Screen Diameter	11 inches
Bulb Contact	J1-21, Recessed Small Cavity Cap
Base	B5-57, Small Shell Duodecal 5-Pin
Basing	12G
Bulb Contact Alignment with Pin Position #3 (vacant)	±10 degrees

MAXIMUM RATINGS-- *Design Center Values*

Anode Voltage (dc)	12,000 volts
Grid Voltage	
Negative-Bias (dc)	125 volts
Positive-Bias (dc)	0 volts
Positive Peak	2 volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-Up Period (1)	410 volts
After Warm-Up Period	125 volts
Heater Positive with Respect to Cathode	125 volts

(1) Not to exceed 15 seconds.

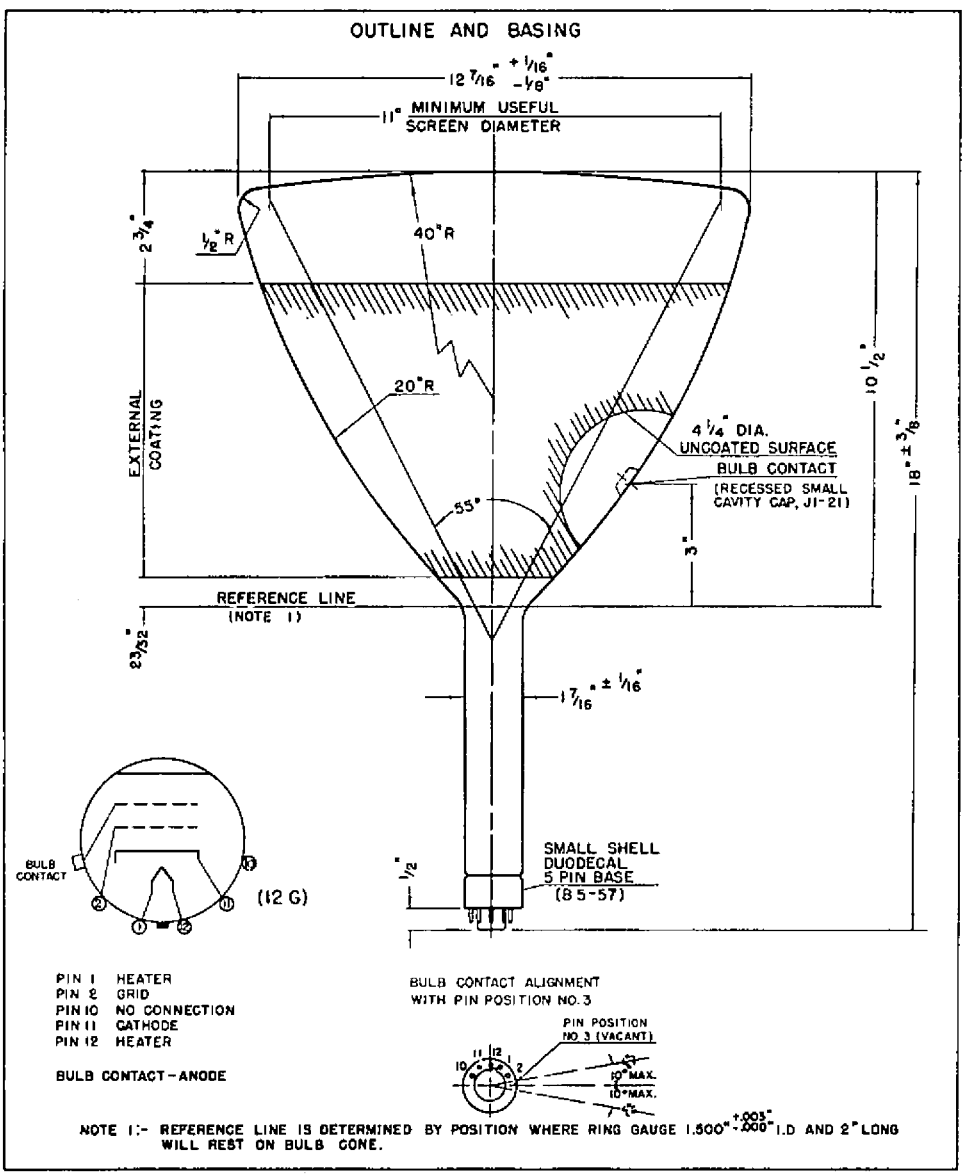
TYPE 12VP4

TYPICAL OPERATING CONDITIONS

Anode Voltage (dc)	11,000	volts
Grid Voltage for Cut-Off (dc)	-33 to -77	volts

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5	megohms



from RMA release #814
Dec. 19, 1949

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 12VP4A

CATHODE-RAY TUBE

The Type 12VP4A is a twelve inch magnetic-focus and magnetic-deflection direct-view picture tube for television applications. The face plate is tinted neutral gray. This type has an external conductive coating, and it has an electron gun of triode construction to be used with an external ion-trap magnet.

GENERAL DATA

ELECTRICAL

Heater Voltage	6.3 volts
Heater Current	0.6 ± 10% amps
Focusing Method	magnetic
Deflecting Method	magnetic
Deflecting Angle (approx.)	55 degrees
Phosphor	P4
Fluorescence	white
Persistence	medium
Face Transmittance(1)	66%
Capacitance	
External Conductive Coating to Anode	
Maximum	3,000 μμf
Minimum	750 μμf

MECHANICAL

Overall Length	18 ± 3/8 inches
Greatest Diameter of Bulb	12 7/16 $^{+\ 1/16}_{-\ 1/8}$ inches
Minimum Useful Screen Diameter	11 inches
Bulb Contact	J1-21, Recessed Small Cavity Cap
Base	B5-57, Small Shell Duodecal 5-Pin
Basing	12G
Bulb Contact Alignment with Pin Position #3 (vacant)	±10 degrees

MAXIMUM RATINGS -- *Design Center Values*

Anode Voltage (dc)	12,000 volts
Grid Voltage	
Negative-Bias (dc)	125 volts
Positive-Bias (dc)	0 volts
Positive Peak	2 volts
Peak Heater-Cathode Voltage(2)	±125 volts

(1) With a 7000° K all-sulphide P4 screen as the light source.

(2) A peak heater-cathode voltage of - 410 volts maximum may be applied for not more than 15 seconds during equipment warm-up periods.

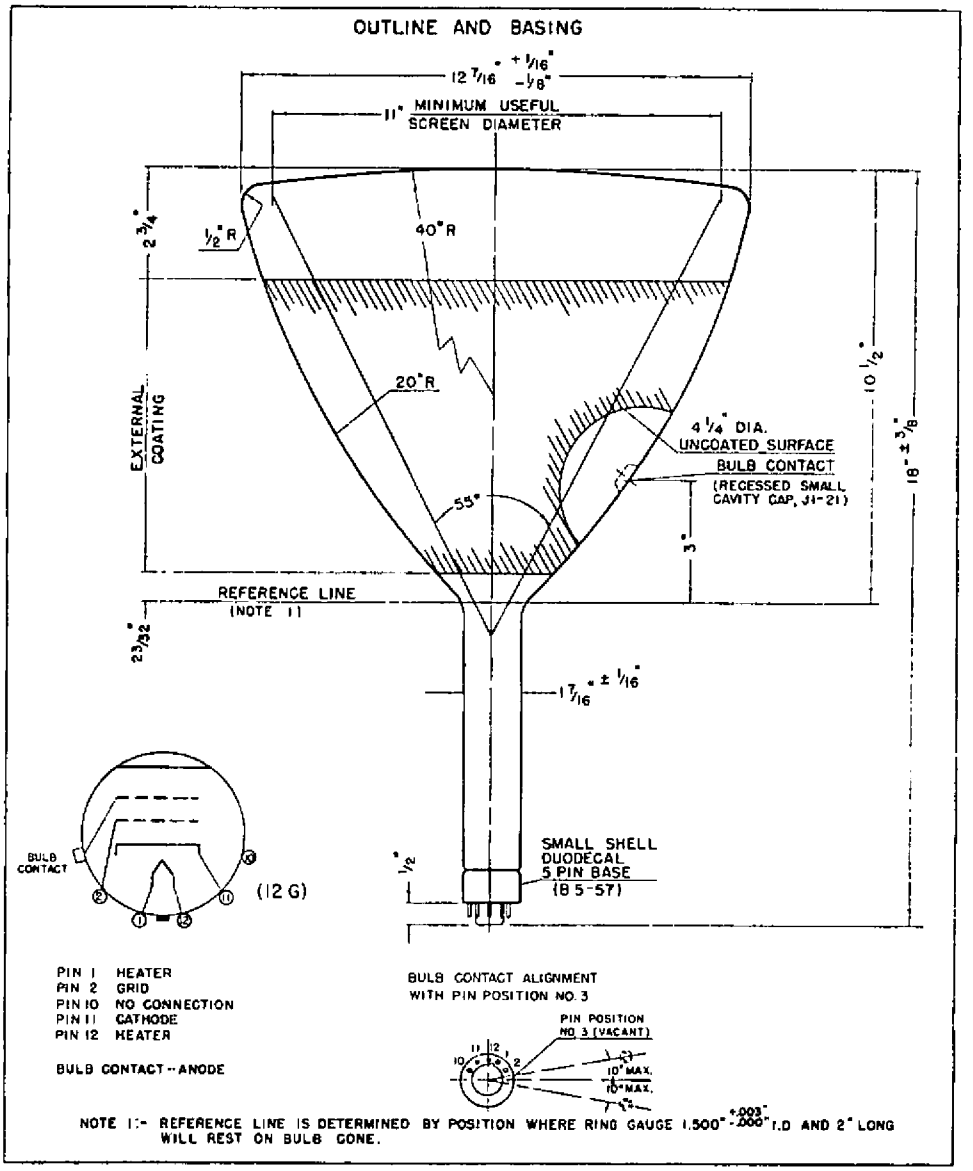
TYPE 12VP4A

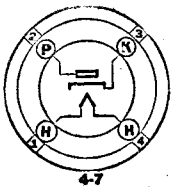
TYPICAL OPERATING CONDITIONS

Anode Voltage (dc)	11,000	volts
Grid Voltage for Cut-Off (dc)	-33 to -77	volts

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5	megohms

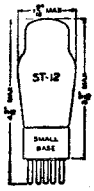




Sylvania

TYPE 12Z3

REDRESSEUR A VIDE UNE ALTERNANCE



CARACTERISTIQUES

Tension de chauffage CA ou CC	12,6 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12
Culot — Petit modèle 4 broches	4-G
Position de montage	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension chauffage CA ou CC	12,6 volts
Courant chauffage	0,3 ampère
Tension inverse de pointe	700 volts max.
Potentiel CC entre filament et cathode	350 volts max.
Chute tension dans tube (110 ma. par plaque) ...	17 volts

Conditions de fonctionnement et caractéristiques :

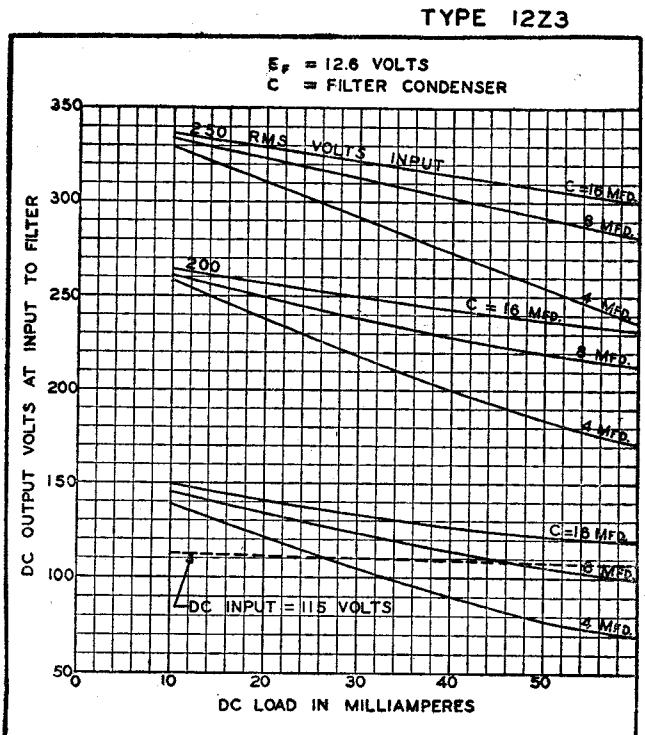
ENTREE CONDENSATEUR :

Tension chauffage	12,6	12,6	12,6 volts
Tension efficace de plaque CA	117	150	235 volts
Courant redressé (max.)	55	55	55 ma.
Source totale impédance plaque	0	30	75 ohms

APPLICATION

Sylvania type 12Z3 est un redresseur à vide, à chauffage indirect, redressant une alternance, convenant spécialement pour les récepteurs universels. La tension de chauffage de 12,6 volts du tube 12Z3 réduit quelque peu la dissipation de chaleur dans la résistance série du circuit filament. Un transformateur réseau n'est pas nécessaire dans un tel récepteur et le tube redresseur reste en circuit, que le réseau soit alternatif ou continu.

Pour courbe redressement, voir fin volume.


TYPE 12Z3
E_f = 12.6 VOLTS
C = FILTER CONDENSER
250 RMS VOLTS INPUT
200
C=16 MFD.
8 MFD.
4 MFD.
C = 16 MFD.
8 MFD.
4 MFD.
C=16 MFD.
8 MFD.
4 MFD.
DC INPUT = 115 VOLTS
DC OUTPUT VOLTS AT INPUT TO FILTER
DC LOAD IN MILLIAMPERES
350
300
250
200
150
100
50
0
10
20
30
40
50

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	65	Degrees
Vertical	50	Degrees
Diagonal	70	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (Approx.)	76	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts	
Heater Current	0.6 ± 10%	Ampere	
Direct Interelectrode Capacitances (Approx.)			
Cathode to All Other Electrodes	5	μμf	
Grid No. 1 to All Other Electrodes	6.5	μμf	
External Conductive Coating to Anode[1]	2000	μμf	Max.
	750	μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions	11½ x 8⅝	Inches
Minimum Useful Screen Area	96	Sq. Inches
Overall Length	16¾	Inches
Neck Length	7½	Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Bulb	J109½ A1 or J109½ C1	
Base (Small Shell Duodecal 6-Pin)	B6-63	
Basing	12L	
Weight (Approx.)	11	Pounds

RATINGS

MAXIMUM RATINGS (Design Maximum Values)

Anode Voltage	22,000	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	800	Volts	dc
Grid No. 2 Voltage	700	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	180	Volts	dc
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

TYPICAL OPERATING CONDITIONS

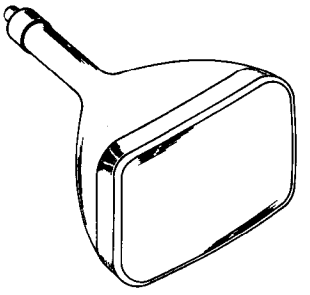
Anode Voltage	18,000	Volts	dc
Grid No 4 Voltage for Focus	0 to +400	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff[2]	−35 to −72	Volts	dc

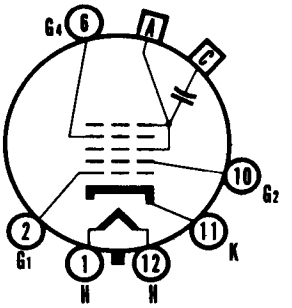
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms Max.

QUICK REFERENCE DATA

Television Monitor Tube
14" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Magnetic Deflection
Electrostatic Focus
No Ion Trap
External Conductive Coating
Aluminized Screen
High Resolution





12-L

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

DECEMBER, 1961

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

NOTES:

1. *External conductive coating must be grounded.*
2. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

OUTLINE

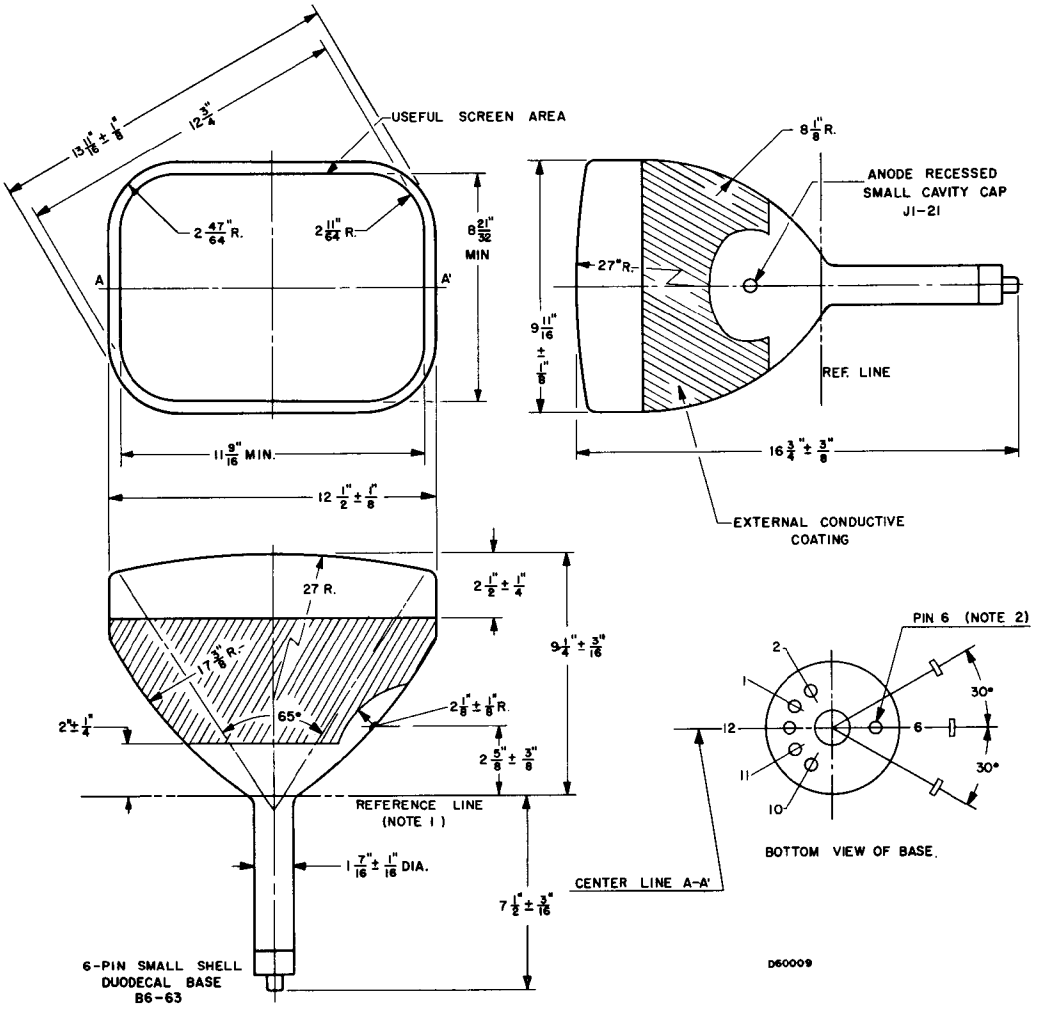


DIAGRAM NOTES:

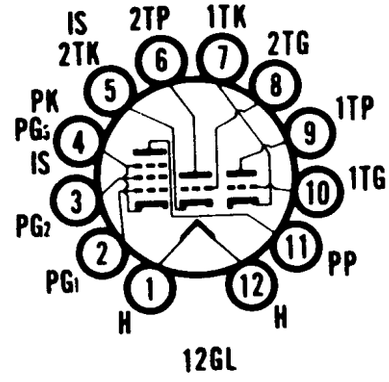
1. *With the tube neck inserted through the flared end of Reference-Line Gauge (JEDEC No. 110) and with the tube seated in the gauge, the reference line is determined by the intersection of the plane C-C' (face of the flared end) of the gauge with the glass funnel.*
2. *The plane through the tube axis and the base pin No. 6 may vary from the plane through the tube axis and the bulb terminal by an angular tolerance of ±30° measured about the tube axis. The bulb terminal is on the same side of the tube as pin No. 6.*

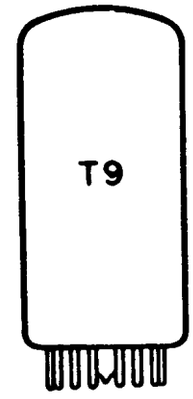
VIDEO AMPLIFIER (P)
GENERAL PURPOSE AMPLIFIER (T)
SYNC SEPARATOR (T)

14BR11

High Mu Triode, Medium Mu Triode and Sharp Cutoff Pentode

Construction.....Compactron T-9
Base .....Button 12 Pin, E12-70
Basing 12GL
Outline 9-59
Maximum Diameter .....1.188 In.
Maximum Seated Height .....2.250 In.
Maximum Overall Height .....2.625 In.





ELECTRICAL DATA

HEATER OPERATION

Heater Voltage	14.2 Volts
Heater Current	450 Ma
Heater Warm-up Time	11 Seconds
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode (Section 1)

Grid to Plate	1.9 Pf
Input: 1Tg to (1 Tk + 2TK + Pk + Pg3 + h + IS)	2.4 Pf
Output: 1Tp to (1Tk + 2Tk + Pk + Pg3 + h + IS)	2.2 Pf

Triode (Section 2)

Grid to Plate	3.8 Pf
Input: 2Tg to (2Tk + Pk + Pg3 + h + IS)	2.8 Pf
Output: 2Tp to (2Tk + Pk + Pg3 + h + IS)	3.8 Pf

Pentode Section

Grid No. 1 to Plate	0.13 Pf
Input: Pg1 to (2Tk + Pk + Pg2 + Pg3 + h + IS)	10 Pf
Output: Pp to (2Tk + Pk + Pg2 + Pg3 + h + IS)	4.6 Pf

Coupling

Pentode Plate to Triode Plate (Section 2) (Max.)	0.16 Pf
Triode Plate (Section 1) to Triode Plate (Section 2)	0.2 Pf

RATINGS (Design Maximum Rating System)

Pentode Section	
Plate Voltage	330 Volts
Screen Supply Voltage	330 Volts
Screen Voltage	See Rating Chart (Gen. Info. Sec.)
Positive DC Grid No. 1 Voltage	0 Volt
Plate Dissipation	4.0 Watts
Screen Dissipation	1.1 Watts
Grid No. 1 Circuit Resistance	
Fixed Bias	1.0 Megohm
Cathode Bias	1.0 Megohm
Triode (Section 1)	
Plate Voltage	330 Volts
Positive DC Grid Voltage	0 Volt
Plate Dissipation	1.5 Watts
Grid Circuit Resistance	
Fixed Bias	0.5 Megohm
Cathode Bias	1.0 Megohm
Triode (Section 2)	
Plate Voltage	330 Volts
Positive DC Grid Voltage	0 Volt
Plate Dissipation	2.0 Watts
Grid Circuit Resistance	
Fixed Bias	0.5 Megohm
Cathode Bias	1.0 Megohm

CHARACTERISTICS AND TYPICAL OPERATION

Pentode Section		
Plate Voltage	35	135 Volts
Screen Voltage	135	135 Volts
Grid No. 1 Voltage	0	— Volt
Cathode Bias Resistor	—	100 Ohms
Plate Resistance (Approx.)	—	45,000 Ohms
Transconductance	—	10,400 μmhos
Plate Current	34	17 Ma
Screen Current	13	4.0 Ma
Grid No. 1 Voltage (Approx.)		
Ib = 100 μa	—	–6 Volts
Triode (Section 1)		
Plate Voltage		200 Volts
Grid Voltage		–2.0 Volts
Amplification Factor		68
Plate Resistance (Approx.)		12,400 Ohms
Transconductance		5500 μmhos
Plate Current		7.0 Ma
Grid Voltage (Approx.)		
Ib = 100 μa		–5.5 Volts
Triode (Section 2)		
Plate Voltage		200 Volts
Cathode Bias Resistor		220 Ohms
Amplification Factor		41
Plate Resistance (Approx.)		9400 Ohms
Transconductance		4400 μmhos
Plate Current		9.2 Ma
Grid Voltage (Approx.)		
Ib = 100 μa		–6.5 Volts

SYLVANIA

engineering data service

SYLVANIA
14QP4
14QP4A

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angles (approx.)	
Horizontal	65 Degrees
Diagonal	70 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	76 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6±5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	900 μμf	Max.
	600 μμf	Min.

Ion Trap Magnet External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions (maximum assured)	11½ x 8⅝ Inches
Minimum Useful Screen Area	96 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12 L

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	12,100 Volts	DC
Grid No. 4 Voltage (Focusing Electrode)	−550 to + 1100 Volts	DC
Grid No. 2 Voltage	550 Volts	DC
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	DC
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	DC
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

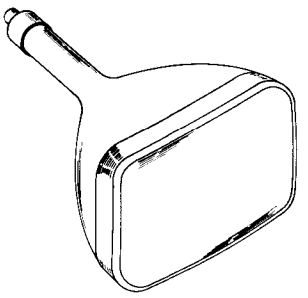
Anode Voltage	9,000 Volts	DC
Grid No. 4 Voltage for Focus	−50 to +250 Volts	DC
Grid No. 2 Voltage	250 Volts	
Grid No. 1 Voltage Required for Cutoff[3]	−24 to −64 Volts	DC
Ion Trap Magnet Current (Average)[4]	24 Ma	DC
Field Strength of PM Ion Trap Magnet[5]	24 Gausses	Min.

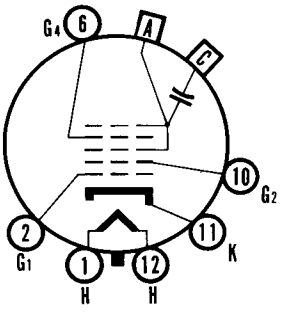
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.

QUICK REFERENCE DATA

Television Picture Tube
14" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
Single Field Ion Trap
External Conductive Coating
14QP4A has Aluminized Screen





12-L

SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JULY 1956

NOTES:

1. *Heater Warm-up Time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of raster.*
4. *For JETEC Ion Trap Magnet No. 117.*
5. *For typical PM ion trap magnet with field strength tolerance of ±3 gausses.*

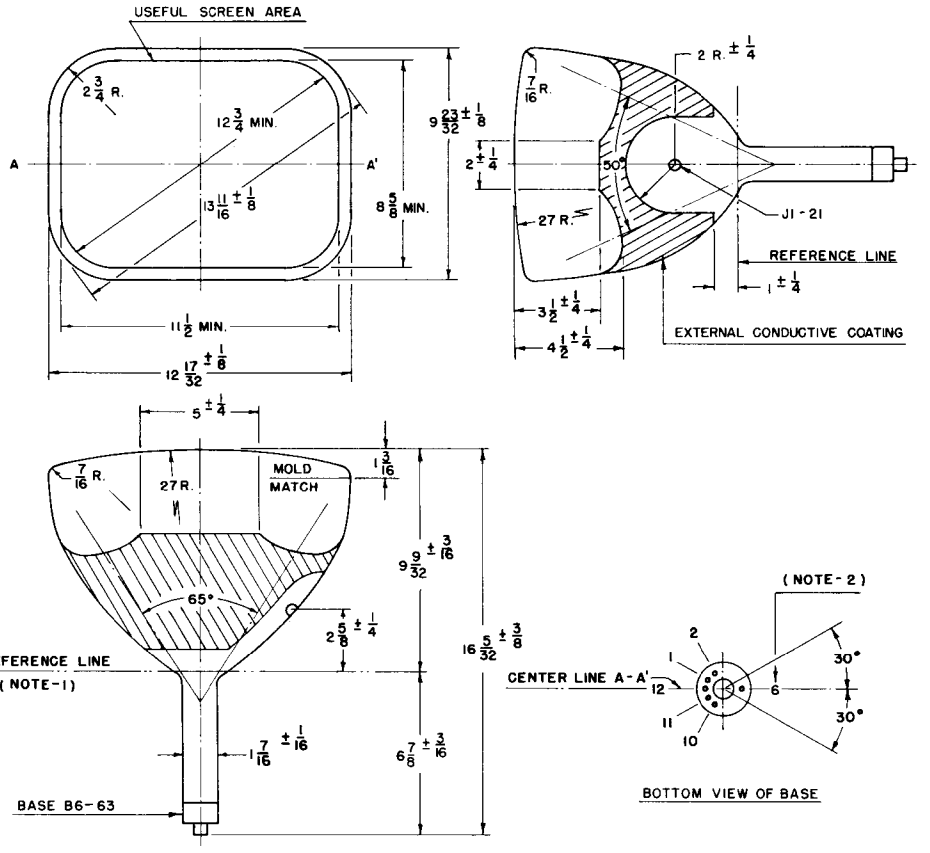


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of the JETEC No. 110 reference line gauge when the gauge is resting on the tube cone.*
2. *Anode contact aligns with Pin No. 6 ±30 degrees.*
3. *All dimensions are in inches.*

14QP4A

The Sylvania Type 14QP4A is identical to Type 14QP4 except it has an aluminized screen.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	
14RP4	P4
14RP4A	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	78 %

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	1200 μμf	Max.
	800 μμf	Min.
Ion Trap Magnet	External, Single Field Type	

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	$12\frac{1}{16}$ x $9\frac{1}{2}$ Inches
Minimum Useful Screen Area	104 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L
Weight (approx.)	8.5 Pounds

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

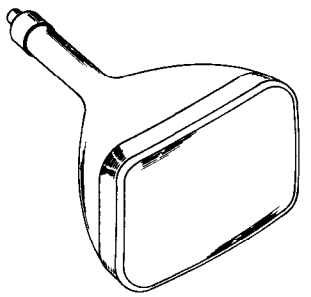
Anode Voltage	15,400 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +550 Volts	dc
Grid No. 2 Voltage	440 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	120 Volts	dc
Negative Peak Value	175 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

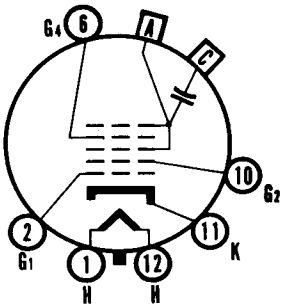
TYPICAL OPERATING CONDITIONS

Anode Voltage	12,000 Volts	dc
Grid No. 4 Voltage for Focus	−50 to +350 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−26 to −70 Volts	dc
Ion Trap Magnet Current (Average)[4]	35 Ma	dc
Field Strength of PM Ion Trap Magnet[5]	40 Gausses	Min.

QUICK REFERENCE DATA

Television Picture Tube
14" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
Single Field Ion Trap
External Conductive Coating
14RP4A has Aluminized Screen





12-L

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JUNE, 1957

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*
4. *For JETEC Ion Trap Magnet No. 117 with pole pieces centered over Grid No. 2 on mount, and rotated for maximum brightness.*
5. *For typical PM ion trap magnet with field strength tolerence of ±3 gausses.*

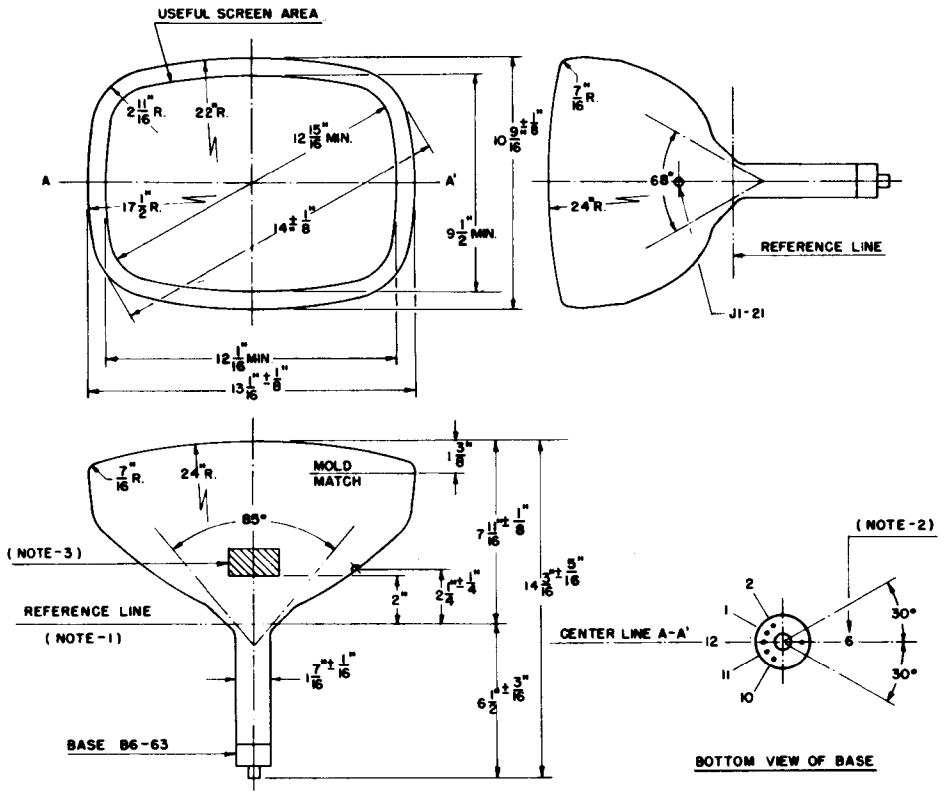


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone.*
2. *Base pin No. 6 aligns with anode contact terminal J1-21 within 30 degrees.*
3. *Contact area 2" x 2" for external conductive coating, located 90 degrees counterclockwise from anode contact as viewed from base end of tube.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

A Technical Publication of
SYLVANIA ELECTRIC
PRODUCTS INC.
EMPORIUM, PA.



CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	79 Degrees
Diagonal	85 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	75 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ±5% Ampere
Heater Warm-up Time[1]	11 Seconds
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6 μμf
External Conductive Coating to Anode[2]	1200 μμf Max.
	900 μμf Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	12 x $9\frac{7}{16}$ Inches
Minimum Useful Screen Area	103 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	15,400 Volts dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts dc
Grid No. 2 Voltage	550 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	154 Volts dc
Negative Peak Value	220 Volts
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	12,000 Volts dc
Grid No. 4. Voltage for Focus	−48 to +264 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[3]	−28 to −72 Volts dc
Ion Trap Magnet Current (Average)[4]	26 Ma dc
Field Strength of PM Ion Trap Magnet[5]	28 Gausses Min.

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

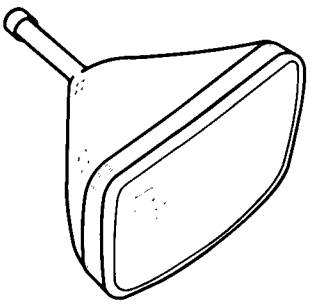
NOTES:

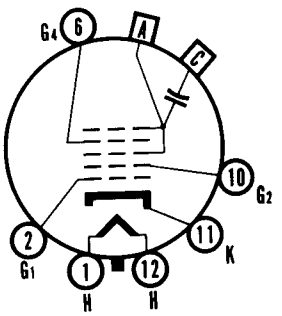
(Continued on Page 2)

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*

QUICK REFERENCE DATA

Television Picture Tube
14" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
Single Field Ion Trap
External Conductive Coating
Aluminized Screen





12-L

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
APRIL 1956

2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*
4. *For JETEC Ion Trap Magnet No. 117 with pole pieces centered over Grid No. 2 on mount, and rotated for maximum brightness.*
5. *For typical PM ion trap magnet with field strength tolerance of ±3 gausses.*

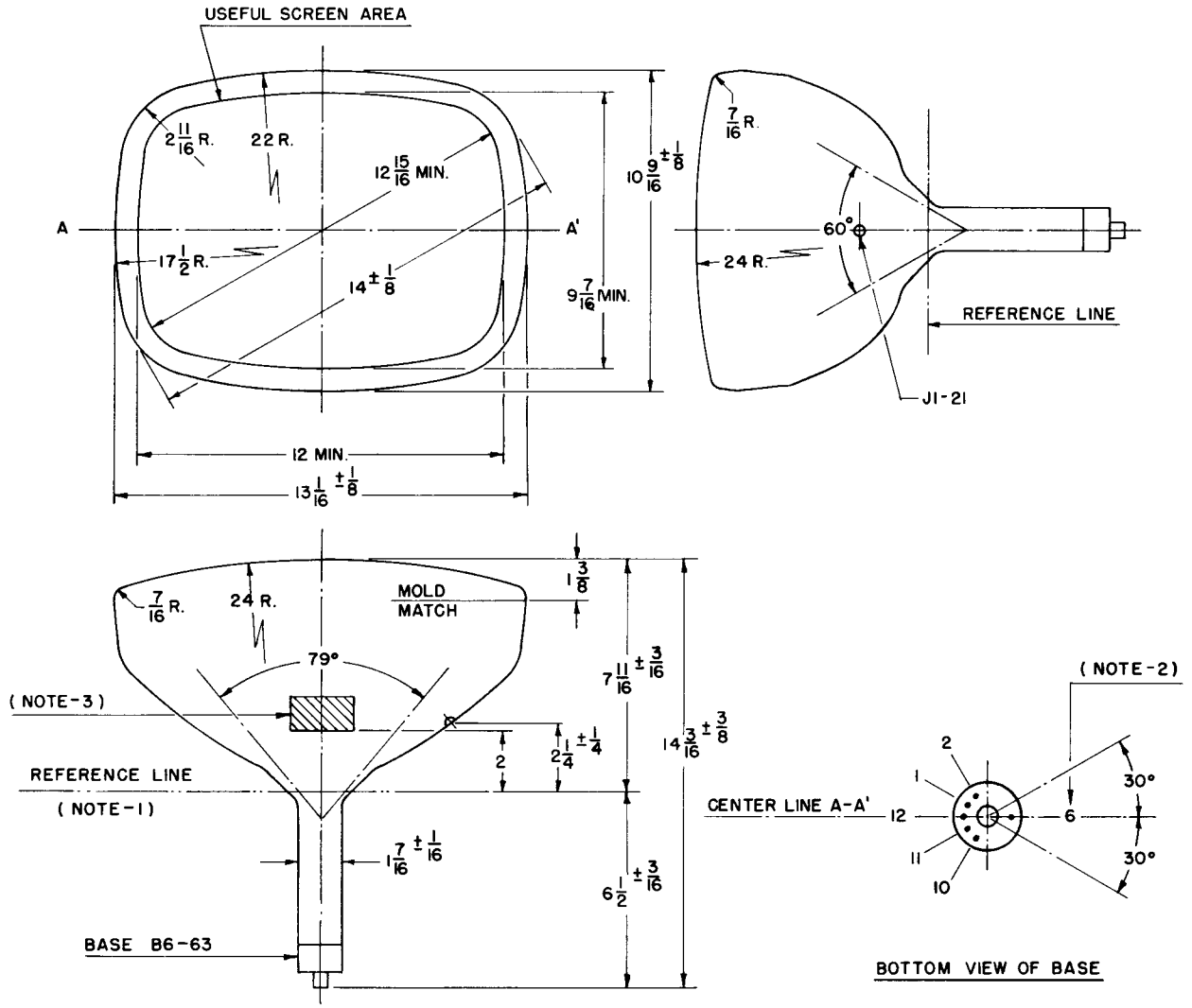


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone.*
2. *Base pin No. 6 aligns with anode contact terminal J1-21 within 30 degrees.*
3. *Contact area for external conductive coating, 2" x 2", located 90 degrees counterclockwise from anode contact as viewed from base end of tube.*
4. *Dimensions are in inches.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

RMA Release # 284 Nov. 7, 1941

HYGRADE SYLVANIA CORPORATION
TECHNICAL DATA
SYLVANIA TYPE 14W7

Amplifier Pentode

Physical Specifications

Coated Unipotential Cathode	
Base	Lock-In 8-pin
Bulb	T-9
Maximum Diameter	1 3/16"
Maximum Overall Length	2 25/32"
Maximum Seated Height	2 1/4"
Pin Connections:	RMA Basing 8BJ-L-5

Pin 1 - Heater	Pin 5 - Internal Shield & Grid #4
Pin 2 - Plate	Pin 6 - Grid #1
Pin 3 - Grids #2 & 3	Pin 7 - Cathode
Pin 4 - Cathode	Pin 8 - Heater

Mounting Position — Any

Direct Interelectrode Capacitances *

Grid to Plate	.0025	max	uuf
Input G1 to (F/K/G2&G3/G4)	9.5		uuf
Output P to (F/K/G2&G3/G4)	7.0		uuf

* With RMA tube shield M8-308 connected to cathode.

Ratings

Heater Voltage (ac or dc) (Nominal)	14.0	volts
Heater Current (Nominal)	0.240	ampere
Maximum Plate Voltage	300	volts
Maximum Screen Voltage	150	volts
Maximum Plate and Screen Dissipation (Total)	4.0	watts
Maximum Screen Dissipation	.8	watt

Typical Operating Conditions and Characteristics:

	Condition I **		Condition II **	
Heater Voltage	12.6		12.6	volts
Heater Current	0.225		0.225	ampere
Plate Voltage	300		300	volts
Screen Supply Voltage ***	150		300	volts
Screen Series Resistor	---		40,000	ohm
Suppressor Voltage	0		0	
Cathode Bias Resistor	160	min	160	min ohms
Plate Resistance	.3		.3	megohm
Mutual Conductance	5800		5800	umhos
Plate Current	10.0		10.0	ma.
Screen Current	3.9		3.9	ma.
Grid Voltage for Cathode Current Cut-Off	-6		-14	volts

** Conditions I and II represent operation with fixed screen supply and with series screen resistor respectively. Condition II gives an extended cut-off characteristic and should be used when gain is controlled by varying the bias.

*** When a screen supply voltage in excess of 150 volts is used a series screen resistor must be used to limit the voltage at the screen to 150 volts when the plate current is at its rated value of 10.0 milliamperes.

Note:

The d-c resistance of the grid circuit should not exceed 0.25 megohm when operated with fixed screen voltage source (Condition I). When a series screen resistor is used and full cathode bias, the d-c resistance in the grid circuit may be as high as 0.5 megohm. (Condition II).

11-5-41

SYLVANIA

engineering data service

SYLVANIA
14XP4
14XP4A

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angle (approx.)	
Horizontal	79 Degrees
Diagonal	85 Degrees
Phosphor	
14XP4	P4
14XP4A	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	78 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.450 ±5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	1500 μμf	Max.
	1100 μμf	Min.
Ion Trap Magnet	External, Single Field Type	

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	$12\frac{1}{16}$ x $9\frac{1}{2}$ Inches
Minimum Useful Screen Area	104 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	16,500 Volts dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts dc
Grid No. 2 Voltage	440 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	140 Volts dc
Negative Peak Value	180 Volts
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

TYPICAL OPERATING CONDITIONS

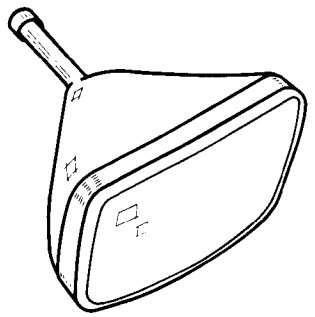
Anode Voltage	12,000 Volts dc
Grid No. 4 Voltage for Focus	−50 to +350 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[3]	−28 to −72 Volts dc
Ion Trap Magnet Current (Average)[4]	28 Ma dc
Field Strength of PM Ion Trap Magnet[5]	30 Gausses Min.

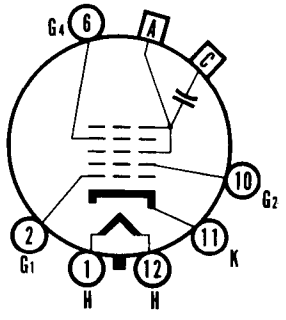
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Television Picture Tube
14" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
Single Field Ion Trap
External Conductive Coating
450 Ma Heater Current
14XP4A has Aluminized Screen





12-L

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION

SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

DEC. 1956

NOTES:

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 42 ohms.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*
4. *For JETEC Ion Trap Magnet No. 117 with pole pieces centered over Grid No. 2 on mount, and rotated for maximum brightness.*
5. *For typcial PM ion trap magnet with field strength tolerance of ±3 gausses.*

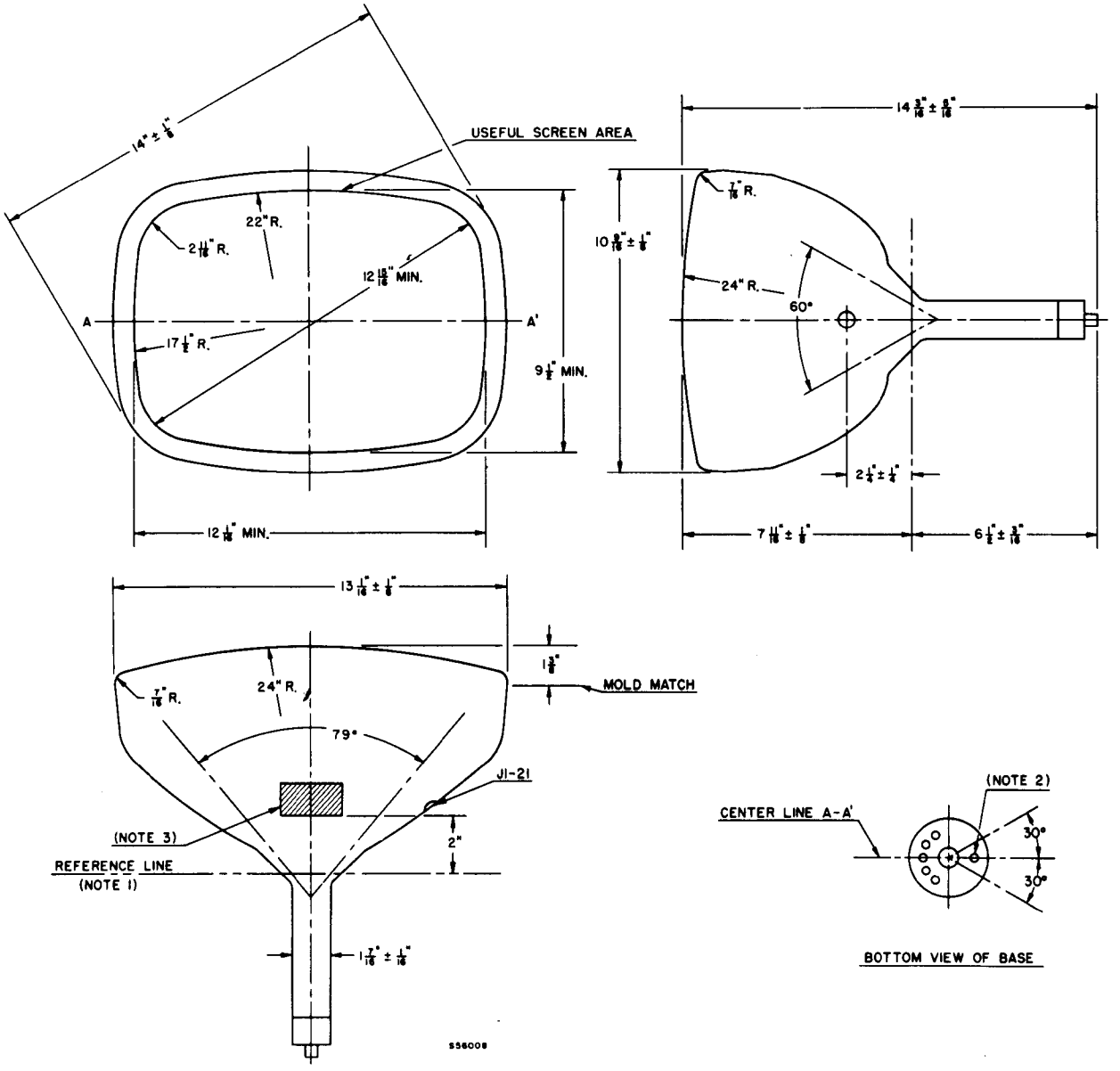


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone.*
2. *Base pin No. 6 aligns with anode contact terminal J1-21 within 30 degrees.*
3. *Contact area for external conductive coating, 2" x 2", located 90 degrees counterclockwise from anode contact as viewed from base end of tube.*
4. *Dimensions are in inches.*

14XP4A

The Sylvania Type 14XP4A is identical to Type 14XP4 except it has an aluminized screen.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

HYGRADE SYLVANIA CORPORATION

TECHNICAL DATA

SYLVANIA TYPE 14Y4

Full-Wave High Vacuum Rectifier

Physical Specifications

Coated Unipotential

Base	Locking-In 8-Pin
Bulb	T-9
Maximum Diameter	1 3/16"
Maximum Overall	2 25/32"
Maximum Seated Height	2 1/4"
Pin Connection	RMA Basing No. 5AB-L-0

Pin 1 - Heater	Pin 5 - No Connection
Pin 2 - No Connection	Pin 6 - Diode Plate #1
Pin 3 - Diode Plate #2	Pin 7 - Cathode
Pin 4 - Internal Connection	Pin 8 - Heater

Mounting Position: Any

Ratings

Heater Voltage (Nominal) (ac or dc)	14.0	volts
Heater Current (Nominal)	0.320	Ampere
Maximum Peak Inverse Voltage	1250	volts
Maximum DC Heater to Cathode Potential	450	volts
Maximum Steady-State Peak Plate Current per plate	210	ma
Tube voltage drop: Measured with applied DC at 70 ma. per plate	22	volts

Typical Operating Conditions — Full-Wave Rectifier

Condenser Input To Filter

Heater Voltage	12.6	volts
Heater Current	0.300	ma.
AC Plate Voltage per plate (RMS)	325	Max. volts
DC Output Current	70	Max. ma.
Total effective plate supply impedance per plate ø	150	Min. ohms

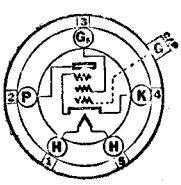
Choke Input to Filter

Heater Voltage	12.6	Volts
Heater Current	0.300	ma.
AC Plate Voltage per plate (RMS)	450	Max. volts
DC Output Current	70	Max. ma.
Minimum Value of Input Choke	8.0	henrys

ø When filter condensers larger than 40 mfds. are used it may be necessary to add additional plate supply impedance.

9-27-40

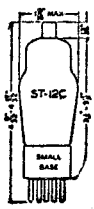
from RMA release #254, Oct. 7, 1940



Sylvania

TYPE 15

PENTODE H. F.
DEUX VOLTS



CARACTERISTIQUES

Tension de chauffage CC	2,0 volts
Courant de chauffage	0,22 ampère
Ampoule	ST-12C
Culot : petit 5 broches	5-F
Position de montage	Toutes

Capacités directes interélectrodes :

Grille à plaque	0,01 $\mu\mu$F
Entrée	2,35 $\mu\mu$F
Sortie	7,80 $\mu\mu$F

Conditions de fonctionnement et caractéristiques :

Tension de chauffage	2,0	2,0 volts
Tension de plaque	67,5	135 volts
Tension grille	—1,5	—1,5 volts
Tension écran	67,5	67,5 volts
Courant plaque	1,85	1,85 ma.
Courant écran	0,30	0,30 ma.
Résistance interne	0,63	0,8 mégohm
Conductance mutuelle	710	750 μmhos
Coefficient d'amplification	450	600

APPLICATION

Le type 15 est un tube à chauffage indirect, batterie, amplificateur pentode H.F. et détecteur.

Quelques applications des plus importantes suivent:

1. Premier détecteur oscillateur, dans un récepteur superhétérodyne;

2. Second détecteur où les caractéristiques pentode et la polarisation automatique peuvent être utilisées;

3. Dans tout circuit où la polarisation automatique et où une connexion séparée de la cathode est d'importance;

4. Le tube 15 peut être utilisé sur alternatif, lorsque la tension filament-cathode n'est pas trop élevée et que l'économie de consommation est importante.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic
Phosphor*	P7
Fluorescence	Blue-White
Phosphorescence	Yellow
Persistence	Long
Faceplate	Gray Filter Glass
Transmittance (Approx.)	76 Percent

*In addition to the P7 screen shown, the 16AMP7 can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10 % Amperes
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	7 μμf
Grid No. 1 to All Other Electrodes	8 μμf
Between Deflecting Plates 1-2	4 μμf
Between Deflecting Plates 3-4	3 μμf
Deflecting Plate 1 to All Other Electrodes	12.5 μμf
Deflecting Plate 2 to All Other Electrodes	12.5 μμf
Deflecting Plate 3 to All Other Electrodes	8.5 μμf
Deflecting Plate 4 to All Other Electrodes	8.5 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	15 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Neck Contacts (Small Ball)	J1-25
Bulb	C129 Exp. 14 or Equiv.
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14Q
Weight (Approx.)	20 Pounds
J1-21 Contact Aligns with Trace D3-D4	±10 Degrees
J1-21 Contact Aligns with Pin No. 11	
J1-25 Contact (A2) Aligns with D1-D2 Trace	±2 ½ Degrees
D3-D4 Trace Aligns with Pin No. 11	±10 Degrees
Positive Voltage on D1 Deflects Beam Approx. Toward Pin No. 8	
Positive Voltage on D3 Deflects Beam Approx. Toward Pin No. 4	
Angle Between D1-D2 and D3-D4 Traces	90 ± 1 Degrees

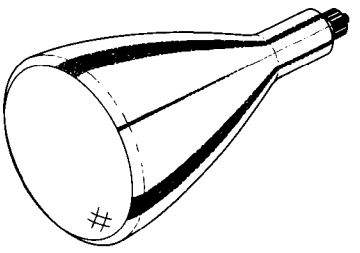
RATINGS

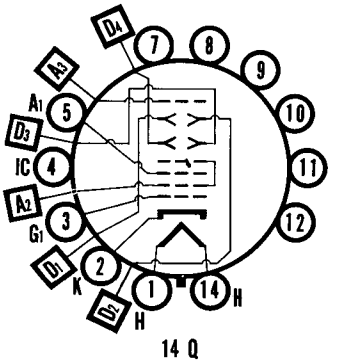
MAXIMUM RATINGS (Absolute Maximum Ratings)

Anode Input[1]	6 Watts	
Anode No. 3 (Post Accelerator) Voltage	17,600 Volts	dc
Anode No. 2 Voltage	8800 Volts	dc
Anode No. 1 (Focusing Electrode) Voltage	3300 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	330 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	
Peak Voltage Between Anode No. 2 and Any Deflecting Plate	1650 Volts	
Ratio Post Accelerator Voltage to Anode Voltage	2:1	

QUICK REFERENCE DATA

Oscilloscope Tube
16″ Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Post Deflection Acceleration
Aluminized Screen





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SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

JULY, 1965

File Under

SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode No. 3 (Post Accelerator) Voltage	12,000 Volts	dc
Anode No. 2 Voltage	7500 Volts	dc
Anode No. 1 Voltage for Focus	1760 – 2670 Volts	dc
Grid No. 1 Voltage Required for Cutoff[2]	–160 to –240 Volts	dc
Deflection Factors[3]		
Deflecting Plates 1-2	96 to 150 Volts	dc/Inch
Deflecting Plates 3-4	96 to 150 Volts	dc/Inch
Modulation[4]	37 Volts	Max.
Line Width "A"[4]	.5 mm	
Focus Electrode Current[4]	–25 to +25 μa	dc
Spot Position, Undeflected	Within 20 mm	Square

CIRCUIT VALUES

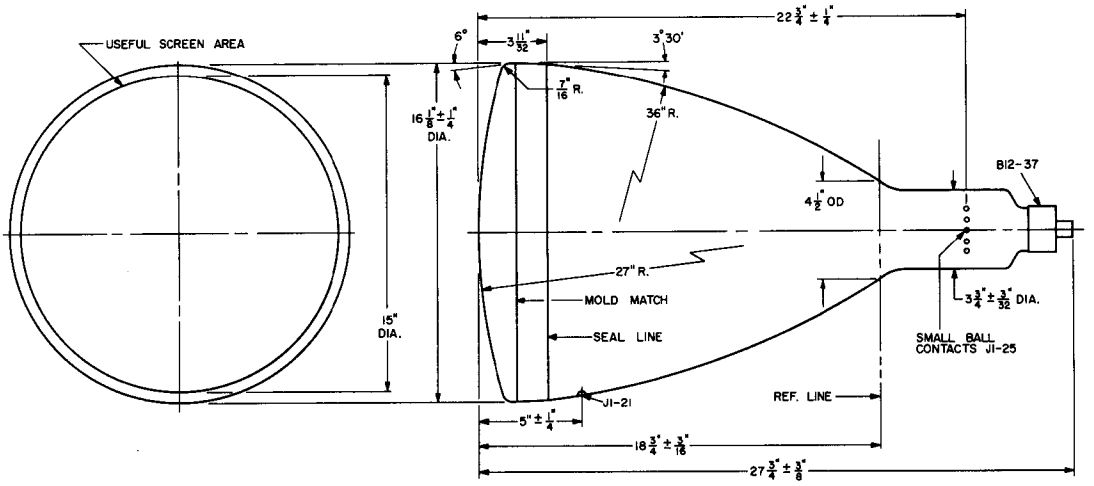
Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Resistance in Any Deflection Plate Circuit	5.0 Megohms Max.

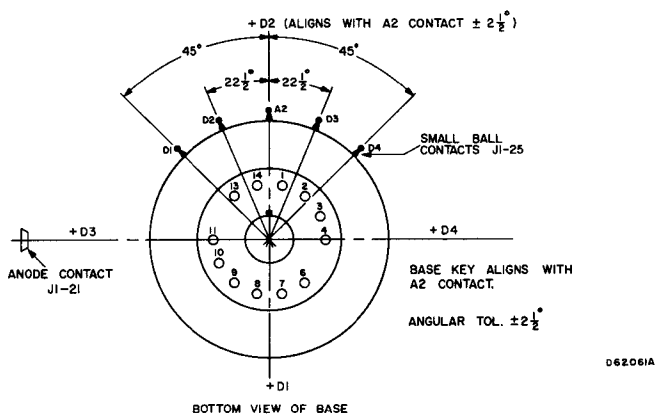
NOTES:

1. *Anode input equals the product of Anode No. 2 voltage and average Anode No. 2 current.*
2. *For visual extinction of undeflected focused spot.*
3. *Deflection Plates 1 and 2 are nearer the screen.*
4. *Measured in accordance with MIL-E-1 specification at a post accelerator current (Ia3) equal to 25 μa.*

X-RAY WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's maximum anode voltage or 16,000 volts, whichever is less.





CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	103 Degrees
Diagonal	114 Degrees
Vertical	88 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	60 Percent
Type 16AQP4 has External Surface of Safety Plate Treated to Reduce Specular Reflection	

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating to Anode[2]	1200 pf	Max.
	800 pf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	10 ¼ Inches
Width	12 15/16 Inches
Diagonal	14 7/8 Inches
Area	125 Sq. Inches
Neck Length	4 1/8 ± 1/8 Inches
Overall Length	10 7/16 ± 5/16 Inches
Bulb	J125A
Safety Plate (16ANP4)	FP125A
Safety Plate (16AQP4)	Same, Anti-Reflection Treated
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (Approx.)	9 ½ Pounds

RATINGS

MAXIMUM RATINGS (Design Maximum Values)

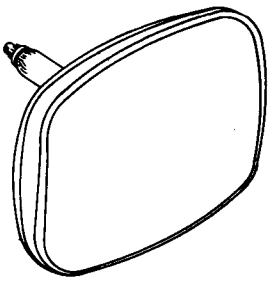
Grid Drive Service[3]

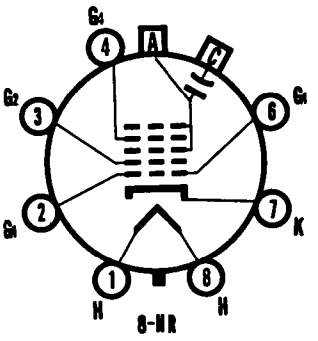
Anode Voltage		
Maximum	18,000 Volts	dc
Minimum	10,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Secs.	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
16" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
No Ion Trap
External Conductive Coating

16AQP4—Anti-Reflection Treated





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE
OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
JUNE, 1963

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) (Continued)

Cathode Drive Service[4]

Anode Voltage		
Maximum	18,000 Volts	dc
Minimum	10,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−400 to +1250 Volts	dc
Grid No. 2 Voltage	700 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]

Anode Voltage	14,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−33 to −70 Volts	dc

Cathode Drive Service[4]

Anode Voltage	14,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Cathode Voltage Required for Cutoff[5]	+31 to +57 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to cathode unless indicated otherwise.*
4. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
5. *Visual extinction of focused raster. For cutoff of the undeflected focused spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

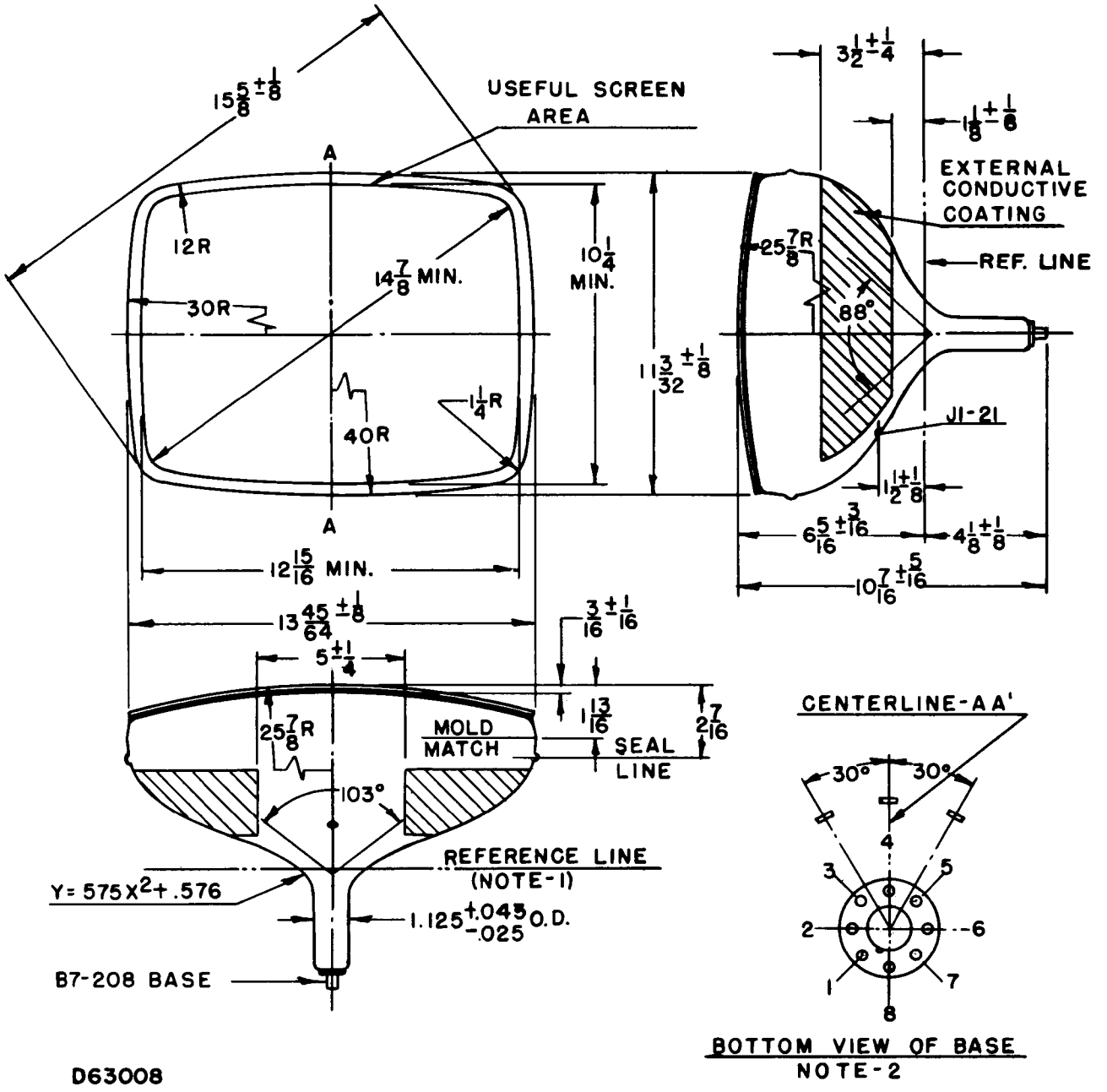


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge when the gauge is seated against the bulb.*
2. *Base pin No. 4 aligns with vertical centerline (A-A') within 30° and is on same side as anode contact (J1-21).*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	103 Degrees
Diagonal	114 Degrees
Vertical	88 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	60 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.30 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating to Anode[2]	1200 pf	Max.
	800 pf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	10 ¼ Inches
Width	12 15/16 Inches
Diagonal	14 7/8 Inches
Minimum Useful Screen Area	125 Sq. Inches
Neck Length	4 3/8 ± 1/8 Inches
Overall Length	10 11/16 ± 5/16 Inches
Bulb	J125A
Safety Plate	FP125A
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (Approx.)	9 ½ Pounds

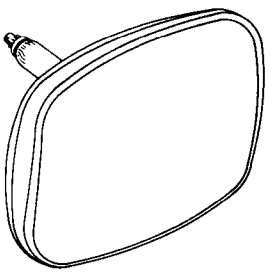
RATINGS

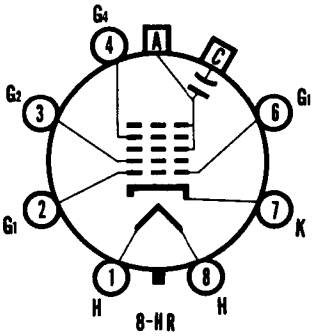
MAXIMUM RATINGS (Design Maximum Values)

Cathode Drive Service[3]		
Anode Voltage		
Maximum	18,000 Volts	dc
Minimum	10,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-400 to +1250 Volts	dc
Grid No. 2 Voltage	70 Volts	dc
Cathode Voltage		
Positive Bias Value	100 Volts	dc
Positive Peak Value	150 Volts	
Negative Bias Value	0 Volt	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
16″ Direct Viewed
Rectangular Glass Type
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
Low Grid No. 2 Voltage
114° Magnetic Deflection
No Ion Trap
External Conductive Coating
6.3 Volt/300 Ma Heater





SYLVANIA
ELECTRONIC TUBES

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PICTURE TUBE
OPERATIONS

SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

DECEMBER, 1963

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS

Cathode Drive Service[3]		
Anode Voltage	14,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	50 Volts	dc
Cathode Voltage Required for Cutoff[4]	+30 to +48 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
4. *Visual extinction of focused raster. For cutoff of the undeflected focused spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

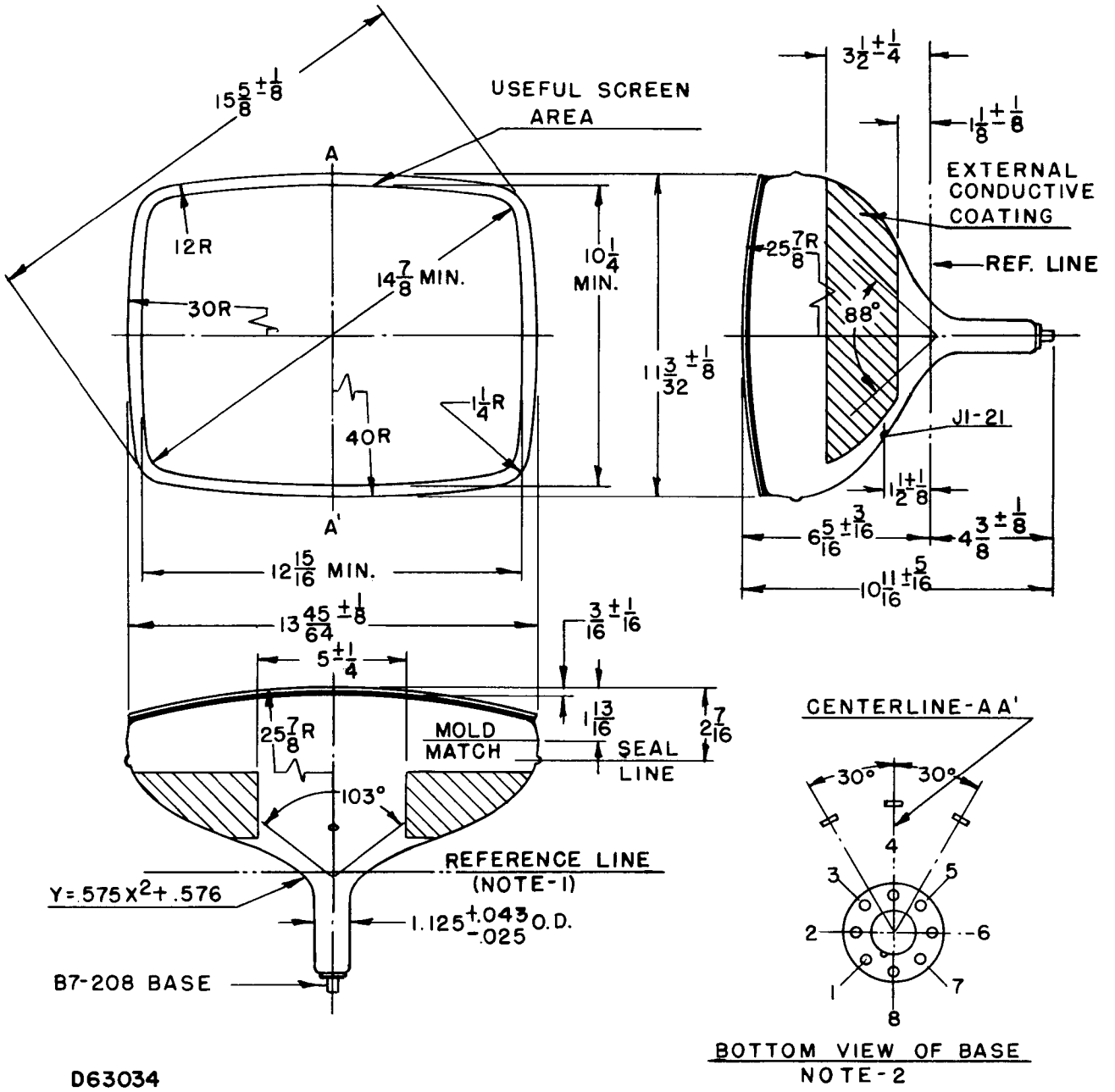


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with vertical centerline (A-A') within 30° and is on same side as anode contact (J1-21).*
3. *Dimensions are in inches.*

SYLVANIA

engineering data service

SYLVANIA
17ATP4
/17AVP4
17ATP4A
/17AVP4A

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	
17ATP4/17AVP4	P4
17ATP4A/17AVP4A	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	71 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode	1500 μμf	Max.
	1200 μμf	Min.
Ion Trap Magnet	External, Single Field Type	

MECHANICAL DATA

Minimum Useful Screen Dimensions	14 5/16 x 11 1/8 Inches
Minimum Useful Screen Area (approx.)	149 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L
Weight (approx.)	13½ Pounds

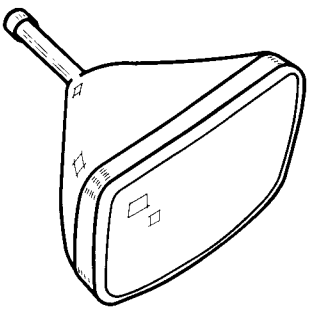
RATINGS

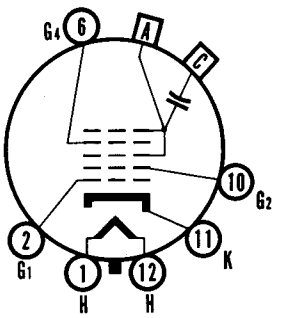
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	17,600 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	
Grid No. 1 Voltage		
Negative Bias Value	140 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
Single Field Ion Trap
External Conductive Coating
17ATP4A/17AVP4A has
Aluminized Screen





12-L

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION

SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JUNE, 1957

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000 Volts	dc
Grid No. 4 Voltage	−56 to +310 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−28 to −72 Volts	dc
Ion Trap Magnet Current (Average)[4]	28 Ma	dc
Field Strength of PM Ion Trap Magnet[5]	31 Gausses	Min.

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.

NOTES:

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*
2. *External Conductive Coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*
4. *For JETEC Ion Trap Magnet No. 117, with pole pieces centered over Grid No. 2 on mount, and rotated for maximum brightness.*
5. *For Typical PM Ion Trap Magnet with field strength tolerance of ± 3 gausses.*

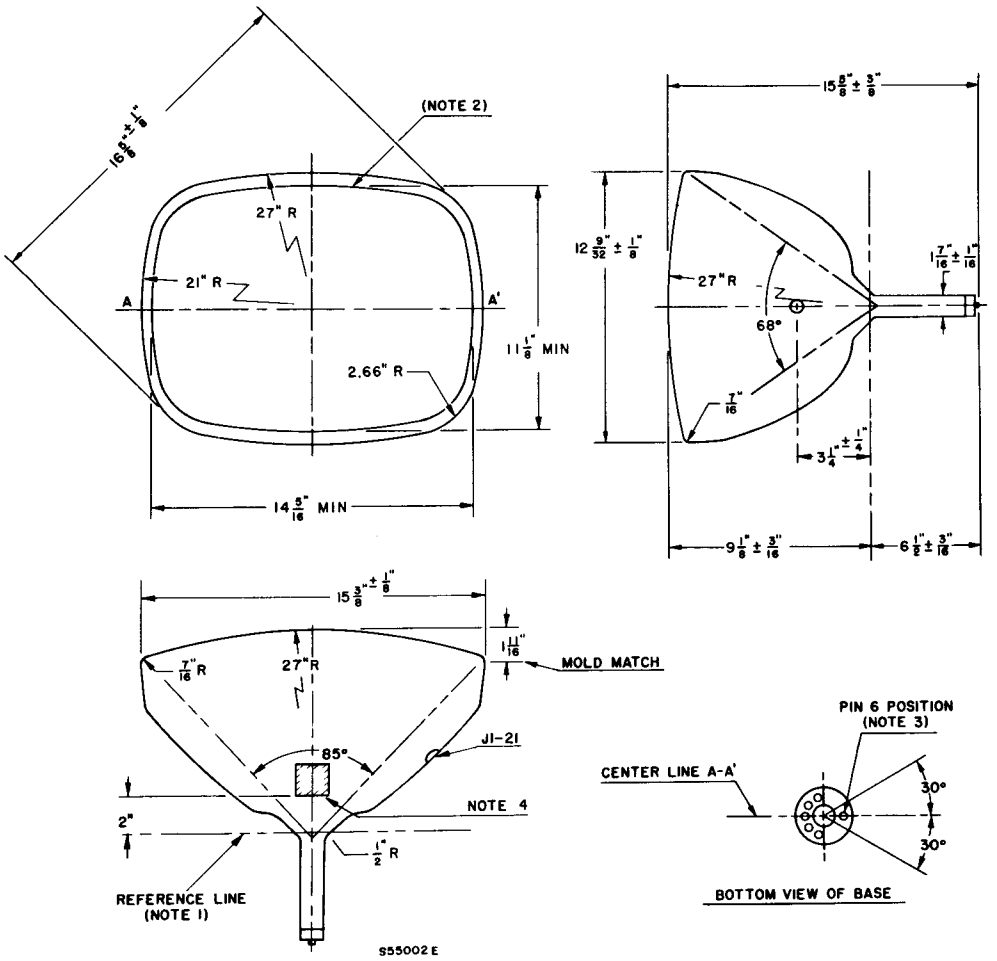


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone. The neck diameter near the cone may exceed 1.500" but is limited by the internal contour of the yoke reference line gauge.*
2. *Useful screen area.*
3. *Anode contact aligns with pin No. 6 ±30 degrees.*

17ATP4A/17AVP4A

The Sylvania Type 17ATP4A/17AVP4A is identical to the Type 17ATP4/17AVP4 except it has an aluminized screen.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

SYLVANIA

engineering data service

17BP4
17BP4A

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflecting Angle (approx.)	
Horizontal	66 Degrees
Diagonal	70 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	66 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	10¾ x 14¼ Inches
Bulb Contact, (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12D

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	16,000 Volts dc
Grid No. 2 Voltage	410 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage:	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	410 Volts dc
After Equipment Warm-up Period	150 Volts dc
Heater Positive with Respect to Cathode	150 Volts dc

RECOMMENDED OPERATING CONDITIONS

Anode Voltage[1]	14,000 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	-33 to -77 Volts dc
Focusing Coil Current[3] (approx.)	95 Ma dc
Ion Trap Magnet Field Strength (approx.)	40 Gausses

CIRCUIT VALUES

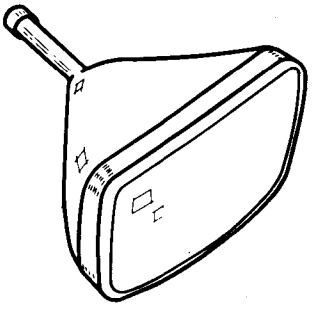
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

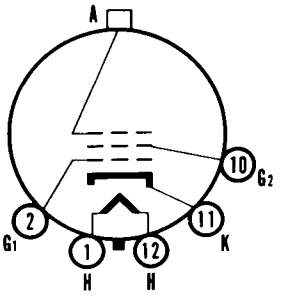
NOTES:

1. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than this value.*
2. *Visual extinction of undeflected focused spot.*
3. *For JETEC focusing coil 109 or equivalent three inches from reference line, bias adjusted to 20 foot lamberts on a 10¾ x 14¼ inch picture area sharply focused at center of screen.*

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Gray Filter Glass
Magnetic Deflection
Magnetic Focus
Single Field Ion Trap
(17BP4A Has External Conductive Coating)





12-D

SYLVANIA ELECTRIC PRODUCTS INC.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

MAY 1952

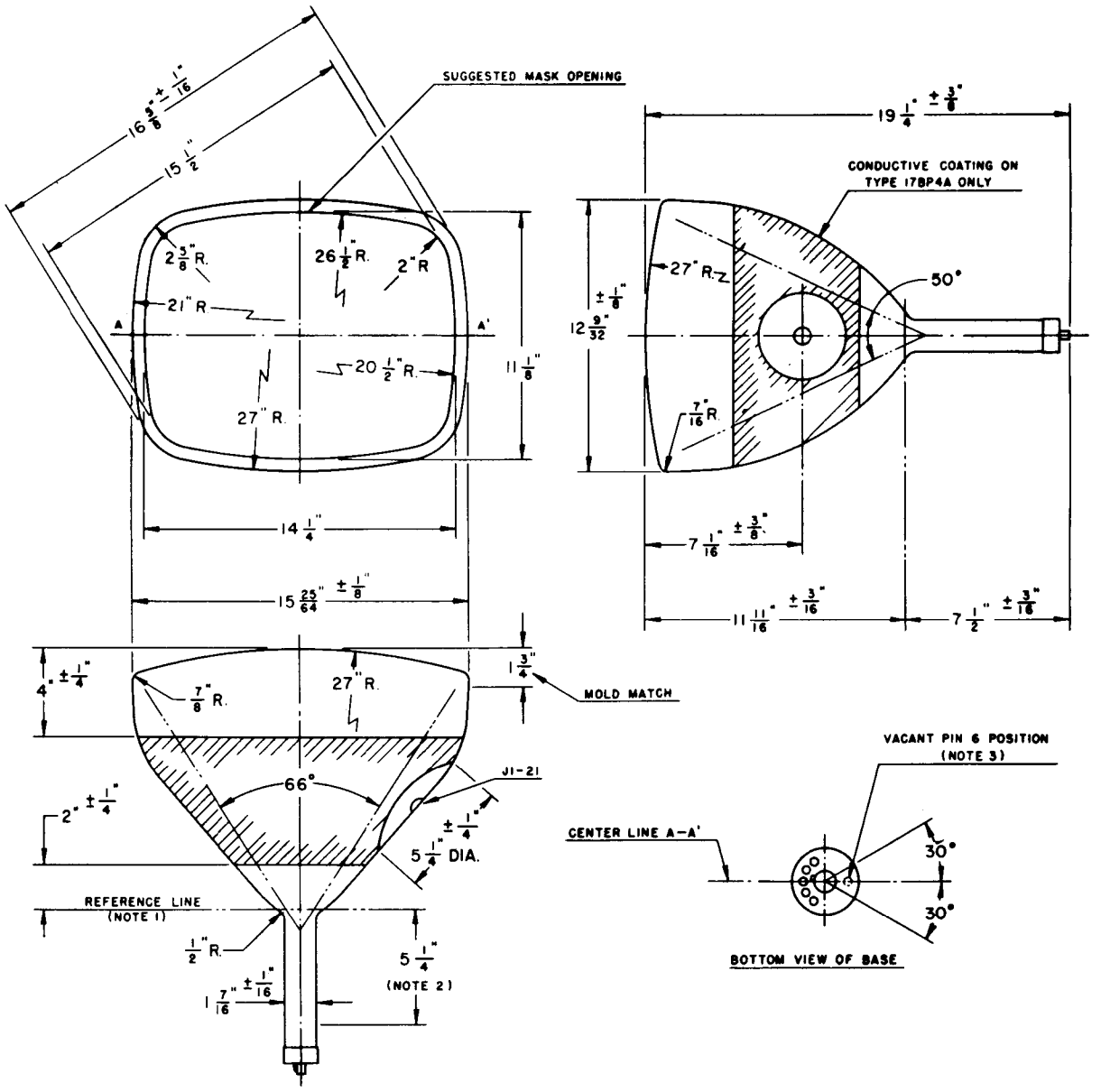


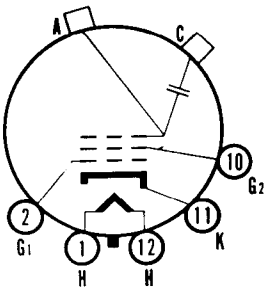
DIAGRAM NOTES:

1. *Reference line is determined by the plane of the upper edge of the reference line gauge (RTMA No. 110) when the gauge is resting on the glass cone.*
2. *Nominal position of ion trap magnet.*
3. *Anode contact aligns with vacant pin position No. 6 ±30 degrees.*

17BP4A

The Sylvania Type 17BP4A is equivalent to the Type 17BP4 except for the addition of an external conductive coating.

External Conductive Coating to Anode Capacitance	
Maximum	1500 μμf
Minimum	750 μμf
Basing	12N



12-N

NOTES:

1. *External conductive coating must be grounded.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	105 Degrees
Diagonal	110 Degrees
Vertical	87 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	79 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ±5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	1500 μμf	Max.
	1000 μμf	Min.
Ion Trap Magnet	External, Single Field Type	

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	$14\frac{3}{4}$ x $11\frac{11}{16}$ Inches
Minimum Useful Screen Area	155 Sq Inches
Bulb	J132½ A1
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-185
Basing	7FA
Weight (approx.)	10 Pounds

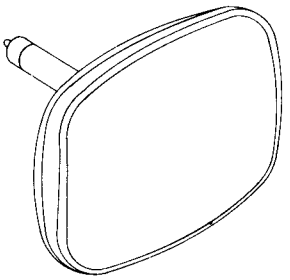
RATINGS

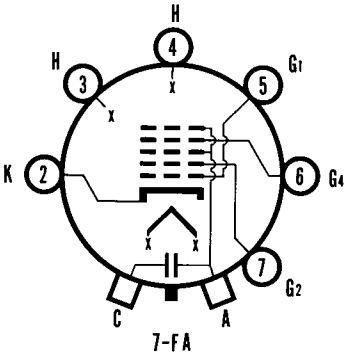
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	17,600 Volts dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts dc
Grid No. 2 Voltage	550 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	154 Volts dc
Negative Peak Value	220 Volts
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

QUICK REFERENCE DATA

Television Picture Tube
17″ Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1⅛″ Neck Diameter
Single Field Ion Trap
External Conductive Coating





SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
APRIL, 1957

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000 Volts dc
Grid No. 4 Voltage for Focus	−50 to +350 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts dc
Field Strength of PM Ion Trap Magnet[4]	33 Gausses Min.

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Meoghms Max.

NOTES:

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*
4. *For typical PM ion trap magnet with field strength tolerance of ±3 gausses.*

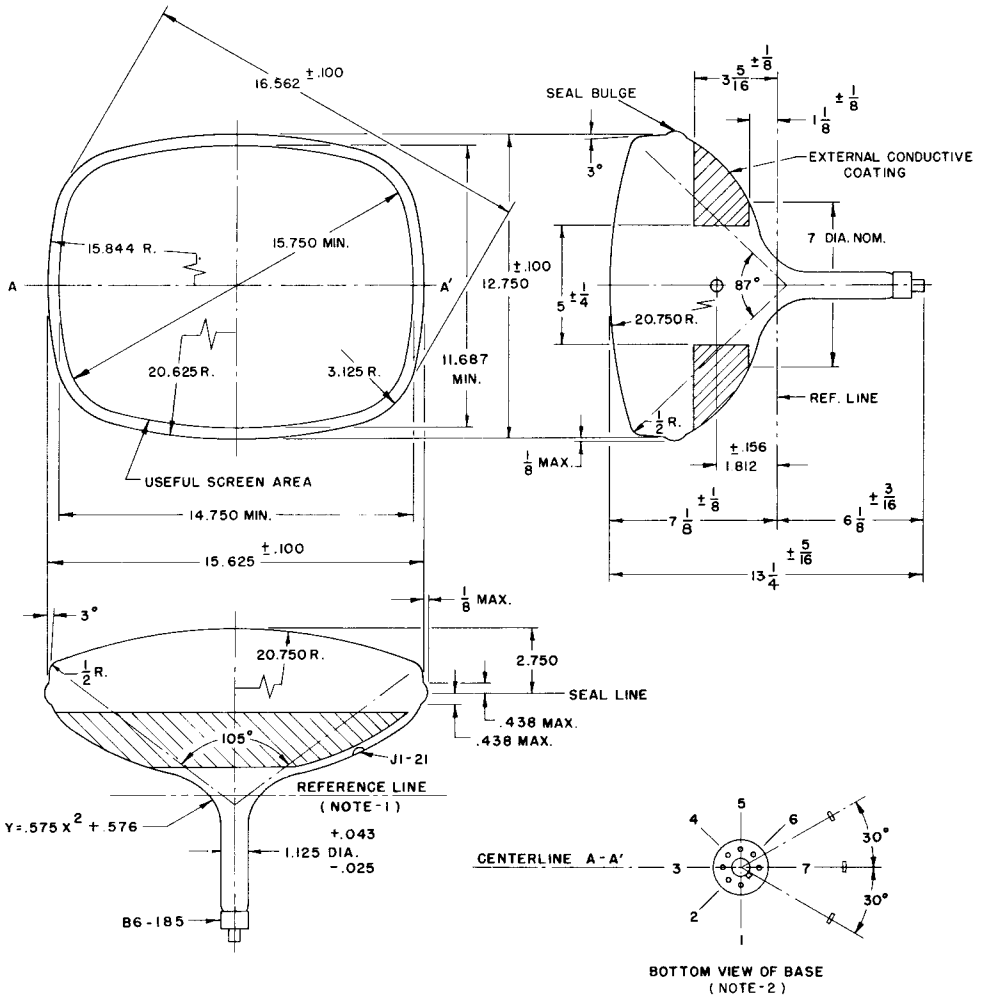


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JETEC No. 126 Reference Line Gauge when the gauge is seated against the bulb.*
2. *Base pin No. 7 aligns with anode contact (J1-21) within 30°*
3. *Dimensions are in inches.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

SYLVANIA

engineering data service

17BWP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	105 Degrees
Diagonal	110 Degrees
Vertical	87 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	79 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	1500 μμf	Max.
	1000 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	$14\frac{3}{4}$ x $11\frac{11}{16}$ Inches
Minimum Useful Screen Area	155 Sq. Inches
Bulb	J132 1/2A1
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-185
Basing	7FA
Weight (approx.)	10 Pounds

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

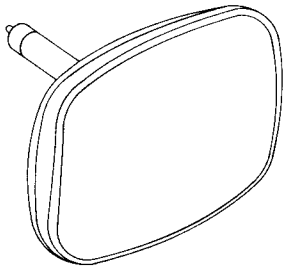
Anode Voltage	17,600 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	154 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

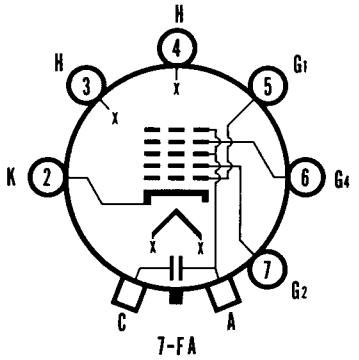
TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000 Volts	dc
Grid No. 4 Voltage for Focus	−50 to +350 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts	dc

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1⅛" Neck Diameter
No Ion Trap
External Conductive Coating





SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JUNE, 1957

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

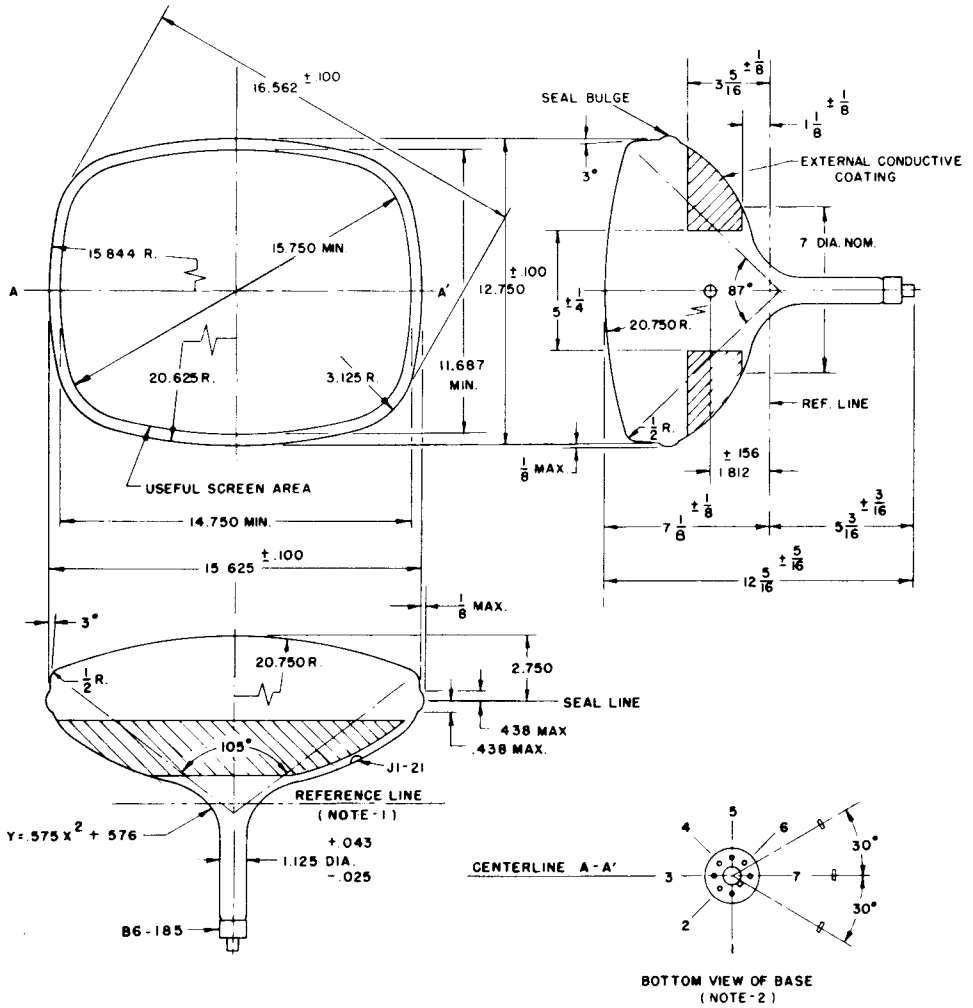


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JETEC No. 126 Reference Line Gauge when the gauge is seated against the bulb.*
2. *Base pin No. 7 aligns with anode contact (J1-21) within 30°.*
3. *Dimensions are in inches.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

engineering data service

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (approx.)		
Horizontal	105	Degrees
Diagonal	110	Degrees
Vertical	87	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	77 ±3	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.450 ±5%	Ampere
Heater Warm-up Time [1]	11	Seconds
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5	µµf
Grid No. 1 to All Other Electrodes	6	µµf
External Conductive Coating to Anode [2]	1500	µµf Max.
	1000	µµf Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	14 3/4 x 11 11/16	Inches
Minimum Useful Screen Area	155	Sq. Inches
Bulb	J132 1/2A1 or equivalent	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B6-185	
Basing	7FA	
Weight (approx.)	10	Pounds

RATINGS

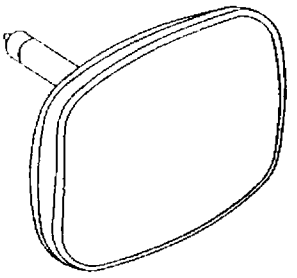
MAXIMUM RATINGS (Absolute Maximum Values)

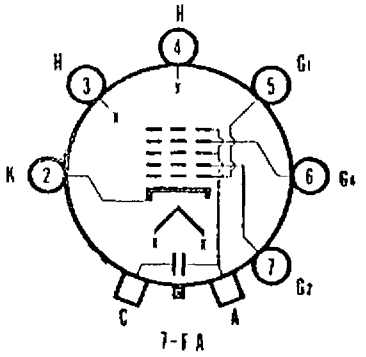
Anode Voltage	17,600	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts	dc
Grid No. 2 Voltage	550	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	154	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	

from JETEC release #1969, July 1, 1957

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1 1/8" Neck Diameter
No Ion Trap
External Conductive Coating
6.3 Volt, 450 Ma Heater





SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

June 5, 1957

MAXIMUM RATINGS (Absolute Maximum Values) (Cont'd.)

Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450	Volts
After Equipment Warm-up Period	200	Volts
Heater Positive with Respect to Cathode	200	Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000	Volts	dc
Grid No. 4 Voltage for Focus	0 to 400	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff [3]	-35 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

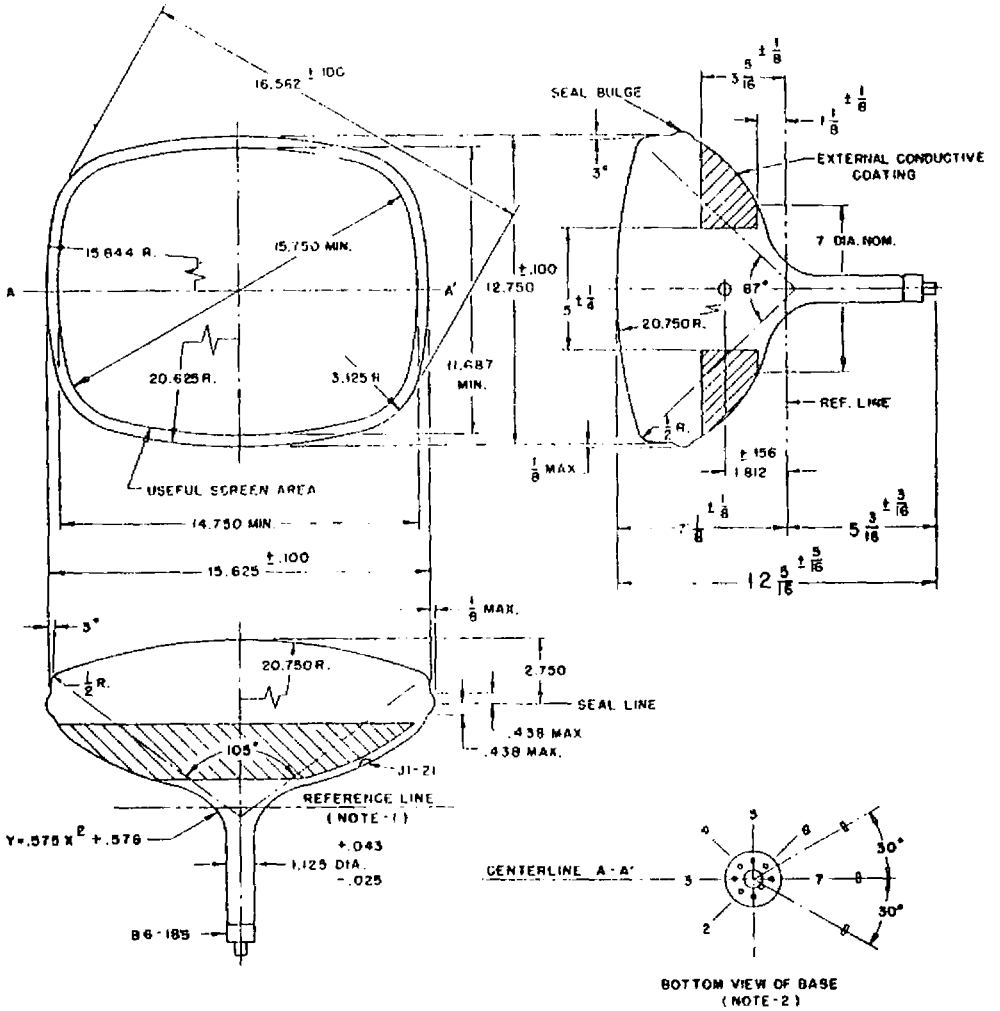


DIAGRAM NOTES:

1. Reference line is determined by plane C-C' of JETEC No. 126 Reference Line Gauge when the gauge is seated against the bulb.
2. Base pin No. 7 aligns with anode contact (J1-21) within 30°.
3. Dimensions are in inches.

SYLVANIA

engineering data service 17CAP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	105 Degrees
Diagonal	110 Degrees
Vertical	87 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	79 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	1500 μμf	Max.
	1000 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	$14\frac{3}{4}$ x $11\frac{11}{16}$ Inches
Minimum Useful Screen Area	155 Sq. Inches
Bulb	J132 ½ A1 or Equiv.
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-183
Basing	8HR
Weight	10 Pounds Approx.

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

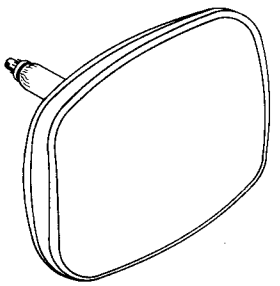
Anode Voltage	17,600 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	154 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

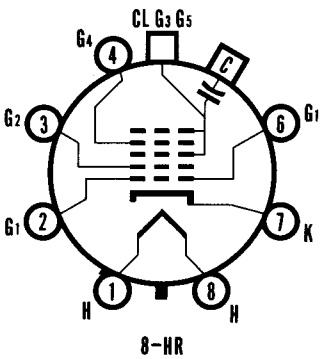
TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000 Volts	dc
Grid No. 4 Voltage for Focus	−50 to +350 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts	dc

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1⅛" Neck Diameter
No Ion Trap
External Conductive Coating





8-HR

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JUNE, 1957

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

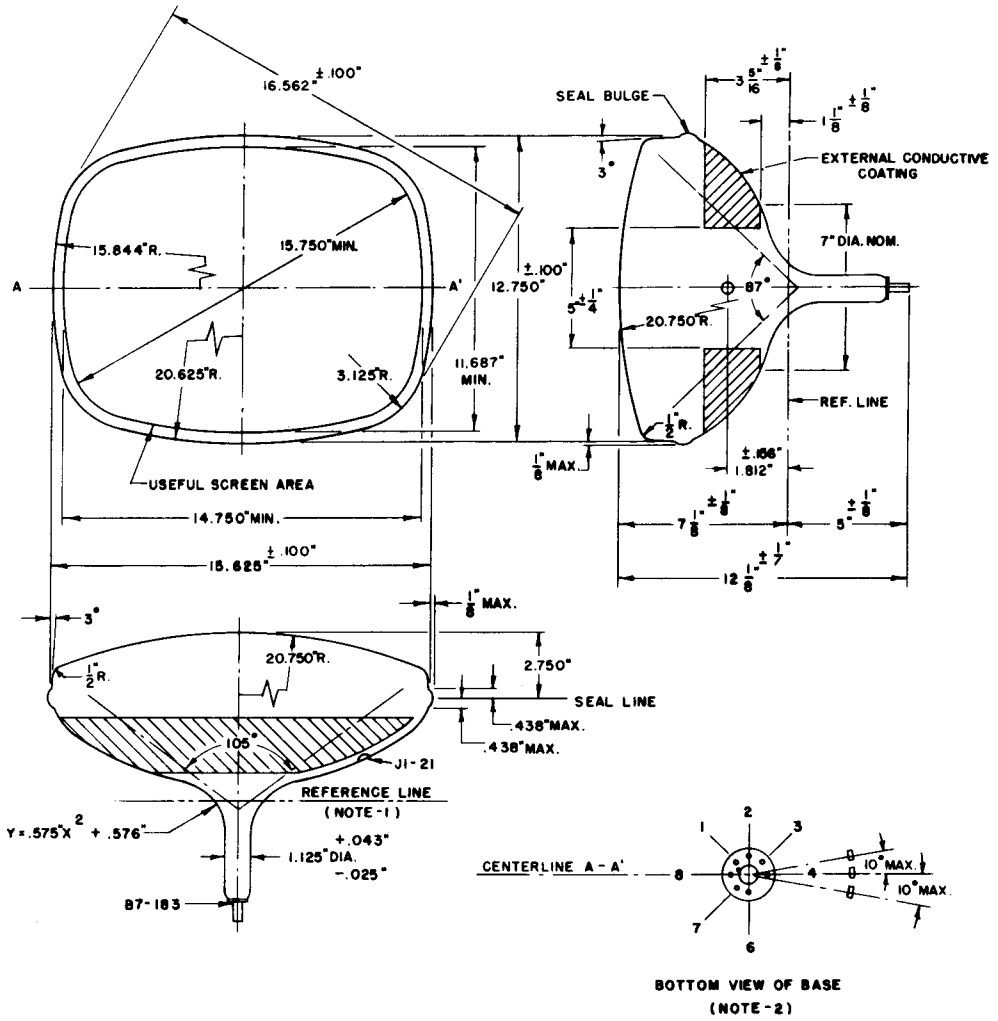


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JETEC No. 126 Reference Line Gauge when the gauge is seated against the bulb.*
2. *Base pin No. 4 aligns with horizontal centerline of tube, within 10°, and is on the same side of tube as anode contact (J1-21).*
3. *Dimensions are in inches.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

SYLVANIA

engineering data service 17CFP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	77 ±3 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ±5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	1500 μμf	Max.
	1200 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	14¾ x 11 11/16 Inches
Minimum Useful Screen Area	155 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-63
Basing	12L
Weight (approx.)	10½ Pounds

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	17,600 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

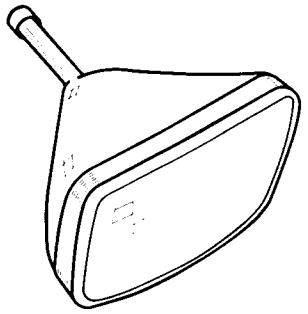
Anode Voltage	14,000 Volts	dc
Grid No. 4 Voltage for Focus	−50 to +350 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts	dc

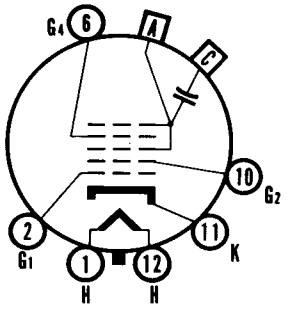
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
90° Magnetic Deflection
Short Neck Tube
No Ion Trap
External Conductive Coating





12-L

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JULY, 1957

NOTES:

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

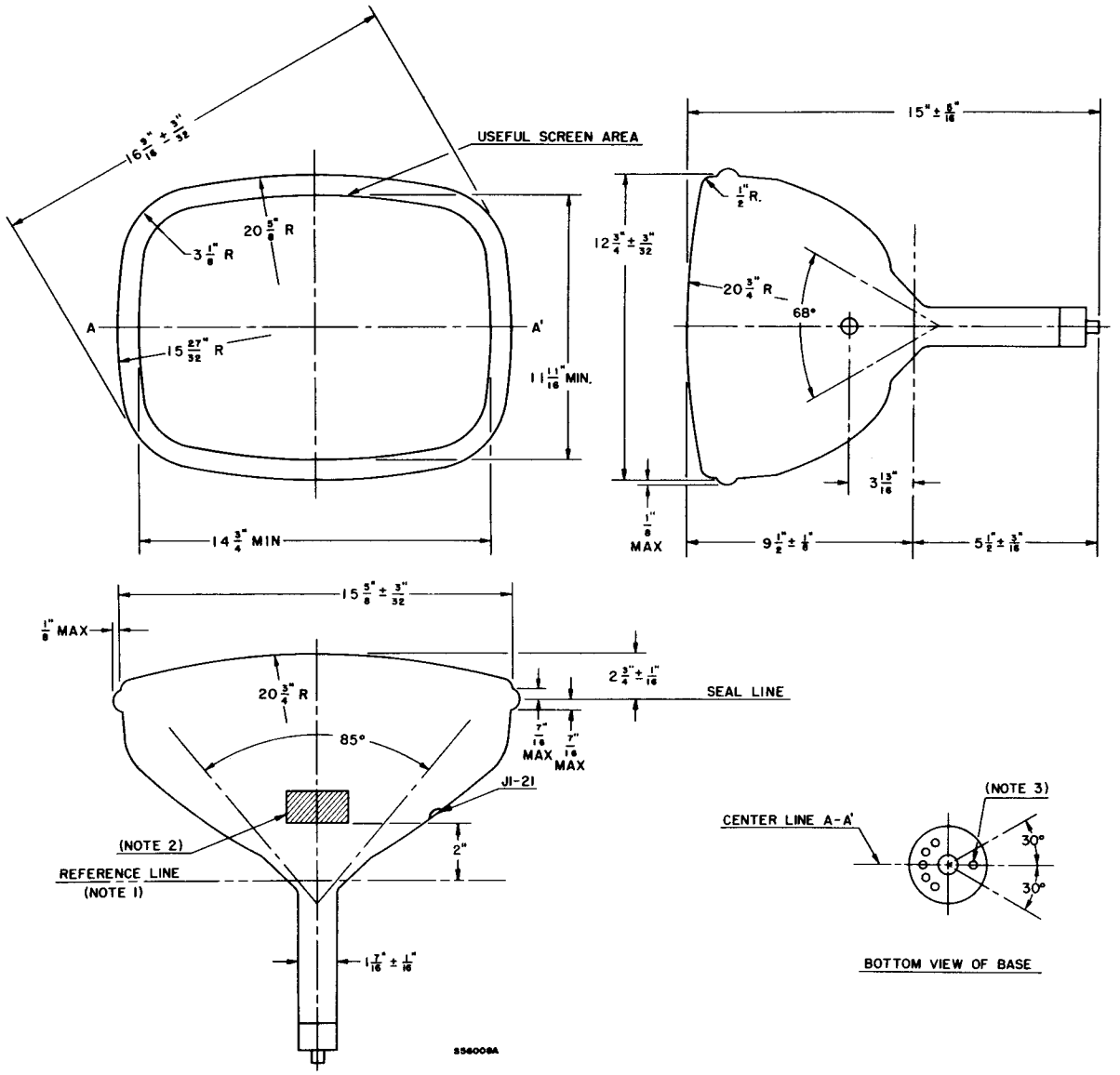


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C¹ of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone.*
2. *Contact area for external conductive coating, 2" x 2", located 90° counter-clockwise from anode contact as viewed from base end of tube.*
3. *Anode contact aligns with pin position No. 6 ±30 degrees.*

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (approx.)		
Horizontal	85	Degrees
Diagonal	90	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistance	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	74	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 5%	Ampere
Heater Warm-up Time [1]	11	Seconds
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5	µµf
Grid No. 1 to All Other Electrodes	6	µµf
External Conductive Coating to Anode[2]	1500	µµf Max.
	1000	µµf Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions	14 5/16 x 11 1/8	Inches
Minimum Useful Screen Area	149	Sq. Inches
Bulb	J133F or J133G	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duodecal 6-Pin)	B6-63	
Basing	12L	

RATINGS

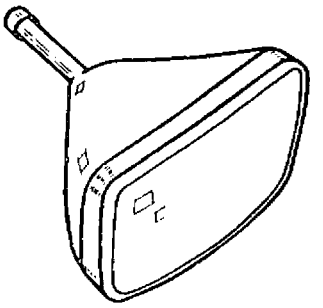
MAXIMUM RATINGS (Absolute Maximum Values)[3]

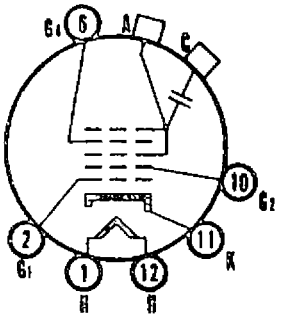
Anode Voltage	17,600	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts	dc
Grid No. 2 Voltage	70	Volts	dc
Cathode Voltage			
Positive Bias Value	150	Volts	dc
Negative Peak Value	0	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period Not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

from JETEC release #2042, Nov. 11, 1957

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
No Ion Trap
External Conductive Coating
Aluminized Screen
Short Neck Tube
Cathode Drive Design
Low Grid No. 2 Voltage





12-L

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

September 19, 1957

TYPICAL OPERATING CONDITIONS [3]

Anode Voltage	14,000	Volts	dc
Grid No. 4 Voltage	0 to +400	Volts	dc
Grid No. 2 Voltage	50	Volts	dc
Cathode Voltage Required for Cutoff[4]	35 to 50	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.

2. External conductive coating must be grounded.

3. This type is designed and rated for cathode-drive service. All voltages shown are positive with respect to Grid No. 1 voltage unless otherwise indicated.

4. For visual extinction of focused raster. Extinction of stationary focused spot will require that these values be increased approximately 5 volts.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

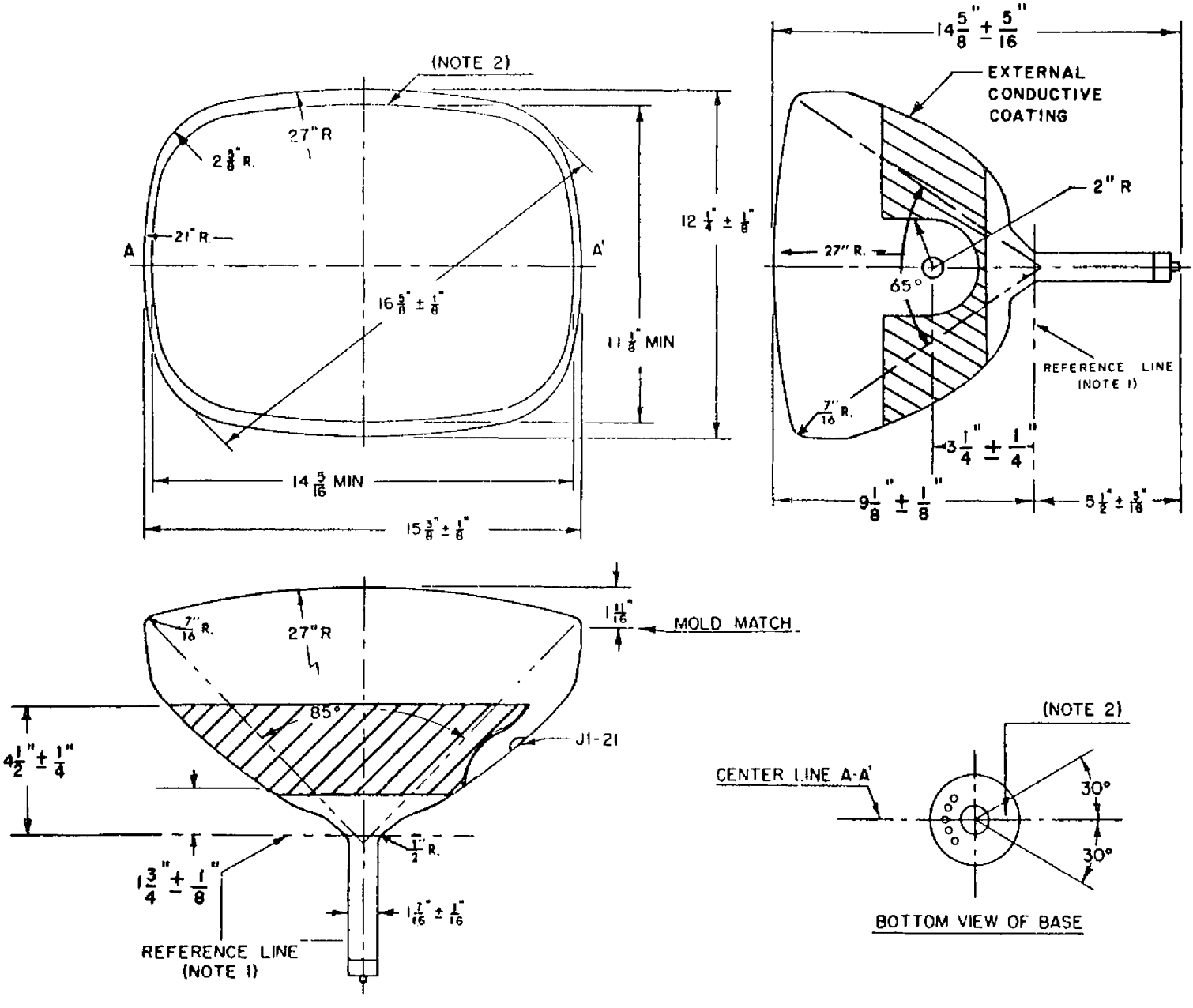


DIAGRAM NOTES:

1. Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone.

2. Anode contact aligns with pin position No. 6 ± 30 degrees.

from JETEC release #2042, Nov. 11, 1957

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (approx.)		
Horizontal	85	Degrees
Diagonal	90	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	77	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 5%	Ampere
Heater Warm-up Time [1]	11	Seconds
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	6	μμf
External Conductive Coating to Anode [2]	1500	μμf Max.
	1000	μμf Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	14 3/4 x 11 11/16	Inches
Minimum Useful Screen Area	155	Sq. Inches
Bulb:	J132 1/2 C or Equivalent	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duodecal 6-Pin)	B6-63	
Basing	12L	
Weight (approx.)	10 1/2	Pounds

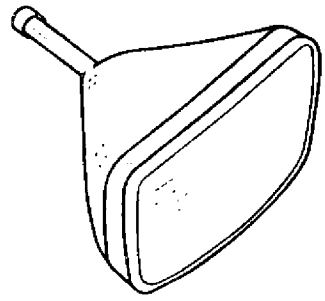
RATINGS

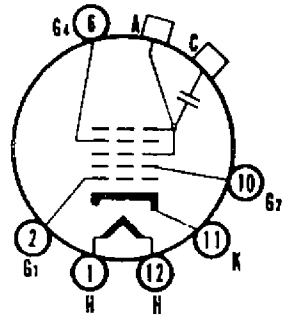
MAXIMUM RATINGS (Absolute Maximum Values) [3]

Anode Voltage	17,600	Volts dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts dc
Grid No. 2 Voltage	70	Volts dc
Cathode Voltage		
Positive Bias Value	150	Volts dc
Negative Peak Value	0	Volts
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450	Volts
After Equipment Warm-up Period	200	Volts
Heater Positive with Respect to Cathode	200	Volts

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
90° Magnetic Deflection
Short Neck Tube
No Ion Trap
External Conductive Coating
Cathode Drive Design
Low Grid No. 2 Voltage





12-1

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION

SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

September 18, 1957

TYPICAL OPERATING CONDITIONS [3]

Anode Voltage	14,000	Volts dc
Grid No. 4 Voltage for Focus	0 to +400	Volts dc
Grid No. 2 Voltage	50	Volts dc
Cathode Voltage Required for Cutoff [4]	35 to 50	Volts dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms Max.

NOTES:

1. Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.

2. External conductive coating must be grounded.

3. This type is designed for cathode-drive service. All voltages shown are positive with respect to Grid No. 1 Voltage, unless otherwise indicated.

4. For visual extinction of focused raster. Extinction of stationary focused spot will require that these values increase approximately 5 volts.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

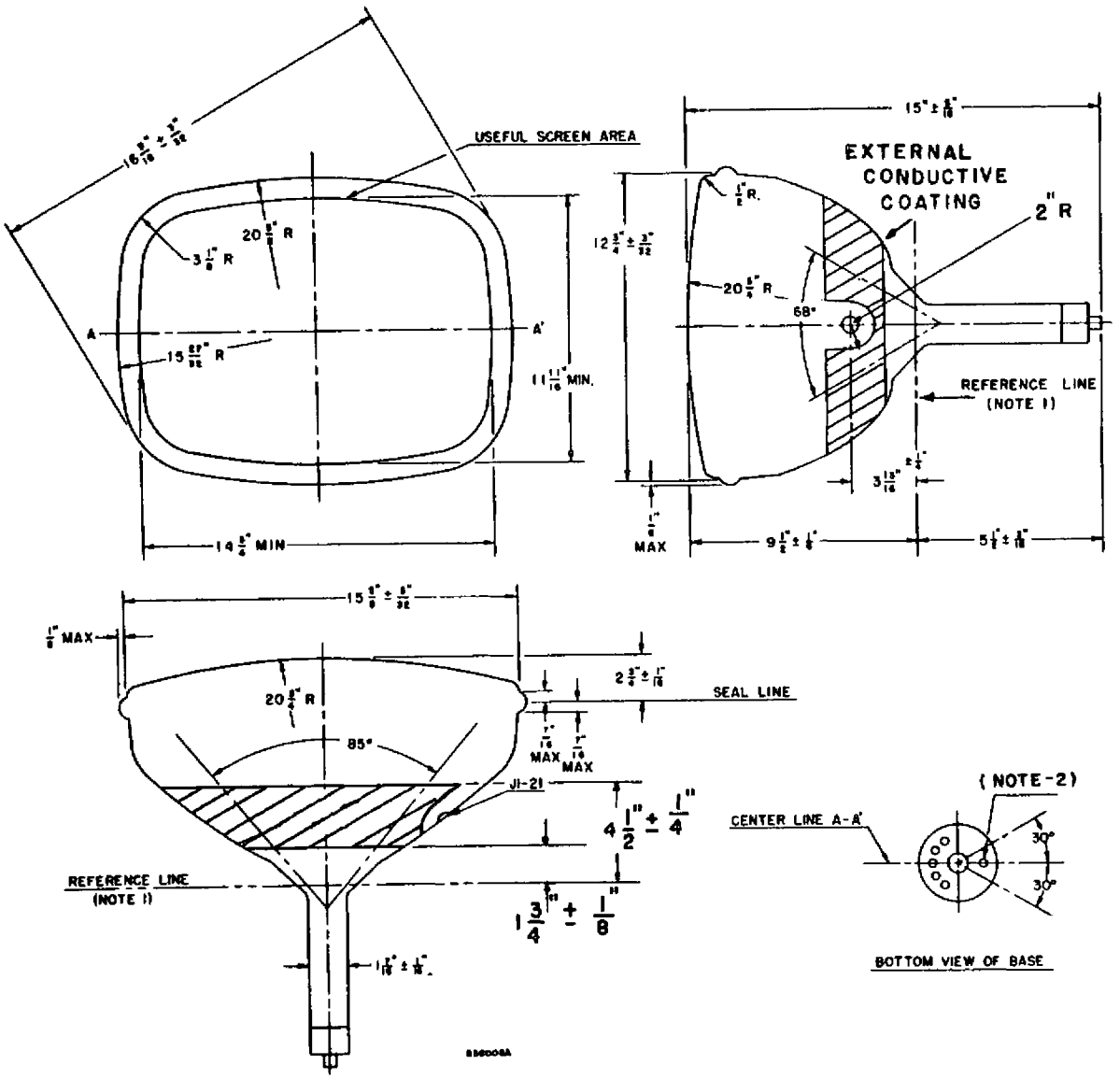


DIAGRAM NOTES:

1. Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone.

2. Anode contact aligns with pin position No. 6 ± 30 degrees.

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	105 Degrees
Diagonal	110 Degrees
Vertical	87 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	77 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	1400 μμf	Max.
	900 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	14¾ x 11$^{11}/_{16}$ Inches
Minimum Useful Screen Area	155 Sq. Inches
Bulb	J132 ½A1 or J132 ½B1
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-185
Basing	7FA
Weight (approx.)	10 Pounds

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	17,600 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	154 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

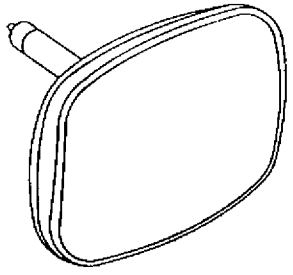
TYPICAL OPERATING CONDITIONS

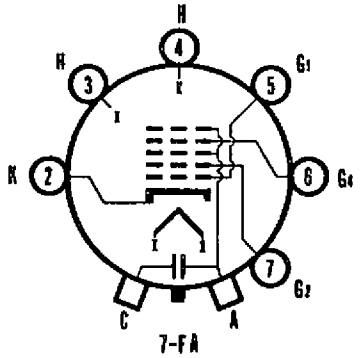
Anode Voltage	14,000 Volts	dc
Grid No. 4 Voltage for Focus	-50 to +350 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	-35 to -72 Volts	dc

from JETEC release #2056, Dec. 9, 1957

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1⅛" Neck Diameter
No Ion Trap
External Conductive Coating





SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
November 1, 1957

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

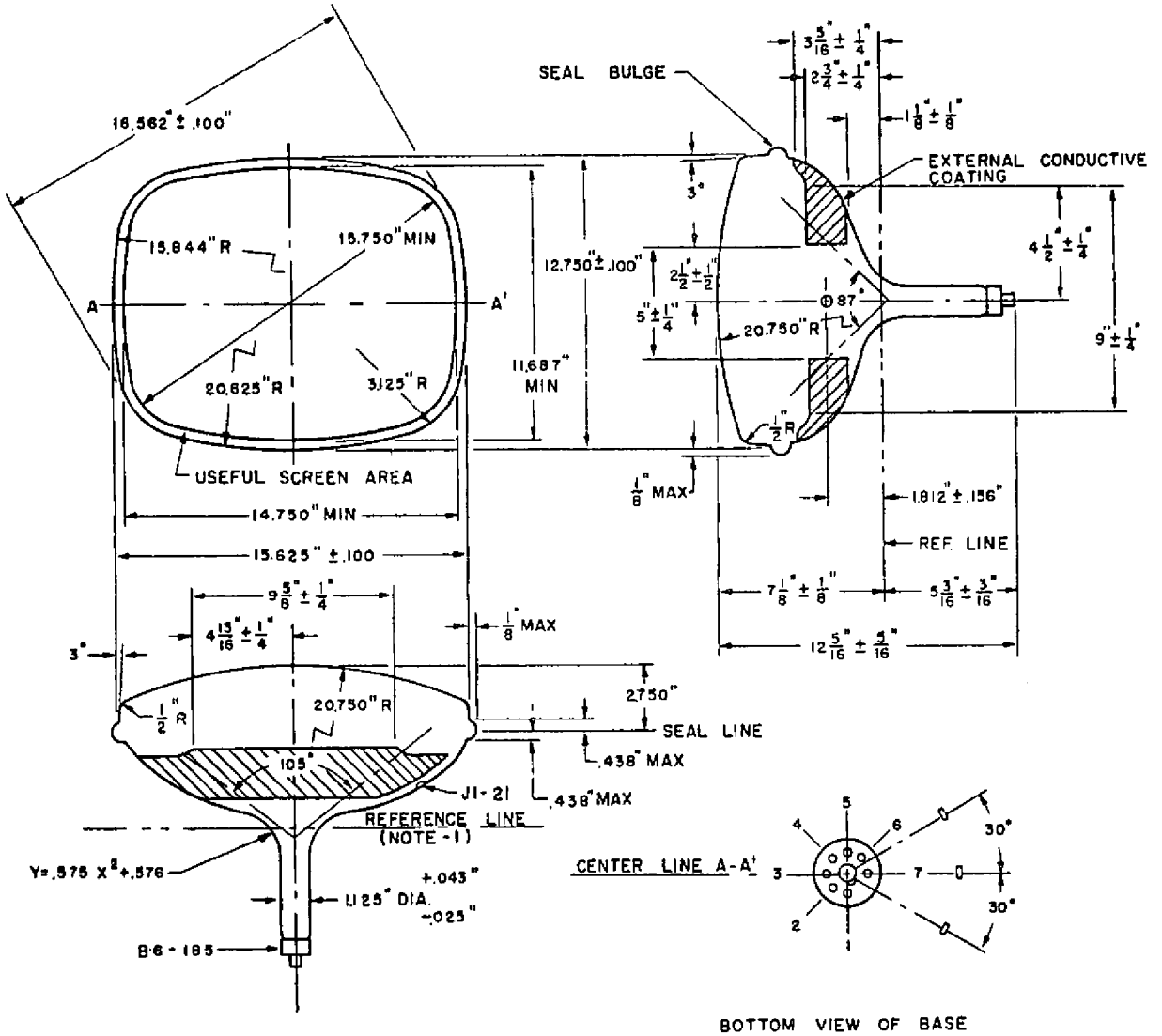


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JETEC No. 126 Reference Line Gauge when the gauge is seated against the bulb.*
2. *Base pin No. 7 aligns with anode contact (J1-21) within 30°.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (approx.)		
Horizontal	105	Degrees
Diagonal	110	Degrees
Vertical	87	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	77	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts	
Heater Current	0.45 ±5%	Ampere	
Heater Warm-up Time [1]	11	Seconds	
Direct Interelectrode Capacitances (approx.)			
Cathode to All Other Electrodes	5	μμf	
Grid No. 1 to All Other Electrodes	6	μμf	
External Conductive Coating to Anode [2]	1500	μμf	Max.
	1000	μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	14 3/4 x 11 11/16	Inches
Minimum Useful Screen Area	155	Sq. Inches
Bulb	J132 1/2-A or J132 1/2-B	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-183	
Basing	8HR	
Weight (approx.)	10	Pounds

RATINGS

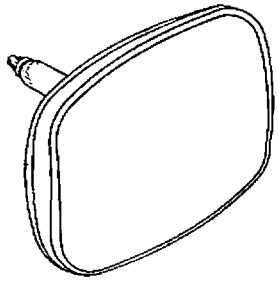
MAXIMUM RATINGS (Absolute Maximum Values)

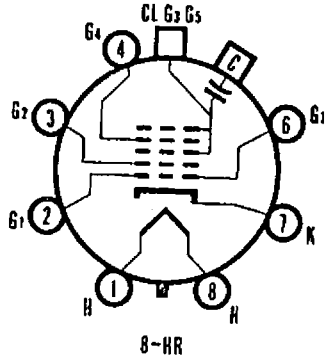
Anode Voltage	17,600	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts	dc
Grid No. 2 Voltage	550	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	154	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	

from JETEC release #2095, Feb. 3, 1958

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1 1/8" Neck Diameter
No Ion Trap
External Conductive Coating
6.3 Volt, 450 Ma Heater





8-HR

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

January 13, 1958

MAXIMUM RATINGS (Absolute Maximum Values) (Cont'd.)

Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000	Volts	dc
Grid No. 4 Voltage for Focus	0 to 400	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff [3]	-35 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

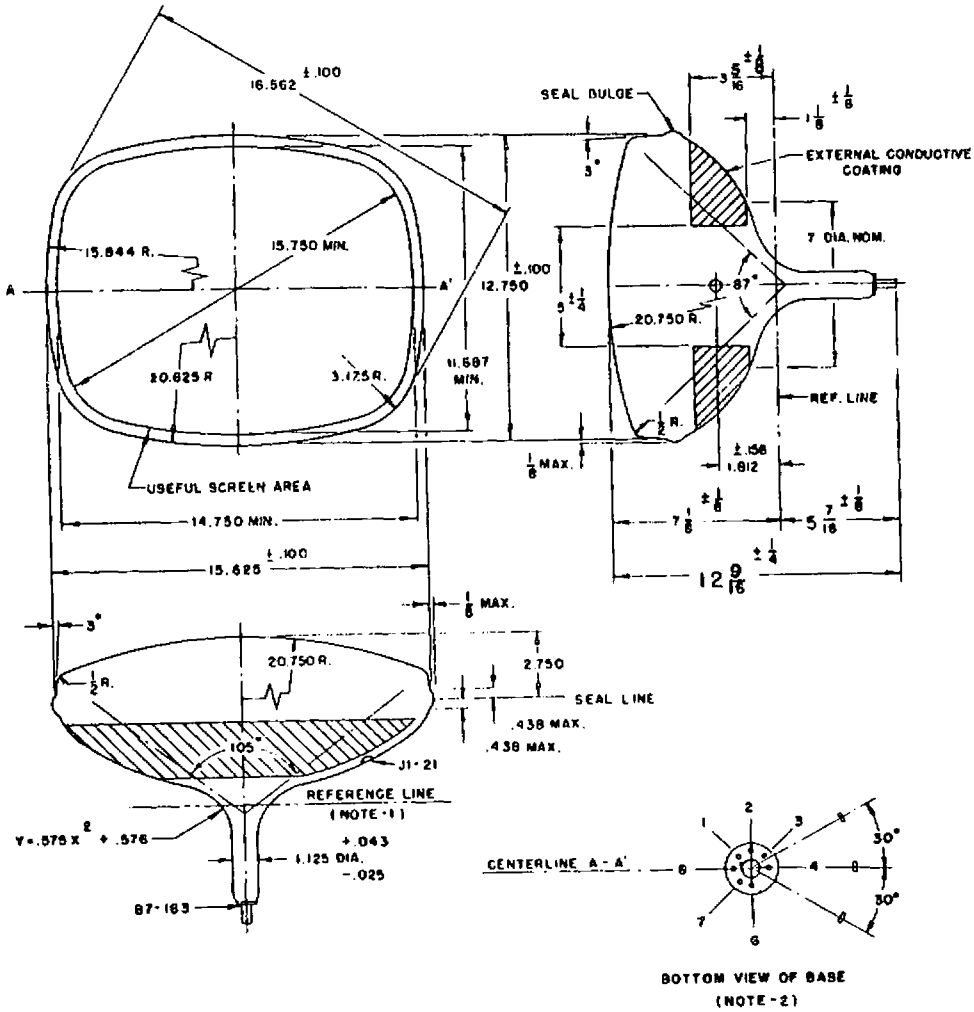


DIAGRAM NOTES:

1. Reference line is determined by plane C-C^1 of JETEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.

2. Base pin No. 4 aligns with anode contact (J1-21) within 10°.

3. Dimensions are in inches.

from JETEC release #2173, May 5, 1958

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	77 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.3 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 µµf	
Grid No. 1 to All Other Electrodes	6 µµf	
External Conductive Coating to Anode[2]	1500 µµf	Max.
	1200 µµf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	14 ¾ x 11 11/16 Inches
Minimum Useful Screen Area	155 Sq. Inches
Bulb	J132½C or Equivalent
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-63 or B6-203
Basing	12L
Weight (Approx.)	10½ Pounds

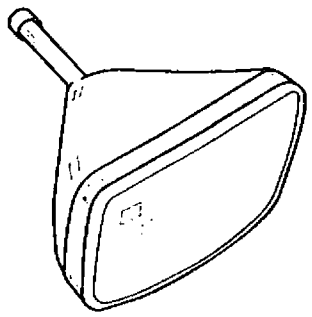
RATINGS

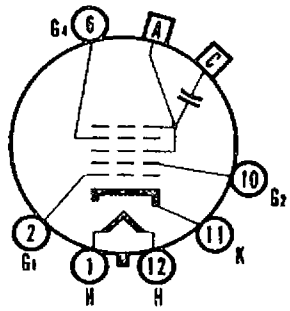
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	17,600 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period not to Exceed 15 Seconds	450 Volts	

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
90° Magnetic Deflection
No Ion Trap
External Conductive Coating
6.3 Volt, 300 Ma Heater





12-L

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

April 2, 1958

MAXIMUM RATINGS (Absolute Maximum Values) (Cont'd.)

After Equipment Warm-up Period	200	Volts
Heater Positive with Respect to Cathode	200	Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000	Volts	dc
Grid No. 4 Voltage for Focus	-50 to +350	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	-35 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater Warm-up Time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

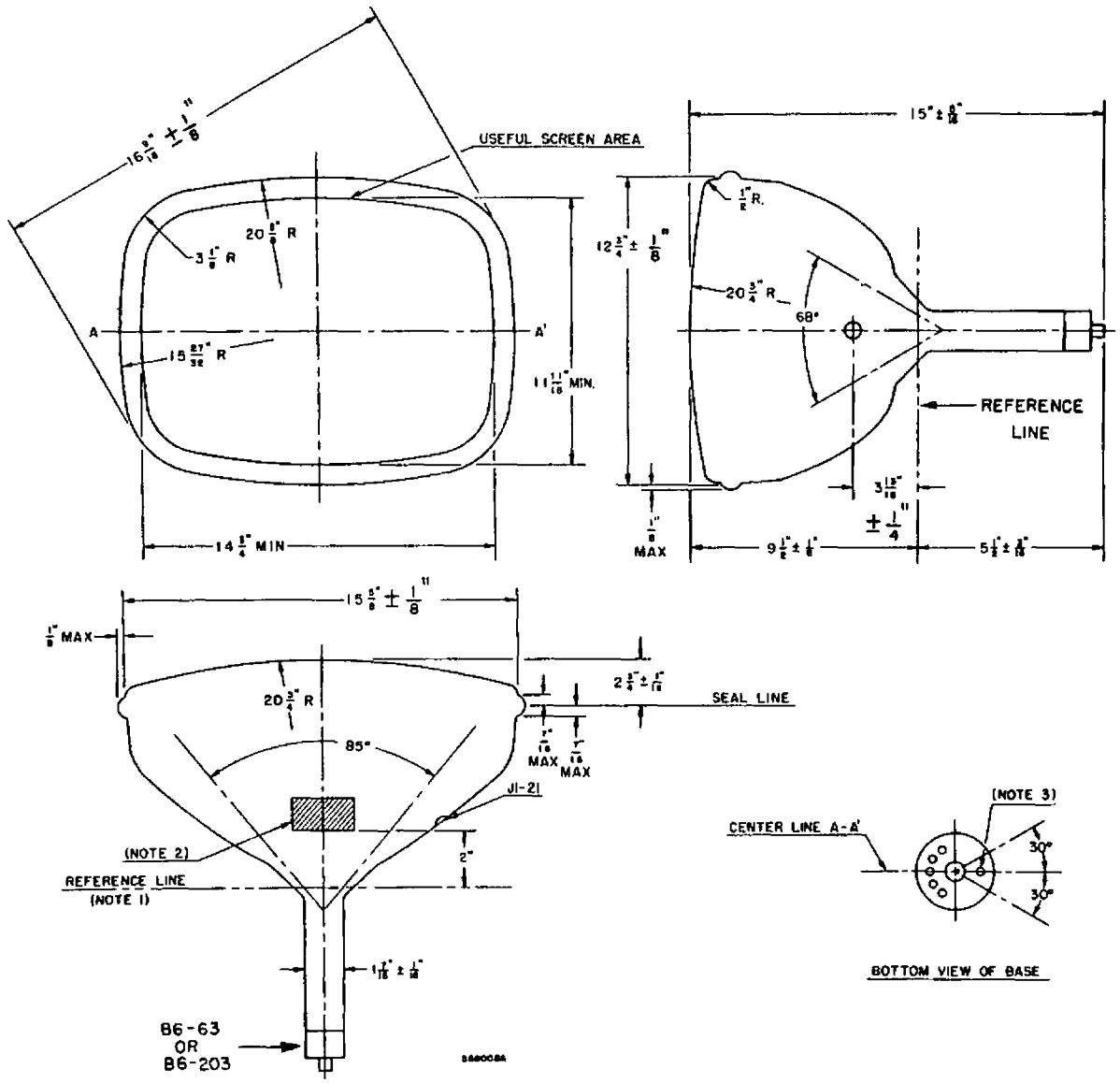


DIAGRAM NOTES:

1. Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is seated against the glass cone.
2. Contact area for external conductive coating, 2" x 2", located 90° counter-clockwise from anode contact as viewed from base end of tube.
3. Pin position No. 6 aligns with horizontal centerline of tube within 30° and is on same side as anode contact, J1-21.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (approx.)		
Horizontal	105	Degrees
Diagonal	110	Degrees
Vertical	87	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	77	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts	
Heater Current	0.30 ±5%	Ampere	
Heater Warm-up Time [1]	11	Seconds	
Direct Interelectrode Capacitances (approx.)			
Cathode to All Other Electrodes	5	µµf	
Grid No. 1 to All Other Electrodes	6	µµf	
External Conductive Coating to Anode [2]	1500	µµf	Max.
	1000	µµf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	14 3/4 x 11 11/16	Inches
Minimum Useful Screen Area	155	Sq. Inches
Bulb	J132 1/2-A or J132 1/2-B	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-183	
Basing	8HR	
Weight (approx.)	10	Pounds

RATINGS

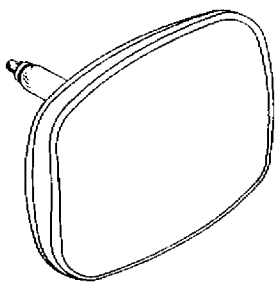
MAXIMUM RATINGS (Absolute Maximum Values)

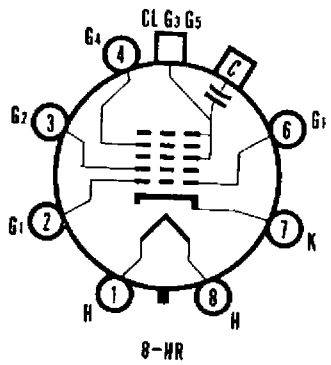
Anode Voltage	17,600	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts	dc
Grid No. 2 Voltage	550	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	154	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	

from JETEC release #2161, April 14, 1958

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1 1/8" Neck Diameter
No Ion Trap
External Conductive Coating
6.3 Volt, 300 Ma Heater





SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

March 17, 1958

MAXIMUM RATINGS (Absolute Maximum Values) (Cont'd.)

Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450	Volts
After Equipment Warm-up Period	200	Volts
Heater Positive with Respect to Cathode	200	Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000	Volts	dc
Grid No. 4 Voltage for Focus	0 to 400	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff [3]	-35 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

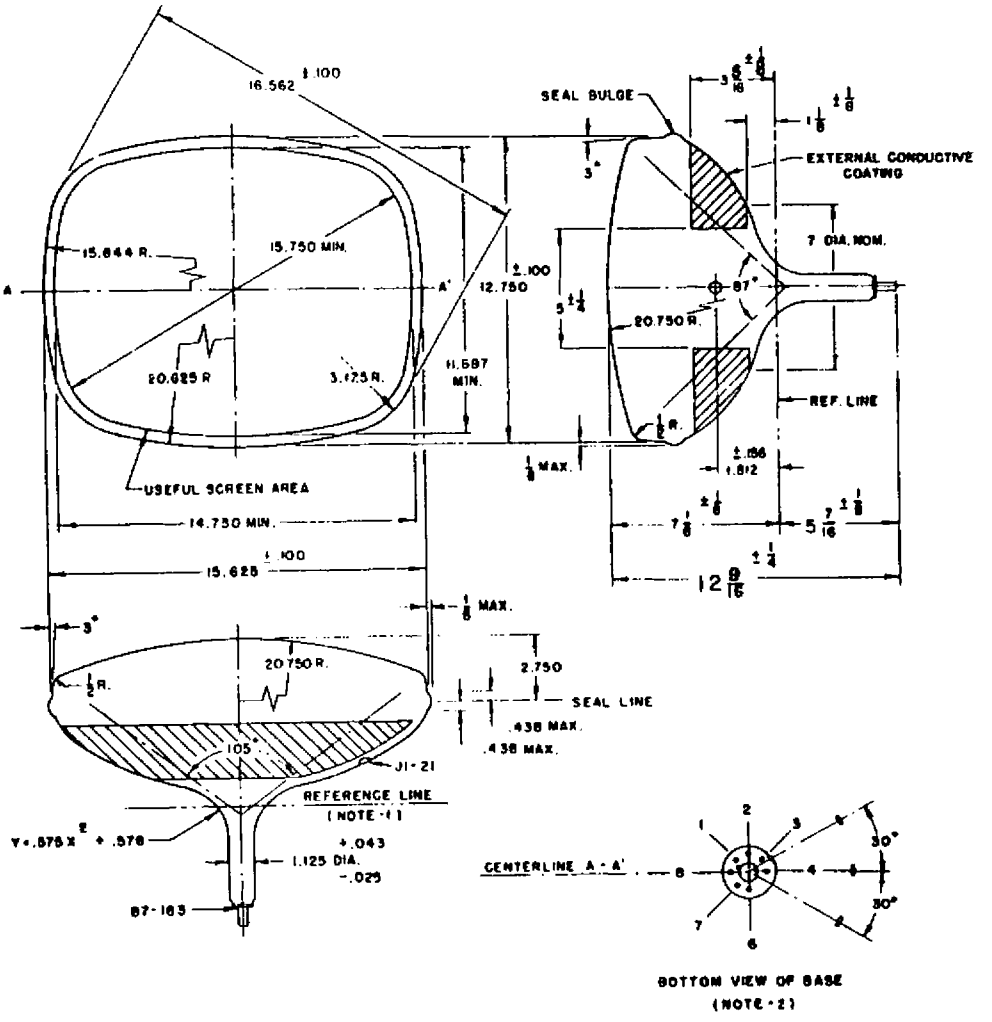


DIAGRAM NOTES:

1. Reference line is determined by plane C-C[1] of JETEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.

2. Base pin No. 4 aligns with anode contact (J1-21) within 10°.

3. Dimensions are in inches.

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflecting Method	Magnetic	
Deflecting Angle (approx.)		
Horizontal	65	Degrees
Diagonal	70	Degrees
Phosphor	Aluminized, P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	74	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.3 ± 5%	Ampere
Heater Warm-up Time[1]	11	Seconds
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	6	μμf
External Conductive Coating to Anode[2]	1500	μμf Max.
	750	μμf Min.
Ion Trap Magnet	External, Single Field Type	

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	14 5/16 x 11 1/8	Inches
Minimum Useful Screen Area	149	Sq. Inches
Bulb	J133B or J133D	
Bulb Contact, (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duodecal 6-Pin)	B6-63	
Basing	12L	
Weight (approx.)	18	Pounds

RATINGS

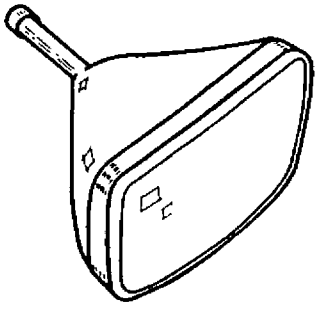
MAXIMUM RATINGS (Absolute Maximum Values)

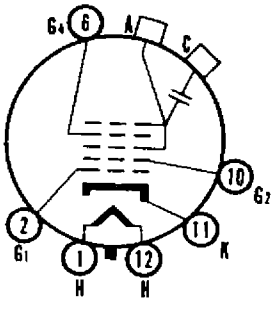
Anode Voltage	17,600	Volts	dc
Grid No. 4 (Focusing Electrode) Voltage	-550 to +1100	Volts	dc
Grid No. 2 Voltage	550	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	155	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	

from JETEC release #2279, Sept. 22 1958

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Gray Filter Glass
70° Magnetic Deflection
Low Voltage Electrostatic Focus
Single Field Ion Trap
External Conductive Coating
Spherical Face Plate
Aluminized Screen
6.3 Volt, 300 Ma Heater





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SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

June 23, 1958

MAXIMUM RATINGS (Absolute Maximum Values - Continued)

Peak Heater-Cathode Voltage:		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 seconds	450	Volts
After Equipment Warm-up Period	200	Volts
Heater Positive with Respect to Cathode	200	Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000	Volts	dc
Grid No. 4 Voltage for Focus[3]	-50 to +300	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff[4]	-35 to -72	Volts	dc
Ion Trap Magnet Field Strength (approx.)	30	Gausses	

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms Max.

NOTES:

1. Heater Warm-up Time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.

2. External conductive coating must be grounded.

3. For best center focus, with grid No. 1 bias voltage and video signal voltage adjusted for 100 µa anode current on a 14 5/16 x 11 1/8" picture area.

4. Visual extinction of focused raster.

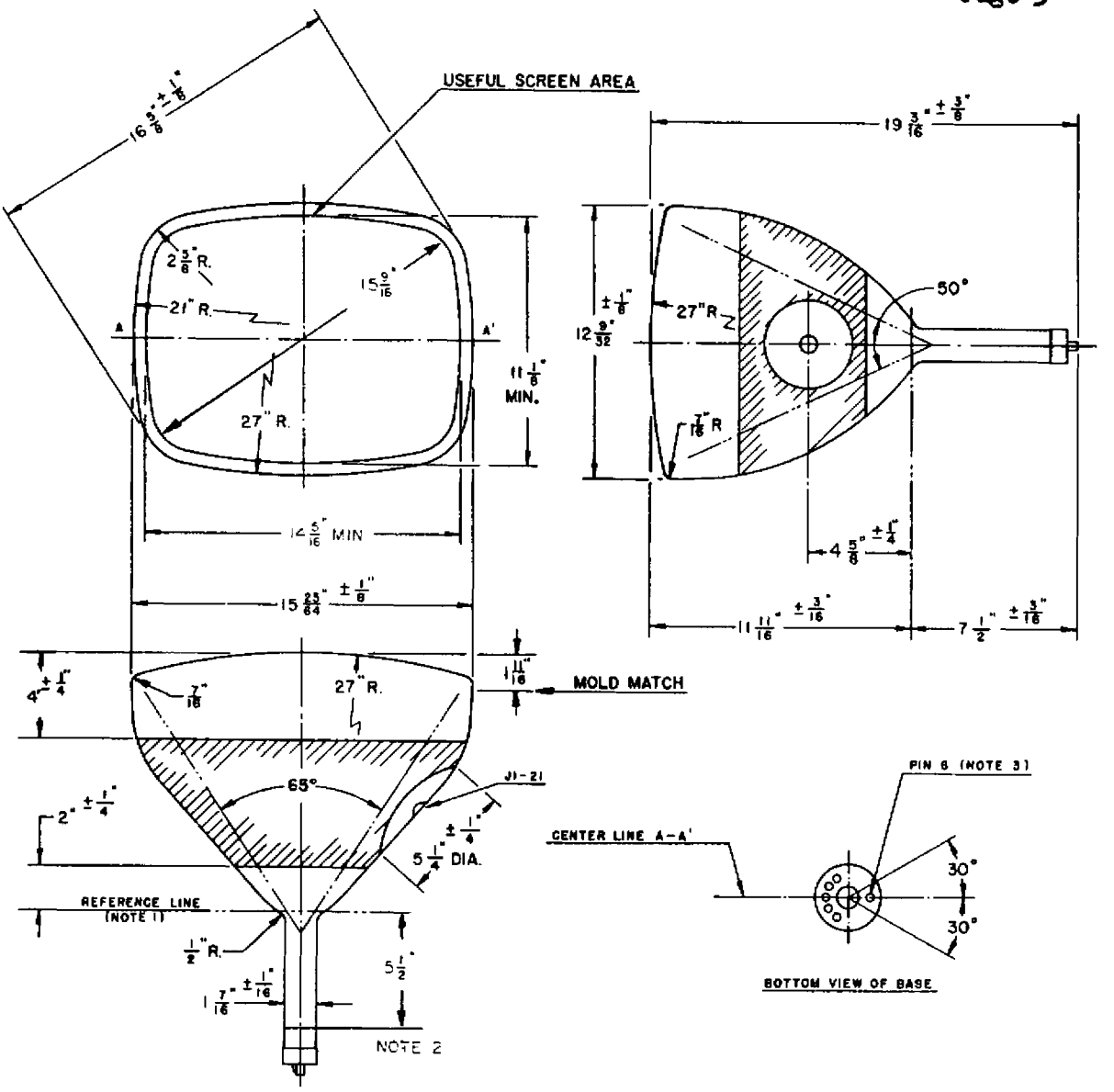


DIAGRAM NOTES:

1. Reference line is determined by the plane of the upper edge of the reference line gauge (JETEC No. 110) when the gauge is seated against the glass cone.

2. Nominal position of ion trap magnet.

3. Base Pin No. 6 aligns with horizontal centerline of tube within 30° and is on same side as anode contact, J1-21.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

from JETEC release #2284, Oct. 6, 1958

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	85	Degrees
Diagonal	90	Degrees
Phosphor	Aluminized P4	
Fluoresence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (Approx.)	74	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.3 ± 5%	Ampere
Heater Warm-up Time[1]	11	Seconds
Direct Interelectrode Capacitance (Approx.)		
Cathode to All Other Electrodes	5	µµf
Grid No. 1 to All Other Electrodes	6	µµf
External Conductive Coating to Anode[2]	1500	µµf Max.
	1000	µµf Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions	14 5/16 x 11 1/8	Inches
Minimum Useful Screen Area	149	Sq. Inches
Bulb	J133F or J133G	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duodecal 6-Pin)	B6-63	
Basing	12L	
Weight (Approx.)	13	Pounds

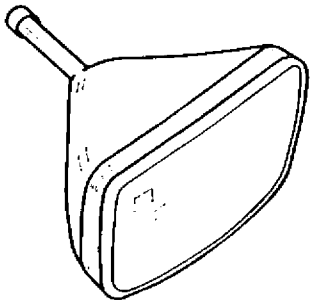
RATINGS

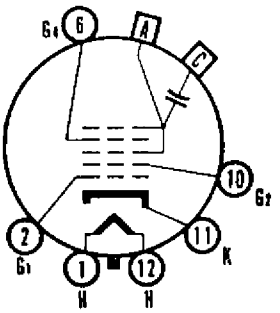
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	17,600 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
No Ion Trap
External Conductive Coating
Aluminized Screen
6.3 Volt, 300 Ma Heater





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SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

September 8, 1958

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000 Volts	dc
Grid No. 4 Voltage	-50 to +300 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	-35 to -72 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. Heater Warm-up Time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

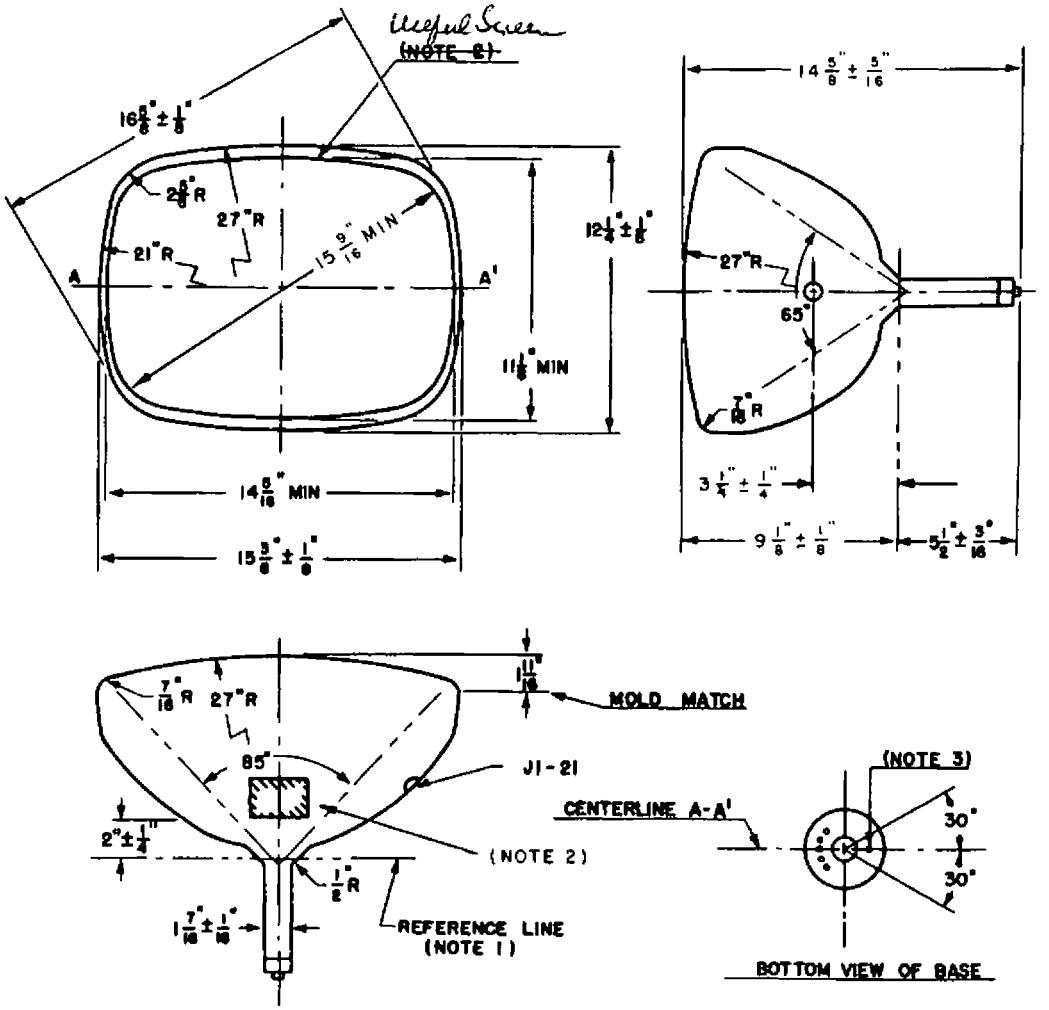


DIAGRAM NOTES:

1. Reference line is determined by the plane C-C' of the Reference Line Gauge (JETEC No. 116) when the gauge is seated on the glass cone.

2. Contact area for external conductive coating 2" x 2", located 90 degrees counterclockwise from anode contact as viewed from base end of tube.

3. Anode contact aligns with pin position No. 6 ± 30 degrees.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Tri-Potential Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	105	Degrees
Diagonal	110	Degrees
Vertical	87	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (Approx.)	77	Percent

ELECTRICAL DATA

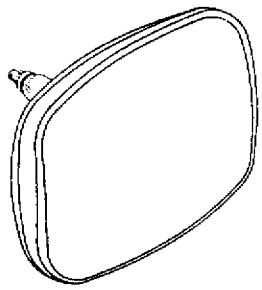
Heater Voltage	2.35	Volts	
Heater Current (±5%)	.600	Ampere	
Heater Warm-up Time[1]	11	Seconds	
Direct Interelectrode Capacitances (Approx.)			
Cathode to All Other Electrodes	3.5	μμf	
Grid No. 1 to All Other Electrodes	4	μμf	
External Conductive Coating to Anode[2]	1400	μμf	Max.
	900	μμf	Min.

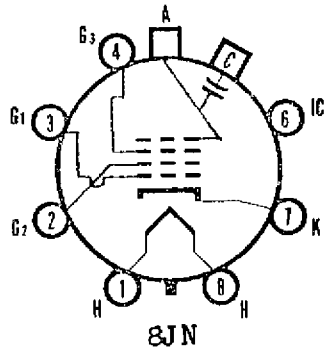
MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	11 11/16	
Width	14 3/4	
Diagonal	15 3/4	
Area	155	Sq. Inches
Neck Length	3 5/16 ± 1/8	Inches
Overall Length	10 7/16 ± 1/4	Inches
Bulb	J132 1/2-A or J132 1/2-B	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-208	
Basing	8JN	
Weight (Approx.)	10	Pounds

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Tri-Potential
Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive
Coating
Short Neck





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SYLVANIA ELECTRIC PRODUCTS INC.
Picture Tube Operations
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
September 11, 1958

from JETEC release #2304, Oct. 27, 1958

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values) Grid Drive Service

Anode Voltage	17,600	Volts	dc
Grid No. 3 Voltage (Focusing Electrode)	700	Volts	dc
Grid No. 2 Voltage	700	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	154	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	14,000	Volts	dc
Grid No. 3 Voltage for Focus	0 to +400	Volts	dc
Grid No. 2 Voltage[3]	500	Volts	dc
Grid No. 1 Voltage Required for Cutoff[4]	-43 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

2. External conductive coating must be grounded.

3. Brightness and resolution improve with increase in Grid No. 2 voltage. A minimum value of 400 volts is recommended.

4. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range is these tubes are operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

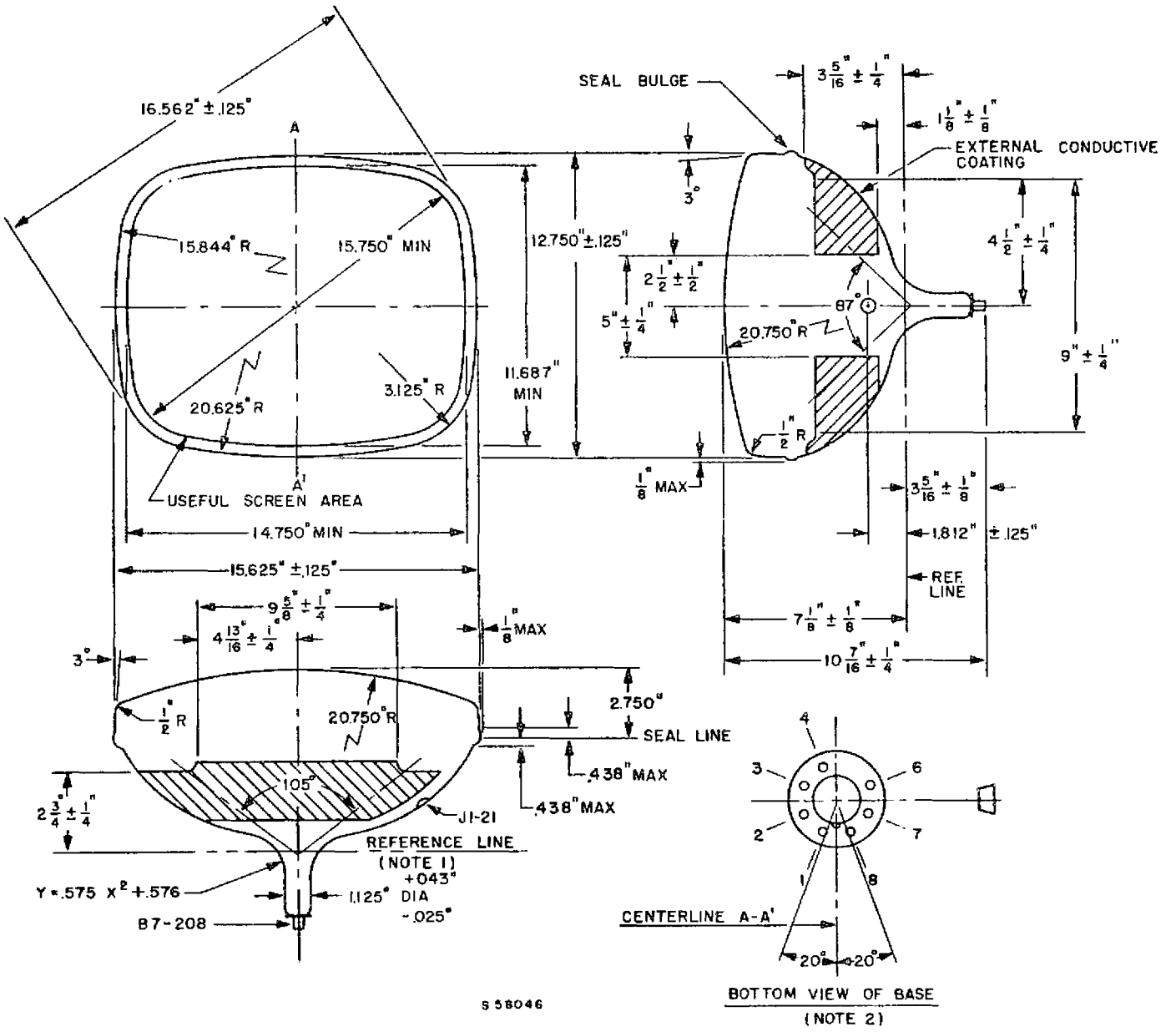


DIAGRAM NOTES:

1. Reference line is determined by plane C-C[1] of JETEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.

2. Base index key aligns with vertical centerline within 20°. Pins No. 6 and 7 are on same side as anode contact, J1-21.

from JETEC release
#2317, Nov. 17, 1958

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	85	Degrees
Diagonal	90	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (Approx.)	74	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.3 ± 5%	Ampere
Heater Warm-up Time[1]	11	Seconds
Direct Interelectrode Capacitance (Approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	6	μμf
External Conductive Coating to Anode[2]	1500	μμf Max.
	1000	μμf Min.
Ion Trap Magnet	External, Single Field Type	

MECHANICAL DATA

Minimum Useful Screen Dimensions	14 5/16 x 11 1/8	Inches
Minimum Useful Screen Area	149	Sq. Inches
Bulb	J133F or J133G	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duodecal 6-Pin)	B6-63	
Basing	12L	
Weight (Approx.)	13	Pounds

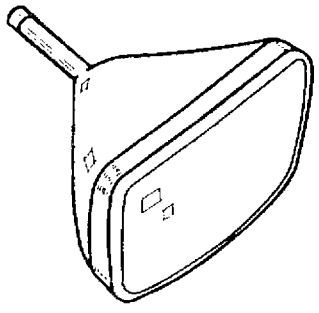
RATINGS

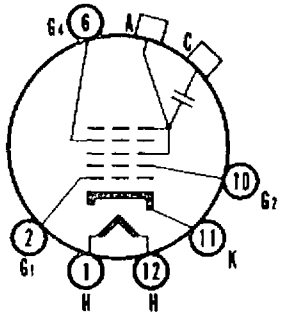
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	17,600	Volts dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts dc
Grid No. 2 Voltage	550	Volts dc
Grid No. 1 Voltage		
Negative Bias Value	155	Volts dc
Negative Peak Value	220	Volts
Positive Bias Value	0	Volts dc
Positive Peak Value	2	Volts
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450	Volts
After Equipment Warm-up Period	200	Volts
Heater Positive with Respect to Cathode	200	Volts

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
Single Field Ion Trap
External Conductive Coating
Aluminized Screen
6.3 Volt, 300 Ma Heater





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SYLVANIA ELECTRIC PRODUCTS INC.

Picture Tube Operations
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

October 27, 1958

FORM 146

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000	Volts	dc
Grid No. 4 Voltage	-50 to +300	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	-35 to -72	Volts	dc
Ion Trap Magnet Current (Avg.)[4]	28	Ma	dc
Field Strength of PM Ion Trap Magnet[5]	31	Gausses	Min.

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater Warm-up Time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater is series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

4. For JETEC Ion Trap Magnet No. 117, with pole pieces centered over Grid #2.

5. For typical PM Ion Trap Magnet with field strength tolerance of ± 3 gausses.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

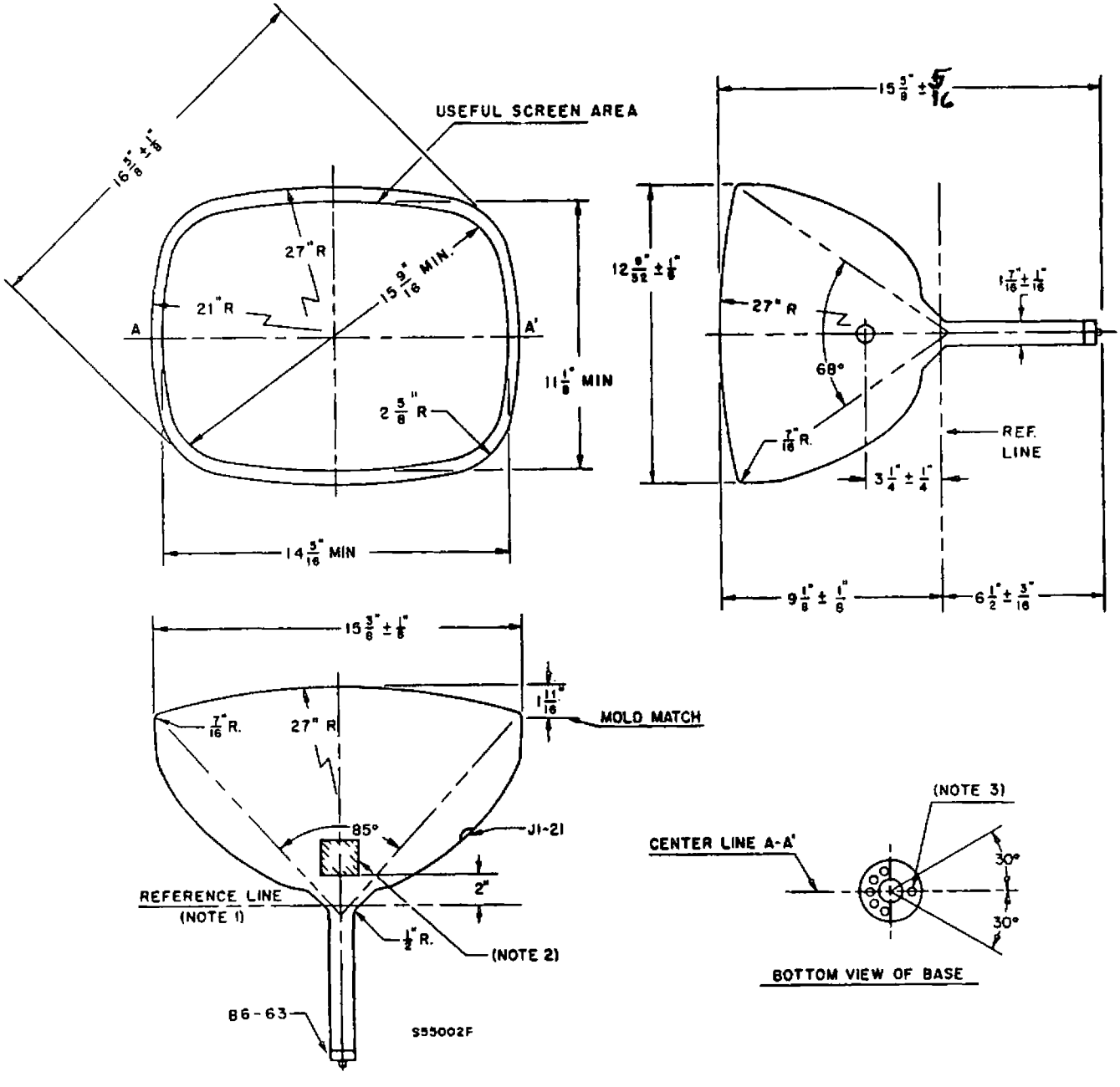


DIAGRAM NOTES:

1. Reference line is determined by the plane C-C' of the Reference Line Gauge (JETEC No. 116) when the gauge is seated on the glass cone.

2. Contact area for external conductive coating 2" x 2", located 90 degrees counterclockwise from anode contact as viewed from base end of tube.

3. Anode contact aligns with pin position No. 6 ± 30 degrees.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	105	Degrees
Diagonal	110	Degrees
Vertical	87	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (Approx.)	78	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts	
Heater Current	0.6	Ampere	
Heater Warm-up Time[1]	11	Seconds	
Direct Interelectrode Capacitance (Approx.)			
Cathode to All Other Electrodes	5	$\mu\mu$f	
Grid No. 1 to All Other Electrodes	6	$\mu\mu$f	
External Conductive Coating to Anode[2]	1500	$\mu\mu$f	Max.
	1000	$\mu\mu$f	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	$14\frac{3}{4}$ x $11\frac{11}{16}$	Inches
Minimum Useful Screen Area	155	Sq. Inches
Neck Length	$4\frac{1}{8}$	Inches
Overall Length	$11\frac{1}{4}$	Inches
Bulb	J132½ A or J132½ B	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-208	
	8HR	
Weight (Approx.)	10	Pounds

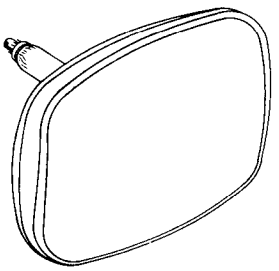
RATINGS

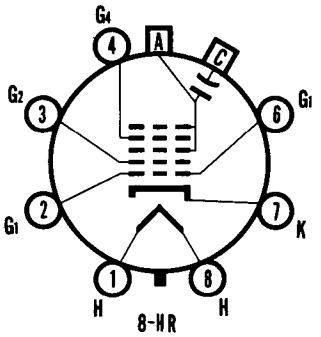
MAXIMUM RATINGS (Design Maximum Values)[3]

Anode Voltage	18,000	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100	Volts	dc
Grid No. 2 Voltage	550	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	154	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
$4\frac{1}{8}$" Neck
No Ion Trap
External Conductive Coating





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JULY, 1960

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]		
Anode Voltage	14,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[4]	−45 to −90 Volts	dc
Cathode Drive Service[5]		
Anode Voltage	14,000 Volts	
Grid No. 4 Voltage for Focus	0 to 400 Volts	
Grid No. 2 Voltage	450 Volts	
Cathode Voltage Required for Cutoff[4]	+46 to +85 Volts	

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to cathode unless indicated otherwise.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be increased about 5 volts.*
5. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*

WARNING:

X ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

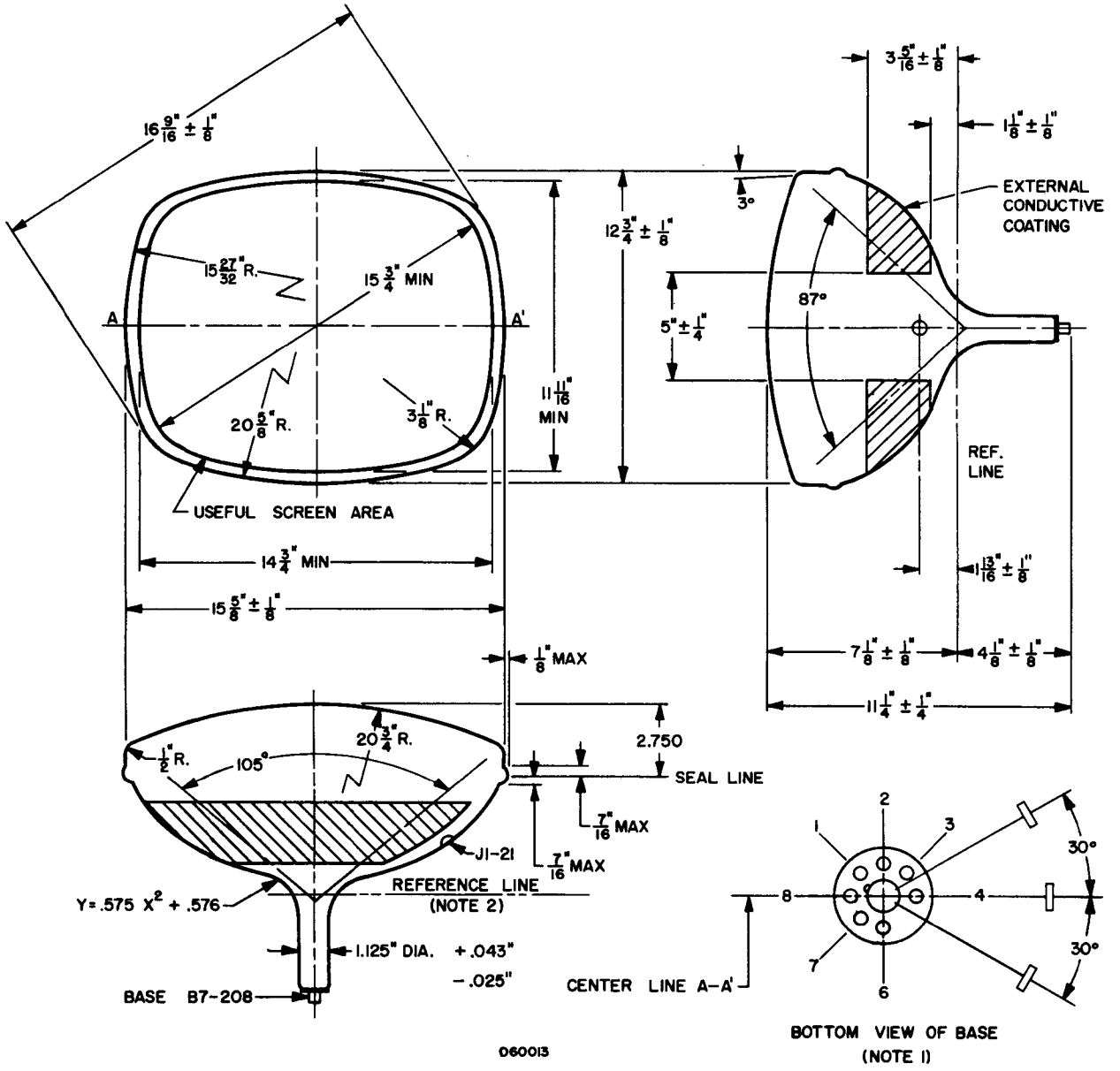


DIAGRAM NOTES:

1. *Base Pin No. 4 aligns with anode contact (J1-21) within 30°.*
2. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*

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17DTP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	105 Degrees
Diagonal	110 Degrees
Vertical	87 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	77 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.60 ± 5% Ampere
Heater Warm-up Time[1]	11 Seconds
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
External Conductive Coating to Anode[2]	1500 $\mu\mu$f Max.
	1000 $\mu\mu$f Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	$11\frac{11}{16}$ Inches
Width	$14\frac{3}{4}$ Inches
Diagonal	$15\frac{3}{4}$ Inches
Area	155 Sq. Inches
Neck Length	$3\frac{5}{8} \pm \frac{1}{8}$ Inches
Overall Length	$10\frac{3}{4} \pm \frac{1}{4}$ Inches
Bulb	J132½-A or J132½-B
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (approx.)	10 Pounds

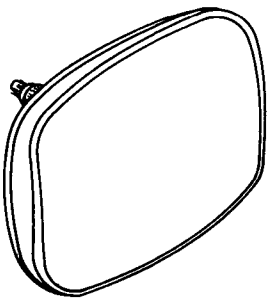
RATINGS

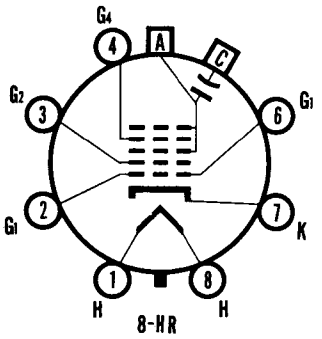
MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Anode Voltage	17,600 Volts dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts dc
Grid No. 2 Voltage	550 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	155 Volts dc
Negative Peak Value	220 Volts
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

QUICK REFERENCE DATA

Television Picture Tube
17" Direct View
Short Neck
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1⅛" Neck Diameter
No Iron Trap
External Conductive Coating





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ELECTRONIC TUBES
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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
APRIL, 1960

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS — Grid Drive Service

Anode Voltage	14,000 Volts dc
Grid No. 4 Voltage for Focus	0 to 400 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts dc

CIRCUIT VALUES

Circuit No. 1 Circuit Resistance	1.5 Megohm Max.

NOTES:

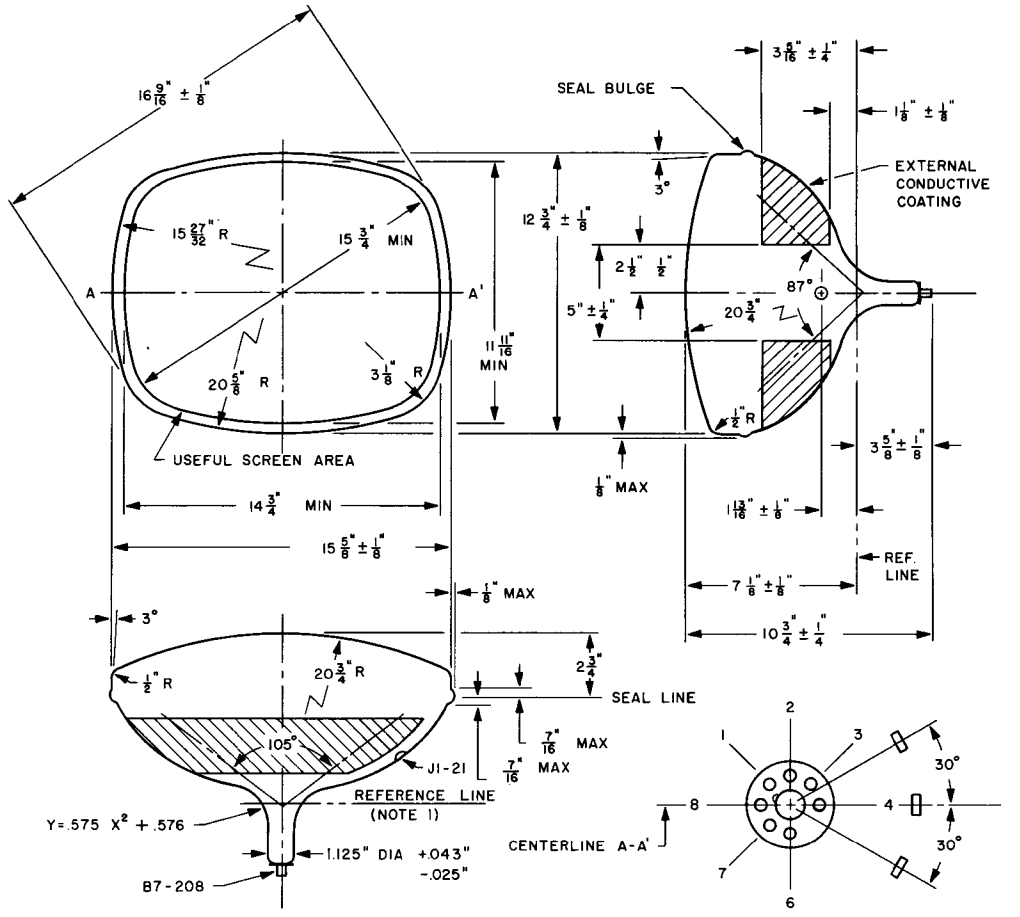
1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

DIAGRAM NOTES

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*



CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflecting Angles (Approx.)	
Vertical	50 Degrees
Horizontal	65 Degrees
Diagonal	70 Degrees
Phosphor	Aluminized, P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	74 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5% Ampere	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6.5 μμf	
External Conductive Coating to Anode[1]	1500 μμf	Max.
	750 μμf	Min.

MECHANICAL DATA

Maximum Useful Screen Dimensions	11⅛ x 14 5/16 Inches
Minimum Useful Screen Area	149 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Bulb	J133B or J133D
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

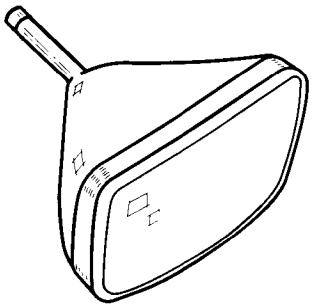
Anode Voltage	22,000 Volts	dc
Grid No. 4 (Focusing Electrode)		
Voltage	−550 to +1100 Volts	dc
Grid No. 2 Voltage	700 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	180 Volts	dc
Negative Peak Value	220 Volts	dc
Positive Bias Value	0 Volts	
Positive Peak Value	2	
Peak Heater-Cathode Voltage	Volts	
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

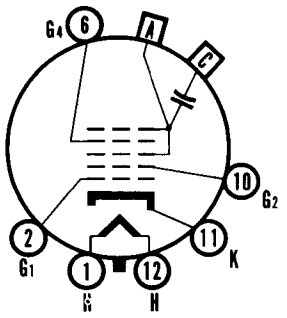
TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[2]	−35 to −72 Volts	dc

QUICK REFERENCE DATA

Television Monitor Tube
17" Direct Viewed
Rectangular Glass Type
Gray Filter Glass
Magnetic Deflection
Low Voltage Electrostatic Focus
No Ion Trap Required
External Conductive Coating
Spherical Faceplate
Aluminized Screen
High Resolution





12-L

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SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JULY, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

CIRCUIT VALUES

Grid No. 1 Circuit Resistance . . . . . 1.5 Megohms Max.

NOTES:

1. *External conductive coating must be grounded.*
2. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

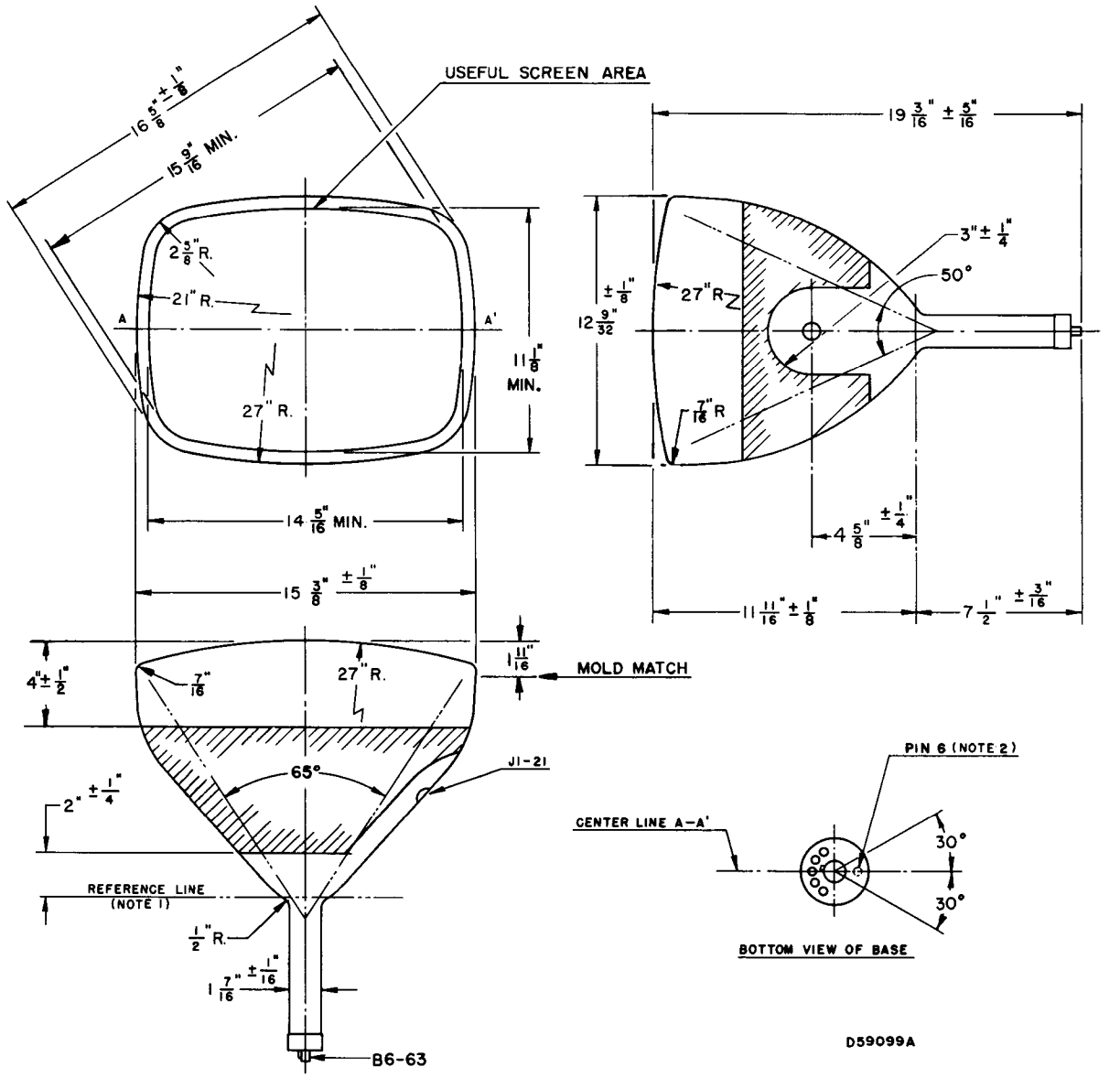

DIAGRAM NOTES:

1. *Reference line is determined by the plane of the upper edge of the reference line gauge (JEDEC No. 110) when the gauge is seated on the glass cone.*
2. *Pin #6 aligns with horizontal centerline within 30° and is on same side as anode contact (J1-21).*

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17DXP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Tri-Potential Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	105	Degrees
Diagonal	110	Degrees
Vertical	87	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (Approx.)	77	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.45 ± 5%	Ampere
Heater Warm-up Time[1]	11	Seconds
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	6	μμf
External Conductive Coating to Anode[2]	1500	μμf Max.
	1000	μμf Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	11 11/16	
Width	14 3/4	
Diagonal	15 3/4	
Area	155	Sq. Inches
Neck Length	3 9/16 ± 1/8	Inches
Overall Length	10 11/16 ± 1/4	Inches
Bulb	J132 1/2-A or J132 1/2-B	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-208	
Basing	8JR	
Weight (Approx.)	10	Pounds

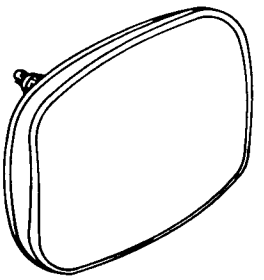
RATINGS

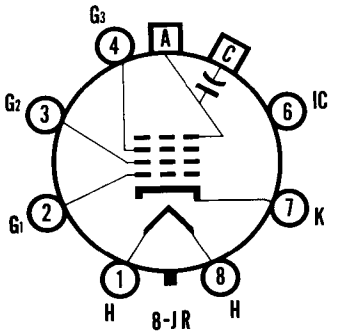
MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Anode Voltage	17,600	Volts	dc
Grid No. 3 Voltage (Focusing Electrode)	700	Volts	dc
Grid No. 2 Voltage	600	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	154	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Tri-Potential Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive Coating
Short Neck
450 Ma Heater





SYLVANIA ELECTRONIC TUBES

A Division of
Sylvania Electric Products, Inc.

PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

SEPTEMBER, 1959

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	14,000	Volts	dc
Grid No. 3 Voltage for Focus	0 to +400	Volts	dc
Grid No. 2 Voltage[3]	500	Volts	dc
Grid No. 1 Voltage Required for Cutoff[4]	−43 to −78	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Brightness and resolution improve with increase in Grid No. 2 voltage. A minimum value of 400 volts is recommended.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

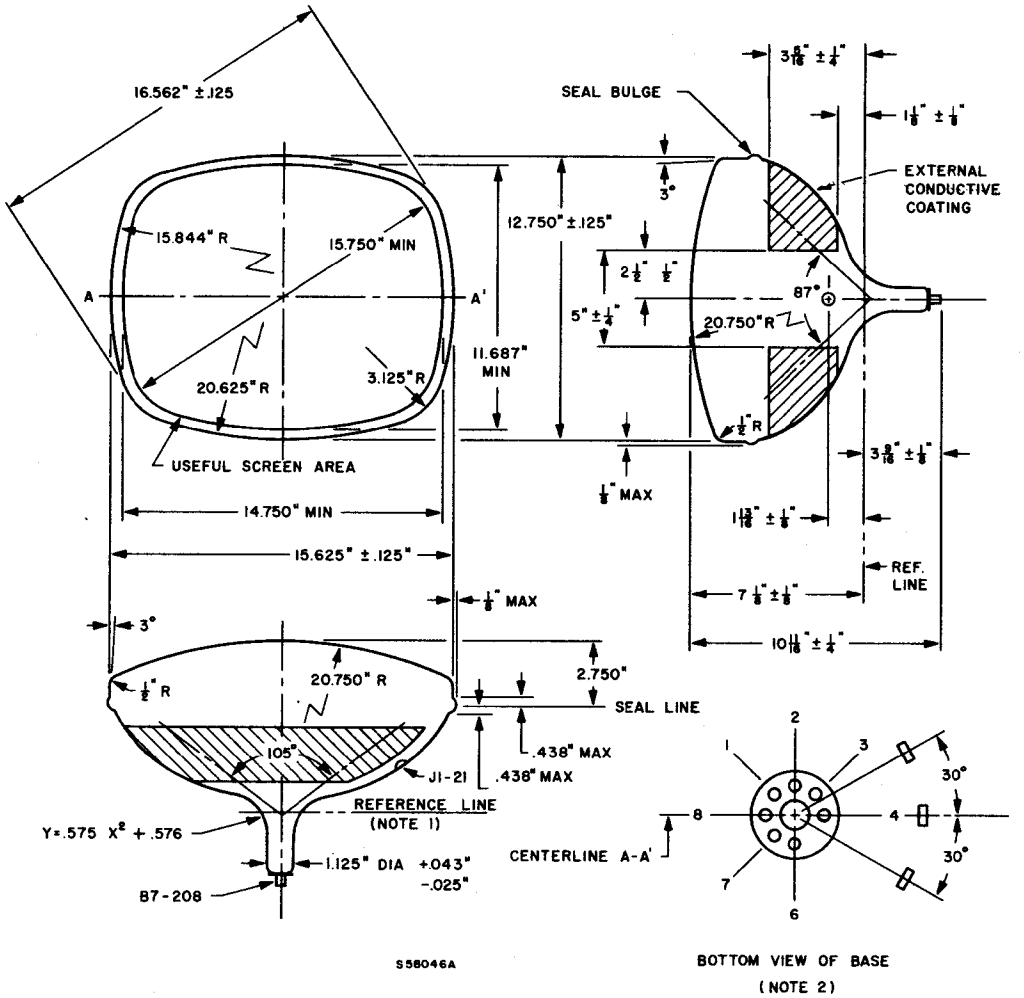


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

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EMPORIUM, PA.



CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflecting Angle	
Horizontal	66 Degrees
Diagonal	70 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	66 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6 μμf
External Conductive Coating to Anode[1]	750 μμf Max.
	500 μμf Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	14¼ x 10¾ Inches
Bulb Contact, (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12N

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	18,000 Volts dc
Grid No. 2 Voltage	410 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage:	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	410 Volts dc
After Equipment Warm-up Period	150 Volts dc
Heater Positive with Respect to Cathode	150 Volts dc

RECOMMENDED OPERATING CONDITIONS

Anode Voltage[2]	16,000 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[3]	−33 to −77 Volts dc
Focusing Coil Current (approx.)[4]	100 Ma dc
Ion Trap Magnet Field Strength (approx.)	45 Gausses

CIRCUIT VALUES

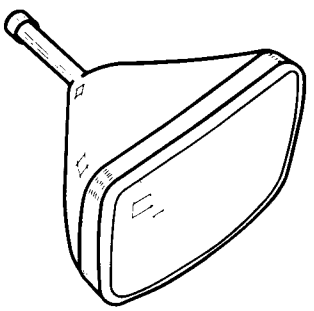
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

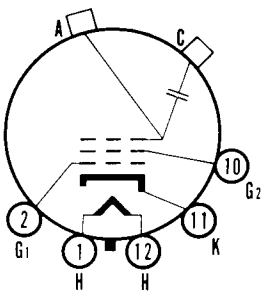
NOTES:

1. *External conductive coating must be grounded.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than this value.*
3. *Visual extinction of undeflected focused spot.*
4. *For JETEC focusing coil 109 or equivalent three inches from reference line, bias adjusted to 20 foot lamberts on a 10¾ x 14¼ inch picture area sharply focused at center of screen.*

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Gray Filter Glass
Magnetic Deflection
Magnetic Focus
Single Field Ion Trap
External Conductive Coating





12-N

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Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

MAY 1952

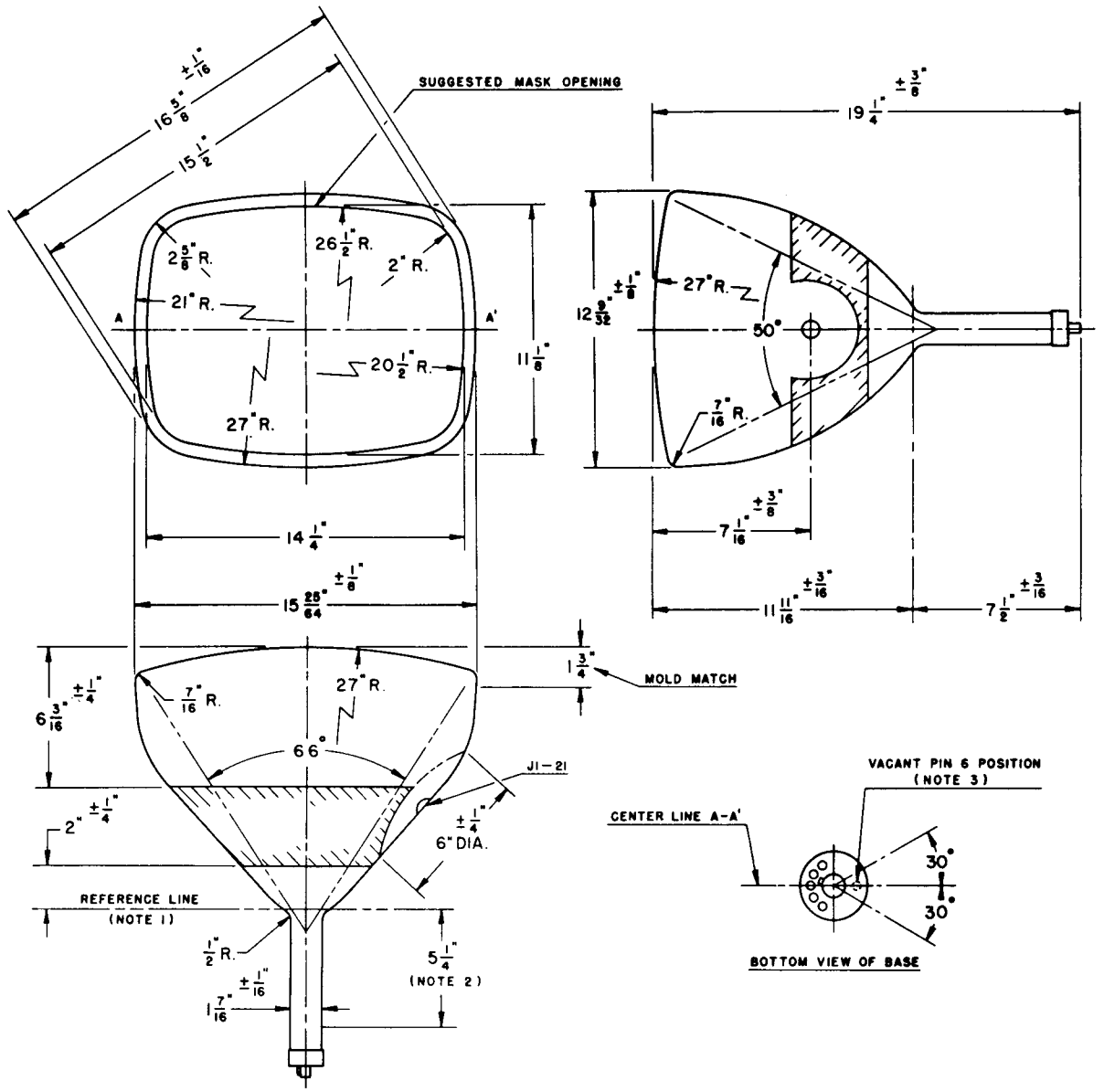


DIAGRAM NOTES:

1. *Reference line is determined by the plane of the upper edge of the reference line gauge (RTMA No. 110) when the gauge is resting on the glass cone.*
2. *Nominal position of ion trap magnet.*
3. *Anode contact aligns with pin position No. 6 ±30 degrees.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-9
Base	E9-75, 9 Pin
Outline	See Drawing
Basing	9QT
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

	17LD8 Series	
Heater Operation		
Heater Voltage	16.8	Volts
Heater Current	450[1]	Ma
Heater Warm-up Time[2]	11	Seconds

Ratings (Design Maximum Values)[4]

	Min.	Max.	
Heater Current[3]	420	480	Ma
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
Total DC and Peak		200	Volts
Heater Positive with Respect to Cathode			
DC		100	Volts
Total DC and Peak		200	Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section

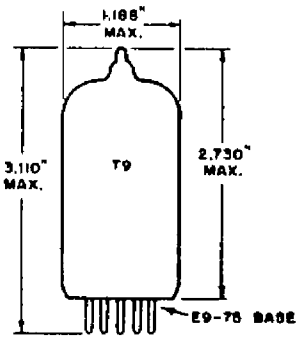
Grid to Plate	3.8	pf
Input: g to (h + Tk)	2.0	pf
Output: p to (h + Tk)	0.4	pf

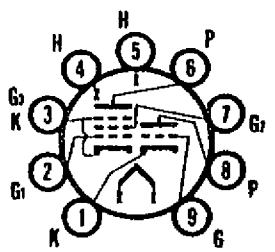
Pentode Section

Grid No. 1 to Plate	0.26	pf Max.
Input: g1 to (h + Pk, g3)	13	pf
Output: p to (h + Pk, g3)	7	pf

QUICK REFERENCE DATA

The Sylvania Type 17LD8 is a triode-pentode contained in a T-9 bulb with a 9 pin base. 17LD8 is intended to serve the combined functions of vertical deflection oscillator and amplifier.





9QT

SYLVANIA ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE OPERATIONS
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

June 12, 1963

146 (10-58)

from JEDEC release #4335, July 8, 1963

RATINGS (Design Maximum Values)[4]

Vertical Deflection Oscillator and Amplifier[5]

	Tri. Osc.	Pent. Amp.	
Plate Voltage	250	250 Volts	Max.
Grid No. 2 Voltage	-	200 Volts	Max.
Peak Positive Pulse Plate Voltage	-	2,000 Volts	Max.
Peak Negative Grid No. 1 Voltage	400	150 Volts	Max.
Plate Dissipation[6]	1.0	7 Watts	Max.
Grid No. 2 Dissipation[6]	-	1.8 Watts	Max.
Average Cathode Current	20	70 Ma	Max.
Peak Cathode Current	70	245 Ma	Max.
Grid Circuit Resistance			
Self Bias	2.2	2.2 Megohms	Max.
Fixed Bias	1.0	1.0 Megohm	Max.

AVERAGE CHARACTERISTICS

	Triode Section	Pentode Section	
Plate Voltage	150	120	Volts
Grid No. 2 Voltage	-	110	Volts
Grid No. 1 Voltage	-5	-8	Volts
Plate Current	3.3	46	Ma
Grid No. 2 Current	-	4	Ma
Transconductance	1,900	7,100	µmhos
Amplification Factor	21.5	-	
Plate Resistance (approx.)	11,300	11,700	Ohms
Ec for Ib = 10 µa (approx.)	-10	-	Volts
Ec for Ib = 100 µa (approx.)	-	-25	Volts

Instantaneous Plate Knee Values
Eb = 45 V; Ec2 = 110 V; and Ec = 0 V
Ib = 122 Ma, and Ic2 = 17 Ma

NOTES:

1. For series operation of heaters, equipment should be designed so that at normal supply voltage bogey tubes will operate at this value of heater current.

2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

3. Heater voltage supply variations shall be restricted to maintain heater current within the specified tolerance.

NOTES: (Cont.)

4. Design Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron tube of a specified type as defined by its published data and should not be exceeded under the worst probable conditions.

   The tube manufacturer chooses these values to provide acceptable serviceability of the tube, making allowance for the effects of changes in operating conditions due to variations in the characteristics of the tube under consideration.

   The equipment manufacturer should design so that initially and throughout life no design maximum value for the intended service is exceeded with a bogey tube under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all other electron devices in the equipment.

5. For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Stations; Federal Communications Commission." The duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.

6. In stages operating with grid leak bias, an adequate bias resistor or other suitable means is required to protect the tube in the absence of excitation.

SYLVANIA

engineering data service

SYLVANIA

17LP4

17VP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflecting Angle (approx.)	
Horizontal	65 Degrees
Diagonal	70 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	72 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
External Conductive Coating to Anode[1]	1500 $\mu\mu$f Max.
	750 $\mu\mu$f Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	10¾ x 14¼ Inches
Bulb Contact, (Recessed Small Cavity Cap)	J1-21
Base, (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	16,000 Volts dc
Grid No. 4 (Focusing Electrode) Voltage	−500 to +1000 Volts dc
Grid No. 2 Voltage	500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	410 Volts dc
After Equipment Warm-up Period	180 Volts dc
Heater Positive with Respect to Cathode	180 Volts dc

RECOMMENDED OPERATING CONDITIONS

Anode Voltage[2]	14,000 Volts dc
Grid No. 4 Voltage	−56 to +310 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage[3] Required for Cutoff	−33 to −77 Volts dc
Ion Trap Magnet Strength (approx.)	35 Gausses

CIRCUIT VALUES

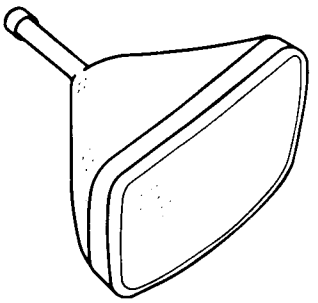
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

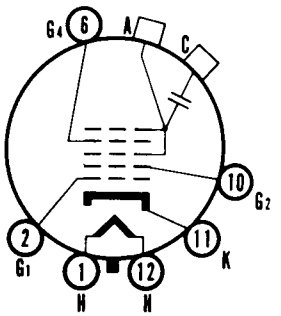
NOTES:

1. *External conductive coating must be grounded.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than this value.*
3. *Visual extinction of undeflected focused spot.*

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Cylindrical Faceplate
Gray Filter Glass
Magnetic Deflection
Low Voltage Electrostatic Focus
Single Field Ion Trap
External Conductive Coating





12-L

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

SEPTEMBER 1952

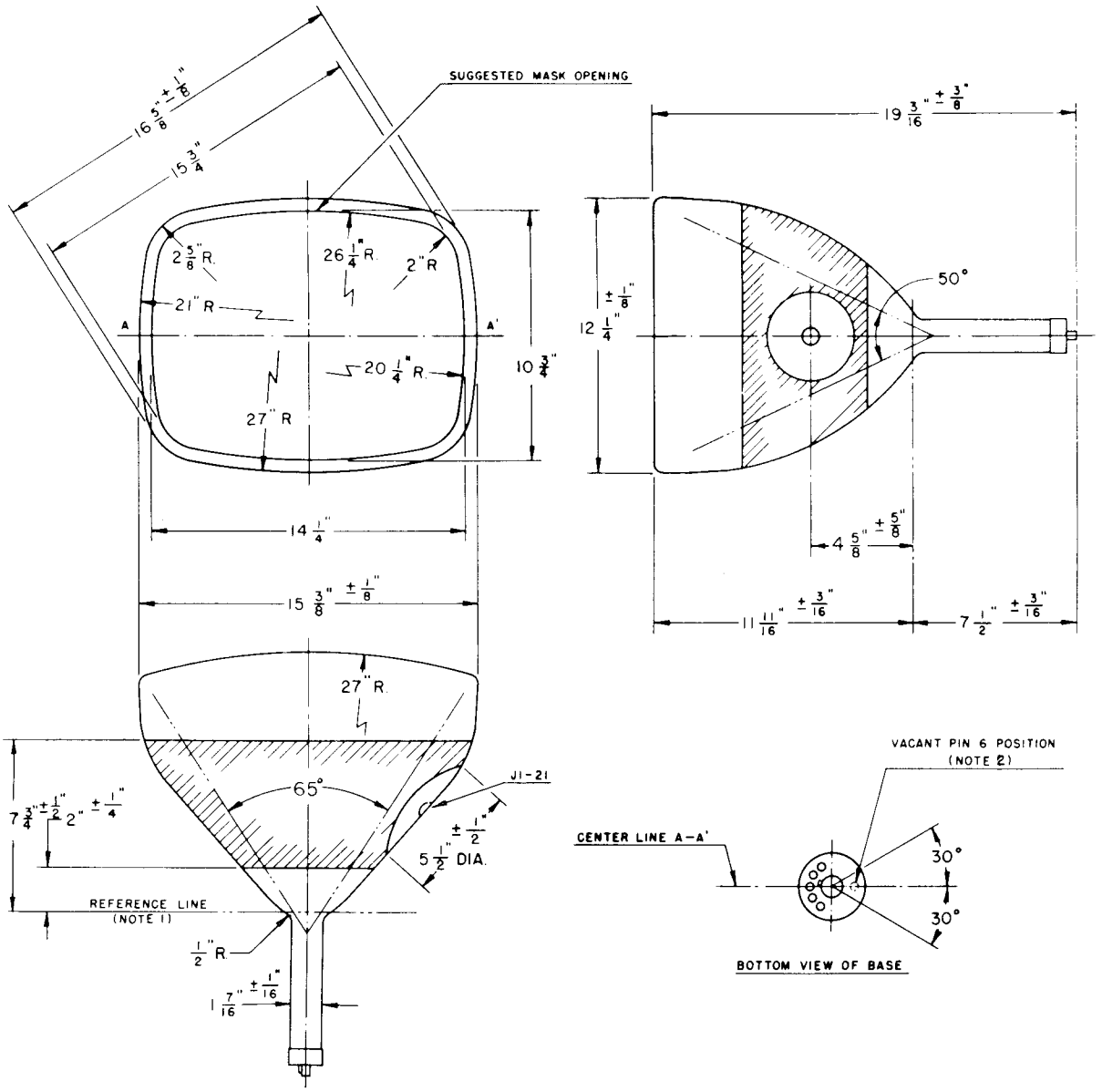


DIAGRAM NOTES:

1. *Reference line is determined by the plane of the upper edge of the reference line gauge (RTMA No. 110) when the gauge is resting on the glass cone.*

2. *Anode aligns with pin position No. 6 ±30 degrees.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

SYLVANIA

engineering data service

SYLVANIA

17YP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflecting Angle (approx.)	
Horizontal	65 Degrees
Diagonal	70 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	72 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
External Conductive Coating to Anode[1]	750 $\mu\mu$f Max.
	500 $\mu\mu$f Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	10¾ x 14¼ Inches
Bulb Contact, (Recessed Small Cavity Cap)	J1-21
Base, (Small Shell Duodecal 5-Pin)	B5-57
Basing	12N

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	18,000 Volts dc
Grid No. 2 Voltage	500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	410 Volts dc
After Equipment Warm-up Period	150 Volts dc
Heater Positive with Respect to Cathode	150 Volts dc

RECOMMENDED OPERATING CONDITIONS

Anode Voltage[2]	16,000 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage[3] Required for Cutoff	-33 to -77 Volts dc
Focusing Coil Current (approx.)[4]	100 Ma dc
Ion Trap Magnet Strength (approx.)	45 Gausses

CIRCUIT VALUES

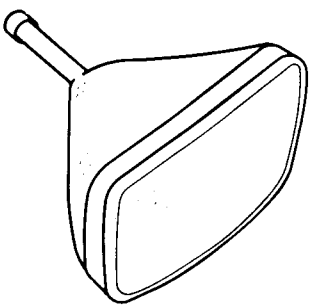
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

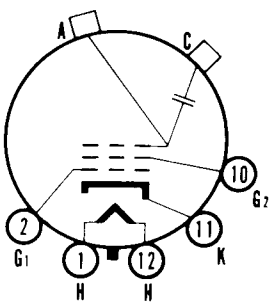
NOTES:

1. *External conductive coating must be grounded.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than this value.*
3. *Visual extinction of undeflected focused spot.*
4. *For JETEC focusing coil 109 or equivalent three inches from reference line, bias adjusted to 20 foot lamberts on a 10¾ x 14¼ inch picture area sharply focused at center of screen.*

QUICK REFERENCE DATA

Television Picture Tube
17" Direct Viewed
Rectangular Glass Type
Cylindrical Faceplate
Gray Filter Glass
Magnetic Deflection
Magnetic Focus
Single Field Ion Trap
External Conductive Coating





12-N

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

SEPTEMBER 1952

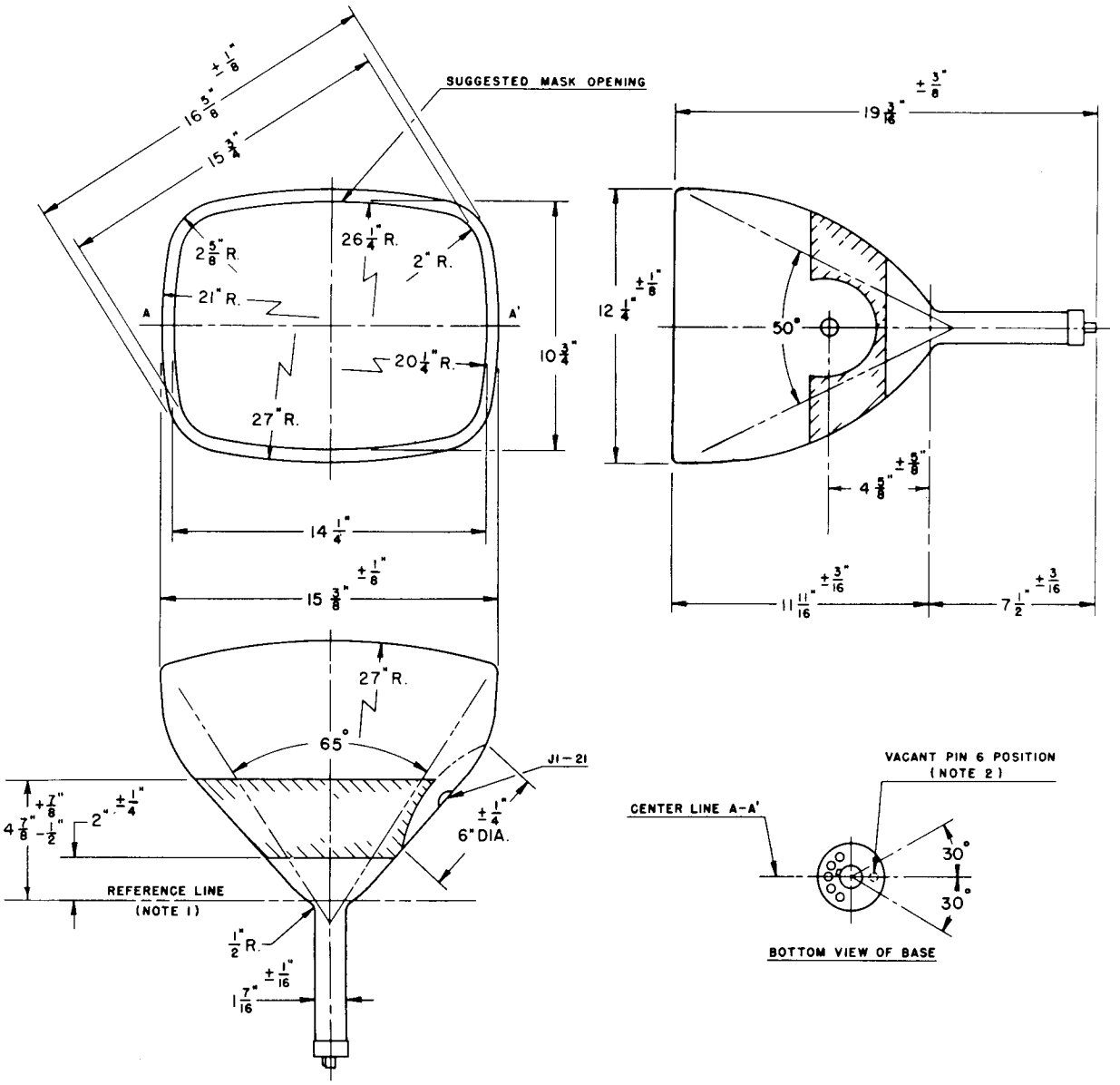


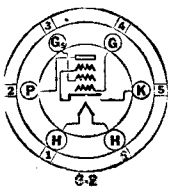
DIAGRAM NOTES:

1. *Reference line is determined by the plane of the upper edge of the reference line gauge (RTMA No. 110) when the gauge is resting on the glass cone.*

2. *Anode aligns with pin position No. 6 ±30 degrees.*

WARNING:

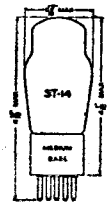
X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.



Sylvania

TYPE 18

AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

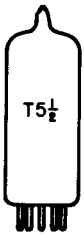
Tension de chauffage CA ou CC	14,0 volts
Courant de chauffage	0,3 ampère
Ampoule	ST 14
Culot — Moyen 6 broches	6-B
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :
(Voir type 42 excepté tension et courant chauffage.)

APPLICATION

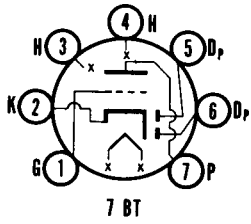
Le type Sylvania 18 est un amplificateur pentode de puissance chauffage indirect semblable aux types 2A5 et 42, à part la tension de chauffage.

Pour de plus amples renseignements sur le type 18, voir le type 42.



SYLVANIA TYPE 18FY6A

DUO DIODE TRIODE



7 BT

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7BT
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

Heater Voltage	18 Volts
Heater Current[1]	100 Ma
Heater Warm-up Time[2]	20 Seconds

Ratings (Design Maximum Values)

	Min-Max
Heater Current[3]	94-106 Ma
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total D C and Peak	100 Volts
Heater Positive with Respect to Cathode	
Total D C and Peak	100 Volts

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid to Plate	1.8	1.8 μμf
Input	2.4	2.4 μμf
Output	2	0.22 μμf
Grid to Diode No. 2 Plate	0.2	0.2 μμf Max.

RATINGS (Design Maximum System)

Plate Voltage	150 Volts Max.
Plate Dissipation	0.5 Watt Max.
Positive Grid Voltage	0 Volts Max.
Diode Plate Current (Each Diode)	1.0 Ma Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

Plate Voltage	100 Volts
Grid Voltage	−1 Volts
Plate Current	0.6 Ma
Plate Resistance	77,000 Ohms
Transconductance	1300 μmhos
Amplification Factor	100
Average Diode Current, Each Diode	
With 10 Volts D C Applied[5]	2.0 Ma

NOTES:

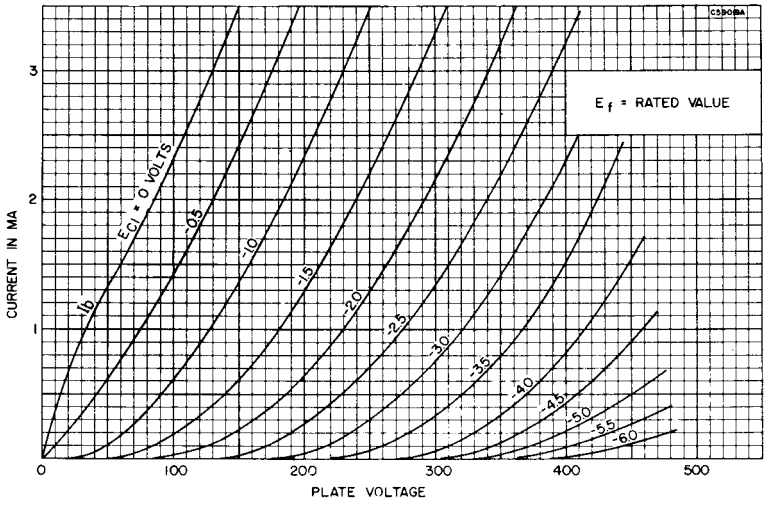
1. For series operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current.
2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
3. Heater voltage supply variations shall be restricted to maintain heater current within the specified values.
4. Shield No. 316 connected to Pin No. 2.
5. Test condition only.

APPLICATION

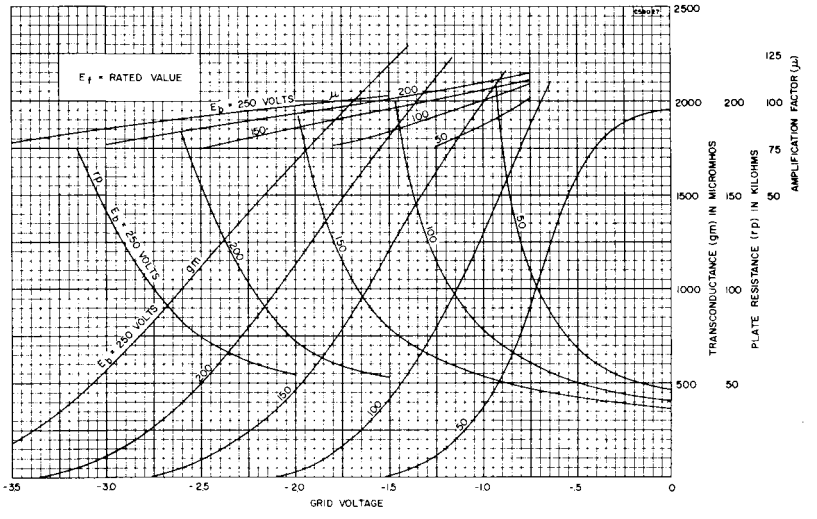
The Sylvania Type 18FY6A is a miniature high mu triode double diode featuring a 100 Ma heater controlled for heater warm-up time. This tube is designed for detector-amplifier applications in AC/DC type radio receivers.
Type 18FY6A replaces obsolete Type 18FY6.

SYLVANIA TYPE 18FY6A (Cont'd)

AVERAGE PLATE CHARACTERISTICS



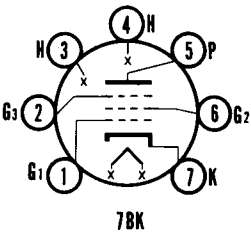
AVERAGE TRANSFER CHARACTERISTICS





SYLVANIA TYPE 18GD6A

RF PENTODE



MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7BK
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

	Series Operation
Heater Voltage	18 Volts
Heater Current[1]	100 Ma
Heater Warm-up Time[2]	20 Seconds
	Min-Max
Heater Current[3]	94-106 Ma
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total D C and Peak	100 Volts
Heater Positive with Respect to Cathode	
Total D C and Peak	100 Volts

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[2]

Grid No. 1 to Plate	.0035 μμf Max.
Input: g1 to (h+k+g2+g3+I.S.)	6.0 μμf
Output: p to (h+k+g2+g3+I.S.)	5.0 μμf

RATINGS (Design Maximum System)[1]

Plate Voltage	150 Volts Max.
Grid No. 2 Supply Voltage	150 Volts Max.
Grid No. 2 Voltage	See 6AM8 Rating Chart
Plate Dissipation	2.5 Watts Max.
Grid No. 2 Dissipation	0.6 Watts Max.

CHARACTERISTICS AND TYPICAL OPERATION

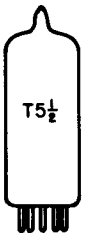
Plate Voltage	100 Volts
Grid No. 3 Voltage	Connected to Cathode at Socket
Grid No. 2 Voltage	100 Volts
Cathode Bias Resistor	150 Ohms
Plate Current	5 Ma
Grid No. 2 Current	2.0 Ma
Transconductance	4300 μmhos
Plate Resistance (approx.)	0.5 Megohm
Ec1 for Ib = 10 μa (approx.)	−4.7 Volts

NOTES:

1. For series operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current.
2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
3. Heater voltage supply variations shall be restricted to maintain heater current within the specified values.
4. External shield No. 316 connected to Pin No. 7 (cathode).

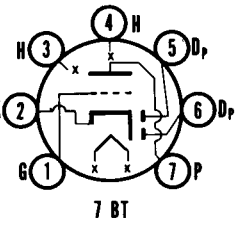
APPLICATION

The Sylvania 18GD6A is a miniature sharp-cutoff pentode featuring a 100 ma heater with controlled heater warm-up time. It is designed for RF and IF applications in AC/DC type radio receivers. Type 18GD6A replaces obsolete Type 18GD6.



SYLVANIA TYPE 18GE6A

DUO DIODE TRIODE



7 BT

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7BT
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

	Series Operation
Heater Voltage	18 Volts
Heater Current[1]	100 Ma
Heater Warm-up Time[2]	20 Seconds

Ratings (Design Maximum Values)

	Min-Max
Heater Current[3]	94-106 Ma
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total D C and Peak	100 Volts
Heater Positive with Respect to Cathode	
Total D C and Peak	100 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	1.8 μμf
Input: g to (h+k)	2.4 μμf
Output: p to (h+k)	0.2 μμf
Grid to Diode No. 2 Plate	0.2 μμf Max.

RATINGS (Design Maximum System)

Plate Voltage	150 Volts Max.
Plate Dissipation	0.5 Watt Max.
Diode Plate Current, (Each Diode)	1.0 Ma Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

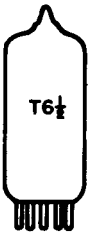
Plate Voltage	100 Volts
Grid Voltage	−1 Volts
Plate Current	1.0 Ma
Plate Resistance	40,000 Ohms
Transconductance	1700 μmhos
Amplification Factor	70
Average Diode Current, Each Diode	
With 10 Volts D C Applied[4]	2.0 Ma

NOTES:

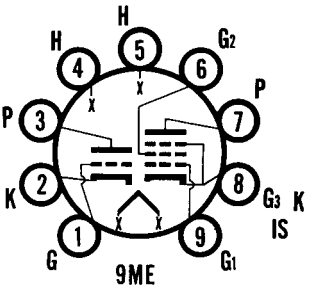
1. For series operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current.
2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
3. Heater voltage supply variations shall be restricted to maintain heater current within the specified values.
4. Test condition only.

APPLICATION

The Sylvania 18GE6A is a miniature high mu triode double diode featuring a 100 ma heater controlled for heater warm-up time. This tube is designed for detector-amplifier applications in AC/DC type radio receivers.
Type 18GE6A replaces obsolete Type 18GE6.



SYLVANIA TYPES
18HB8
35HB8



TRIODE-BEAM POWER AMPLIFIER

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	JEDEC 6-3
Basing	9ME
Cathodes	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	18HB8	35HB8
Heater Voltage[1]	18.0	35.0 Volts
Heater Current	300	150 Ma
Heater-Cathode Voltage (Design Max. Values)		
Heater Negative with Respect to Cathode		
Total D C and Peak	200	200 Volts Max.
Heater Positive with Respect to Cathode		
D C	100	100 Volts Max.
Total D C and Peak	200	200 Volts Max.

RATINGS (Design Maximum Values)

	Triode Section	Pentode Section
Plate Voltage	150	150 Volts Max.
Grid No. 2 Voltage	...	135 Volts Max.
Cathode Current	5	50 Ma Max.
Plate Dissipation	0.75	6.5 Watts Max.
Grid No. 2 Dissipation	...	1.5 Watts Max.
Grid Circuit Resistance		
Fixed Bias	...	0.1 Megohm Max.
Cathode Bias	...	0.47 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

	Triode Section	Pentode Section
Plate Voltage	115	115 Volts
Grid No. 2 Voltage	...	115 Volts
Peak AF Grid No. 1 Voltage	...	6.0 Volts
Cathode Resistor	410	150 Ohms
Zero-Signal Plate Current	2.5	33 Ma
Maximum-Signal Plate Current	...	32 Ma
Zero-Signal Grid No. 2 Current	...	7.5 Ma
Maximum-Signal Grid No. 2 Current	...	10 Ma
Transconductance	3900	6250 μmhos
Amplification Factor	74	...
Load Resistance	...	3500 Ohms
Maximum-Signal Power Output	...	1.0 Watt
Total Harmonic Distortion (approx.)	...	8 Percent

NOTE:

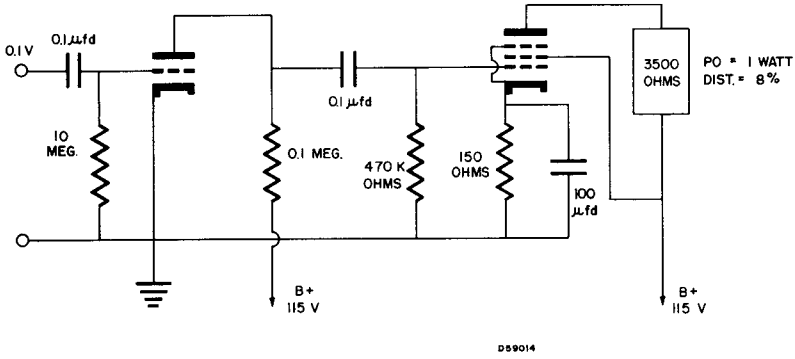
1. The heater should be connected with Pin No. 4 closest to the ground end of the heater string.

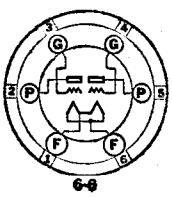
APPLICATION

The Sylvania Types 18HB8 and 35HB8 are miniature triode-pentodes designed for audio applications in stereo and monaural sound equipment.

SYLVANIA TYPES 18HB8 (Cont'd)
35HB8

FIGURE 1

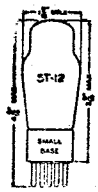




Sylvania

TYPE 19

AMPLIFICATEUR CLASSE B DEUX VOLTS



CARACTERISTIQUES

Tension filament CC	2,0 volts
Courant filament	0,260 ampère
Ampoule	ST 12
Culot — Petit modèle 6 broches	6-C
Position de montage	Verticale

Conditions limites de fonctionnement. (Voir page 9) :

Tension filament CC	2,0 volts
Courant filament	0,260 ampère
Tension plaque	135 volts max.
Courant plaque de pointe par plaque	50 ma. max.

Conditions de fonctionnement et caractéristiques :

Tension filament	2,0	2,0	2,0 volts
Tension plaque	135	135	135 volts
Tension grille	0	—3,0	—6,0 volts
Courant plaque sans signal ...	10,0	3,4	0,2 ma.
Courant plaque*	27,0	25,0	22,0 ma.
Puissance d'entrée requise ...	170	130,0	95 mw. appr.
Puissance modulée	2,1	1,9	1,6 watts
Impédance de charge (plaque à plaque)	10.000	10.000	10.000 ohms

* Signal de 50 volts grille à grille.

APPLICATION

Le type Sylvania 19 est un tube amplificateur complet classe B destiné à fonctionner sur batterie 2 volts. Ce tube permet l'utilisation d'un étage de sortie classe B puissant qui, précédemment, devait être équipé de deux tubes 30 polarisés à courant plaque nul. Dans ce dernier cas, une polarisation de 22,5 approximativement doit être appliquée, ce qui rend nécessaire l'emploi d'une batterie H.T. de 180 volts. Le type 19 ne demande qu'une polarisation de 0 à 6 volts, suivant la tension appliquée aux plaques et la consommation à signal nul à obtenir.

Avec 135 volts seulement appliqués aux plaques, la puissance obtenue avec un tube 19 est plus grande que celle fournie par une paire de tubes 30 fonctionnant avec une tension plaque de 157,5 volts.

Comme amplificateur classe B, le type 19 peut fonctionner avec 135 volts plaque. Pour une plus grande puissance, la tension peut être élevée jusqu'à 180 volts, une puissance d'entrée d'environ 100 milliwatts étant alors nécessaire pour une puissance de sortie de 1,6 watt. Avec un étage pilote équipé d'un tube 30, fonctionnant avec une tension plaque de 135 v. et une polarisation de 9 volts, la puissance de sortie atteint seulement 1,25 watt, la puissance à l'entrée du tube 19 fournie par le type 30 étant insuffisante. L'augmentation de la tension plaque du tube 30 ne produit une augmentation de puissance que si le détecteur est capable de fournir des tensions suffisantes pour faire rendre au tube 30 son maximum de puissance. En général, un étage supplémentaire B.F. est requis.

L'usage du type 49 dans l'étage pilote permet d obtenir du tube 19 une puissance supérieure, mais exige également un étage basse fréquence supplémentaire pour obtenir plus de 1,5 watt.

SYLVANIA engineering data service

SYLVANIA
19AFP4 19AUP4
19BAP4 19BCP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	102 Degrees
Diagonal	114 Degrees
Vertical	86 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	44 Percent

Types 19AUP4 and 19BCP4 have external surface of safety plate treated to reduce specular reflection.

ELECTRICAL DATA

	19BAP4 19BCP4	19AFP4 19AUP4	
Heater Voltage	6.3	6.3	Volts
Heater Current ± 5%	0.30	0.60	Ampere
Heater Warm-up Time[1]	11	11	Seconds
Direct Interelectrode Capacitances (Approx.)			
Cathode to All Other Electrodes		5	μμf
Grid No 1 to All Other Electrodes		6	μμf
External Conductive Coating to Anode[2]		1500	μμf Max.
		1000	μμf Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	$12\frac{1}{16}$ Inches
Width	$15\frac{1}{4}$ Inches
Diagonal	$17\frac{3}{4}$ Inches
Area	174 Sq. Inches
Neck Length	$4\frac{1}{8} \pm \frac{1}{8}$ Inches
Overall Length	$11\frac{5}{8} \pm \frac{5}{16}$ Inches
Bulb	J149C
Safety Plate (19AFP4, 19BAP4)	FP159A
Safety Plate (19AUP4, 19BCP4)	FP159B
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (Approx.)	$18\frac{1}{2}$ Pounds

RATINGS

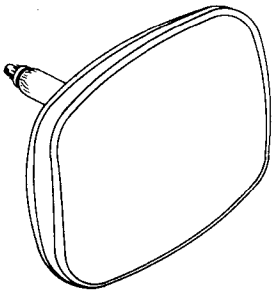
MAXIMUM RATINGS (Design Maximum Values)

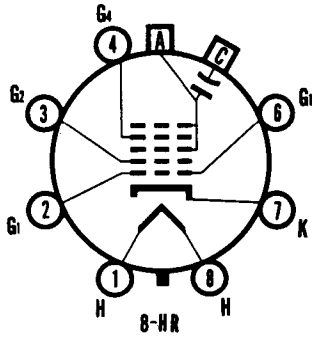
Grid Drive Service[3]

Anode Voltage	20,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Voltage	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
19″ Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
No Ion Trap
External Conductive Coating





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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

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EMPORIUM, PENNSYLVANIA
OCTOBER, 1961

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) Con't.

Cathode Drive Service[4]

Anode Voltage	20,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	–400 to +1250 Volts	dc
Grid No. 2 Voltage	700 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	–46 to –94 Volts	dc

Cathode Drive Service[4]

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Cathode Voltage Required for Cutoff[5]	42 to 78 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to cathode unless indicated otherwise.*
4. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
5. *Visual extinction of focused raster. For cutoff of the undeflected focused spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

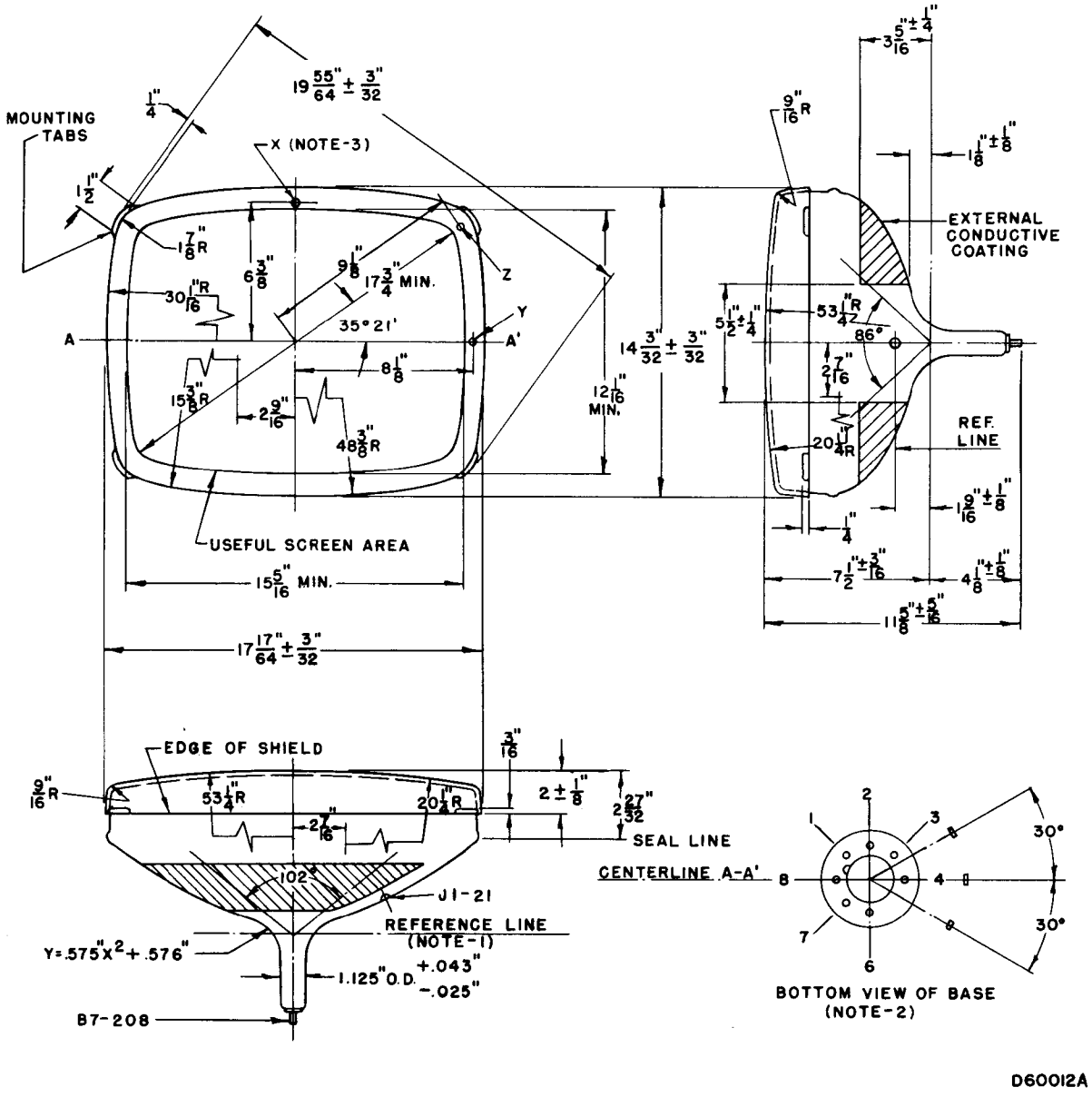


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through points X, Y and Z are located as follows:*

   Plane tangent to crown of face to plane of X: 0.500" Nominal
   Plane of X to plane of Y = .421" ±.025"
   Plane of X to plane of Z = .738" ± .045"

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	101 Degrees
Diagonal	114 Degrees
Vertical	86 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	79 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.45+5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 $\mu\mu$f	
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f	
External Conductive Coating to Anode[2]	1900 $\mu\mu$f	Max.
	1400 $\mu\mu$f	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	12 Inches
Diagonal	17 9/16 Inches
Width	15⅛ Inches
Minimum Useful Screen Area	172 Sq. Inches
Neck Length	4⅛ ± ⅛ Inches
Bulb	J149A
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-214
Basing	7FA
Weight (Approx.)	13½ Pounds
Overall Length	11⅜ ± ¼ Inches

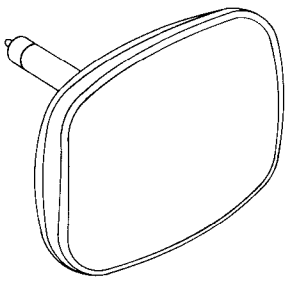
RATINGS

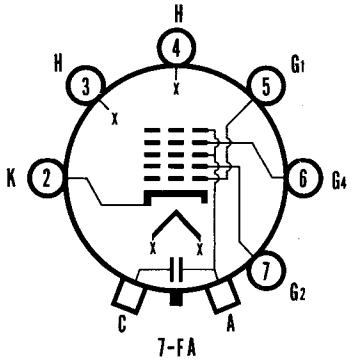
MAXIMUM RATINGS (Design Maximum Values)[3]

Anode Voltage		
Maximum	19,800 Volts	dc
Minimum	12,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)[4]	−550 to +1100 Volts	dc
Grid No. 2 Voltage		
Maximum	70 Volts	dc
Minimum	40 Volts	dc
Cathode Voltage		
Positive Bias Value	100 Volts	dc
Negative Peak Value	0 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period not to Exceed 15 Seconds	410 Volts	
After Equipment Warm-up Period	180 Volts	
Heater Positive with Respect to Cathode	180 Volts	

QUICK REFERENCE DATA

Television Picture Tube
19" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
1⅛" Neck Diameter
No Ion Trap
External Conductive Coating
Low Grid No. 2 Voltage
Cathode Drive Design
6.3 Volt, 450 ma heater





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JUNE, 1961

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS[3]

Anode Voltage	14,500 Volts	dc
Grid No. 4 Voltage for Focus	0 to +500 Volts	dc
Grid No. 2 Voltage	50 Volts	dc
Cathode Voltage Required for Cutoff[5]	35 to 50 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater Warm-up Time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating must be grounded.*
3. *This type is designed for cathode-drive service. All voltages shown are positive with respect to Grid No. 1 Voltage, unless otherwise indicated.*
4. *The focus electrode may be modulated to improve overall focus.*
5. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be increased approximately 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

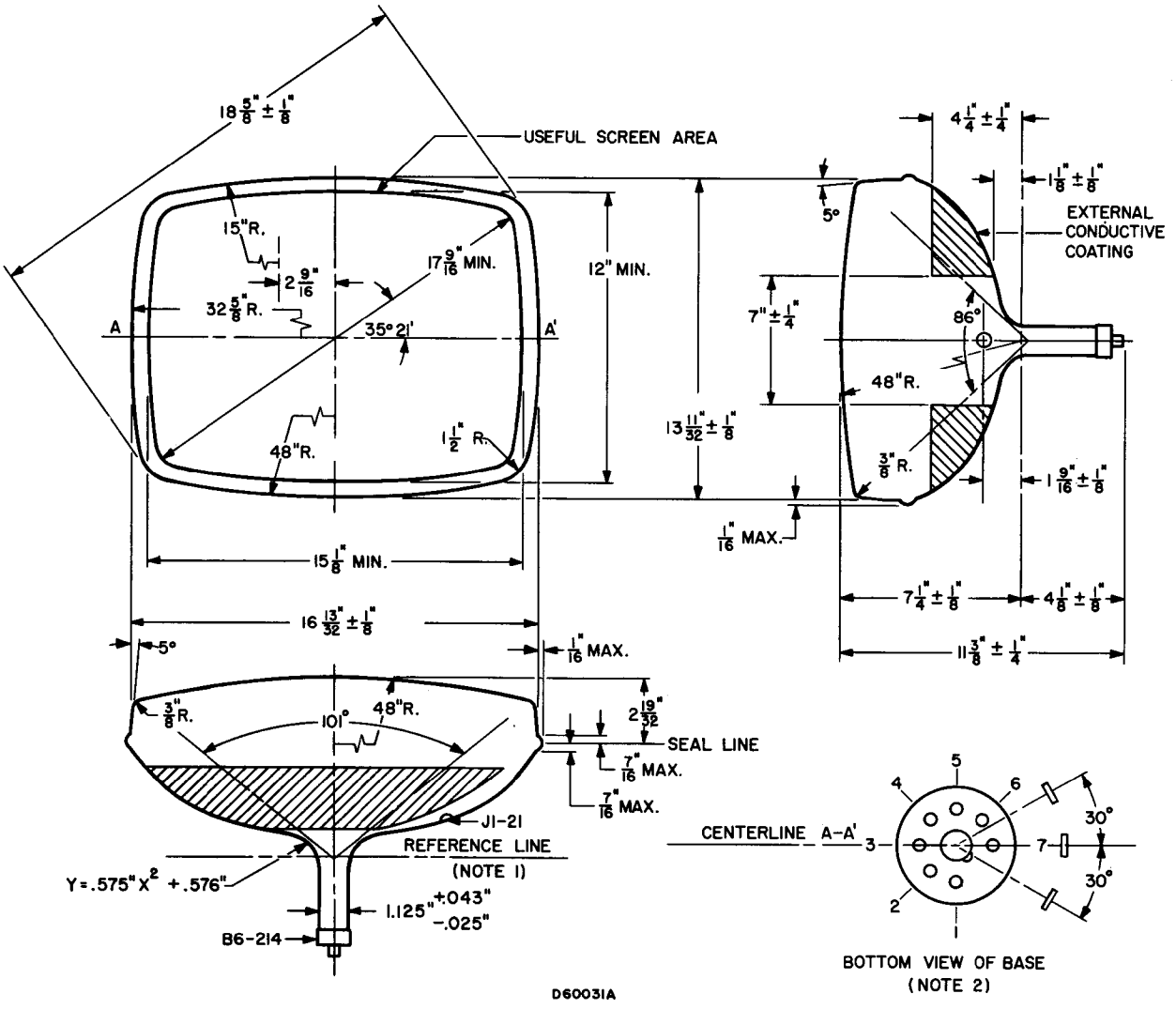


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' JEDEC No. 126 Reference Gauge when the gauge is seated against the bulb.*
2. *Base Pin No. 7 aligns with anode contact (J1-21) within 30°.*

SYLVANIA

engineering data service

SYLVANIA
19ANP4
19YP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Tri-Potential Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	102	Degrees
Diagonal	114	Degrees
Vertical	85	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (Approx.)	78	Percent

ELECTRICAL DATA

	19ANP4	19YP4	
Heater Voltage	6.3	6.3	Volts
Heater Current	0.450±5%	0.600±5%	Ampere
Heater Warm-up Time[1]		11	Seconds
Direct Interelectrode Capacitances (Approx.)			
Cathode to All Other Electrodes		5	μμf
Grid No. 1 to All Other Electrodes		6	μμf
External Conductive Coating to Anode [2]		1500	μμf Max.
		1000	μμf Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	15⅛ x 12	Inches
Minimum Useful Screen Area	172	Sq. Inches
Neck Length	3 9/16 ± ⅛	Inches
Overall Length	10 13/16 ±¼	Inches
Bulb	J149A1	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-208	
Basing	8JR	
Weight (Approx.)	14	Pounds

RATINGS

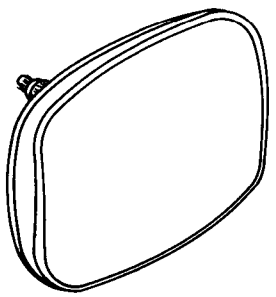
MAXIMUM RATINGS (Design Maximum Values)

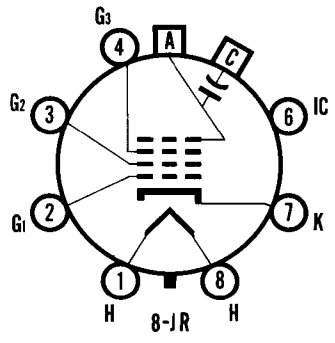
Grid Drive Service

Maximum Anode Voltage	20,000	Volts	dc
Minimum Anode Voltage	11,000	Volts	dc
Grid No. 3 Voltage (Focusing Electrode)	−350 to +700	Volts	dc
Maximum Grid No. 2 Voltage	600	Volts	dc
Minimum Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	155	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period Not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

QUICK REFERENCE DATA

Television Picture Tube
19" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Tri-Potential
Electrostatic Focus
114° Magnetic Deflection
1⅛" Neck Diameter
No Ion Trap
External Conductive Coating
Short Neck
19ANP4: 450 Ma Heater





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EMPORIUM, PENNSYLVANIA

DECEMBER, 1961

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) (Continued)

Cathode Drive Service

Maximum Anode Voltage	20,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 3 Voltage (Focusing Electrode)	−200 to +850 Volts	dc
Maximum Grid No. 2 Voltage	750 Volts	dc
Minimum Grid No. 2 Voltage	450 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	dc
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service

Anode Voltage	16,000 Volts	dc
Grid No. 3 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	500 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−43 to −78 Volts	dc

Cathode Drive Service

Anode Voltage	16,000 Volts
Grid No. 3 Voltage for Focus	0 to 400 Volts
Grid No. 2 Voltage	500 Volts
Grid No. 1 Voltage	0 Volts
Cathode Voltage Required for Cutoff	41 to 69 Volts

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

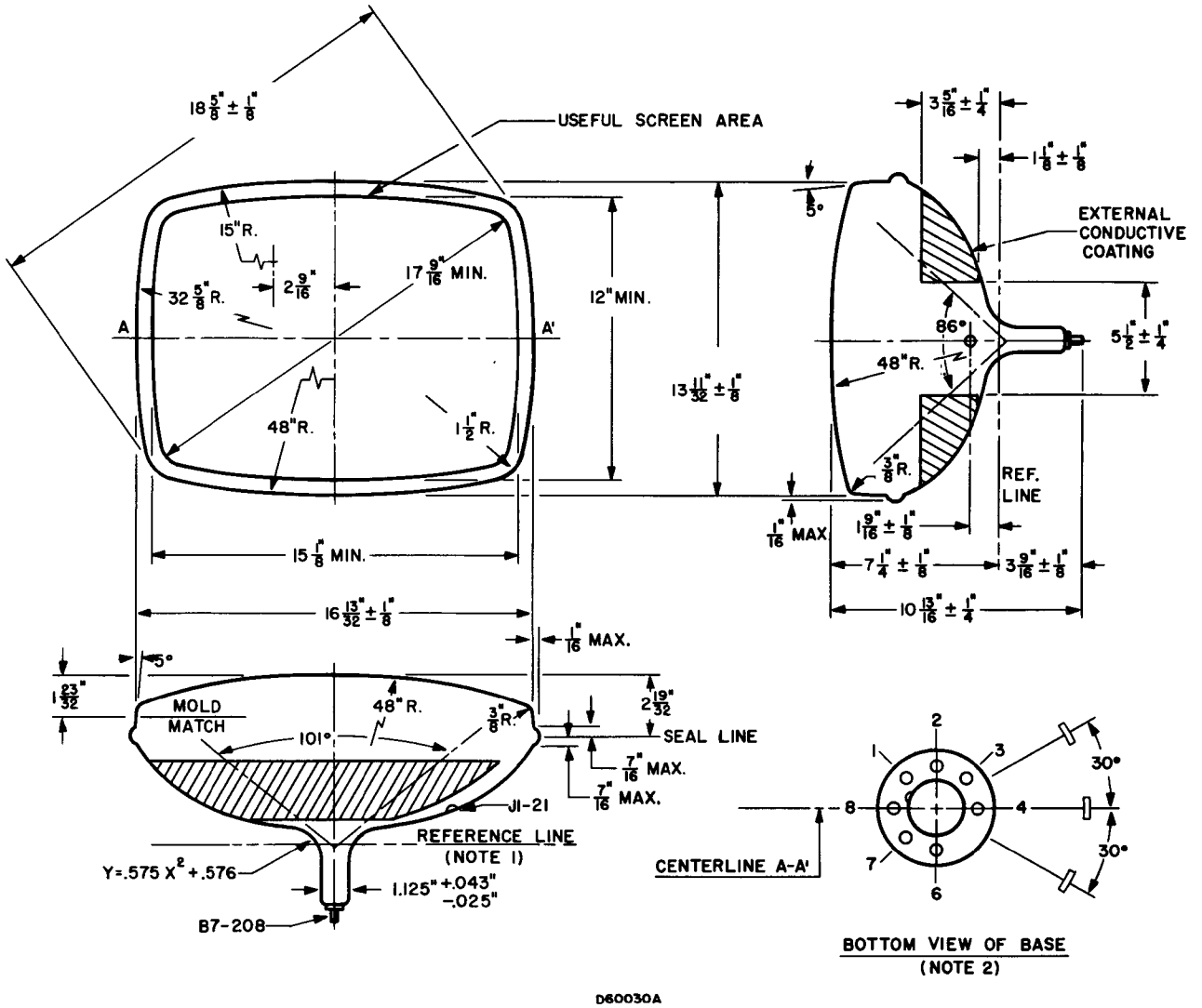


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	102	Degrees
Diagonal	114	Degrees
Vertical	86	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Bonded Shield	
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)		
Light Transmittance of Faceplate Assembly (Approx.)	44	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts	
Heater Current	0.60 ±5%	Ampere	
Heater Warm-up Time[1]	11	Seconds	
Direct Interelectrode Capacitances (Approx.)			
Cathode to All Other Electrodes	5	μμf	
Grid No. 1 to All Other Electrodes	6	μμf	
External Conductive Coating to Anode[2]	1500	μμf	Max.
	1000	μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	12 1/16	Inches
Width	15 5/16	Inches
Diagonal	17¾	Inches
Area	174	Sq. Inches
Neck Length	5⅛ ± ⅛	Inches
Overall Length	12⅜ ± 5/16	Inches
Bulb	C149 Exp. #5 or Equiv.	
Safety Plate	FP159A	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-208	
Basing	8HR	
Weight (Approx.)	18½	Pounds

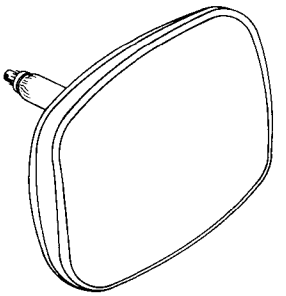
RATINGS

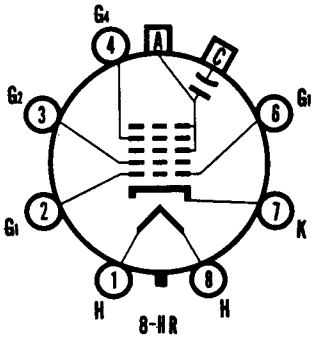
MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Maximum Anode Voltage	20,000	Volts	dc
Minimum Anode Voltage	12,000	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100	Volts	dc
Grid No. 2 Voltage	550	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	155	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

QUICK REFERENCE DATA

Television Picture Tube
19" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
No Ion Trap
External Conductive Coating





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

FEBRUARY, 1961

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	16,000	Volts	dc
Grid No. 4 Voltage for Focus	0 to +400	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

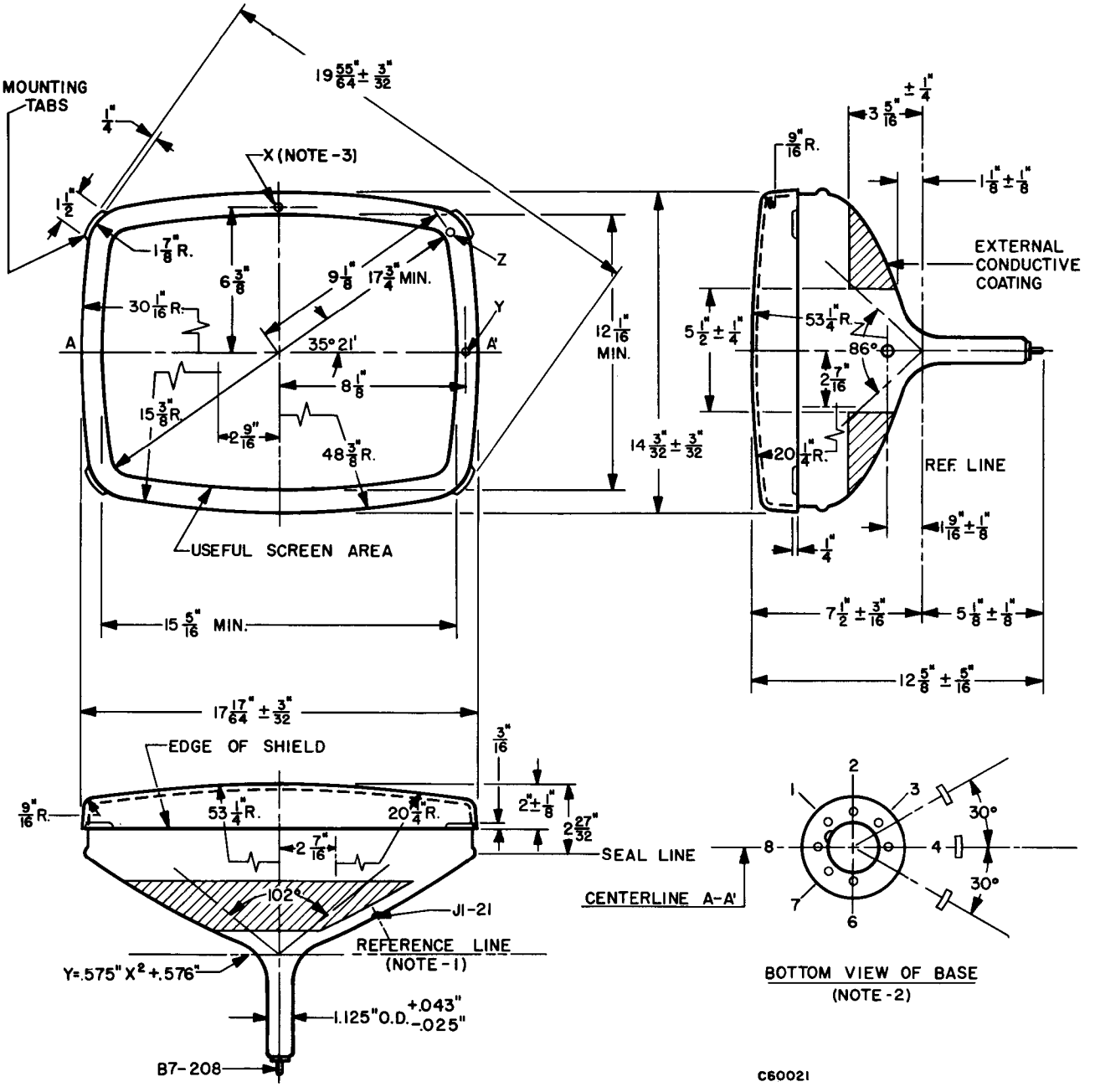


DIAGRAM NOTES

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through points X, Y and Z are located as follows:*

   Plane tangent to crown of face to plane of X: 0.500" Nominal

   Plane of X to plane of Y = .421" ± .025"

   Plane of X to plane of Z = .738" ± .045"

SYLVANIA

engineering data service

SYLVANIA

19ASP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	102	Degrees
Diagonal	114	Degrees
Vertical	86	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Bonded Shield	
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)		
Light Transmittance of Faceplate Assembly (Approx.)	44	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts	
Heater Current	0.30 ± 5%	Ampere	
Heater Warm-up Time[1]	11	Seconds	
Direct Interelectrode Capacitances (Approx.)			
Cathode to All Other Electrodes	5	μμf	
Grid No. 1 to All Other Electrodes	6	μμf	
External Conductive Coating to Anode[2]	1500	μμf	Max.
	1000	μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	12 1/16	Inches
Width	15 5/16	Inches
Diagonal	17¾	Inches
Area	174	Sq. Inches
Neck Length	5⅛ ± ⅛	Inches
Overall Length	12⅜ ± 5/16	Inches
Bulb	C149 Exp. #5 or Equiv.	
Safety Plate	FP159A	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-208	
Basing	8HR	
Weight (Approx.)	18½	Pounds

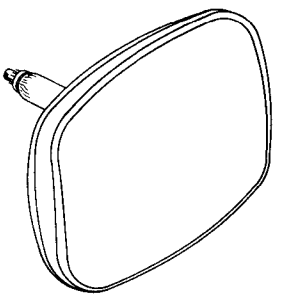
RATINGS

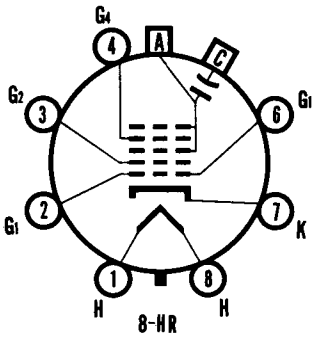
MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Maximum Anode Voltage	20,000	Volts	dc
Minimum Anode Voltage	12,000	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100	Volts	dc
Grid No. 2 Voltage	550	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	155	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

QUICK REFERENCE DATA

Television Picture Tube
19" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
No Ion Trap
External Conductive Coating
300 Ma Heater





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ELECTRONIC TUBES
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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
FEBRUARY, 1961

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts. more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

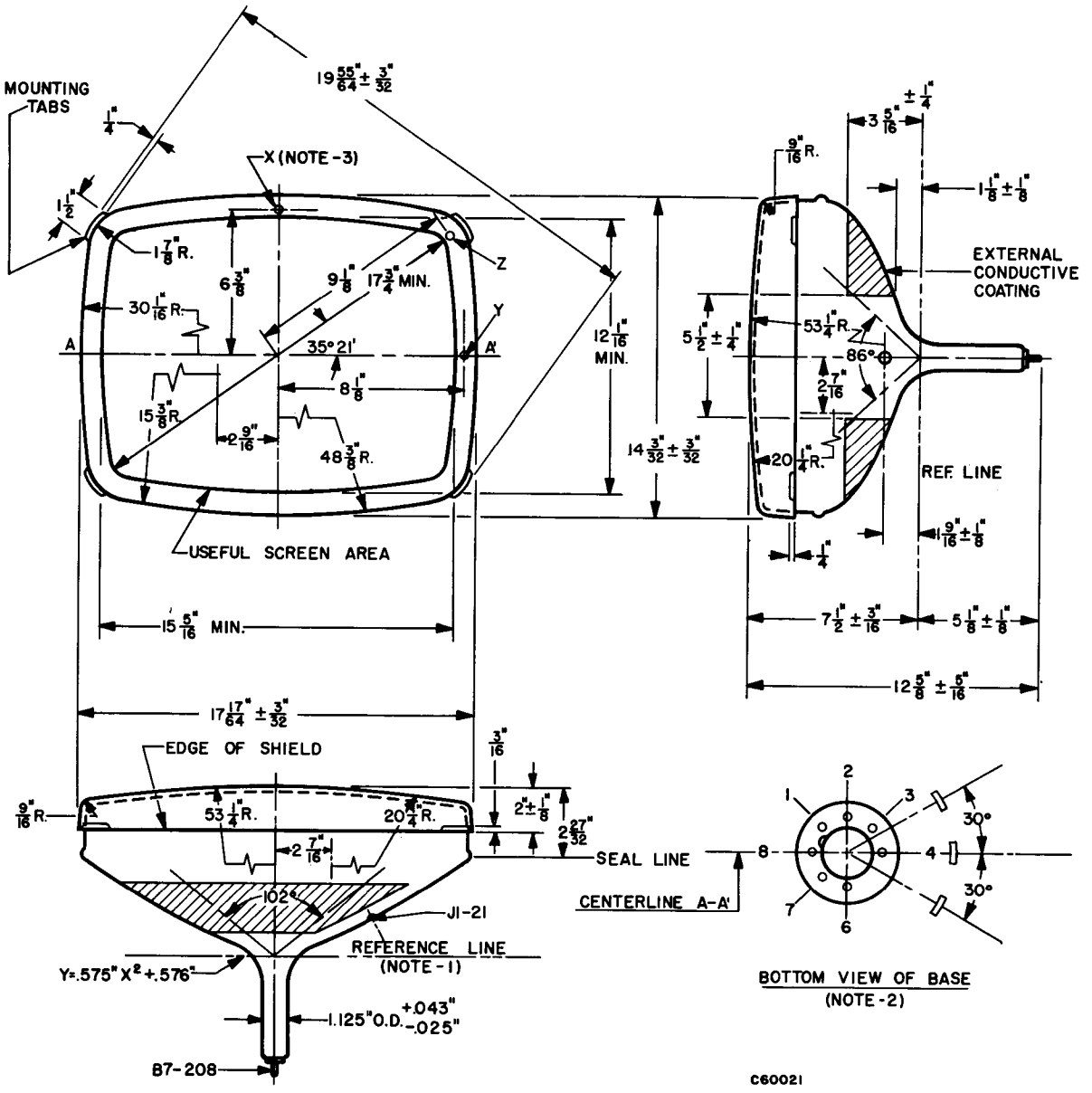


DIAGRAM NOTES:

1. *Reference line is determined by place C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through points X, Y and Z are located as follows:*

   Plane tangent to crown of face to plane of X: 0.500" Nominal

   Plane of X to plane of Y = .421" ± .025"

   Plane of X to plane of Z = .738" ± .045"

CHARACTERISTICS

GENERAL DATA

Focusing Method	Tri-Potential Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	102 Degrees
Diagonal	114 Degrees
Vertical	86 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	44 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 $\mu\mu$f	
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f	
External Conductive Coating to Anode[2]	1500 $\mu\mu$f	Max.
	1000 $\mu\mu$f	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	12 1/16 Inches
Width	15 5/16 Inches
Diagonal	17¾ Inches
Area	174 Sq. Inches
Neck Length	3 9/16 ± ⅛ Inches
Overall Length	11 1/16 ± 5/16 Inches
Bulb	C149 Exp. #5 or Equiv.
Safety Plate	FP159A
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8JR
Weight (Approx.)	18½ Pounds

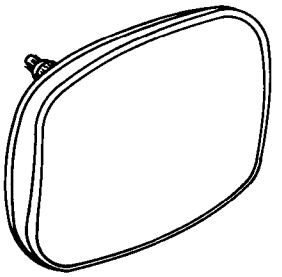
RATINGS

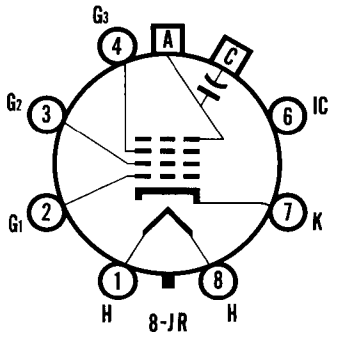
MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Maximum Anode Voltage	20,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 3 Voltage (Focusing Electrode)	700 Volts	dc
Grid No. 2 Voltage	600 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
19" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Tri-Potential Electrostatic Focus
114° Magnetic Deflection
No Ion Trap
External Conductive Coating





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ELECTRONIC TUBES
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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

FEBRUARY, 1961

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	16,000 Volts	dc
Grid No. 3 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	500 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−43 to −78 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts. more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

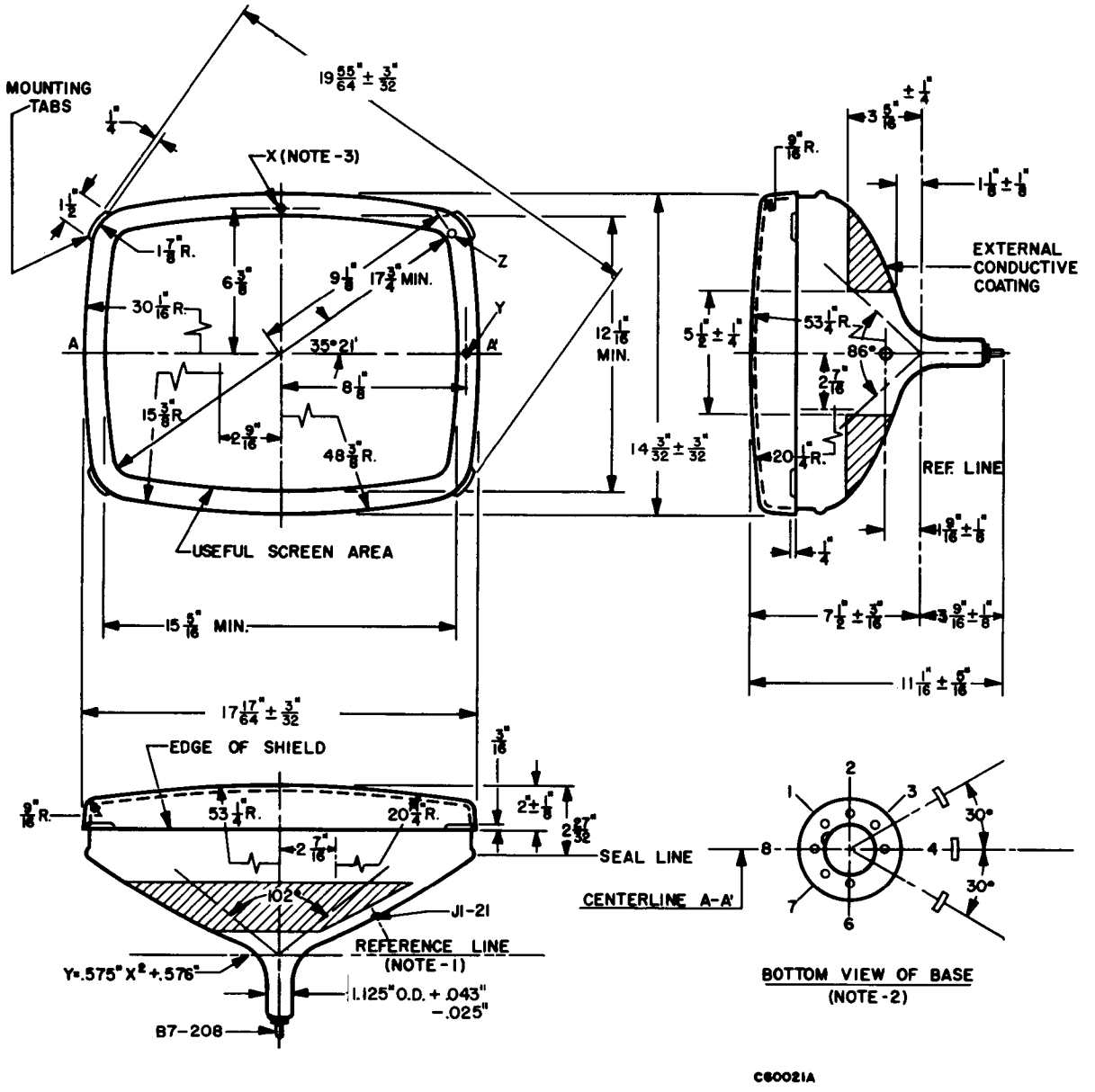


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through points X, Y and Z are located as follows:*
   Plane tangent to crown of face to plane of X: 0.500" Nominal
   Plane of X to plane of Y = .421" ± .025"
   Plane of X to plane of Z = .738" ± .045"

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	102 Degrees
Diagonal	114 Degrees
Vertical	86 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	44 Percent
19BQP4: External Surface of Safety Plate Treated to Reduce Specular Reflection	

ELECTRICAL DATA

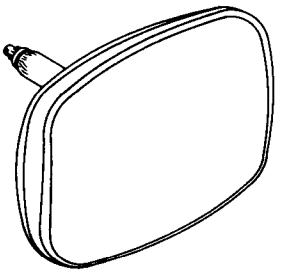
Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	1500 μμf	Max.
	1000 μμf	Min.

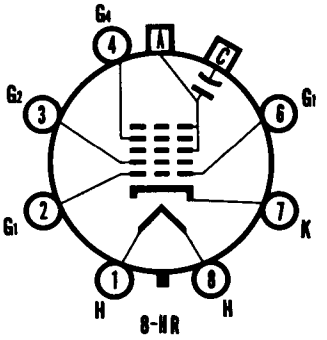
MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	12 1/16 Inches
Width	15 ¼ Inches
Diagonal	17 5/8 Inches
Area	172 Sq. Inches
Neck Length	5 1/8 ± 1/8 Inches
Overall Length	12 5/8 ± 5/16 Inches
Bulb	J149C
Safety Plate	
19BNP4	FP159A
19BQP4	FP159B
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (Approx.)	18 ½ Pounds

QUICK REFERENCE DATA

Television Picture Tube
19″ Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
External Conductive Coating
19BQP4: Anti-Reflection Treated





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ELECTRONIC TUBES
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PICTURE TUBE
OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
MAY, 1962

File Under
TELEVISION PICTURE TUBES

RATINGS

MAXIMUM RATINGS (Design Maximum Values) Cathode Drive Service[3]

Maximum Anode Voltage	20,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	70 Volts	dc
Cathode Voltage		
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS, Cathode Drive Service[3]

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	ds
Grid No. 2 Voltage	50 Volts	dc
Cathode Voltage Required for Cutoff[4]	+32 to +50 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to Grid No. 1 Voltage, unless otherwise indicated.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more positive.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

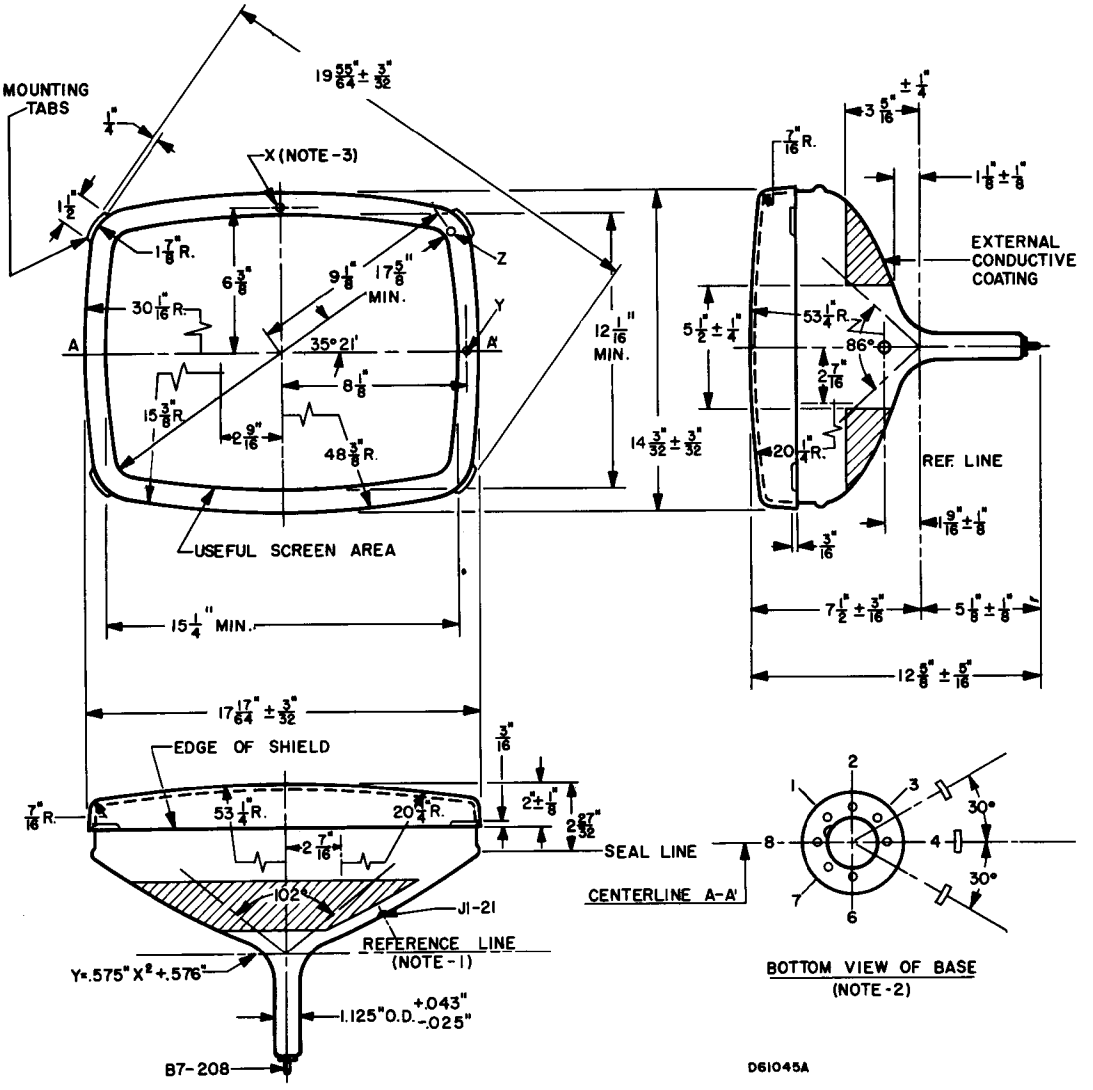


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through Points X, Y, and Z are located as follows:*

   Plane tangent to crown of face to plane of X: 0.531" Nominal

   Plane of X to plane of Y = .421" ± .025"

   Plane of X to plane of Z = .738" ± .045"

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	81 Degrees
Diagonal	92 Degrees
Vertical	67 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	44 Percent
External Surface Treated to Reduce Specular Reflection	

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	1700 μμf	Max.
	1400 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	12 1/16 Inches
Width	15 1/4 Inches
Diagonal	17 5/8 Inches
Area	172 Sq. Inches
Neck Length	5 1/2 ± 3/16 Inches
Overall Length	15 1/2 ± 3/8 Inches
Bulb	J149D
Safety Plate	FP159B
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-203
Basing	12L
Weight (Approx.)	20 Pounds

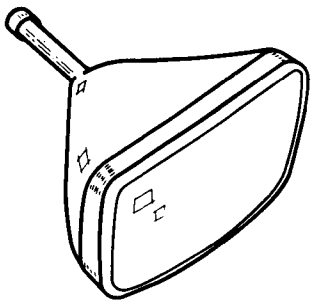
RATINGS

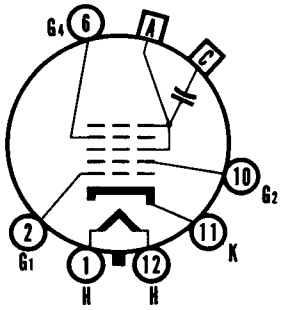
MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Maximum Anode Voltage	20,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
19″ Direct Viewed
Rectangular Glass Type
Bonded Shield
Gray Filter Glass
Anti-Reflection Treated
Aluminized Screen
Electrostatic Focus
92° Magnetic Deflection
No Ion Trap
External Conductive Coating





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PICTURE TUBE
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SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
MARCH, 1962

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS, Grid Drive Service

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

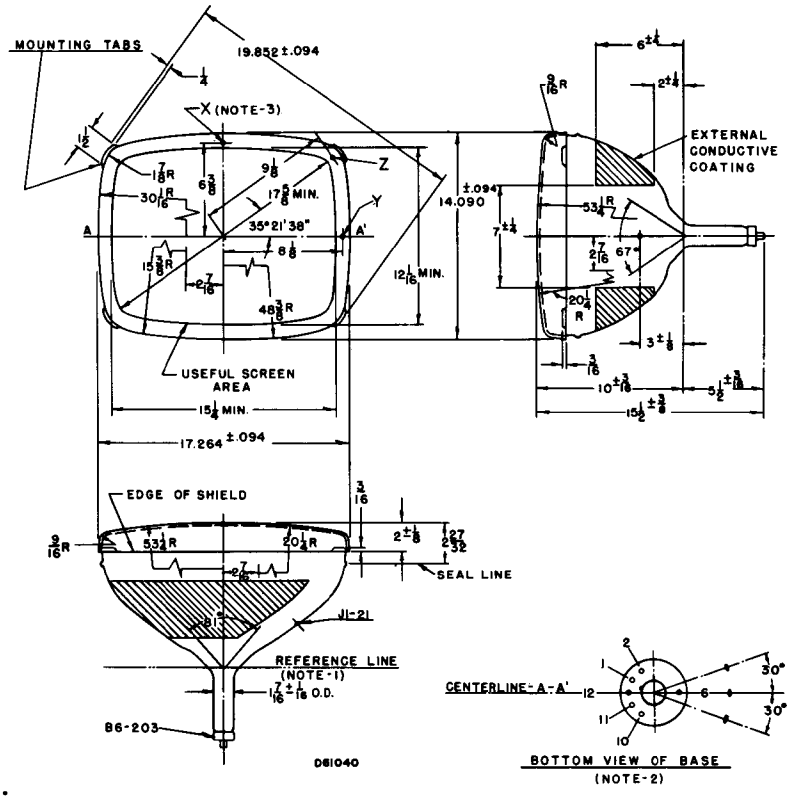


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 116 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base pin No. 6 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to the tube axis and passing through points X, Y, and Z are as follows:*
   Plane tangent to crown of face to plane of X: 0.500 nom.
   Plane of X to plane of Y: 0.421" ± .025"
   Plane of X to plane of Z: 0.738" ± .045"
4. *Dimensions are in inches.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	101 Degrees
Diagonal	114 Degrees
Vertical	86 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	78 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating to Anode[2]	1500 pf	Max.
	1000 pf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	12 Inches
Width	15 1/8 Inches
Diagonal	17 9/16 Inches
Minimum Useful Screen Area	172 Sq. Inches
Neck Length	4 3/8 ± 1/8 Inches
Overall Length	11 5/8 ± 1/4 Inches
Bulb	J149A
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (Approx.)	13 ½ Pounds

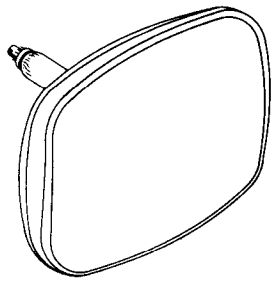
RATINGS

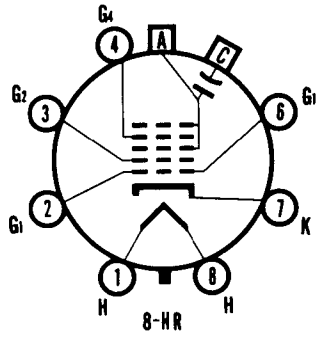
MAXIMUM RATINGS (Design Maximum Values)

Cathode Drive Service[3]		
Maximum Anode Voltage	20,000 Volts	dc
Minimum Anode Voltage	10,000 Volts	dc
Grid No. 4 Voltage		
(Focusing Electrode)	−400 to +1250 Volts	dc
Maximum Grid No. 2 Voltage	70 Volts	dc
Minimum Grid No. 2 Voltage	40 Volts	dc
Cathode Voltage		
Positive Bias Value	100 Volts	dc
Positive Peak Value	150 Volts	
Negative Bias Value	0 Volt	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
19" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
1⅛" Neck Diameter
No Ion Trap
External Conductive Coating
Low Grid No. 2 Voltage





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE
OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
DECEMBER, 1963

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS

Cathode Drive Service[3]

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	50 Volts	dc
Cathode Voltage Required for Cutoff[4]	32 to 50 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to Grid 1 unless indicated otherwise.*
4. *Visual extinction of focused raster. For cutoff of the undeflected focused spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

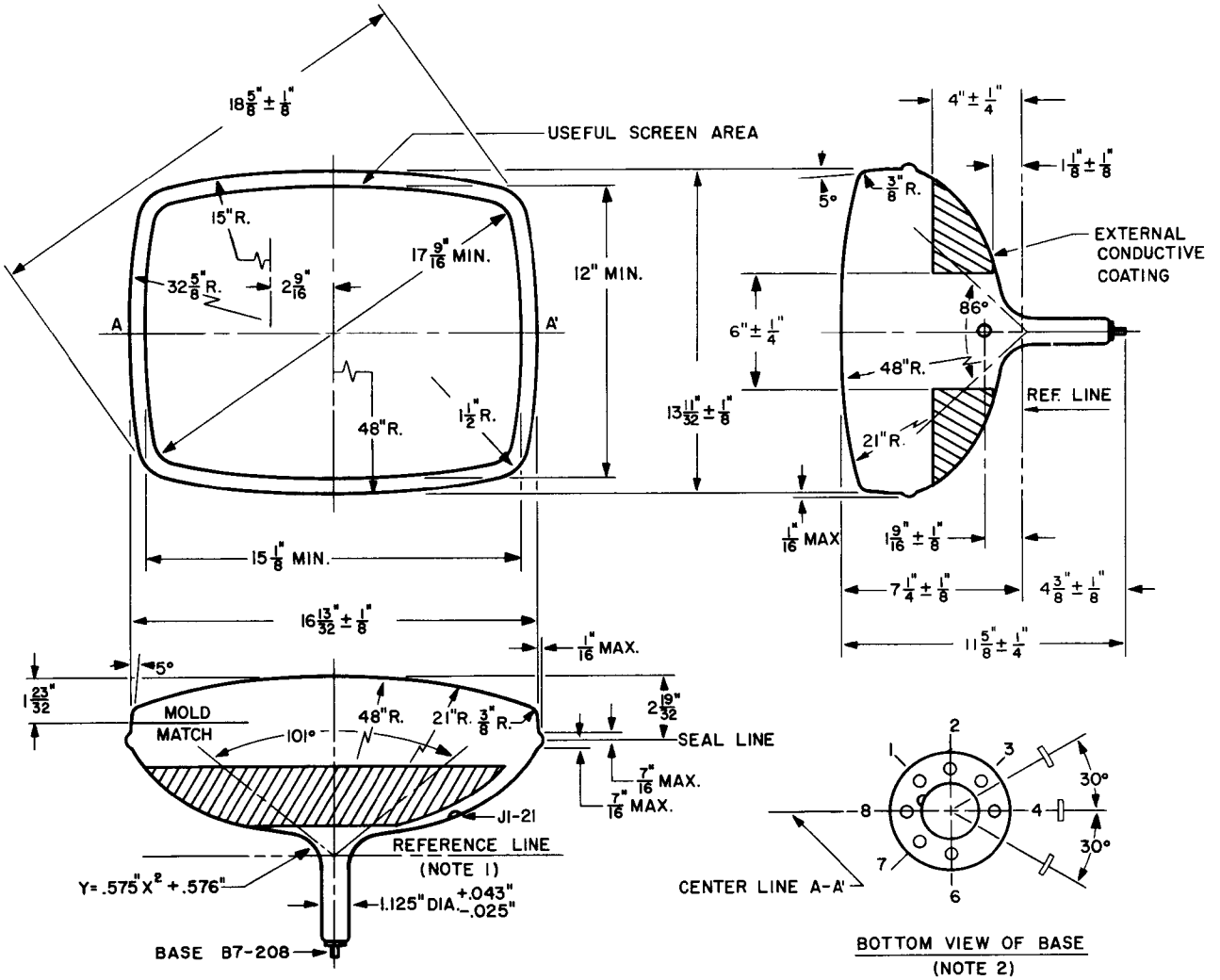


DIAGRAM NOTES:

1. *Reference Line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	102 Degrees
Diagonal	114 Degrees
Vertical	86 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	44 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.45 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating to Anode[2]	2100 pf	Max.
	1700 pf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	12 1/16 Inches
Width	15 ¼ Inches
Diagonal	17 5/8 Inches
Area	172 Sq. Inches
Neck Length	4 1/8 ± 1/8 Inches
Overall Length	11 5/8 ± 5/16 Inches
Bulb	J149C
Safety Plate	FP159A
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (Approx.)	18 ½ Pounds

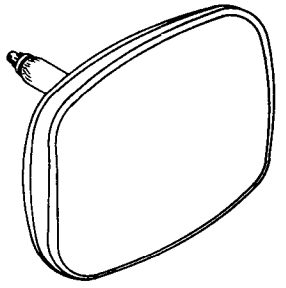
RATINGS

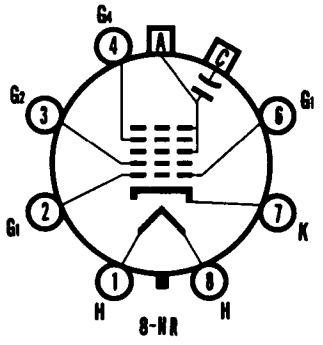
MAXIMUM RATINGS (Design Maximum Values)

Cathode Drive Service[3]		
Maximum Anode Voltage	23,000 Volts	dc
Minimum Anode Voltage	15,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-400 to +1250 Volts	dc
Grid No. 2 Voltage	70 Volts	dc
Cathode Voltage		
Positive Bias Value	100 Volts	dc
Positive Peak Value	150 Volts	
Negative Bias Value	0 Volt	
Negative Peak Value	2 Volts	dc
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
19" Direct Viewed
Rectangular Glass Type
Bonded Shield
Gray Filter Glass
Aluminized Screen
Neck Length 4 1/8"
Electrostatic Focus
114° Magnetic Deflection
No Ion Trap
External Conductive Coating
6.3 Volt, 450 Ma Heater
Low Grid No. 2 Voltage





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PICTURE TUBE
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SENECA FALLS, NEW YORK

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EMPORIUM, PENNSYLVANIA
SEPTEMBER, 1963

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS

Cathode Drive Service[3]		
Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage[3]	50 Volts	dc
Cathode Voltage Required for Cutoff[4]	+32 to +50 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more positive.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

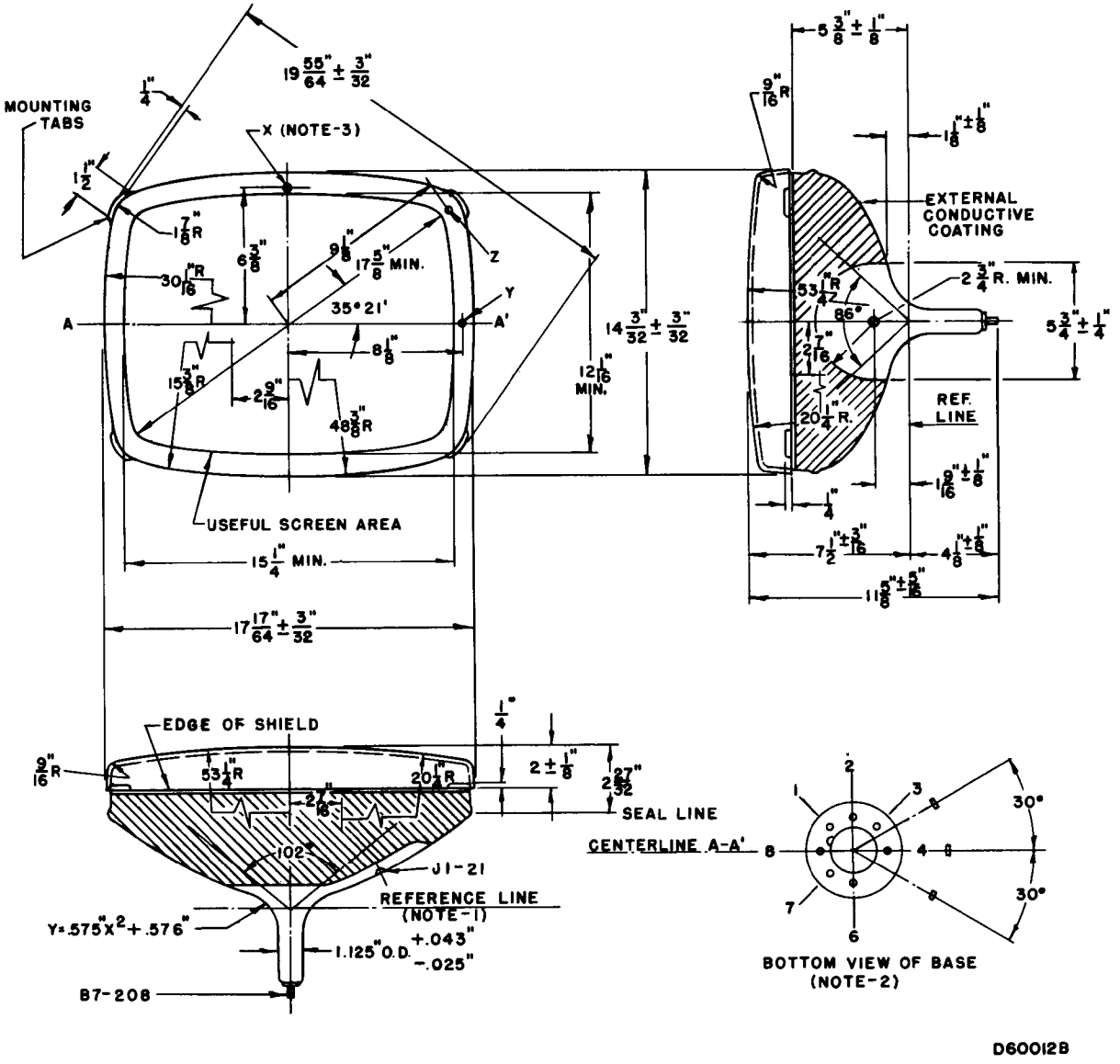


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through points X, Y and Z are located as follows:*
   Plane tangent to crown of face to plane of X: 0.500" Nominal
   Plane of X to plane of Y = .421" ± .025"
   Plane of X to plane of Z = .738" ± .045"

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	101 Degrees
Diagonal	114 Degrees
Vertical	86 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	78 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating to Anode[2]	1900 pf	Max.
	1400 pf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	12 Inches
Width	15 1/8 Inches
Diagonal	17 9/16 Inches
Area	172 Sq. Inches
Neck Length	4 3/8 ± 1/8 Inches
Overall Length	11 5/8 ± 1/4 Inches
Bulb	J149A
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-214
Basing	7FA
Weight (Approx.)	14 Pounds

RATINGS

MAXIMUM RATINGS (Design Maximum Values)

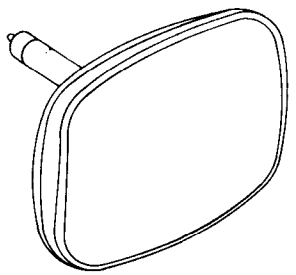
Cathode Drive Service[3]		
Maximum Anode Voltage	20,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−500 to +1100 Volts	dc
Grid No. 2 Voltage	55 Volts	dc
Cathode Voltage		
Negative Bias Value	0 Volt	dc
Negative Peak Value	2 Volts	
Positive Bias Value	100 Volts	dc
Positive Peak Value	140 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During		
Warm-up Period Not to Exceed 15 Seconds	410 Volts	
After Equipment Warm-up Period	180 Volts	
Heater Positive with Respect to Cathode	180 Volts	

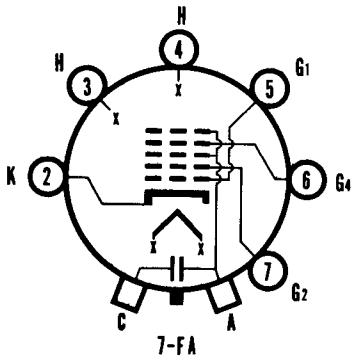
TYPICAL OPERATING CONDITIONS

Cathode Drive Service[3]		
Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage[3]	45 Volts	dc
Cathode Voltage Required for Cutoff[4]	35 to 50 Volts	dc

QUICK REFERENCE DATA

Television Picture Tube
19″ Direct Viewed
Rectangular Glass Type
Gray Filter Glass
Aluminized Screen
Neck Length 4 3/8″
Electrostatic Focus
114° Magnetic Deflection
No Ion Trap
External Conductive Coating
6.3 Volts, 600 ma Heater
Low Grid No. 2 Voltage





7-FA

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EMPORIUM, PENNSYLVANIA
SEPTEMBER, 1963

File Under
TELEVISION PICTURE TUBES

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more positive.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

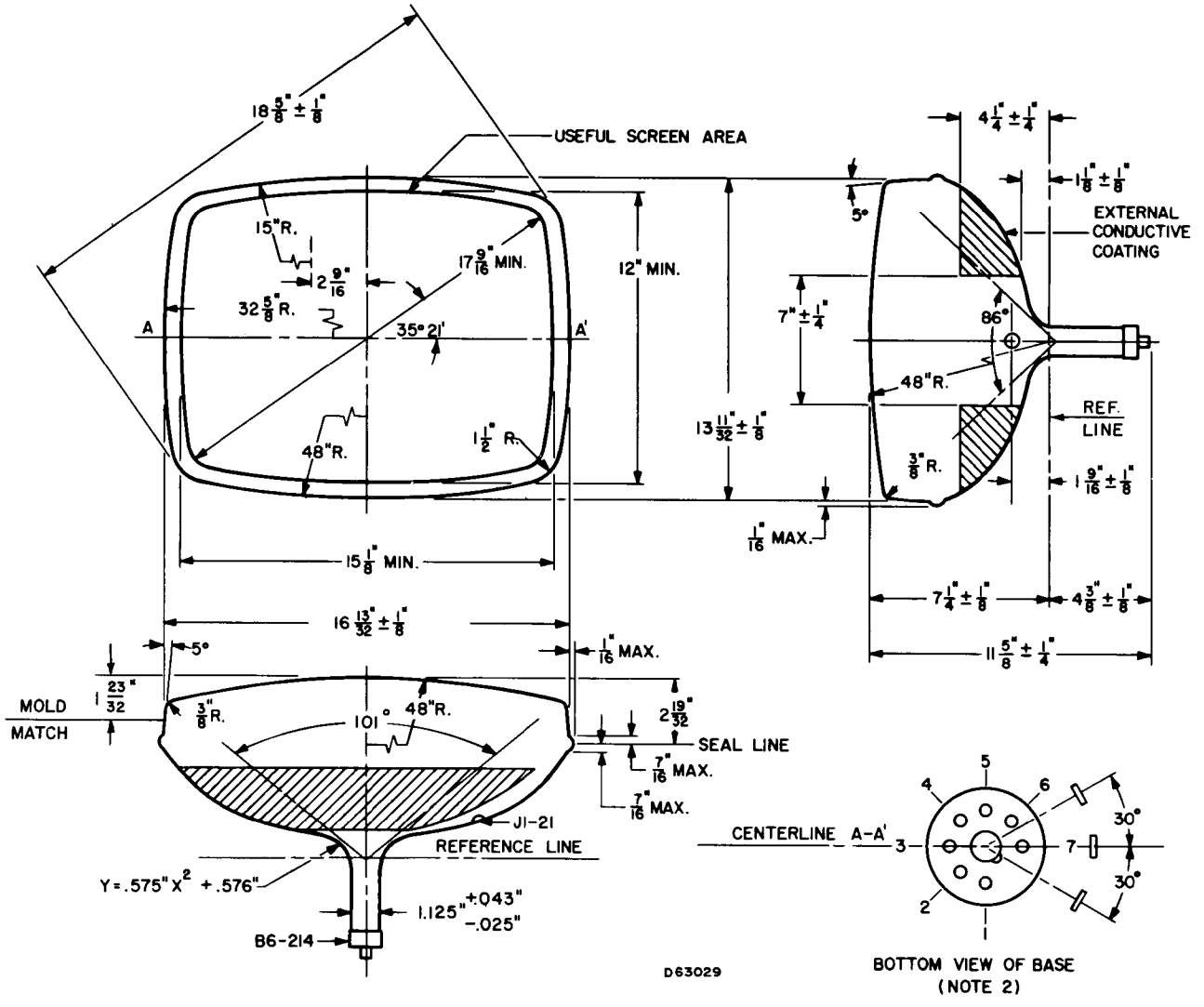


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' JEDEC No. 126 Reference Gauge when the gauge is seated against the bulb.*
2. *Base Pin No. 7 aligns with anode contact (J1-21) within 30°.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	101 Degrees
Diagonal	114 Degrees
Vertical	86 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance (Approx.)	60 Percent

Type 19DAP4 has External Surface of Safety Plate Treated to Reduce Specular Reflection

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.45 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating to Anode[2]	1500 pf	Max.
	1000 pf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	12 1/16 Inches
Width	15 1/4 Inches
Diagonal	17 5/8 Inches
Minimum Useful Screen Area	172 Sq. Inches
Neck Length	4 1/8 ± 1/8 Inches
Overall Length	11 9/16 ± 5/16 Inches
Bulb	J149C
Safety Plate	19CZP4—1/8" Gray Glass
	19DAP4—Same, Anti-Reflection Treated
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (Approx.)	15 ½ Pounds

RATINGS

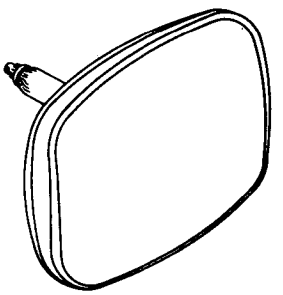
MAXIMUM RATINGS (Design Maximum Values)

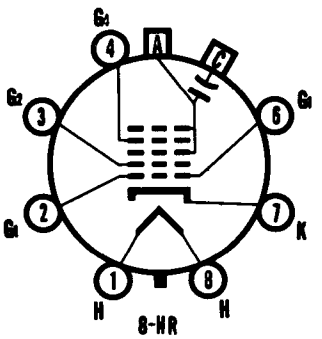
Grid Drive Service[3]		
Maximum Anode Voltage	23,000 Volts	dc
Minimum Anode Voltage	15,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100 Volts	dc
Maximum Grid No. 2 Voltage	550 Volts	dc
Minimum Grid No. 2 Voltage	200 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Secs.	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
19" Direct Viewed
Rectangular Glass Type
Bonded Shield

19DAP4: Anti-Reflection Treated
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
1 1/8" Neck Diameter
No Ion Trap
External Conductive Coating





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PICTURE TUBE
OPERATIONS

SENECA FALLS, NEW YORK

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EMPORIUM, PENNSYLVANIA

JUNE, 1963

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) (Continued)

Cathode Drive Service[4]

Maximum Anode Voltage	23,000 Volts	dc
Minimum Anode Voltage	15,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−400 to +1250 Volts	dc
Maximum Grid No. 2 Voltage	700 Volts	dc
Minimum Grid No. 2 Voltage	350 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]

Anode Voltage	20,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−46 to −94 Volts	dc

Cathode Drive Service[4]

Anode Voltage	20,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Cathode Voltage Required for Cutoff[5]	42 to 78 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to cathode unless indicated otherwise.*
4. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
5. *Visual extinction of focused raster. For cutoff of the undeflected focused spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

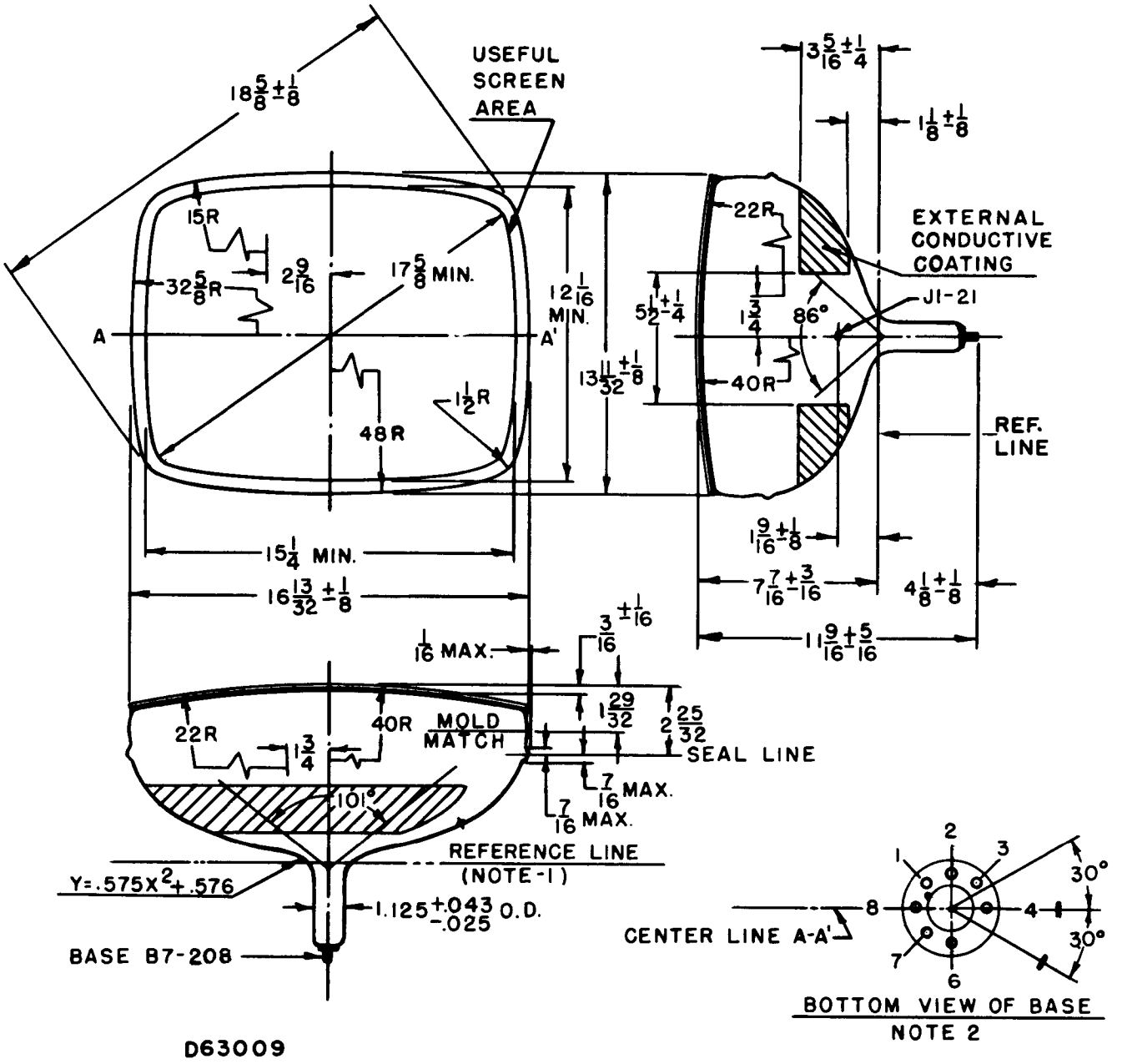


DIAGRAM NOTES:

1. *Reference Line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge when the gauge is seated against the bulb.*
2. *Base pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact (J1-21).*

SYLVANIA

engineering data service

SYLVANIA
19DKP4
19DNP4

CHARACTERISTICS

GENERAL DATA

Focusing	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	101 Degrees
Diagonal	114 Degrees
Vertical	86 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Bonded Shield
(Gray Filterglass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	
19DKP4	45 Percent
19DNP4	60 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating to Anode[2]	1500 pf	Max.
	1000 pf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	12 1/16 Inches
Width	15 ¼ Inches
Diagonal	17 5/8 Inches
Minimum Useful Screen Area	172 Sq. Inches
Neck Length	4 1/8 ± 1/8 Inches
Overall Length	11 9/16 ± 5/16 Inches
Bulb	J149C
Safety Plate	
19DKP4	FP149B2 (1/8 Inches Thick, 55 % Transmittance)
19DNP4	FP149B1 (1/8 Inches Thick, 70 % Transmittance)
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (Approx.)	15 ½ Pounds

RATINGS

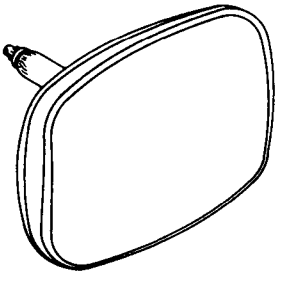
MAXIMUM RATINGS (Design Maximum Values)

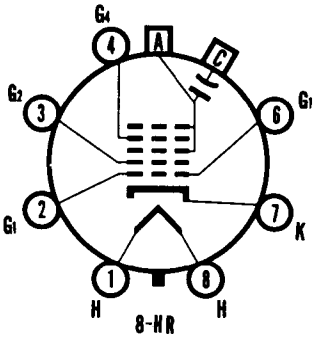
Grid Drive Service[3]

	19DNP4	19DKP4	
Maximum Anode Voltage	18,000	23,000 Volts	dc
Minimum Anode Voltage	10,000	15,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)		−550 to +1100 Volts	dc
Maximum Grid No. 2 Voltage		550 Volts	dc
Minimum Grid No. 2 Voltage		200 Volts	dc
Grid No. 1 Voltage			
Negative Bias Value		155 Volts	dc
Negative Peak Value		220 Volts	
Positive Bias Value		0 Volt	dc
Positive Peak Value		2 Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds		450 Volts	
After Equipment Warm-up Period		200 Volts	
Heater Positive with Respect to Cathode		200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
19″ Direct Viewed
Rectangular Glass Type
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
1⅛″ Neck Diameter
No Ion Trap
External Conductive Coating
19DKP4—High Anode Voltage
19DNP4—Low Anode Voltage





SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

JUNE, 1965

File Under

TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) Continued

Cathode Drive Service[4]

	19DNP4	19DKP4	
Maximum Anode Voltage	18,000	23,000 Volts	dc
Minimum Anode Voltage	10,000	15,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)		−400 to +1250 Volts	dc
Maximum Grid No. 2 Voltage		700 Volts	dc
Minimum Grid No. 2 Voltage		350 Volts	dc
Cathode Voltage			
Positive Bias Value		155 Volts	dc
Positive Peak Value		220 Volts	
Negative Bias Value		0 Volt	dc
Negative Peak Value		2 Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period Not to Exceed 15 Seconds		450 Volts	
After Equipment Warm-up Period		200 Volts	
Heater Positive with Respect to Cathode		200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]

	19DNP4	19DKP4	
Anode Voltage	16,000	20,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400	0 to 400 Volts	dc
Grid No. 2 Voltage	400	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	40 to 76	−46 to −94 Volts	dc

Cathode Drive Service[4]

	19DNP4	19DKP4	
Anode Voltage	16,000	20,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400	0 to 400 Volts	dc
Grid No. 2 Voltage	400	400 Volts	dc
Cathode Voltage Required for Cutoff[5]	40 to 76	42 to 78 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to cathode unless indicated otherwise.*
4. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
5. *Visual extinction of focused raster. For cutoff of the undeflected focused spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 Volts, whichever is less.

OUTLINE

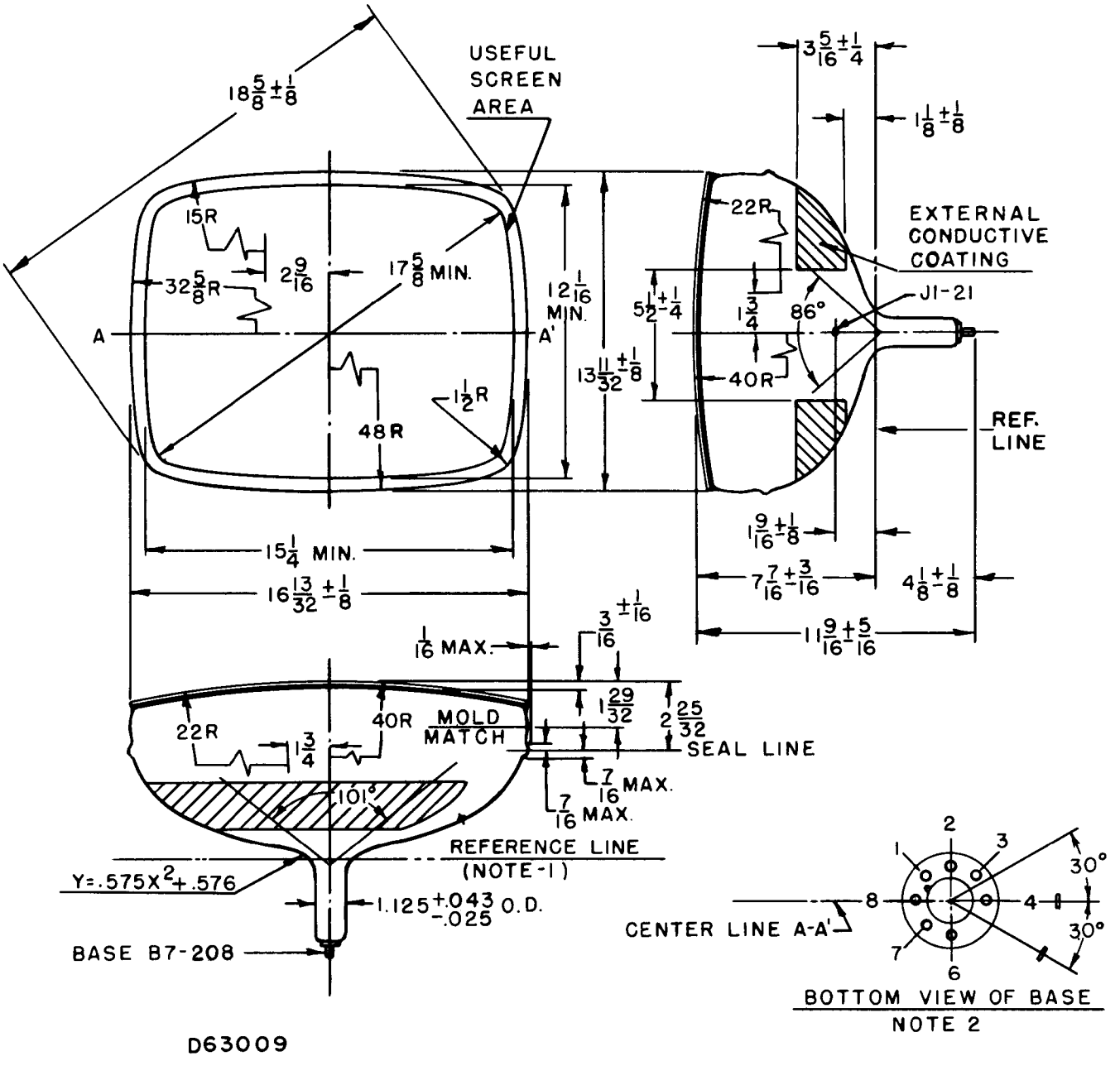


DIAGRAM NOTES:

1. *Reference Line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact (J1-21).*
3. *Dimensions are in inches.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	101 Degrees
Diagonal	114 Degrees
Vertical	86 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	49 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.45 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating and Rimbands to Anode[2]	1500 pf	Max.
	1000 pf	Min.
Resistance Between External Conductive Coating and Metal Bands	50 Megohms	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	12 Inches	
Width	$15\frac{3}{16}$ Inches	
Diagonal	$17\frac{9}{16}$ Inches	
Minimum Useful Screen Area	172 Sq. Inches	
Neck Length	$4\frac{1}{8} \pm \frac{1}{8}$ Inches	
Overall Length	$11\frac{3}{8} \pm \frac{1}{4}$ Inches	
Bulb	J149F	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-208	
Basing	8HR	
Weight (Approx.)	15 Pounds	

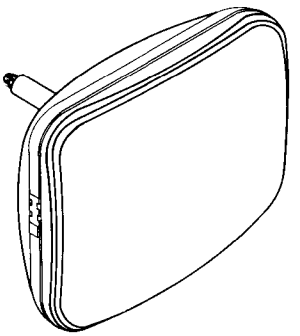
RATINGS

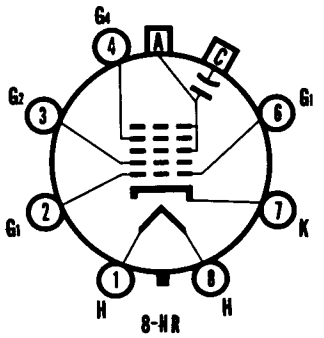
MAXIMUM RATINGS (Design Maximum Values)

Grid Drive Service[3]		
Maximum Anode Voltage	23,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Maximum Grid No. 2 Voltage	550 Volts	dc
Minimum Grid No. 2 Voltage	200 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	154 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volt	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	300 Volts	
Heater Positive with Respect to Cathode	200 Volts	
DC Component	100 Volts	

QUICK REFERENCE DATA

Television Picture Tube
19″ Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
$1\frac{1}{8}$″ Neck Diameter
No Ion Trap
External Conductive Coating
Banded Tube Integral
Implosion Protection





SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

JULY, 1965

File Under

TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) (Continued)

Cathode Drive Service[4]

Maximum Anode Voltage	23,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−400 to +1250 Volts	dc
Maximum Grid No. 2 Voltage	700 Volts	dc
Minimum Grid No. 2 Voltage	350 Volts	dc
Cathode Voltage		
Positive Bias Value	154 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volt	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	300 Volts	
Heater Positive with Respect to Cathode	200 Volts	
DC Component	100 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]

Anode Voltage	20,000 Volts	dc
Grid No. 4 Voltage for Focus	−200 to +200 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−50 to −98 Volts	dc

Cathode Drive Service[4]

Anode Voltage	20,000 Volts	dc
Grid No. 4 Voltage for Focus	−200 to +200 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Cathode Voltage Required for Cutoff[5]	48 to 82 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating and rimbands must be grounded.*
3. *Voltages are positive with respect to cathode unless indicated otherwise.*
4. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
5. *Visual extinction of focused raster. For cutoff of the undeflected focused spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

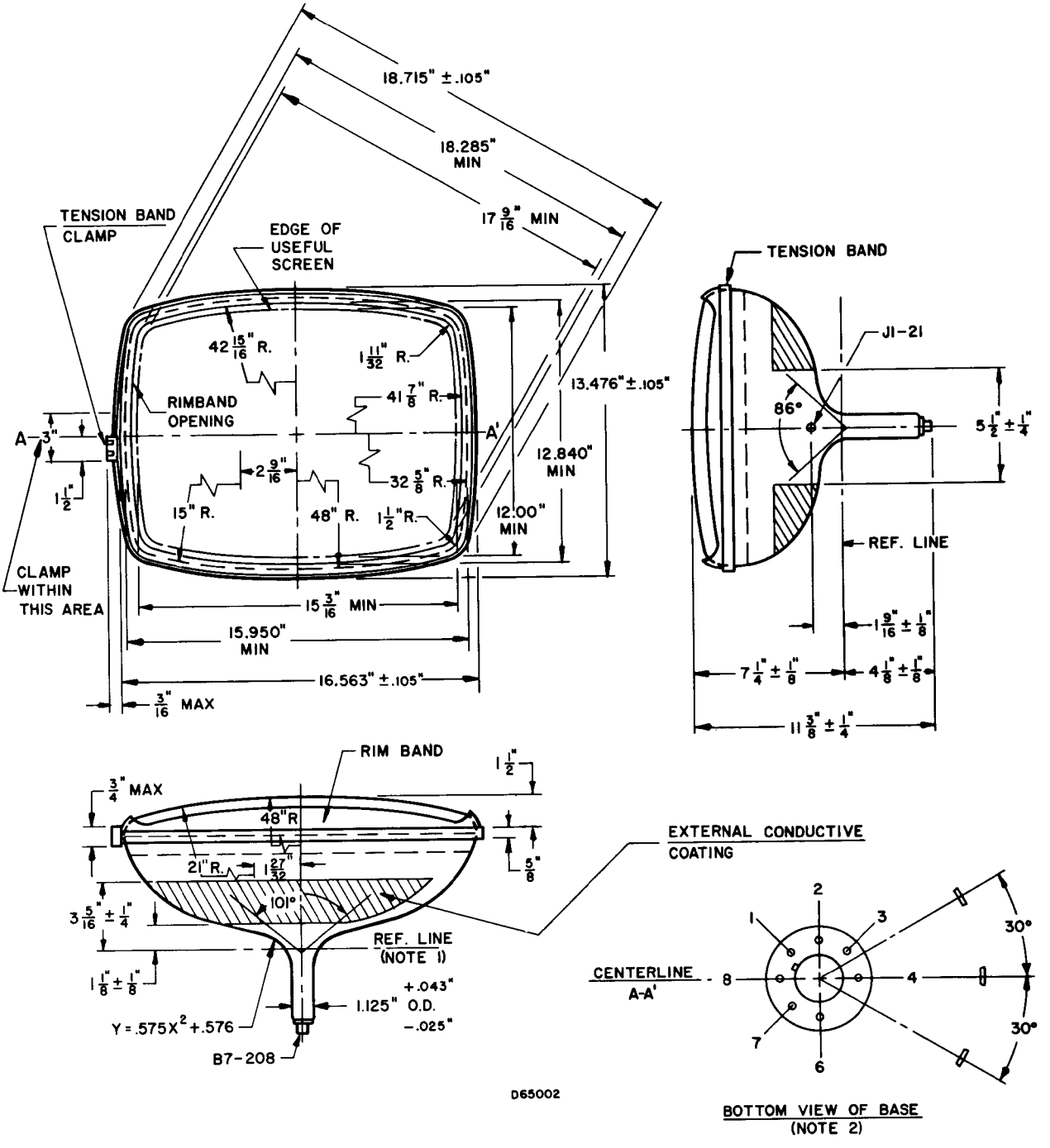


DIAGRAM NOTES:

1. *Reference Line is determined by Plane C-C' of JEDEC No. 126 Reference Line Gauge when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on the same side as anode contact (J1-21).*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	101 Degrees
Diagonal	114 Degrees
Vertical	86 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Gray Filter Glass
Light Transmittance of Faceplate (Approx.)	49 Percent

These types employ banded tube integral implosion protection.

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating and Rimbands to Anode[2]	1500 pf	Max.
	1000 pf	Min.
Resistance Between External Conductive Coating and Rimband	50 Megohms	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Max. Assured)	
Height	12 Inches
Width	15 3/16 Inches
Diagonal	17 9/16 Inches
Minimum Useful Screen Area	172 Sq. Inches
Neck Length	4 3/8 ± 1/8 Inches
Overall Length	11 5/8 ± 1/4 Inches
Bulb	J149F
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (Approx.)	15 Pounds

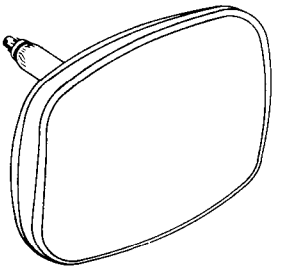
RATINGS

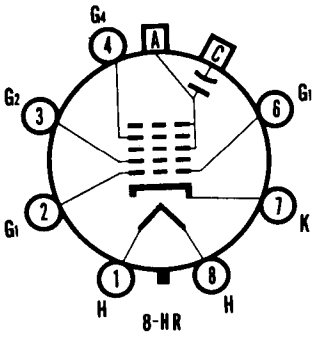
MAXIMUM RATINGS (Design Maximum Values)

Grid Drive Service[3]	19EHP4	19EDP4	
Maximum Anode Voltage	18,000	23,000 Volts	dc
Minimum Anode Voltage	10,000	15,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)		−550 to +1100 Volts	dc
Maximum Grid No. 2 Voltage		550 Volts	dc
Minimum Grid No. 2 Voltage		200 Volts	dc
Grid No. 1 Voltage			
Negative Bias Value		155 Volts	dc
Negative Peak Value		220 Volts	
Positive Bias Value		0 Volt	dc
Positive Peak Value		2 Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period Not to Exceed 15 Seconds		450 Volts	
After Equipment Warm-up Period		200 Volts	
Heater Positive with Respect to Cathode		200 Volts	

QUICK REFERENCE DATA

Television Picture Tubes
19 Inch Direct Viewed
Rectangular Glass Types
Banded Tubes
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114 Degree Magnetic Deflection
1 1/8 Inch Neck Diameter
No Ion Trap
External Conductive Coating
19EDP4—High Anode Voltage
19EHP4—Low Anode Voltage





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SENECA FALLS, NEW YORK

A Technical Publication
JUNE, 1965

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) (cont'd)

Cathode Drive Service[4]	19EHP4	19EDP4	
Maximum Anode Voltage	18,000	23,000 Volts	dc
Minimum Anode Voltage	10,000	15,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)		−400 to +1250 Volts	dc
Maximum Grid No. 2 Voltage		700 Volts	dc
Minimum Grid No. 2 Voltage		350 Volts	dc
Cathode Voltage			
Positive Bias Value		155 Volts	dc
Positive Peak Value		220 Volts	
Negative Bias Value		0 Volt	dc
Negative Peak Value		2 Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period Not to Exceed 15 Seconds		450 Volts	
After Equipment Warm-up Period		300 Volts	
DC Component		200 Volts	dc
Heater Positive with Respect to Cathode		200 Volts	
DC Component		100 Volts	dc

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]	19EHP4	19EDP4	
Anode Voltage	16,000	20,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400	0 to 400 Volts	dc
Grid No. 2 Voltage	300	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−35 to −72	−46 to −94 Volts	dc

Cathode Drive Service[4]	19EHP4	19EDP4	
Anode Voltage	16,000	20,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400	0 to 400 Volts	dc
Grid No. 2 Voltage	400	400 Volts	dc
Cathode Voltage Required for Cutoff[5]	40 to 76	42 to 78 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating and rimbands must be grounded.*
3. *Voltages are positive with respect to cathode unless indicated otherwise.*
4. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
5. *Visual extinction of focused raster. For cutoff of the undeflected focused spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

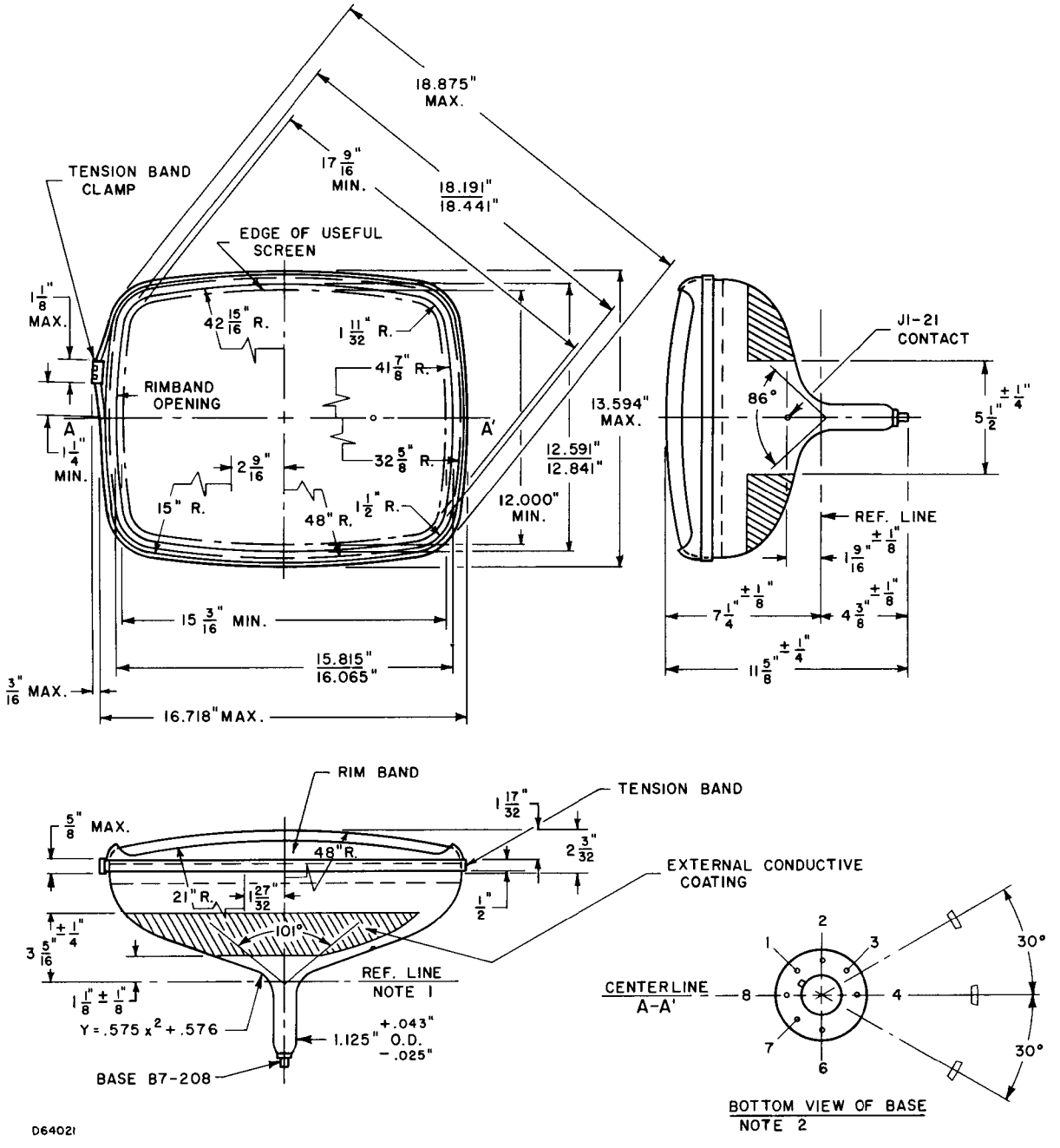


DIAGRAM NOTES:

1. *Reference Line is determined of Plane C-C' of JEDEC No. 126 Reference Line Gauge when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact (J1-21).*

ADVANCE DATA

MECHANICAL DATA

Bulb	T-6½
Base	E10-73, 10-Pin, Center Pin Added to E9-1 Base
Outline	6-13
Basing	10H
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	18.9 Volts	
Heater Current	150 Ma	
Heater Warm-up Time[1]	17 Seconds	
Heater-Cathode Voltage (Design Maximum Values)		
Heater Negative with Respect to Cathode		
Total DC and Peak	200 Volts	Max.
Heater Positive with Respect to Cathode		
DC	100 Volts	Max.
Total DC and Peak	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[2]	Unshielded		
Triode Section				
Grid to Plate	1.7	1.7	µµf	
Input: g to (h+k+Pk+I.S.)	3.2	3.2	µµf	
Output: p to (h+k+Pk+I.S.)	1.9	1.1	µµf	
Heater to Cathode	3.0[3]	3.0	µµf	
Pentode Section				
Grid No. 1 to Plate	.035	.050	µµf	Max.
Input: g1 to (h+k+g2+Pk+I.S.)	5.0	5.0	µµf	
Output: p to (h+k+g2+Pk+I.S.)	3.3	2.4	µµf	
Heater to Cathode	3.0[3]	3.0	µµf	
Coupling				
Pentode g1 to Triode Plate	.030	.035	µµf	Max.
Pent. Plate to Triode Plate	.030	0.13	µµf	Max.
Triode Grid to Pent. Plate	.002	.009	µµf	Max.

RATINGS (Design Maximum Values)

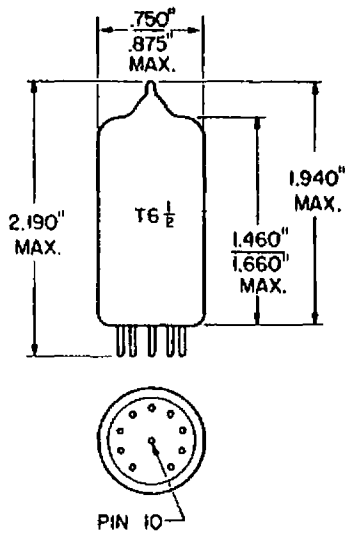
	Triode Section	Pentode Section		
Plate Voltage	330	330	Volts	Max.
Grid No. 2 Supply Voltage		330	Volts	Max.
Grid No. 2 Voltage	See Rating Chart			
Plate Dissipation	2.5	3.0	Watts	Max.
Grid No. 2 Dissipation		0.55	Watts	Max.
Positive Grid No. 1 Voltage	0	0	Volts	Max.
Grid No. 1 Circuit Resistance				
Fixed Bias	0.5	0.25	Megohm	
Self Bias	1.0	1.0	Megohm	

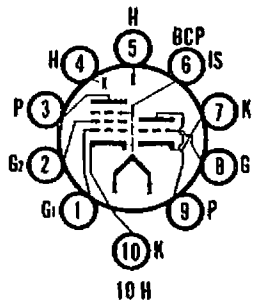
from JEDEC release #3725, May 14, 1962

146 (10-58)

QUICK REFERENCE DATA

The Sylvania Type 1909 has a medium mu triode and a semi-remote cutoff pentode contained in a T-6½ 10-pin bulb. It is intended primarily for use as an FM RF amp. and autodyne mixer.





SYLVANIA
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EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

April 18, 1962

RATINGS (Cont'd)

Control grid to cathode spacing in the triode section of this tube type is of such order of magnitude as to preclude the use of voltage between these elements of more than 100 volts dc or peak ac in commercial tube checkers and shorts indicating devices, particularly where mechanical excitation of the tube is employed.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier	Triode Section	Pentode Section	
Plate Voltage	125	125	Volts
Grid No. 2 Voltage		125	Volts
Grid No. 1 Voltage	-1.0	-1.0	Volts
Plate Current	14	12	Ma
Grid No. 2 Current		4.0	Ma
Transconductance	8000	6500	μmhos
Amplification Factor	40		
Plate Resistance	5000	200K	Ohms
Grid No. 1 Voltage for Ib = 20 μa (Approx.)	-9	-9	Volts
Gm with Ec1 = 0V, Eb = 100V and Ec2 = 70V		7000	μmhos

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) time rated heater voltage divided by rated heater current.

2. Shield No. 315 connected to pin Number 4.

3. Shield No. 315 connected to pin Number 3.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	101 Degrees
Diagonal	114 Degrees
Vertical	86 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	78 Percent

ELECTRICAL DATA

	19AYP4 19AXP4	19XP4 19AVP4	
Heater Voltage	6.3	6.3	Volts
Heater Current ± 5%	0.45	0.60	Ampere
Heater Warm-up Time[1]	11	11	Seconds
Direct Interelectrode Capacitances (Approx.)			
Cathode to All Other Electrodes		5	μμf
Grid No. 1 to All Other Electrodes		6	μμf
External Conductive Coating to Anode[2]		1500	μμf Max.
		1000	μμf Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	12	Inches
Width	15⅛	Inches
Diagonal	17 9/16	Inches
Minimum Useful Screen Area	172	Sq. Inches
Neck Length	4⅛ ± ⅛	Inches
Overall Length	11⅜ ± ¼	Inches
Bulb	J149A	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-208	
Basing	8HR	
Weight (Approx.)	13½	Pounds

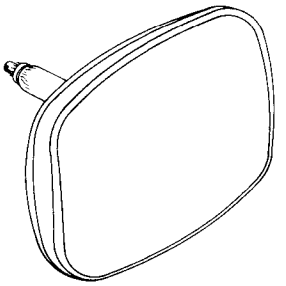
RATINGS

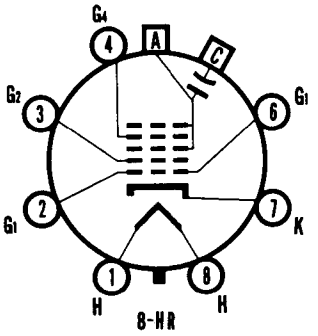
MAXIMUM RATINGS (Design Maximum Values)

Grid Drive Service[3]	19AYP4 19AVP4	19AXP4	19XP4		
Maximum Anode Voltage	23,000	20,000	20,000	Volts	dc
Minimum Anode Voltage	15,000	10,000	11,000	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)			−550 to +1100	Volts	dc
Maximum Grid No. 2 Voltage			550	Volts	dc
Minimum Grid No. 2 Voltage			200	Volts	dc
Grid No. 1 Voltage					
Negative Bias Value			154	Volts	dc
Negative Peak Value			220	Volts	
Positive Bias Value			0	Volts	dc
Positive Peak Value			2	Volts	
Peak Heater-Cathode Voltage					
Heater Negative with Respect to Cathode					
During Warm-up Period not to Exceed 15 Seconds			450	Volts	
After Equipment Warm-up Period			200	Volts	
Heater Positive with Respect to Cathode			200	Volts	

QUICK REFERENCE DATA

Television Picture Tube
19" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
1 ⅛" Neck Diameter
No Ion Trap
External Conductive Coating





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Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK
Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
OCTOBER, 1961

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) Con't.

Cathode Drive Service[4]	19AYP4 19AVP4	19AXP4	19XP4		
Maximum Anode Voltage	23,000	20,000	20,000	Volts	dc
Minimum Anode Voltage	15,000	10,000	11,000	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)			−400 to +1250	Volts	dc
Maximum Grid No. 2 Voltage			700	Volts	dc
Minimum Grid No. 2 Voltage			350	Volts	dc
Cathode Voltage					
Positive Bias Value			154	Volts	dc
Positive Peak Value			220	Volts	
Negative Bias Value			0	Volts	dc
Negative Peak Value			2	Volts	
Peak Heater-Cathode Voltage					
Heater Negative with Respect to Cathode					
During Warm-up Period not to Exceed 15 Seconds			450	Volts	
After Equipment Warm-up Period			200	Volts	
Heater Positive with Respect to Cathode			200	Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]	19AYP4 19AVP4	19AXP4 19XP4		
Anode Voltage	20,000	16,000	Volts	dc
Grid No. 4 Voltage for Focus		0 to 400	Volts	dc
Grid No. 2 Voltage		400	Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]		−46 to −94	Volts	dc

Cathode Drive Service[4]	19AYP4 19AVP4	19AXP4 19XP4		
Anode Voltage	20,000	16,000	Volts	dc
Grid No. 4 Voltage for Focus		0 to 400	Volts	dc
Grid No. 2 Voltage		400	Volts	dc
Cathode Voltage Required for Cutoff[5]		42 to 78	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to cathode unless indicated otherwise.*
4. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
5. *Visual extinction of focused raster. For cutoff of the undeflected focused spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

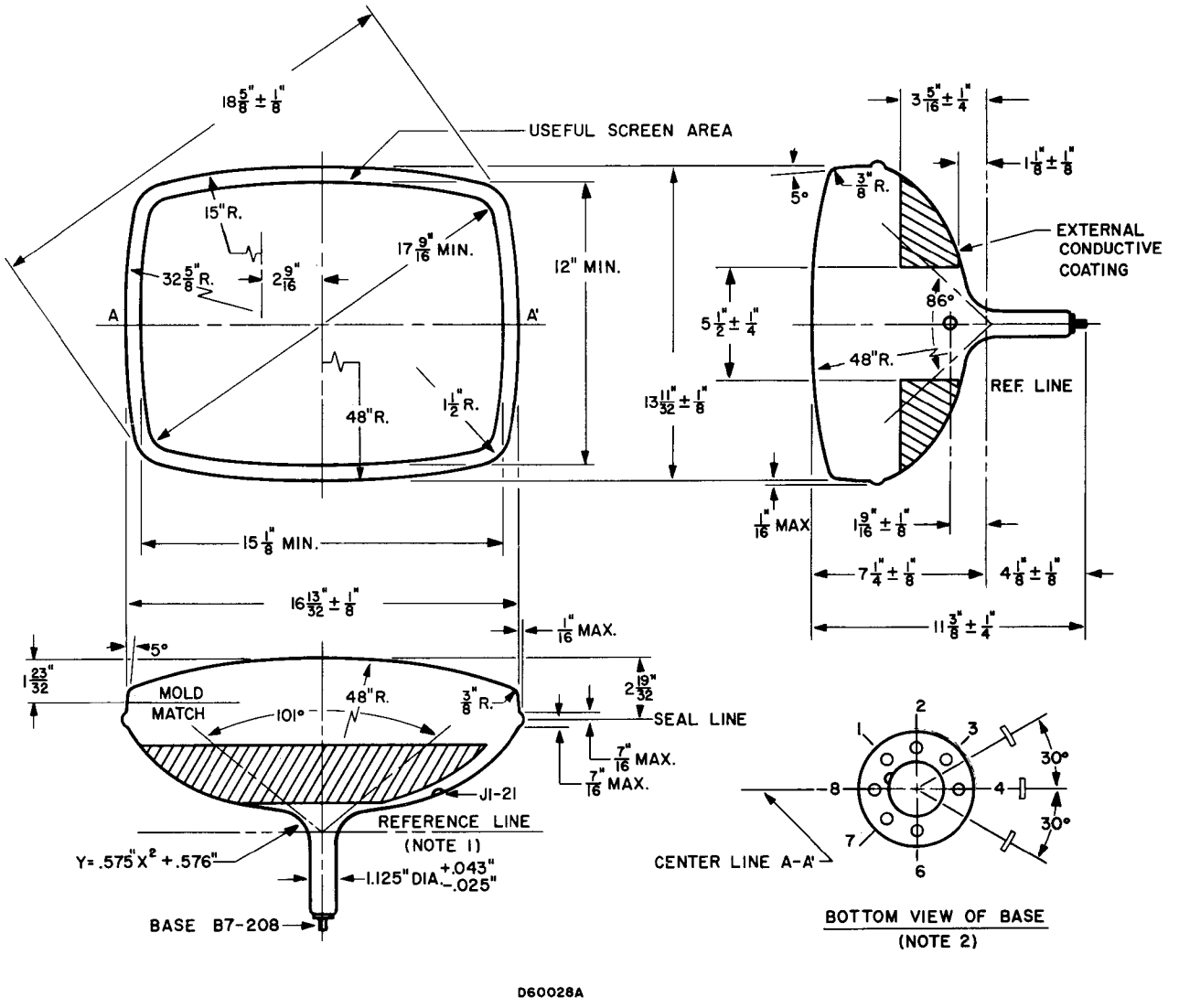

DIAGRAM NOTES:

1. *Reference Line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

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engineering data service

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20DP4B

20DP4C

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflecting Angle (approx.)	
Horizontal	66 Degrees
Diagonal	70 Degrees
Phosphor	Aluminized, P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	73 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (±10%)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	12¾ x 17 Inches
Bulb Contact, (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12D

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	18,000 Volts dc
Grid No. 2 Voltage	410 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage:	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	410 Volts
After Equipment Warm-up Period	180 Volts
Heater Positive with Respect to Cathode	180 Volts

RECOMMENDED OPERATING CONDITIONS

Anode Voltage[1]	16,000 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	-28 to -72 Volts dc
Focusing Coil Current (approx.)[3]	95 Ma dc
Ion Trap Magnet Field Strength (approx.)	35 Gausses

CIRCUIT VALUES

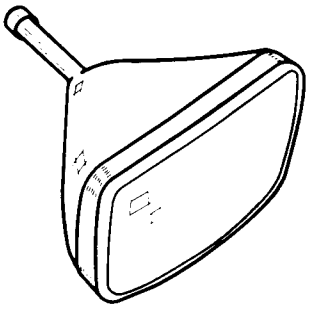
Grid No. 1 Resistance	1.5 Megohms Max.

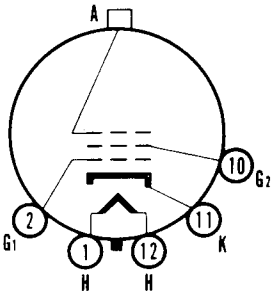
NOTES:

1. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than this value.*
2. *Visual extinction of focused raster.*
3. *For JETEC focusing coil 109 or equivalent three inches from reference line, bias adjusted to 20 foot lamberts on a 12¾ x 17 inch picture area sharply focused at center of screen.*

QUICK REFERENCE DATA

Television Picture Tube
20" Direct Viewed
Rectangular Glass Type
Gray Filter Glass
Magnetic Deflection
Magnetic Focus
Single Field Ion Trap
Spherical Face Plate
Aluminized Screen
(20DP4C Has External Conductive Coating)





12-D

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

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MAY 14, 1954

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20DP4B

20DP4C

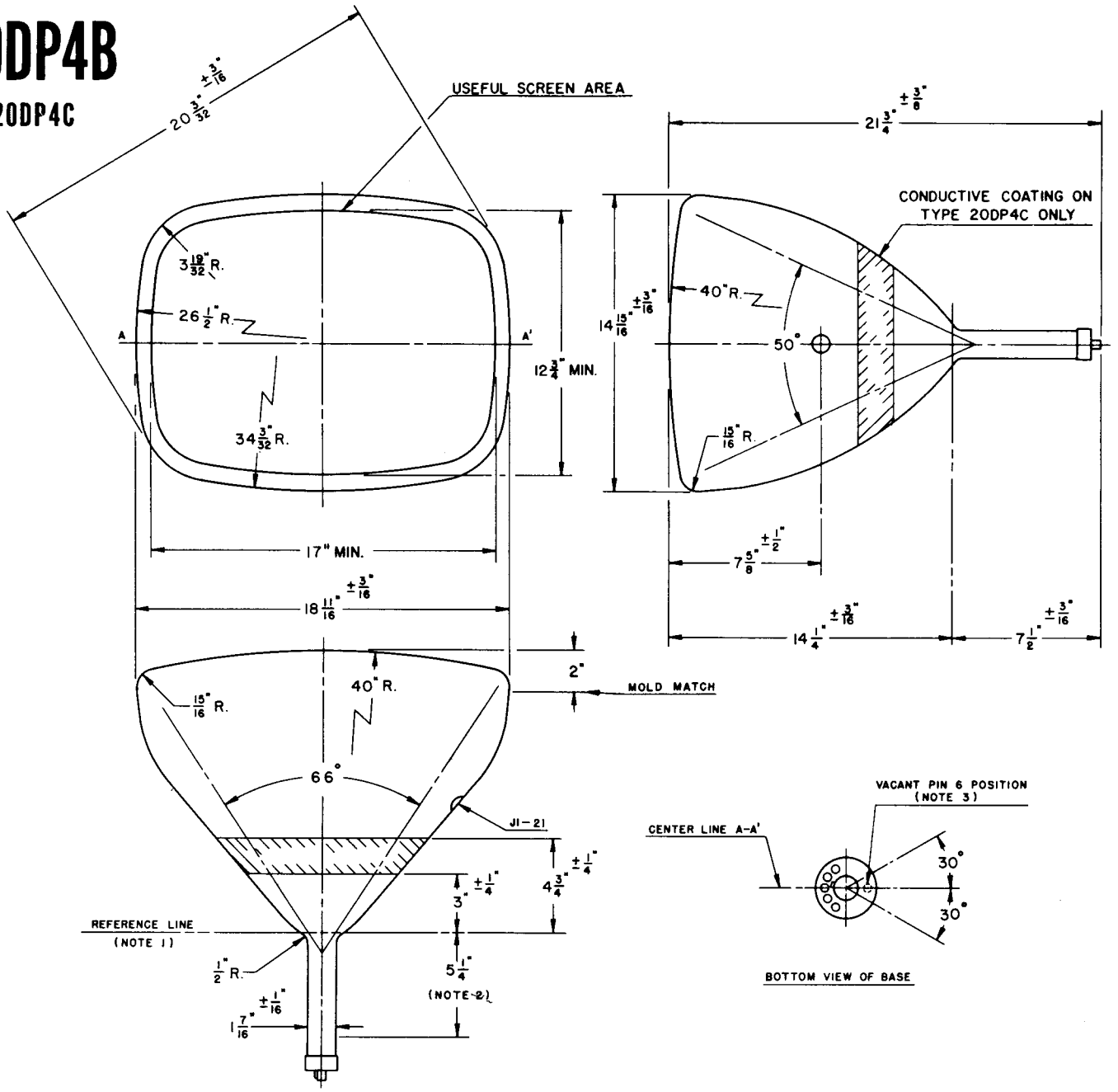


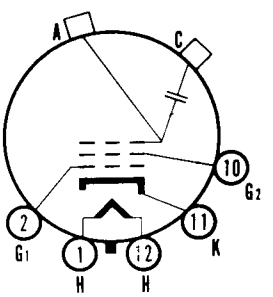
DIAGRAM NOTES:

1. *Reference line is determined by the plane of the upper edge of the reference line gauge (JETEC No. 110) when the gauge is resting on the glass cone.*
2. *Nominal position of ion trap magnet.*
3. *Anode contact aligns with vacant pin position No. 6 ±30 degrees.*

20DP4C

The Sylvania Type 20DP4C is equivalent to the Type 20DP4B except for the addition of an external conductive coating.

External Conductive Coating to Anode Capacitance	
Maximum	750 μμf
Minimum	500 μμf
Basing	12N



12-N

NOTES:

1. *External conductive coating must be grounded.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

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engineering data service

SYLVANIA
20HP4C
20HP4D

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflecting Angle (approx.)	
Horizontal	66 Degrees
Diagonal	70 Degrees
Phosphor	Aluminized, P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	73 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (±10%)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu f$
Grid No. 1 to All Other Electrodes	6 $\mu\mu f$
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	12¾ x 17 Inches
Bulb Contact, (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12M

RATINGS

MAXIMUM RATINGS (Design Center Values)

Final Anode Voltage	16,000 Volts dc
Grid No. 4 (Focusing Electrode) Voltage	−500 to +1000 Volts dc
Grid No. 2 Voltage	500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage:	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	410 Volts
After Equipment Warm-up Period	180 Volts
Heater Positive with Respect to Cathode	180 Volts

RECOMMENDED OPERATING CONDITIONS

Final Anode Voltage[1]	14,000 Volts dc
Grid No. 4 Voltage[2]	−56 to +310 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[3]	−28 to −72 Volts dc
Ion Trap Magnet Field Strength (approx.)	30 Gausses

CIRCUIT VALUES

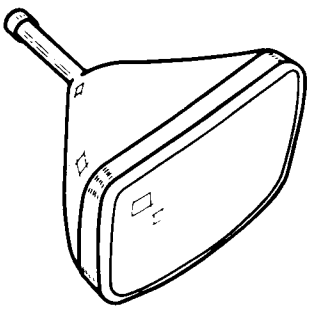
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

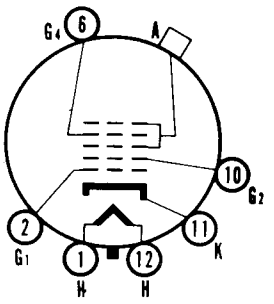
NOTES:

1. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than this value.*
2. *For best center focus, with grid No. 1 bias voltage and video signal voltage adjusted for 100 μa anode current on a 10¾" x 14¼" picture.*
3. *Visual extinction of focused raster.*

QUICK REFERENCE DATA

Television Picture Tube
20" Direct Viewed
Rectangular Glass Type
Gray Filter Glass
Magnetic Deflection
Low Voltage Electrostatic Focus
Single Field Ion Trap
Aluminized Screen
Spherical Face Plate
(20HP4D Has External Conductive Coating)





12-M

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

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MAY 14, 1954

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20HP4C

20HP4D

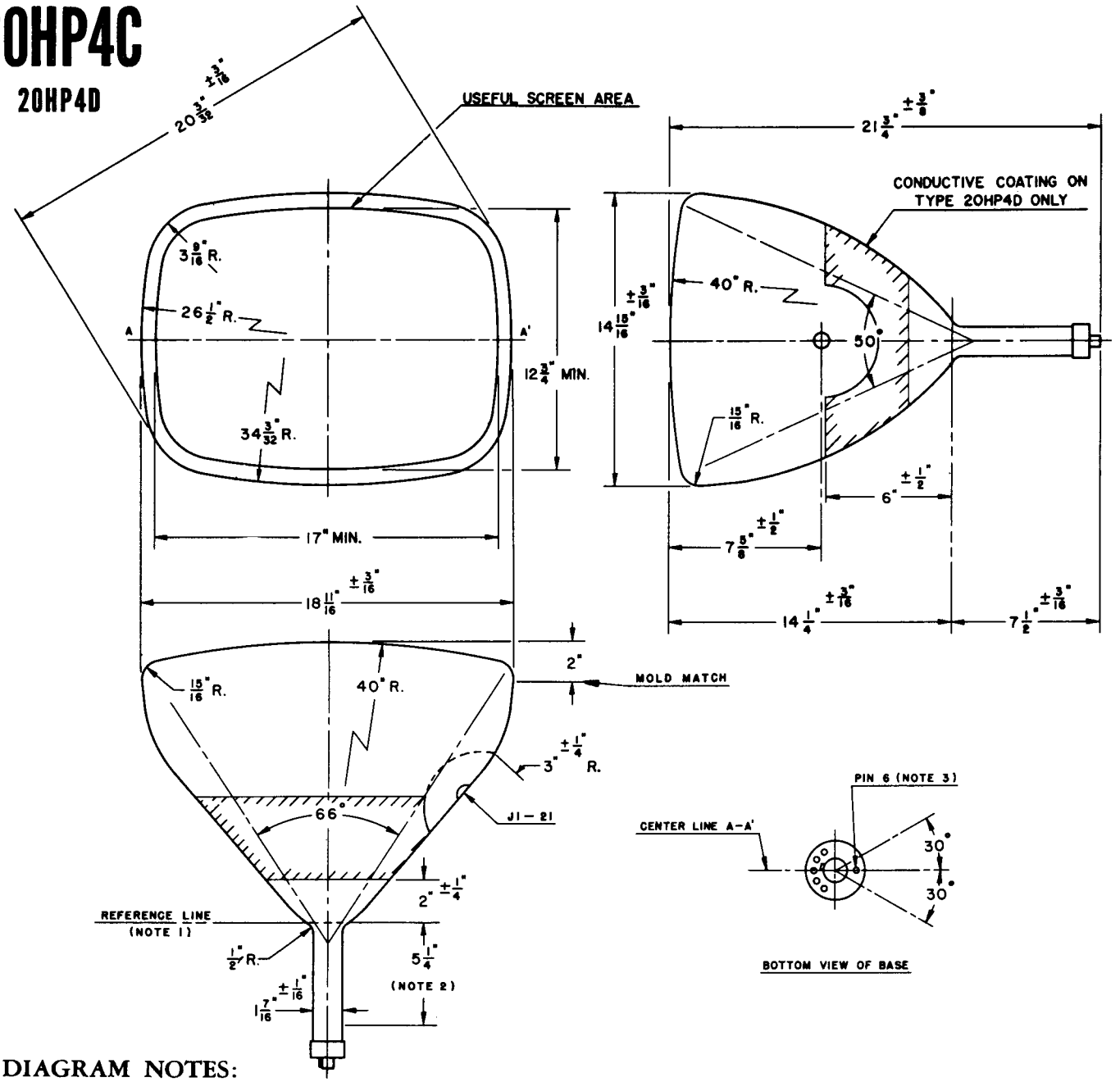


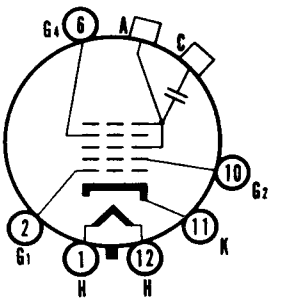
DIAGRAM NOTES:

1. *Reference line is determined by the plane of the upper edge of the reference line gauge (JETEC No. 110) when the gauge is resting on the glass cone.*
2. *Nominal position of ion trap magnet.*
3. *Anode contact aligns with pin position No. 6 ±30 degrees.*

20HP4D

The Sylvania Type 20HP4D is equivalent to the Type 20HP4C except for the addition of an external conductive coating.

External Conductive Coating to Anode Capacitance[1]	
Maximum	1500 μμf
Minimum	750 μμf
Basing	12L



12-L

NOTES:

1. *External conductive coating must be grounded.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

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21AFP4

21YP4, 21YP4A

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle (approx.)	
Horizontal	65 Degrees
Diagonal	70 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	72 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	$19\frac{1}{8}$ x $14\frac{3}{16}$ Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12M

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	18,000 Volts dc
Grid No. 4 (Focusing Electrode) Voltage	−500 to +1000 Volts dc
Grid No. 2 Voltage	500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period Not to Exceed 15 Seconds	410 Volts
After Equipment Warm-up Period	180 Volts
Heater Positive with Respect to Cathode	180 Volts

RECOMMENDED OPERATING CONDITIONS

Anode Voltage	16,000 Volts dc
Grid No. 4 Voltage	−64 to +350 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage[1] Required for Cutoff	−28 to −72 Volts dc
Ion Trap Magnet Strength (approx.)	35 Gausses

CIRCUIT VALUES

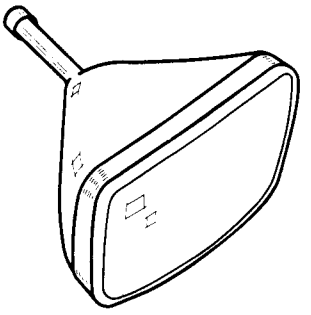
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

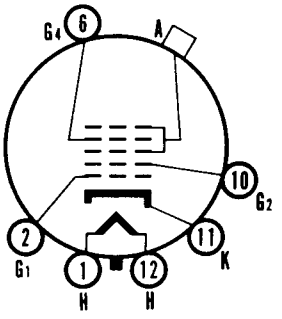
NOTES:

1. *Visual extinction of focused raster. Extinction of the stationary focused spot will require that these values be about 5 volts more negative.*

QUICK REFERENCE DATA

Television Picture Tube
21″ Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Low Voltage Electrostatic Focus
Single Field Ion Trap
(21YP4, 21YP4A have an External Conductive Coating)
(21YP4A has an Aluminized Screen)





12-M

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

OCTOBER 1953

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21AFP4

21YP4, 21YP4A

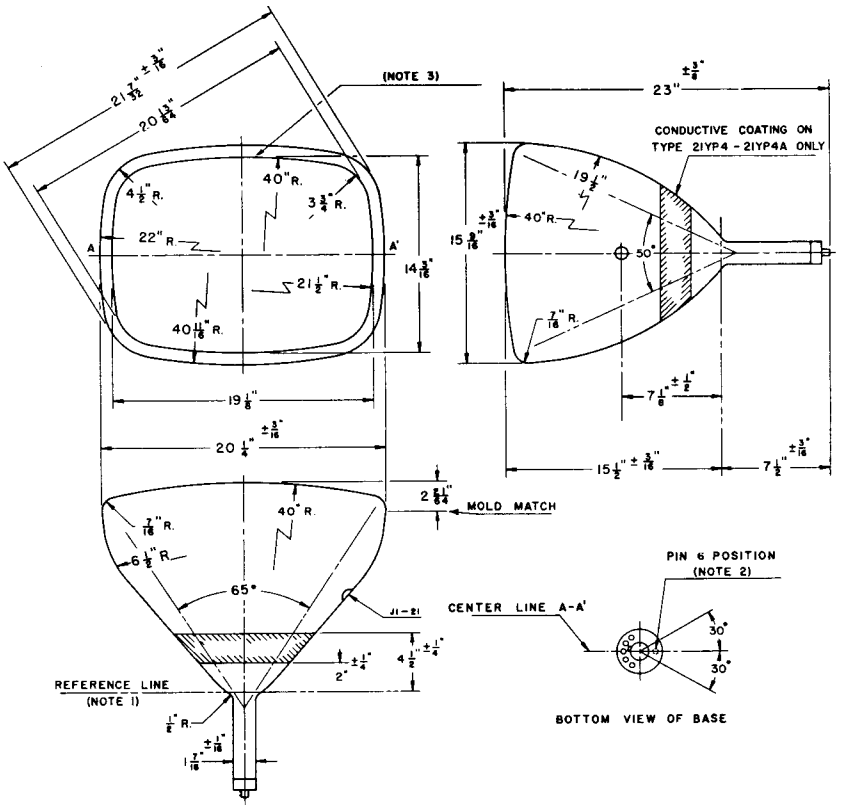


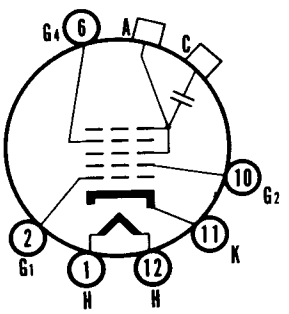
DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C1 of the reference line gauge (JETEC No. 110) when the gauge is resting on the glass cone. The neck diameter near the cone may exceed 1.500" but is limited by the internal contour of the yoke reference line gauge.*
2. *Anode contact aligns with pin position No. 6 ± 30 degrees.*
3. *Suggested mask opening.*

21YP4

The Sylvania Type 21YP4 is identical to Type 21AFP4 except for having an external conductive coating, which must be grounded.

External Conductive Coating to Anode Capacitance	
Maximum	750 μμf
Minimum	500 μμf
Basing	12L



12-L

21YP4A

The Sylvania Type 21YP4A is identical to Type 21YP4 except that it has an aluminized screen.

The aluminized screen of Type 21YP4A increases its picture brightness and contrast. While the 16 kv operating condition is recommended for optimum picture quality, this type will operate satisfactorily at substantially lower voltages.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

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21AXP22
21AXP22A

engineering data service

GENERAL INFORMATION

The Sylvania Type 21AXP22 and 21AXP22A are direct viewed, metal picture tubes for use in color television receivers. They are capable of producing either a full-color or black and white picture measuring 19 1/16 by 15 1/4 inches with rounded sides and having a projected area of 255 square inches.

The 21AXP22 and 21AXP22A each utilize three electrostatic focus guns spaced 120 degrees apart with axes tilted toward the tube axis to facilitate convergence of the three beams at the shadow mask; individual convergence control of each beam radially by internal magnetic poles and supplemental control of the blue beam tangentially by internal magnetic poles; and an assembly consisting of a spherical, metal shadow mask with uniform holes and a metalized, tri-color, phosphor dot screen.

The tri-color, phosphor-dot screen is composed of an orderly array of small, closely spaced, phosphor dots arranged in triangular groups. Each group consists of a green-emitting dot, a red-emitting dot, and a blue-emitting dot, and is aligned with a corresponding hole in the shadow mask.

The 21AXP22A features an internal neck coating having high resistance which eliminates the need for an external resistor between the anode power supply and the tube to protect the tube against damage by a momentary internal arc. The resistance of the neck coating permits use of a tube insulating boot having an external conductive coating which with the metal envelope of the tube forms a supplementary filter capacitor.

CHARACTERISTICS

GENERAL DATA

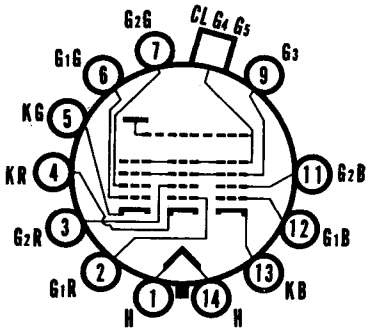
Focusing Method	Electrostatic
Deflecting Method	Magnetic
Converging Method	Magnetic
Deflecting Angles (approx.)	
Horizontal	70 Degrees
Vertical	55 Degrees
Phosphor, Blue-Green-Red Dots	P22
Persistence	Medium
Arrangement	Triangular groups each consisting of blue dot, green dot and red dot.
Spacing Between Centers of Adjacent Dot Trios (approx.)	0.029 Inches
Faceplate, Spherical	Filter Glass
Light Transmittance (approx.)	77 Percent
Screen	Aluminized, Tri-color, Phosphor-dot Type

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	1.8 ± 10% Amperes
Direct Interelectrode Capacitances (approx.)	
Grid No. 1 of any Gun to All Other Electrodes Except the No. 1 Grids of other Two Guns	7 μμf
Cathode of Blue Gun + Cathode of Green Gun + Cathode of Red Gun to All Other Electrodes	16 μμf
Grid No. 3 (of Each Gun Tied Within Tube to No. 3 Grids of Other Two Guns) to All Other Electrodes	9 μμf

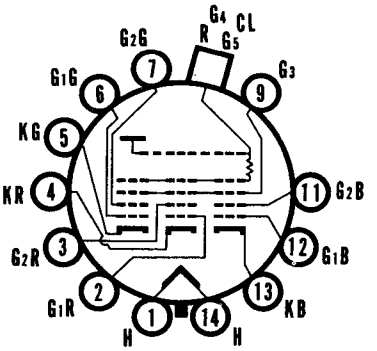
QUICK REFERENCE DATA

Color Television Picture Tube
21" Direct Viewed
Round Metal Type
Spherical Faceplate
Filter Glass
Electrostatic Focus
Magnetic Convergence
Magnetic Deflection
Three Electron-Gun Type



14-W

21AXP22



14-AH

21AXP22A

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION

SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

AUGUST, 1957

MECHANICAL DATA

Minimum Useful Screen Dimensions	19 1/16 x 15 1/4 Inches
Projected Screen Area	255 Sq. Inches
Anode[1] Terminal	Metal Shell Lip
Base (Small Shell Neodiheptal 12-Pin)	B12-131
Basing	
21AXP22	14W
21AXP22A	14AH
Mounting Position (base pin 12 on top)	Blue Gun Up
Weight (approx.)	28 Pounds
Tube Dimensions	
Maximum Overall Length	25 5/16 Inches
Diameter	
At Lip	20 9/16 ± 1/8 Inches
At Flange (Max.)	20 15/16 ± 5/16 Inches

RATINGS

Unless otherwise specified, voltage values are positive with respect to cathode of specified gun

MAXIMUM RATINGS (Absolute Maximum Values)

Anode[1]-to-Cathode (Of Each Gun) Voltage	27,500 Volts	Max.
Anode[1] Current (Average Each Gun)[2]	500 μa	Max.
Grid No. 3-to-Cathode (Of Each Gun) Voltage	6600 Volts	Max.
Grid No. 2-to-Cathode Voltage (Each Gun)	880 Volts	Max.
Grid No. 1-to-Cathode Voltage (Each Gun)		
Negative Bias Value	440 Volts	Max.
Positive Bias Value	0 Volts	Max.
Positive Peak Value	2 Volts	Max.
Peak Heater-Cathode Voltage (Each Gun)		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	Max.
After Equipment Warm-up Period	200 Volts	Max.
Heater Positive with Respect to Cathode	200 Volts	Max.

EQUIPMENT DESIGN RANGES (For Anode Voltage E_{c4k} (Each Gun) between 20,000[3] and 25,000 Volts)

Grid No. 3 (Focusing Electrode)-to-Cathode (Of Each Gun) Voltage	15.2% to 21.2 % of E_{c4k} Each Gun Volts
Grid No. 2-to-Cathode Voltage (Each Gun)	
When circuit design utilizes Grid No. 1-to Cathode Voltage (E_{c1k}) At Fixed Value for Raster Cutoff	See Chart
Grid No. 1-to-Cathode Voltage (Each Gun)	
For Visual Extinction of Focused Raster when Circuit Design Utilizes Grid No. 2-to-Cathode Voltage (E_{c2k}) At Fixed Value	See Chart
Variation in Raster Cutoff Between Guns	
In Any Tube	±21% of average of highest and lowest cutoff values
Maximum Grid No. 3 Current for Anode Current of 800 μa	75 μa
Grid No. 2 Current (Each Gun)	−5 to +5 μa
Percentage of Total Anode Current Supplied by	
Each Gun to Produce Illuminant-C White:	
Red Gun	47 to 67 Percent
Blue Gun	11 to 24 Percent
Green Gun	20 to 33 Percent
Each Gun to Produce White of 8500° K:	
Red Gun	42 to 60 Percent
Blue Gun	12 to 27 Percent
Green Gun	23 to 38 Percent

EQUIPMENT DESIGN RANGES (Continued)

Maximum Raster Shift in Any Direction from Screen Center[4]

Maximum Compensation to be Provided by the following Components:

Purifying Magnet	Raster shift of 1 Inch in any direction from screen center
Magnetic-Field Equalizer	Beam displacement with respect to phosphor dot at edge of screen
Tangential	±0.0005 to ±0.007 Inches
Radial	±0.0005 to ±0.005 Inches

Lateral-Converging Magnet:[5 & 6]
After adjustment has been made for color purity and dynamic convergence

Max. shift of blue beam	±1/4 Inch
Max. shift of red and green beams	±1/8 to ±3/8 Inch
Average of Max. shift of red and green beams	±7/32 to ±9/32 Inch

Radial-Converging Magnet Assembly:[5]
For static convergence after adjustment has been made for optimum color purity and dynamic convergence (Each Beam) . . . Shift of ±5/8 Inch

For dynamic convergence[7]
Effected by mmf of approximately parabolic and/or sawtooth waveshape synchronized with scanning

Horizontal:

Blue Pattern	
Parabola Amplitude to provide[8]	Shift of 1/4 to 9/16 Inch
Sawtooth Amplitude to provide[9]	Shift of ±50% of the shift caused by Parabola Amplitude
Red pattern and green pattern	
Parabola:	
Amplitude to provide[8]	Shift of 1/8 to 3/8 Inch
Ratio of red-pattern shift to green-pattern shift	1/2 to 2
Sawtooth:	
Amplitude for red-pattern to provide[9]	Shift of −35% to +85% of the shift caused by Parabola Amplitude.
Amplitude for green-pattern to provide[9]	Shift of −85% to +35% of the shift caused by Parabola Amplitude.
Difference between red-pattern shift and green-pattern shift ($Shift_R - Shift_G$)	0 to +100 Percent

Vertical:

Blue pattern	
Parabola:	
Amplitude to provide[8]	Shift of 0 to 1/8 Inch
Sawtooth:	
Amplitude to provide[9]	Shift of 0 to 1/4 Inch
Red pattern and green pattern	
Parabola:	
Amplitude to provide[8]	Shift of 1/8 to 3/8 Inch
Ratio of red-pattern shift to green-pattern shift	1/2 to 2
Sawtooth:	
Amplitude to provide[9]	Shift of −1/8 to +3/8
Difference between red-pattern shift and green-pattern shift ($Shift_R - Shift_G$)	0 to +100 Percent

EXAMPLES OF USE DESIGN RANGES (For Anode Voltage of 25,000 VOLTS)

Grid No. 3 (Focusing Electrode)-to-Cathode (Of Each Gun) Voltage	3800 to 5300 Volts
Grid No. 2-to-Cathode Voltage (Each Gun) When Circuit Design Utilizes Grid No. 1-to-Cathode Voltage of −70 Volts for Raster Cutoff	130 to 370 Volts
Grid No. 1-to-Cathode Voltage (Each Gun) For Visual Extinction of Focused Raster When Circuit Design utilizes Grid No. 2-to-Cathode Voltage of 200 Volts	−45 to −100 Volts

LIMITING CIRCUIT VALUES

High Voltage Circuits

In order to minimize the possibility of damage to the 21AXP22 caused by a momentary internal arc, it is recommended that the anode power supply and the Grid No. 3 power supply be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 50 milliamperes. In addition, to prevent cathode damage with resultant decrease in tube life, the effective resistance between the anode power supply output capacitor and the anode, and the effective resistance between Grid No. 3 power supply output capacitor and the Grid No. 3 electrode should be not less than 50000 ohms. These resistances should be capable of withstanding the maximum instantaneous currents and voltages in their respective circuits. It is to be noted that the effectiveness of the resistance between the anode power supply output capacitor and the anode may be impaired if capacitance in excess of 750 $\mu\mu$f is introduced between the tube and ground by the mounting arrangement of the tube.

For the 21AXP22A, the need for an external resistor between the anode power supply and the tube is eliminated by the addition of an internal neck coating which has a high resistance.

In equipment utilizing a well-regulated anode power supply, the Grid No. 3 circuit resistance should be limited to 7.5 megohms.

Low Voltage Circuits

Grid No. 1 Circuit Resistance (Each Gun)	1.5 Megohms Max.

When the cathode of each gun is not connected directly to the heater, the Grid No. 2-to-heater circuit, the Grid No. 1-to-heater circuit, and the cathode-to-heater circuit should each have an impedance such that their respective power sources in combination will not supply an instantaneous or continuous short-circuit current of more than 300 milliamperes total. Such current limitation will prevent heater burnout in case of a momentary internal arc within the tube.

When the cathode is connected directly to the heater, the Grid No. 2-to-heater circuit, and the Grid No. 1-to-heater circuit should each have an impedance such that their respective power sources in combination will not supply an instantaneous or continuous short-circuit current of more than 300 milliamperes total. Such current limitation will prevent heater burnout in case of a momentary internal arc within the tube.

NOTES:

1. *The anode in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In this tube the anode function is performed by Grid No. 4. Since Grid No. 4, Grid No. 5, and collector are connected together within the tube, they are collectively referred to simply as anode for convenience in presenting data.*
2. *A value of average anode current higher than 500 microamperes per gun will increase picture brightness but may impair resolution and shorten cathode life.*
3. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 20,000 volts.*
4. *Centering of the raster on the screen is accomplished by passing direct current of the required value through each pair of deflecting coils to compensate for raster shift resulting from adjustments for optimum convergence and color purity.*
5. *Shift is the movement of the regions of bar-or-dot generator pattern indicated in Notes 8 and 9.*
6. *The direction of movement of the red and green beam is opposite to that of the blue beam.*
7. *Indicated values apply when test yoke is used with 21AXP22A.*
8. *The parabola amplitude is determined by the average value of the shifts at the extremities of the respective horizontal and vertical axes of the screen with convergence of the three beams maintained at the center of the screen. An increase in amplitude should move the blue beam toward the top of the screen; and the red beam toward the lower left of the screen; and the green beam toward the lower right of the screen.*
9. *The sawtooth amplitude is determined by the difference between the shifts at the extremities of the respective horizontal and vertical axes of the screen. Positive amplitude indicates that the shift at the right or bottom of the screen is greater than the shift at the left or top of the screen.*

GENERAL CONSIDERATIONS

The absolute-maximum ratings in the tabulated data are limiting values beyond which the serviceability of the tube may be impaired from the viewpoint of life and satisfactory performance. The equipment designer must establish the circuit design so that initially and throughout tube and equipment life, no absolute-maximum value is exceeded under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variation in tube characteristics.

X-RAY WARNING. X-ray radiation is produced by the tube when it is operated at its normal anode voltage. The radiation is through the faceplate and is sufficient to require the adoption of safety measures. Simple shielding, such as that provided by a ¼-inch thickness of safety glass (lime), in front of the faceplate, should prove adequate to provide protection against personal injury from prolonged exposure at close range when the tube is operated at its maximum anode voltage rating.

When this tube is being serviced outside of the TV receiver cabinet, it should never be operated without providing adequate X-ray shielding in front of the faceplate. Because the anode voltage may rise above its maximum rated value for short periods during adjustment with increase in the amount of X-ray radiation, provision should be made for placing a ⅜ inch thickness of safety glass in front of the faceplate to avoid the hazard of X-ray radiation.

HIGH VOLTAGES. The high voltage at which cathode-ray tubes are operated may be very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with the high voltages. Precautions include the enclosing of high-potential terminals and the use of interlocking switches to break the primary circuit of the power supply when access to the equipment is required.

METAL SHELL. The metal shell of the tube operates at high voltage. After power is turned off, the metal shell should be grounded before it is touched.

CORONA CONSIDERATIONS. Adequate spacing between the lip of the metal shell and any grounded element in the receiver, or between the small end of the metal shell and any grounded element, should be provided to preclude the possibility of corona. Similarly, adequate air spacing, or equivalent, should be provided around the body of the metal shell.

ANODE CONNECTION. Anode connection may be made to any part of the metal envelope. A spring-type contact may be incorporated on the inside of the tube insulating boot or contact may be made to the metal-shell lip. With either method, adequate insulation and freedom from corona discharge must be provided in the design of the contact and its associated lead wire. The decorative paint on the metal envelope will not prevent a good electrical connection from being made provided the contact is under pressure.

INSULATING MATERIAL FOR EXTERNAL MASK. The external mask should be made only of insulating material. This material should provide insulation for the full applied anode voltage. Mask material providing the specified insulation can bear directly against the faceplate.

SHATTER-PROOF COVER OVER THE TUBE FACE. Following conventional practice, it is recommended that the cabinet be provided with a shatter-proof, clear glass cover over the face of the tube to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide the necessary X-ray protection recommended under X-RAY WARNING.

TUBE HANDLING. Care should be taken to prevent bumping or striking of lip of the tube. Rough treatment may damage the faceplate seal.

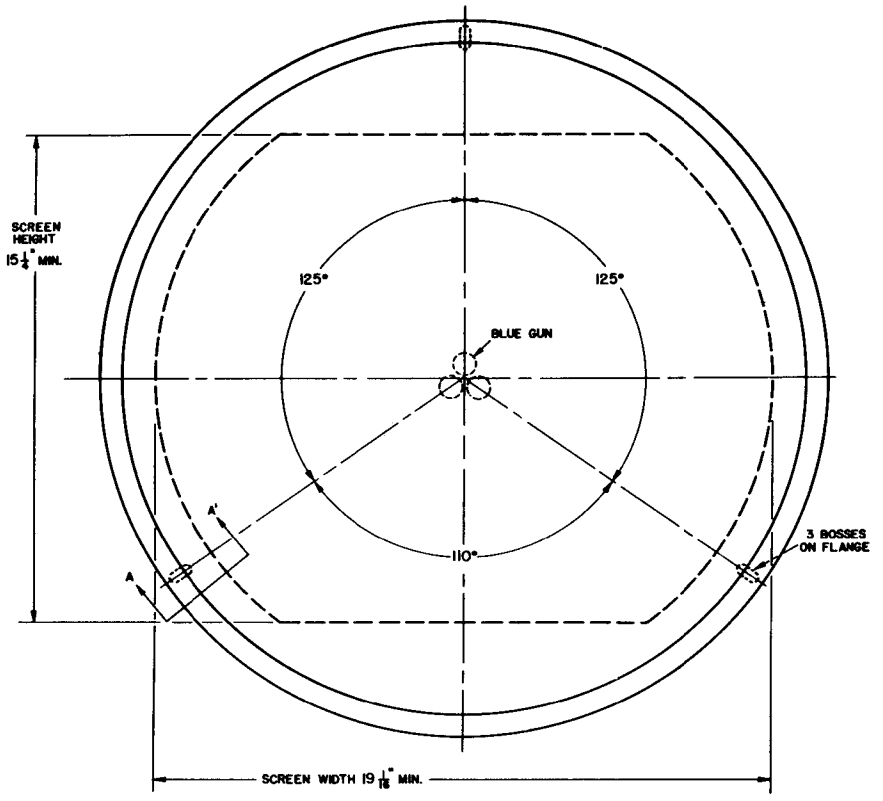
Always handle the tube by the shell. Do not handle the tube by the neck or that part having the insulating coating. Finger prints or dust on the insulating coating may cause electrical breakdown during humid weather.

DEFLECTING YOKE. It is recommended that the deflecting yoke be insulated from the neck and funnel of the tube by an insulating liner. The liner should be made of material of such thickness that the yoke will be held back from the funnel no more than 3/32 inch when located in its most forward position. The liner should be capable of providing insulation for approximately one-half the maximum applied anode voltage.

In supporting the yoke, provision should be made to allow it to move freely along the neck for a distance of ⅝ inch from its most forward position.

MAGNETIC-FIELD EQUALIZER ASSEMBLY. Use of adjustable magnets located peripherally at the front end of the tube provides sectionalized magnetic fields to eliminate the need for a magnetic shield over the body of the tube and to permit compensation in localized areas for the effects of stray magnetic fields and of the earth's magnetic field on color purity.

DEGAUSSING PROCEDURE.—For the 21AXP22 and 21AXP22A. After the tube and components are in place, and before voltages are applied to the receiver, a degaussing coil, consisting of about 425 turns of No. 20 enameled wire wound 12 inches in diameter and connected directly to a 115 V ac outlet, should be passed in front of the tube faceplate several times. It should be slowly withdrawn to a distance of about six feet and then turned on its axis 90 degrees before the current is turned off. For optimum performance, the above procedure must be repeated every time the tube or receiver is moved.



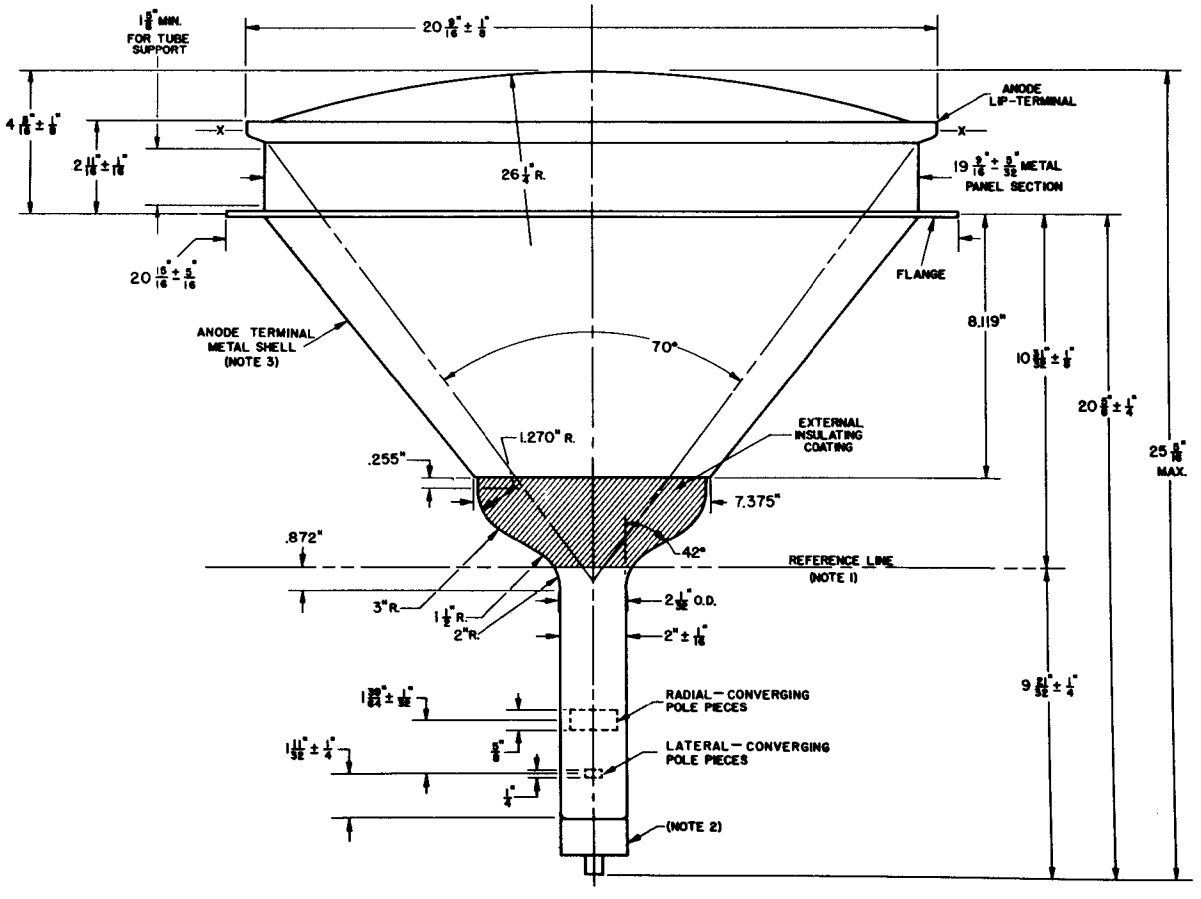
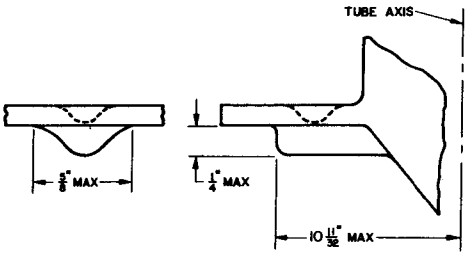
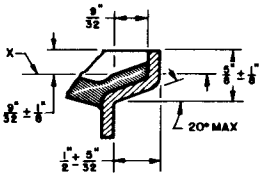


DIAGRAM NOTES:

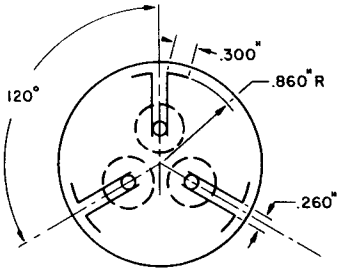
1. *With tube neck inserted through flared end of reference-line and neck-funnel-contour gauge and with tube seated in gauge, the reference line is determined by the intersection of the plane C-C' of the gauge with the glass funnel.*
2. *Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. Bottom circumference of base shell will fall within a circle concentric with metal-shell axis and having a diameter of 3 inches.*
3. *Metal shell and glass face operate at high voltage. Any material in contact with the shell or face must be insulated to withstand the maximum applied anode voltage.*



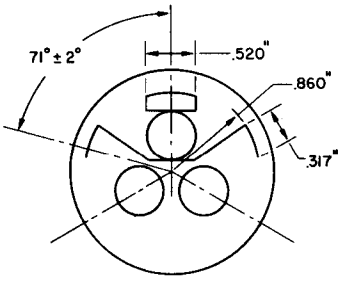
EXTERNAL VIEW AT A-A'
DETAIL OF FLANGE BOSSES



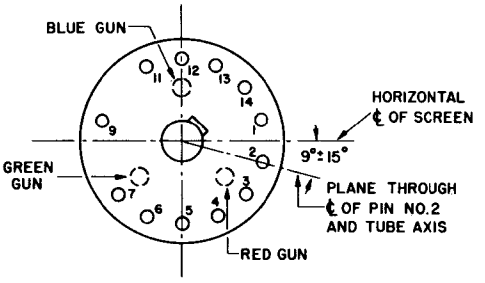
DETAIL OF LIP



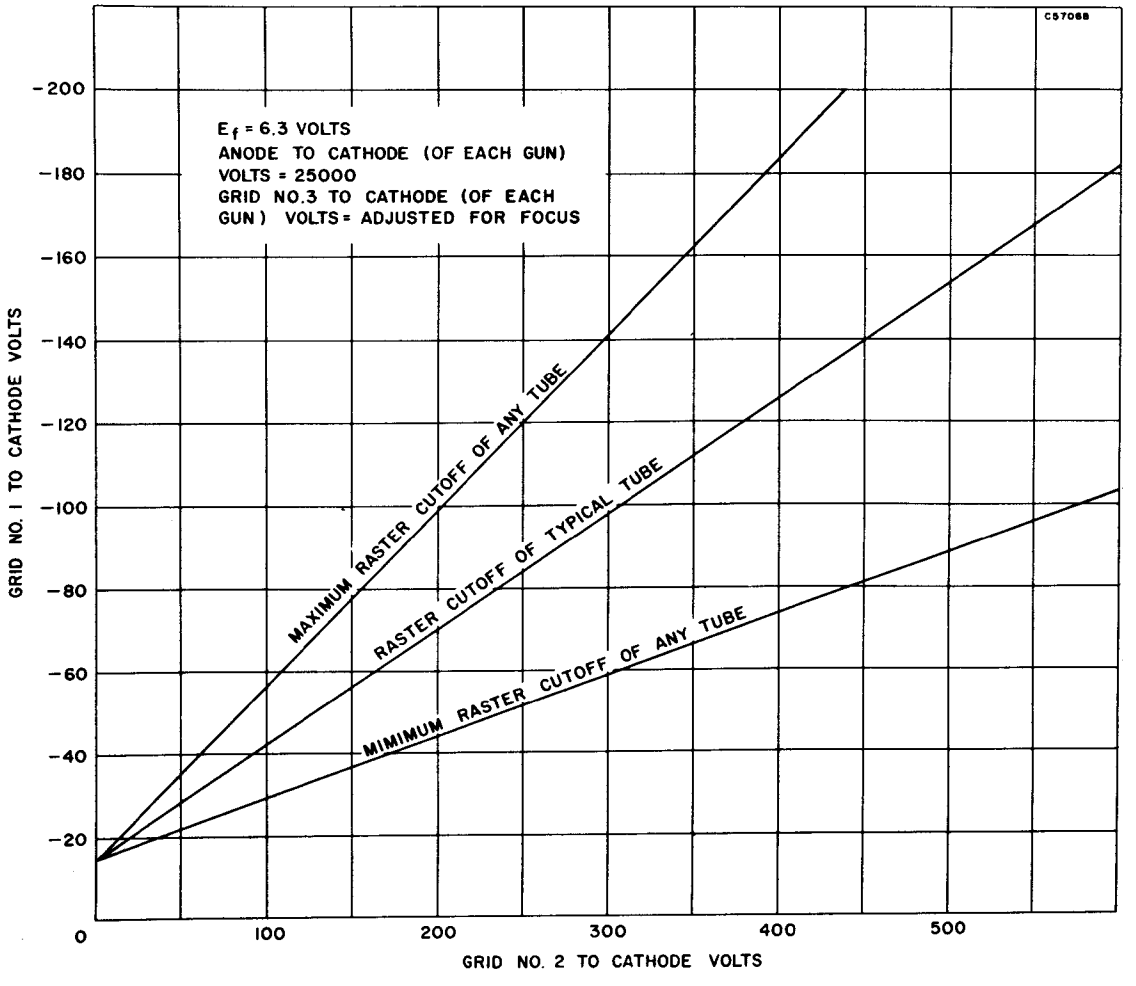
LOCATION OF RADIAL
CONVERGING POLE PIECES



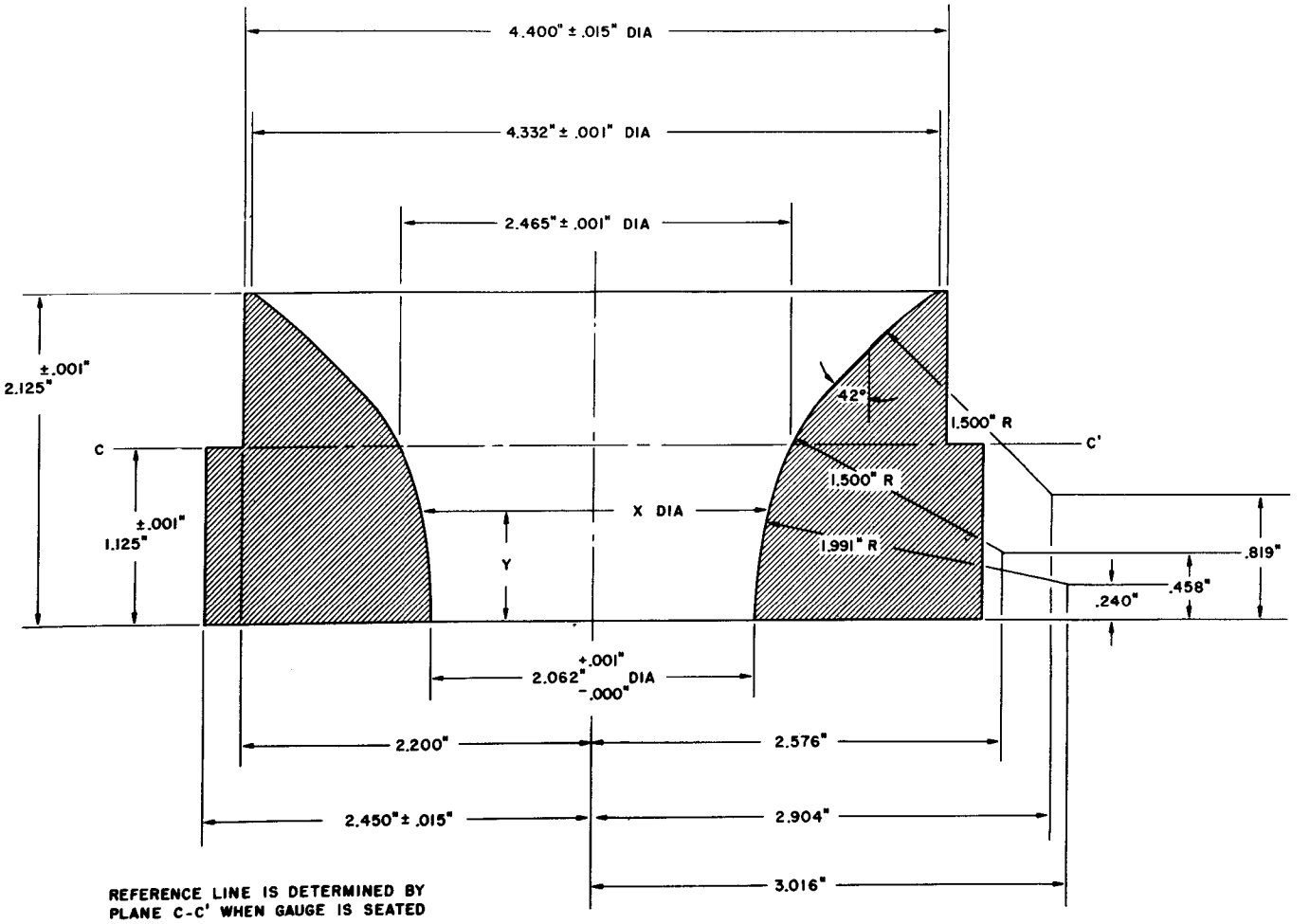
LOCATION OF LATERAL
CONVERGING POLE PIECES



BASE
BOTTOM VIEW



REFERENCE-LINE AND NECK-FUNNEL-CONTOUR GAUGE



Y	X
0.000″	2.062″ $^{+\ 0.001''}_{-\ 0.000''}$
0.125″	2.062″ $^{+\ 0.001''}_{-\ 0.000''}$
0.250″	2.062″ $^{+\ 0.001''}_{-\ 0.000''}$
0.375″	2.062″ $^{+\ 0.001''}_{-\ 0.000''}$
0.385″	2.062″ $^{+\ 0.001''}_{-\ 0.000''}$
0.500″	2.084″ ± 0.001″
0.625″	2.122″ ± 0.001″
0.750″	2.182″ ± 0.001″
0.875″	2.258″ ± 0.001″
1.000″	2.352″ ± 0.001″

Y	X
1.125″	2.465″ ± 0.001″
1.250″	2.604″ ± 0.001″
1.375″	2.778″ ± 0.001″
1.500″	2.990″ ± 0.001″
1.625″	3.216″ ± 0.001″
1.750″	3.440″ ± 0.001″
1.875″	3.678″ ± 0.001″
2.000″	3.958″ ± 0.001″
2.125″	4.332″ ± 0.001″

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engineering data service 21AYP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle (approx.)	
Horizontal	66 Degrees
Diagonal	70 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	72 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
External Conductive Coating to Anode[1]	1500 $\mu\mu$f Max.
	750 $\mu\mu$f Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	17 x 12¾ Inches
Minimum Useful Screen Area	219 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	18,000 Volts dc
Grid No. 4 Voltage (Focusing Electrode)	-500 to +1000 Volts dc
Grid No. 2 Voltage	500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-Up Period Not to Exceed 15 Seconds	410 Volts
After Equipment Warm-Up Period	180 Volts
Heater Positive with Respect to Cathode	180 Volts

RECOMMENDED OPERATING CONDITIONS

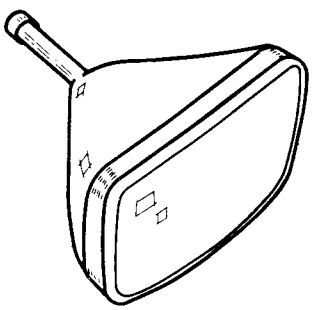
Anode Voltage	16,000 Volts dc
Grid No. 4 Voltage	-64 to +352 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	-28 to -72 Volts dc
Ion Trap Magnet Strength (approx.)	35 Gausses

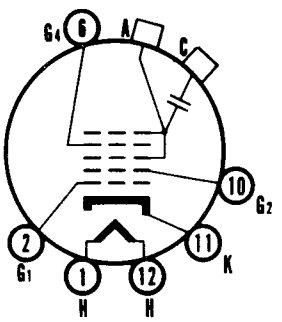
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
Single Field Ion Trap
External Conductive Coating





12-L

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
OCTOBER 1954

SYLVANIA

21AYP4

NOTES:

1. *External Conductive Coating must be grounded.*
2. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

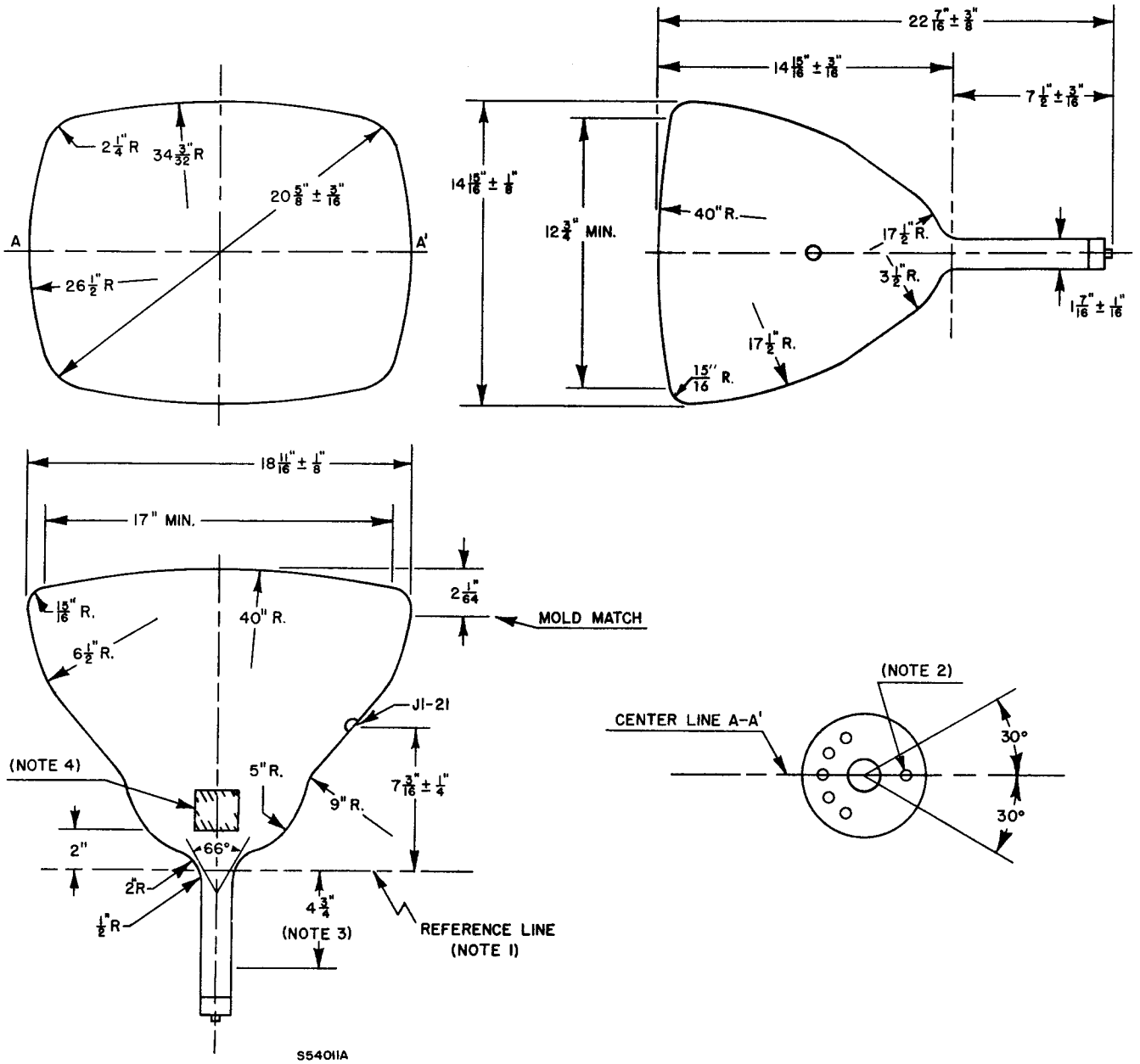


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C1 of the reference line gauge (JETEC No. 110) when the gauge is resting on the glass cone. The neck diameter near the cone may exceed 1.500" but is limited by the internal contour of the yoke reference line gauge.*
2. *Anode contact aligns with Pin No. 6 ±30 degrees.*
3. *Nominal position of ion trap magnet.*
4. *Contact area for external conductive coating, 2" x 2", located 90 degrees counter clockwise from anode contact as viewed from base end of tube.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflection Angles (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	74 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 5% Ampere
Heater Warm-up Time[1]	11 Seconds
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6 μμf
External Conductive Coating to Anode[2]	2500 μμf Max.
	2000 μμf Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	$19\frac{1}{16}$ x $15\frac{1}{16}$ Inches
Minimum Useful Screen Area	262 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12N

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	22,000 Volts dc
Grid No. 2 Voltage	550 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	155 Volts dc
Negative Peak Value	220 Volts
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[3]	−28 to −72 Volts dc
Focusing Coil Current[4]	116 ± 15% Ma dc
Ion Trap Magnet Current (Average)[5]	30 Ma dc
Field Strength of PM Ion Trap Magnet[6]	33 Gausses Min.

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

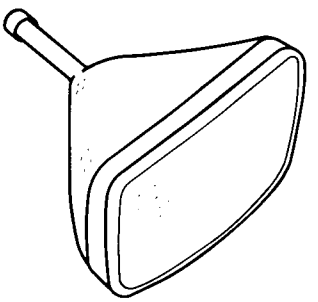
NOTES:

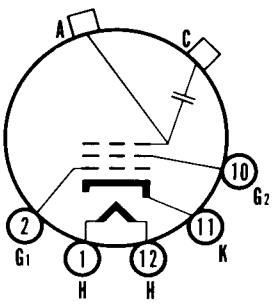
(Continued on Page 2)

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Magnetic Focus
Single Field Ion Trap
External Conductive Coating
Aluminized Screen





12-N

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION

SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

APRIL 1956

4. *For JETEC focusing coil 109 or equivalent three inches from reference line, bias adjusted to 20 foot lamberts on a $19\frac{1}{16}$ x $15\frac{1}{16}$ inch picture area sharply focused at center of screen.*
5. *For JETEC Ion Trap Magnet No. 117 with pole pieces centered over Grid No. 2 on mount, and rotated for maximum brightness.*
6. *For typical PM ion trap magnet with field strength tolerance of ± 3 gausses.*

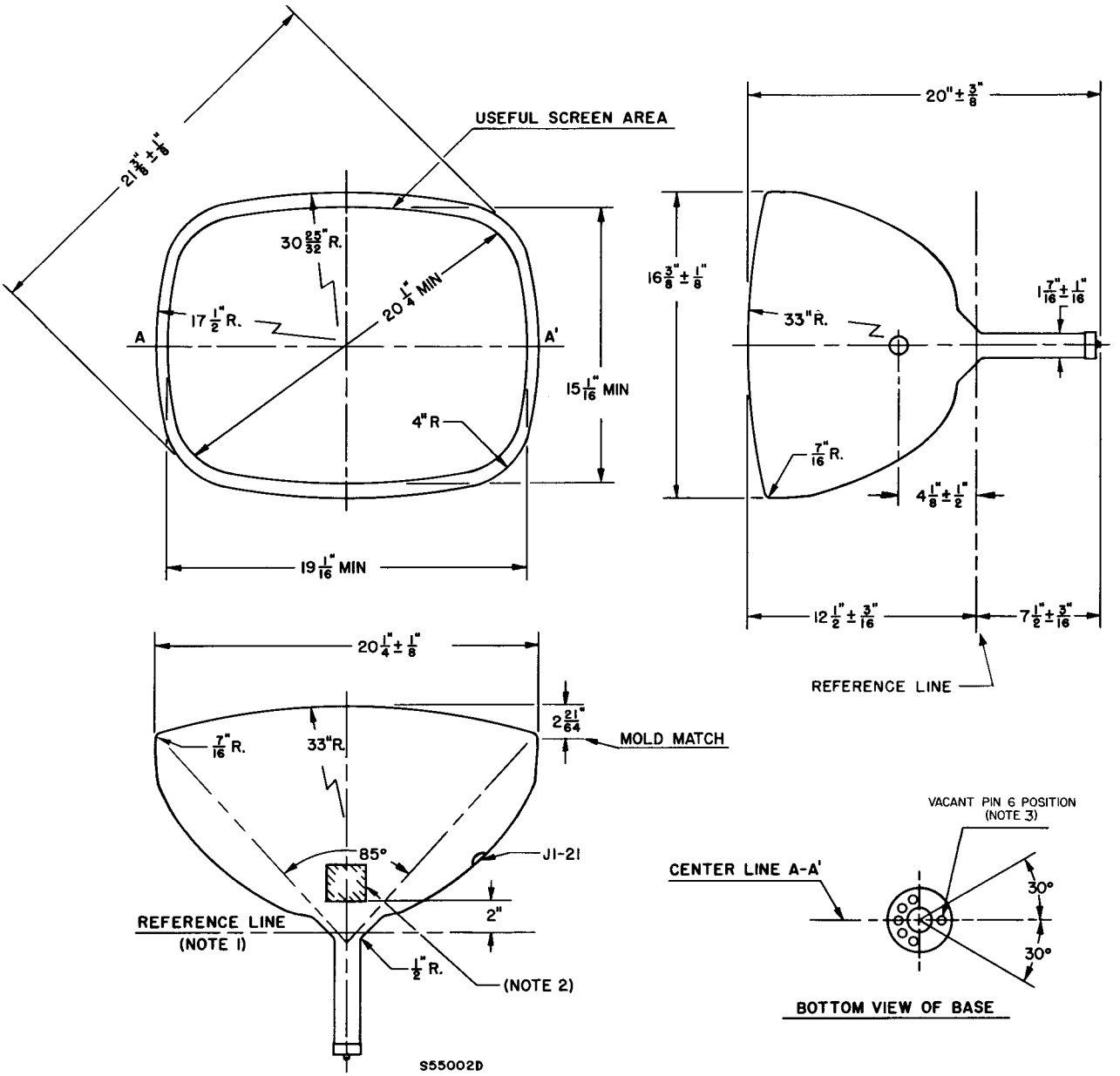


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone.*
2. *Contact area for external conductive coating, 2" x 2", located 90 degrees counterclockwise from anode contact as viewed from base end of tube.*
3. *Anode contact aligns with vacant pin position No. 6 ±30 degrees.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	74 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ±5% Ampere
Heater Warm-up Time[1]	11 Seconds
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6 μμf
External Conductive Coating to Anode[2]	2500 μμf Max.
	2000 μμf Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	$19\frac{1}{16}$ x $15\frac{1}{16}$ Inches
Minimum Useful Screen Area	262 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	22,000 Volts dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts dc
Grid No. 2 Voltage	550 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	155 Volts dc
Negative Peak Value	220 Volts
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts dc
Grid No. 4 Voltage for focus	−64 to +352 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[3]	−28 to −72 Volts dc
Ion Trap Magnet Current (Average)[4]	30 Ma dc
Field Strength of PM Ion Trap Magnet[5]	33 Gausses Min.

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

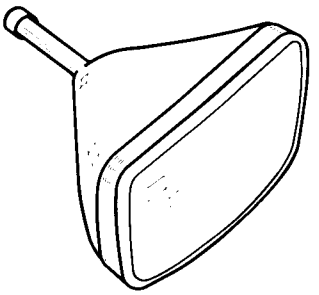
NOTES:

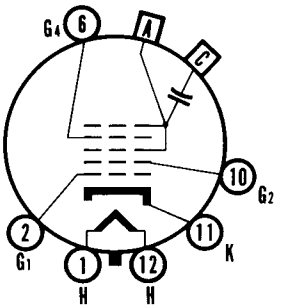
(Continued on Page 2)

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
Single Field Ion Trap
External Conductive Coating
Aluminized Screen





12-L

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION

SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

APRIL 1956

2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*
4. *For JETEC Ion Trap Magnet No. 117 with pole pieces centered over Grid No. 2 on mount, and rotated for maximum brightness.*
5. *For typical PM ion trap magnet with field strength tolerance of ±3 gausses.*

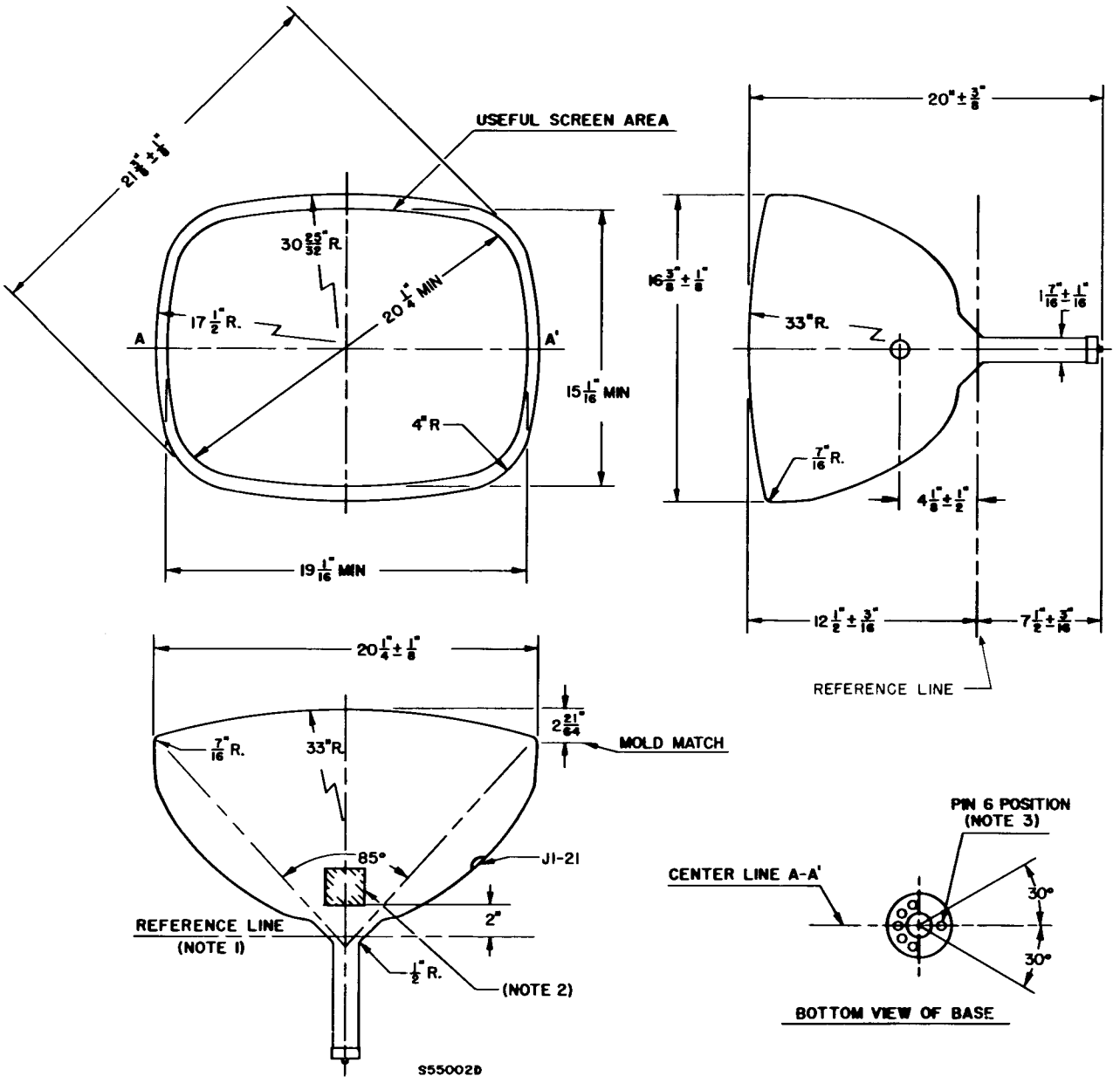


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone.*
2. *Contact area for external conductive coating, 2" x 2", located 90 degrees counterclockwise from anode contact as viewed from base end of tube.*
3. *Anode contact aligns with pin position No. 6 ± 30 degrees.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	74 ±3 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ±5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	2000 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions	19 1/16 x 15 1/16 Inches
Minimum Useful Screen Area	262 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

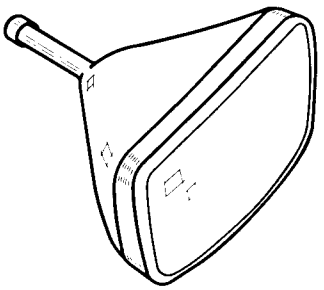
Anode Voltage	22,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

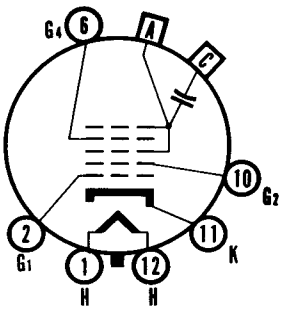
TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage	−50 to +350 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−28 to −72 Volts	dc

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
No Ion Trap
External Conductive Coating
Aluminized Screen





12-L

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JULY, 1957

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

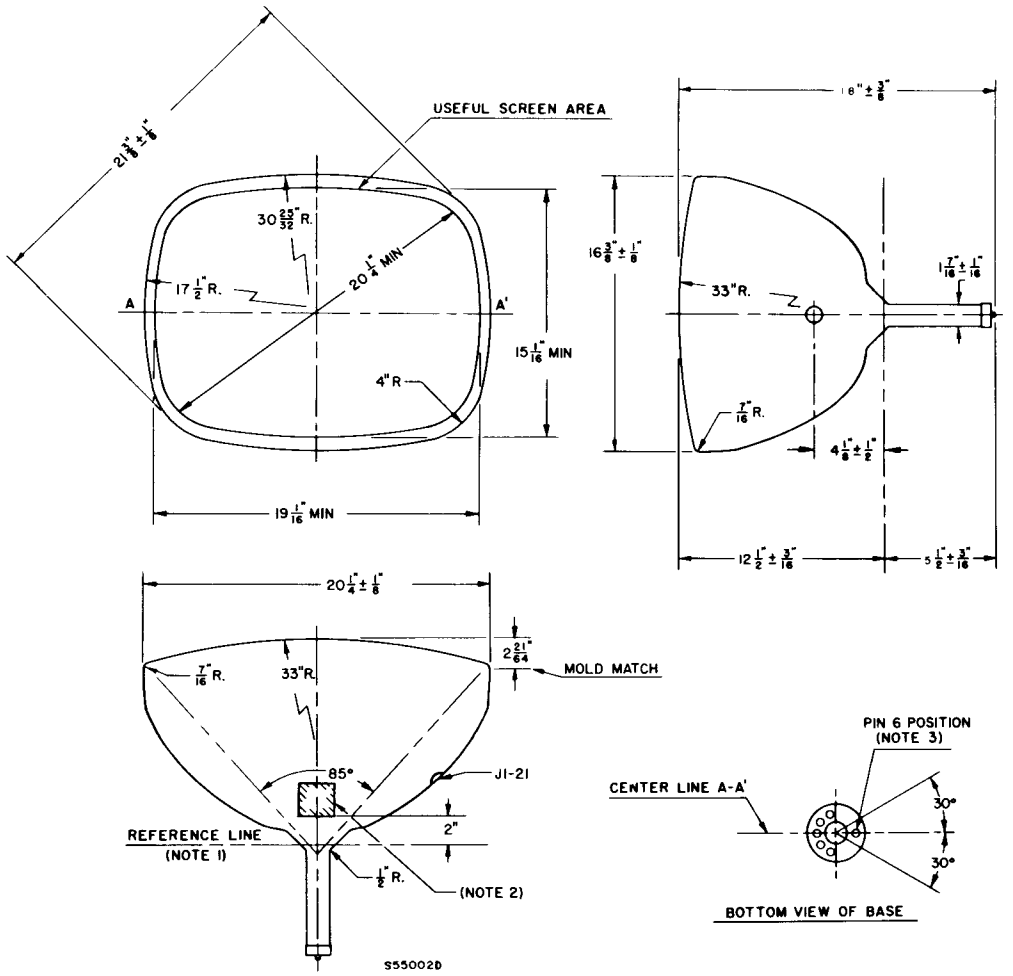


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C¹ of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone.*
2. *Contact area for external conductive coating, 2" x 2", located 90° counterclockwise from anode contact as viewed from base end of tube.*
3. *Anode contact aligns with pin position No. 6 ±30 degrees.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

SYLVANIA

engineering data service 21CQP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	105 Degrees
Diagonal	110 Degrees
Vertical	87 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	.73 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	2000 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	19 1/16 x 15 1/16 Inches
Minimum Useful Screen Area	262 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Bulb	C171 Exp. 19
Base	B6-185
Basing	7FA
Weight (approx.)	20 Pounds

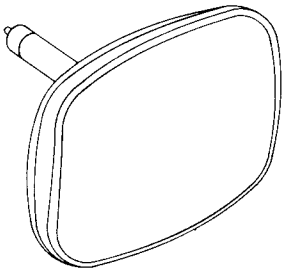
RATINGS

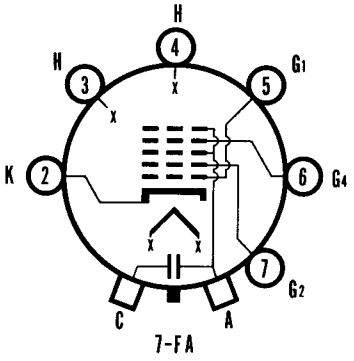
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	19,800 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	154 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1 1/8" Neck Diameter
No Ion Trap
External Conductive Coating





7-FA

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JUNE, 1957

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	−50 to +350 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage required for Cutoff[3]	−35 to −72 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

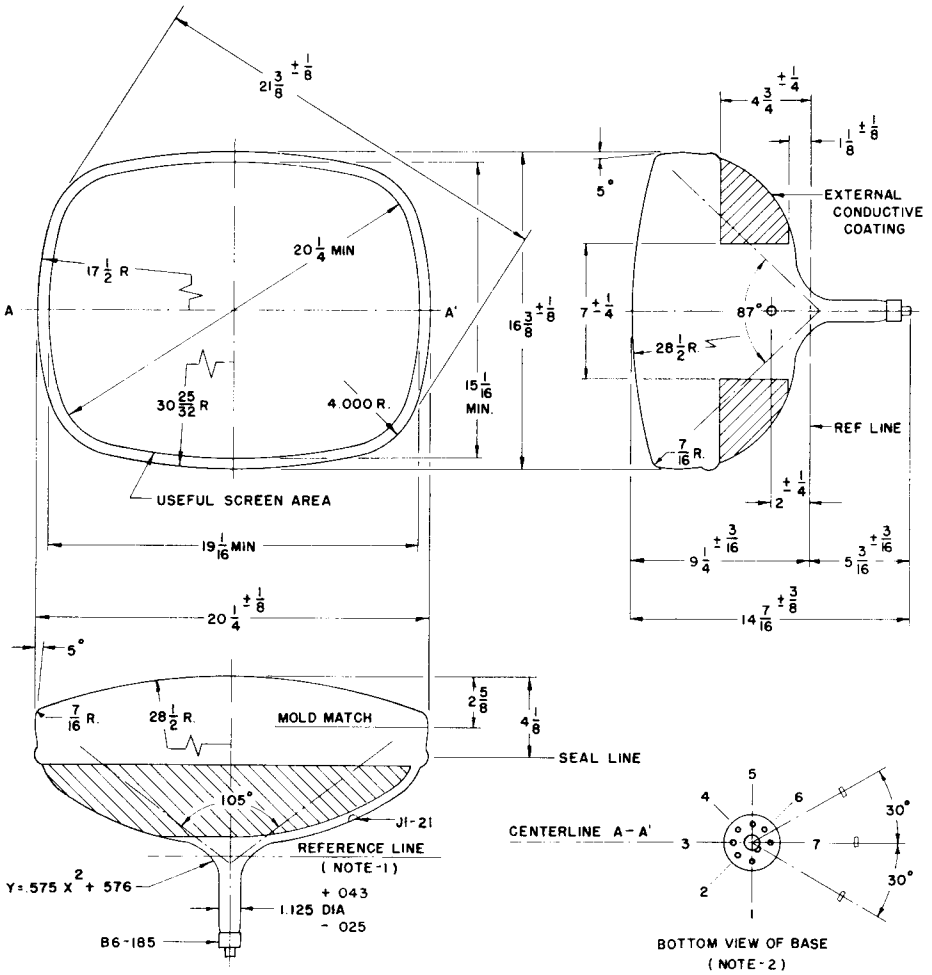


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JETEC No. 126 Reference Line gauge when the gauge is seated against the bulb.*
2. *Base Pin No. 7 aligns with anode contact (J1-21) within 30°.*
3. *Dimensions are in inches.*

SYLVANIA engineering data service

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (approx.)		
Horizontal	105	Degrees
Diagonal	110	Degrees
Vertical	87	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	75	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts	
Heater Current	0.450 ±5%	Ampere	
Heater Warm-up Time [1]	11	Seconds	
Direct Interelectrode Capacitances (approx.)			
Cathode to All Other Electrodes	5	µµf	
Grid No. 1 to All Other Electrodes	6	µµf	
External Conductive Coating to Anode [2]	2500	µµf	Max.
	2000	µµf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	19 1/16 x 15 1/16	Inches
Minimum Useful Screen Area	262	Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Bulb	J171-C1 or equivalent	
Base	B6-185	
Basing	7FA	
Weight (approx.)	20	Pounds

RATINGS

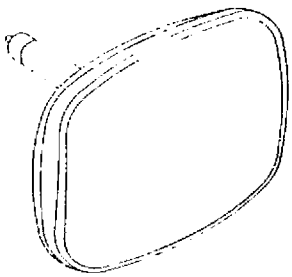
MAXIMUM RATINGS (Absolute Maximum Values)

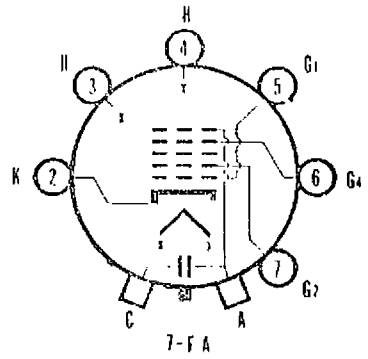
Anode Voltage	19,800	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts	dc
Grid No. 2 Voltage	550	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	154	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	

from JETEC release #1969, July 1, 1957

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1 1/8" Neck Diameter
No Ion Trap
External Conductive Coating
6.3 Volt, 450 Ma Heater





SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

June 5, 1957

MAXIMUM RATINGS (Absolute Maximum Values) (Cont'd.)

Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450	Volts
After Equipment Warm-up Period	200	Volts
Heater Positive with Respect to Cathode	200	Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000	Volts	dc
Grid No. 4 Voltage for Focus	0 to 400	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff [3]	-35 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

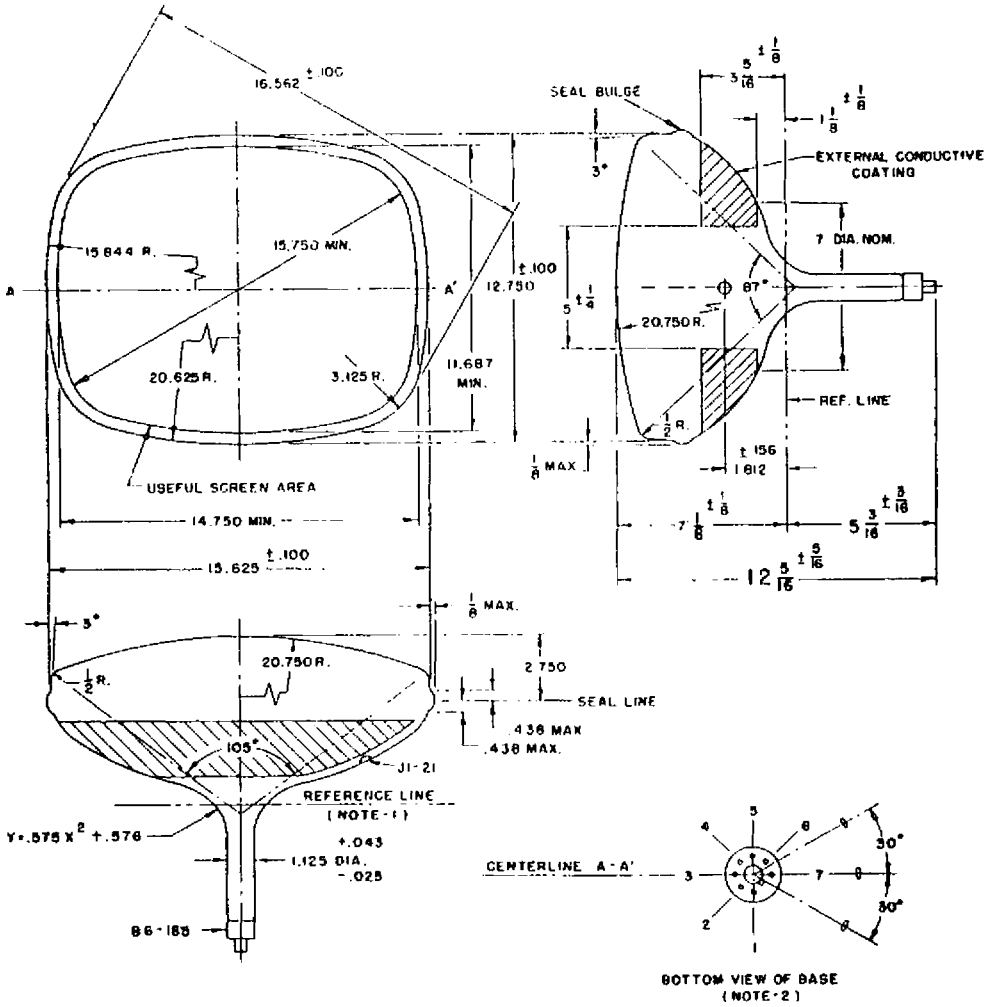


DIAGRAM NOTES:

1. Reference line is determined by plane C–C' of JETEC No. 126 Reference Line Gauge when the gauge is seated against the bulb.

2. Base pin No. 7 aligns with anode contact (J1-21) within 30°.

3. Dimensions are in inches.

SYLVANIA

engineering data service

SYLVANIA
21CYP22
21CYP22A
21FBP22
21FJP22
21FKP22

GENERAL INFORMATION

The Sylvania Types 21CYP22, 21CYP22A, 21FBP22, 21FJP22, and 21FKP22 are direct viewed round glass picture tubes for use in color television receivers. They are capable of producing either a full color or black and white picture measuring 19 ¼ x 15 ½ inches with rounded sides and having a projected area of 261 square inches.

These tubes utilize three electrostatic focus guns spaced 120 degrees apart with axes tilted toward the tube axis to facilitate convergence of the three beams at the shadow mask; individual convergence control of each beam radially by internal magnetic poles; and supplemental control of the three beams horizontally by internal magnetic poles; and an assembly consisting of a spherical metal graded-hole shadow mask and a tri-color, phosphor dot screen on the inner surface of the spherical Filterglass faceplate.

The tri-color, phosphor dot screen is composed of an orderly array of small, closely spaced, phosphor dots arranged in triangular groups. Each group consists of a green-emitting dot, a red-emitting dot, and a blue-emitting dot, and is aligned with a corresponding hole in the shadow mask.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Convergence Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	70 Degrees
Vertical	55 Degrees
Screen Type	Aluminized, Three-Color, Phosphor Dot
Phosphor, Blue-Green-Red Dots	P22
Persistence	Medium
Arrangement	Triangular Groups Each Consisting of Blue Dot, Green Dot and Red Dot
Spacing Between Center of Adjacent Dot Trios (Approx.)	.029 Inches
Faceplate (Spherical)	Filter Glass
Light Transmittance (Approx.)	
Faceplate (21FBP22, 21FJP22, 21FKP22)	73 ½ ± 3 Percent
Faceplate (21CYP22A)	72 Percent
Bonded Shield (21FJP22, 21FKP22)	61 Percent
Combined Faceplate and Bonded Shield (21FJP22, 21FKP22)	45 ± 4 Percent

Surface of Bonded Shield (21FJP22) Treated to Reduce Specular Reflection.

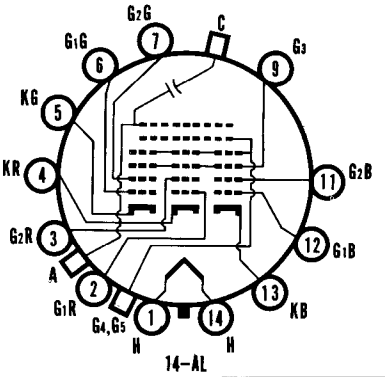
ELECTRICAL DATA

	21FBP22 21FJP22 21FKP22	21CYP22A	
Heater Voltage (±10 %)	6.3	6.3 Volts	
Heater Current (Approx.)	1.8	1.6 Amperes	
Direct Interelectrode Capacitances (Approx.)			
Grid No. 1 of Any Gun to All Other Electrodes (Except Grid No. 1 of Other Guns)	10	7 pf	
Cathode of Blue Gun + Cathode of Green Gun + Cathode of Red Gun to All Other Electrodes	16	16 pf	
Grid No. 3 (Of All Guns Tied Together) to All Other Electrodes	9	9 pf	
Ex. Conductive Coating to Anode	2500	2500 pf	Max.
	2000	2000 pf	Min.

QUICK REFERENCE DATA

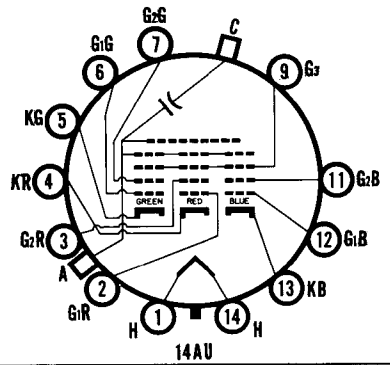
Color Television Picture Tube
21" Direct Viewed
Round Glass Type
Magnetic Deflection
Filter Glass
Spherical Faceplate
Electrostatic Focus
Magnetic Convergence
Aluminized Screen
Three Electron Gun Type
21CYP22A supersedes and replaces 21CYP22
21FJP22, 21FKP22: Bonded Shield
21FJP22: Anti-Reflection Treated

21CYP22A



14-AL

21FBP22
21FJP22
21FKP22



14AU

SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

PICTURE TUBE
OPERATIONS

SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

SEPTEMBER, 1963

File Under
TELEVISION PICTURE TUBES

MECHANICAL DATA

	21FJP22 21FKP22	21CYP22A 21FBP22
Minimum Useful Screen Dimensions (Maximum Assured)	19 ¼ x 15 ½	19 ¼ x 15 ½ Inches
Minimum Useful Screen Area	261	261 Sq. Inches
Overall Length	$25\frac{9}{32} \pm \frac{3}{8}$	$25\frac{1}{32} \pm \frac{3}{8}$ Inches
Diameter	21 Max.	$20\frac{13}{16} \pm \frac{1}{8}$ Inches
Anode Terminal (Recessed Small Cavity)	J1-21	J1-21
Base (Small Shell Neodiheptal 12-Pin)	B12-131	B12-131
Basing	14AU	14AU for 21FBP22 14AL for 21CYP22A
Operation Position (Base Pin 12 and V Grooved Panel Pad on Top)	Tube Axis Horizontal	
Weight (Approx.)	43	36 ½ Pounds

RATINGS

Unless otherwise specified, voltage values are positive with respect to cathode of specified gun

MAXIMUM RATINGS (Design Maximum Values)

	21FBP22 21FJP22 21FKP22	21CYP22A See Note 5	
Anode[1]-to-Cathode (Of Each Gun) Voltage	27,500	27,500 Volts	Max.
Grid No. 3-to-Cathode (Of Each Gun) Voltage	6000	6600 Volts	Max.
Grid No. 2-to-Cathode Voltage + Video Signal Voltage (Each Gun)	1000	660 Volts	Max.
Grid No. 1-to-Cathode Voltage (Each Gun)			
Operating Cutoff Value	200	Volts	
Negative Bias Value	400	440 Volts	Max.
Positive Bias Value	0	0 Volt	Max.
Positive Peak Value	2	2 Volts	Max.
Peak Heater-Cathode Voltage (Each Gun)			
Heater Negative with Respect to Cathode			
During Warm-up Period Not to Exceed 15 Seconds	450	450 Volts	Max.
After Equipment Warm-up Period	200	200 Volts	Max.
Heater Positive with Respect to Cathode	200	200 Volts	Max.
Maximum Anode Current, Long Term Average	1000	μa	

EQUIPMENT DESIGN RANGES

Anode Voltage (Ec4k Each Gun) Between 20,000[2] and 27,500 Volts (21CYP22A, 21FBP22, 21FJP22, 21FKP22)

Grid No. 3 (Focusing Electrode)-to-Cathode (Of Each Fun) Voltage . . . . . 16.8 % to 20 % of Ec4k Each Gun Volts

Grid No. 2-to-Cathode Voltage (Each Gun)
When Circuit Design Utilizes Grid No. 1-to-Cathode Voltage (Ec1K) of 70 Volts for Raster Cutoff . . . . . 130 to 370 Volts

Grid No. 2-to-Cathode Voltage (Each Gun)
When Circuit Design Utilizes Grid No. 1-to-Cathode Voltage (Ec1K) of 165 Volts for Raster Cutoff . . . . . 355 to 1010 Volts

Grid No. 1-to-Cathode Voltage (Each Gun)
For Visual Extinction of Focused Raster when Circuit Design Utilizes Grid No. 2-to-Cathode Voltage (Ec2K) of 200 Volts . . . . . −45 to −100 Volts

Grid No. 1-to-Cathode Voltage (Each Gun)
For Visual Extinction of Focused Raster when Circuit Design Utilizes Grid No. 2-to-Cathode Voltage (Ec2K) of 550 Volts . . . . . −96 to −246 Volts

EQUIPMENT DESIGN RANGES (Cont'd)

Variation in Raster Cutoff Between Guns in Any Tube		±21 % of Average of Highest and Lowest Cutoff Values
Grid No. 3 Current		−45 to +45 μa
Grid No. 2 Current (Each Gun)		−5 to +5 μa
	21FBP22 21FJP22 21FKP22	**21CYP22A (8500°K + 27MPCD)**
Percentage of Total Anode Current Supplied by Each Gun to Produce White of 9300°K + 27MPCD (CIE Coordinates: X=.281; Y=.311)		
Red Gun	42	49 Percent
Blue Gun	28	18 Percent
Green Gun	30	33 Percent
Ratio of Cathode Currents (Typical) Each Gun to Produce White of 9300°K + 27MPCD		
Red to Green	1.4	1.5
Red to Blue	1.5	2.7
Maximum Raster Centering Correction in Any Direction	7/8 In.	7/8 Inch
Maximum Compensation to be Provided by the Following Components:		
Purifying Magnet Maximum Required Displacements of Beam Trios in Any Direction with Respect to Associated Phosphor Dot Trios	0.005 In.[4]	0.005 Inch[4]
Lateral-Converging Magnet After Adjustment has been made for Color Purity and Dynamic Convergence (Maximum Lateral Shift of Blue Beam)	± ¼ In.	± ¼ Inch
Radial-Converging Magnet Assembly For Static Convergence after Adjustment has been made for Optimum Color Purity and Dynamic Convergence (Each Beam)	Shift of ±5/8 In.	Shift of ±5/8 Inch

EXAMPLES OF USE DESIGN RANGES

	For All Types	
Anode Voltage	20,000	25,000 Volts
Grid No. 3 (Focusing Electrode)-to-Cathode (Of Each Gun) Voltage	3360 to 4000	4200 to 5000 Volts
Grid No. 2- to-Cathode Voltage (Each Gun) When Circuit Design Utilizes Grid No. 1-to-Cathode Voltage of −70 Volts for Raster Cutoff	130 to 370	130 to 370 Volts
Grid No. 2-to-Cathode Voltage (Each Gun) When Circuit Design Utilizes Grid No. 1-to-Cathode Voltage of −165 Volts for Raster Cutoff	355 to 1010	355 to 1010 Volts
Grid No. 1-to-Cathode Voltage (Each Gun) For Visual Extinction of Focused Raster When Circuit Design Utilized Grid No. 2-to-Cathode Voltage of 200 Volts	−45 to −100	−45 to −100 Volts
Grid No. 1-to-Cathode Voltage (Each Gun) For Visual Extinction of Focused Raster When Circuit Design Utilized Grid No. 2-to-Cathode Voltage of 550 Volts	−96 to −246	−96 to −246 Volts

LIMITING CIRCUIT VALUES

High Voltage Circuits

In order to minimize the possibility of damage to the tube caused by a momentary internal arc, it is recommended that the anode power supply and the Grid No. 3 power supply be of the limited-energy type. In equipment utilizing a well-regulated anode power supply, the Grid No. 3 circuit resistance should be limited to 7.5 Megohms.

Low Voltage Circuits

Grid No. 1 Circuit Resistance (Each Gun) . . . . . 0.75 Megohms Max.

When the cathode of each gun is not connected directly to the heater, the Grid No. 1-to-Heater Circuit, and the Cathode-to-Heater Circuit should each have an impedance such that their respective power sources in combination will not supply an instantaneous or continuous short-circuit current of more than 300 milliamperes total. Such current limitation will prevent heater burn-out in case of a momentary internal arc within the tube.

NOTES:

1. *The anode in a cathode-ray tube is the electrode to which is applied the highest d c voltage for accelerating the electrons in the beam prior to its deflection. In this tube the anode function is performed by Grid No. 4. Since Grid No. 4 and Grid No. 5 are connected together within the tube, they are collectively referred to simply as anode for convenience in presenting data.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 20,000 volts.*
3. *Centering of the raster on the screen is accomplished by passing direct current of the required value through each pair of deflecting coils. With all components properly adjusted, the raster centering correction is the distance from the undeflected focused beams to the center of the screen.*
4. *The equivalent raster movement is about ¾".*
5. *Between the anode terminal and the high voltage-supply terminal (see dimensional outline), it is necessary to connect a resistor of 50,000 ohms. The high voltage must be connected to the high voltage-supply terminal, never directly to the anode terminal.*

GENERAL CONSIDERATIONS

X-RADIATION WARNING. Because these tubes are designed to be operated at anode voltages as high as 27.5 kilovolts (design-maximum value), shielding of the bulb for X-radiation may be needed to protect against possible injury from prolonged exposure at close range.

TUBE HANDLING. The bulb should be handled carefully as required by any glass picture tube. Particular care should be taken to prevent damage to the seal area.

SHATTER-PROOF COVER OVER THE TUBE FACE. Following conventional picture tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the tube to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required. This applies only to 21CYP22, 21CYP22A, and 21FBP22.

Types 21FJP22 and 21FKP22 have integral gray filter glass safety plate laminated directly to face of tube.

ORIENTATION. The tube must be operated with tube axis in a horizontal position and with the blue gun uppermost (i.e., base pin 12 and V-grooved panel pad on top). This operating position is required to take advantage of the correction built into the tube for the vertical component of the earth's magnetic field in the northern hemisphere, and is the position for which the beam-displacement values shown in this bulletin apply.

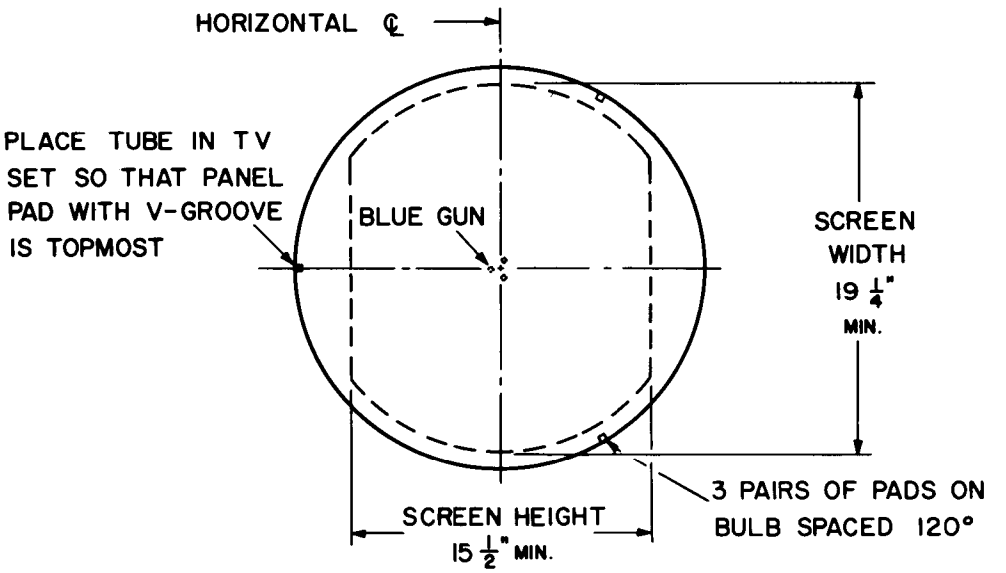
The deflection yoke should not be used for supporting the picture tube because it should be centered on the neck and be free to move along the neck for a distance of approximately $\frac{5}{8}$ inch from its most forward position for adjustment purposes. The yoke mount should also provide for a small amount of rotational adjustment.

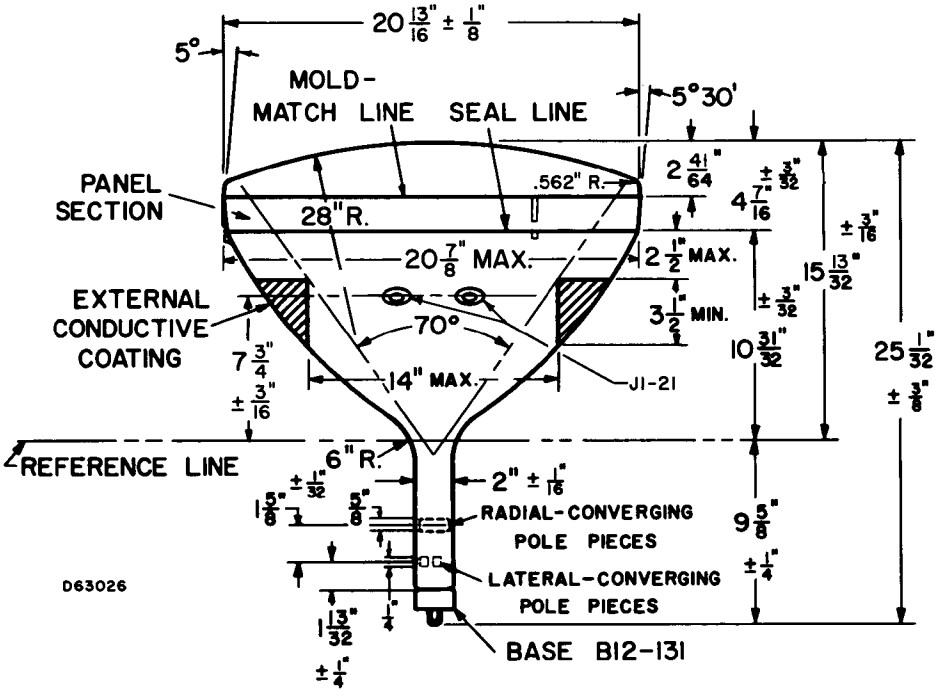
If a yoke liner is employed such as to support the yoke on the neck of the tube, the liner should be of such thickness that the yoke will be held back from the funnel no more than $\frac{3}{32}$" when located in its most forward position.

MISREGISTER COMPENSATION. Proper operation requires compensation for the effects of extraneous magnetic fields, the earth's magnetic field, and other causes which may produce misregister. Compensation for these effects may be accomplished by the use of a purifying magnet.

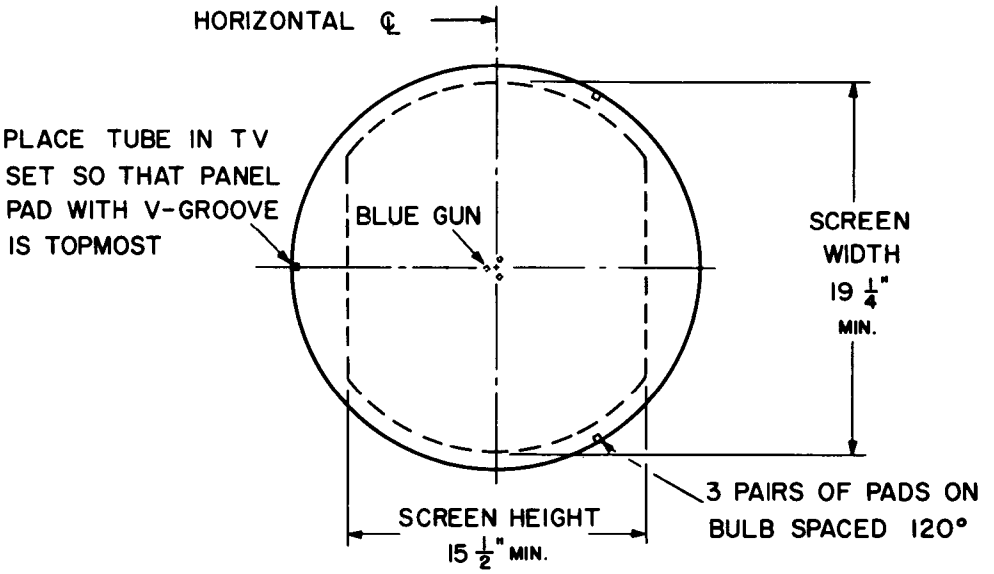
The purifying magnet, designed to provide a magnetic field adjustable in magnitude and direction, effects register over the entire area of the screen.

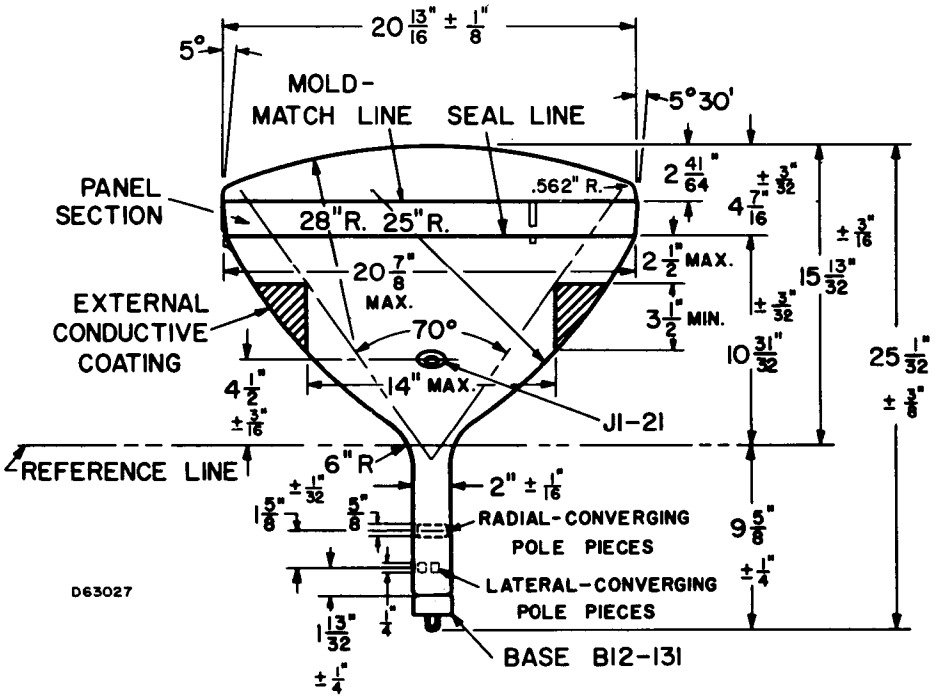
OUTLINE
21CYP22, 21CYP22A



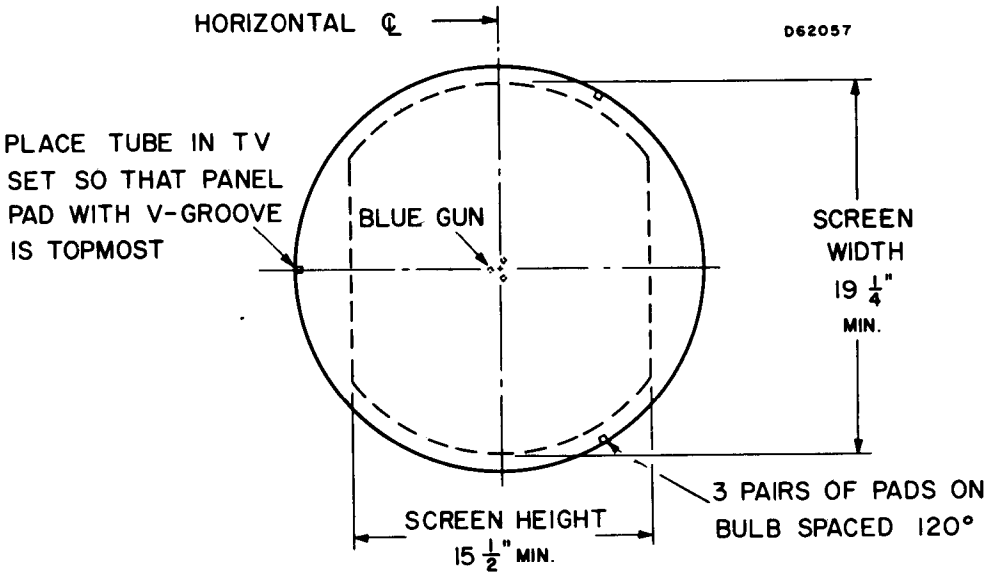


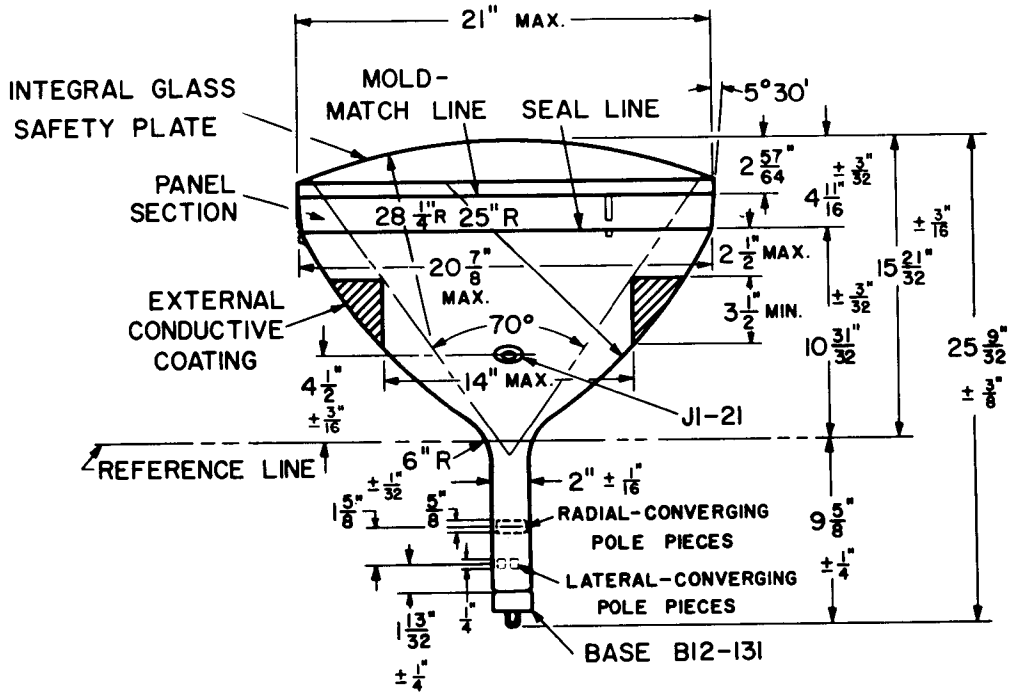
OUTLINE
21FBP22





OUTLINE
21FJP22, 21FKP22





CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	105 Degrees
Diagonal	110 Degrees
Vertical	87 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	76 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ±5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	2000 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	19 1/16 x 15 1/16 Inches
Minimum Useful Screen Area	262 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Bulb	J171 G1 or Equivalent
Base	B7-183
Basing	8HR
Weight (approx.)	20 Pounds

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	19,800 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	154 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

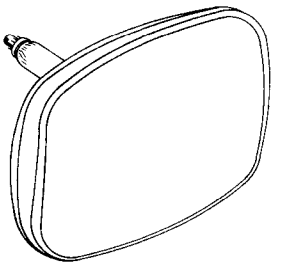
Anode Voltage	17,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage required for Cutoff[3]	−35 to −72 Volts	dc

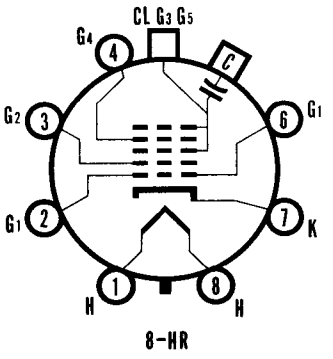
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1⅛" Neck Diameter
No Ion Trap
External Conductive Coating





SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
DECEMBER, 1957

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher that the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

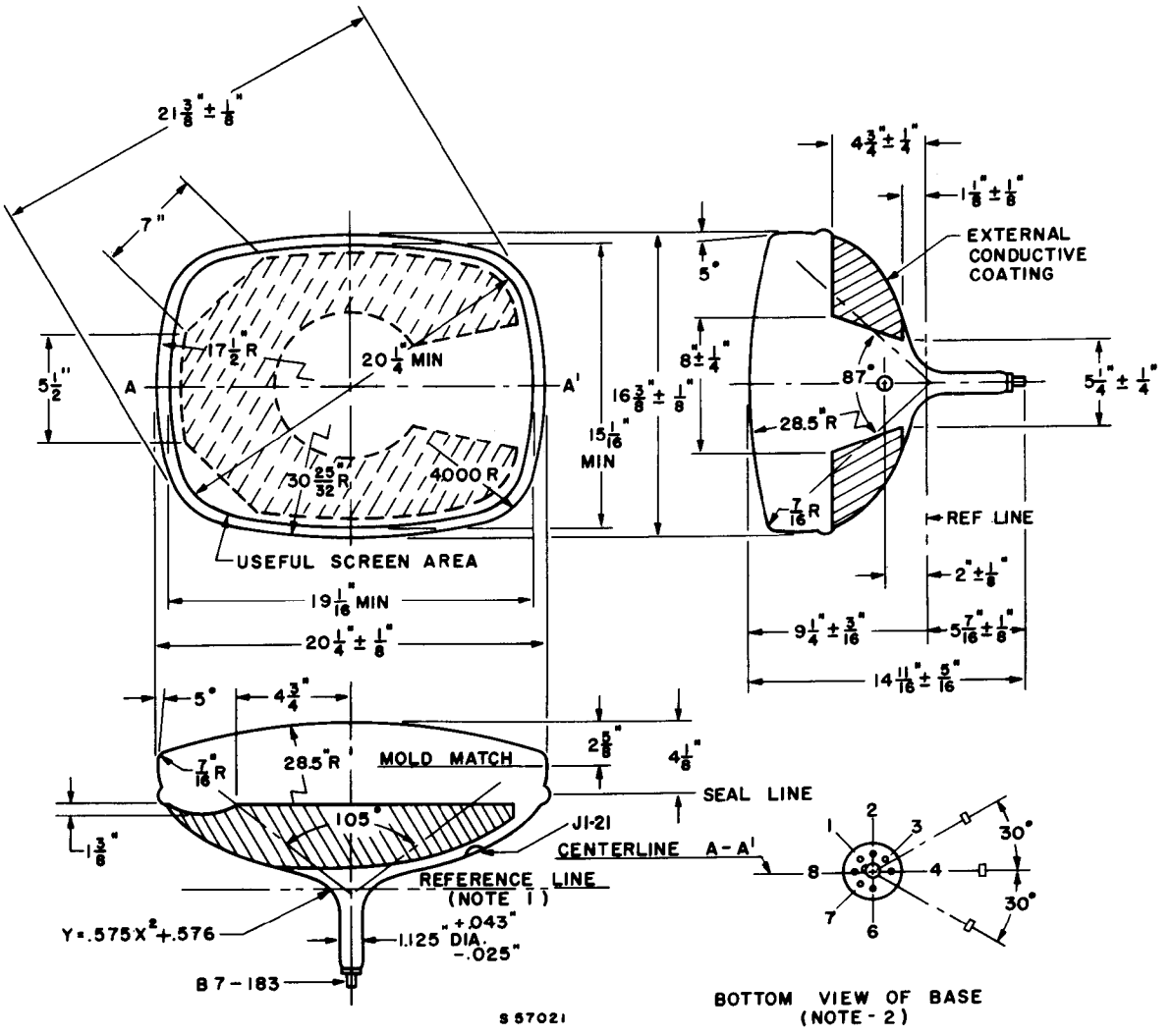


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of (JETEC No. 126) reference line gauge when the gauge is seated against the bulb.*
2. *Base pin No. 4 aligns with horizontal centerline of tube within 30°, and is on same side of tube as anode contact (J1-21).*

A Technical Publication of
SYLVANIA ELECTRIC
PRODUCTS INC.
EMPORIUM, PA.



ADVANCE DATA

CHARACTERISTICS

GENERAL DATA		
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (approx.)		
Horizontal	105	Degrees
Diagonal	110	Degrees
Vertical	87	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	76	Percent
ELECTRICAL DATA		
Heater Voltage	6.3	Volts
Heater Current	0.45 ±5%	Ampere
Heater Warm-up Time [1]	11	Seconds
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	6	μμf
External Conductive Coating to Anode [2]	2500	μμf Max.
	1700	μμf Min.
MECHANICAL DATA		
Minimum Useful Screen Dimensions (Maximum Assured)	19 1/16 x 15 1/16	Inches
Minimum Useful Screen Area	262	Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Bulb	J171-G1 or equivalent	
Base	B7-183	
Basing	8HR	
Weight (approx.)	20	Pounds

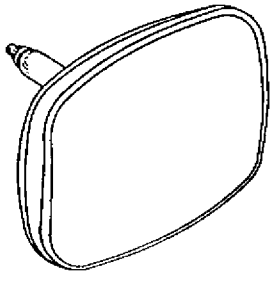
RATINGS

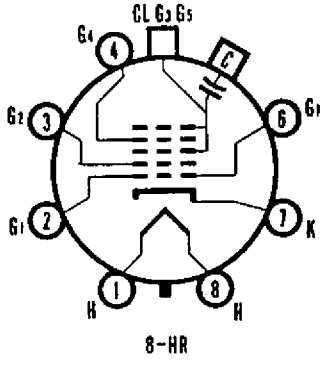
MAXIMUM RATINGS (Absolute Maximum Values)		
Anode Voltage	19,800	Volts dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts dc
Grid No. 2 Voltage	550	Volts dc
Grid No. 1 Voltage		
Negative Bias Value	154	Volts dc
Negative Peak Value	220	Volts
Positive Bias Value	0	Volts dc
Positive Peak Value	2	Volts

from JETEC release #2095, Feb. 3, 1958

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1 1/8" Neck Diameter
No Ion Trap
External Conductive Coating
6.3 Volt, 450 Ma Heater





SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

January 13, 1958

MAXIMUM RATINGS (Absolute Maximum Values) (Cont'd.)

Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450	Volts
After Equipment Warm-up Period	200	Volts
Heater Positive with Respect to Cathode	200	Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000	Volts	dc
Grid No. 4 Voltage for Focus	0 to 400	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff [3]	-35 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

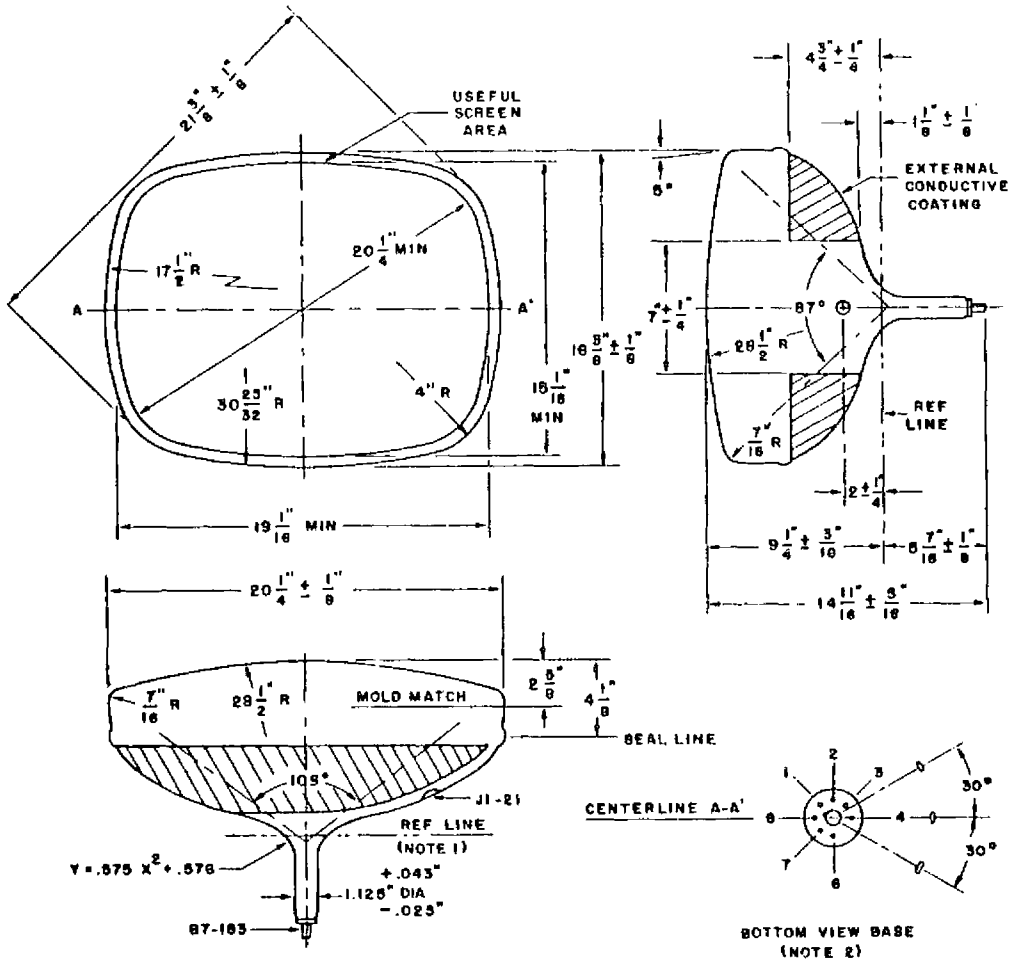


DIAGRAM NOTES:

1. Reference line is determined by plane C-C' of JETEC No. 126 Reference Line gauge when the gauge is seated against the bulb.

2. Base Pin No. 4 aligns with anode contact (J1-21) within 30°.

from JETEC release #2173, May 5, 1958

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	85	Degrees
Diagonal	90	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (Approx.)	74	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts	
Heater Current	0.3 ± 5%	Ampere	
Heater Warm-up Time[1]	11	Seconds	
Direct Interelectrode Capacitances (Approx.)			
Cathode to All Other Electrodes	5	µµf	
Grid No. 1 to All Other Electrodes	6	µµf	
External Conductive Coating to Anode[2]	2500	µµf	Max.
	2000	µµf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions	19 1/16 x 15 1/16	Inches
Minimum Useful Screen Area	262	Sq. Inches
Bulb	J171D or J171E	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duodecal 6-Pin)	B6-63 or B6-203	
Basing	12L	
Weight (Approx.)	22½	Pounds

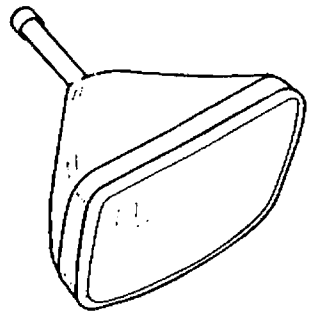
RATINGS

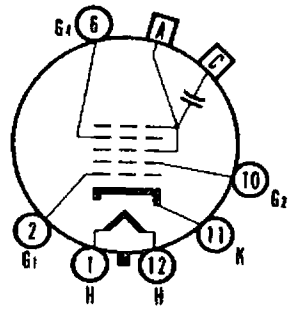
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	22,000	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts	dc
Grid No. 2 Voltage	550	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	155	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period Not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Electrostatic Focus
No Ion Trap
90° Magnetic Deflection
External Conductive Coating
Aluminized Screen
6.3 Volt, 300 Ma Heater





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SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

April 2, 1958

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000	Volts	dc
Grid No. 4 Voltage	-50 to +350	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	-35 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

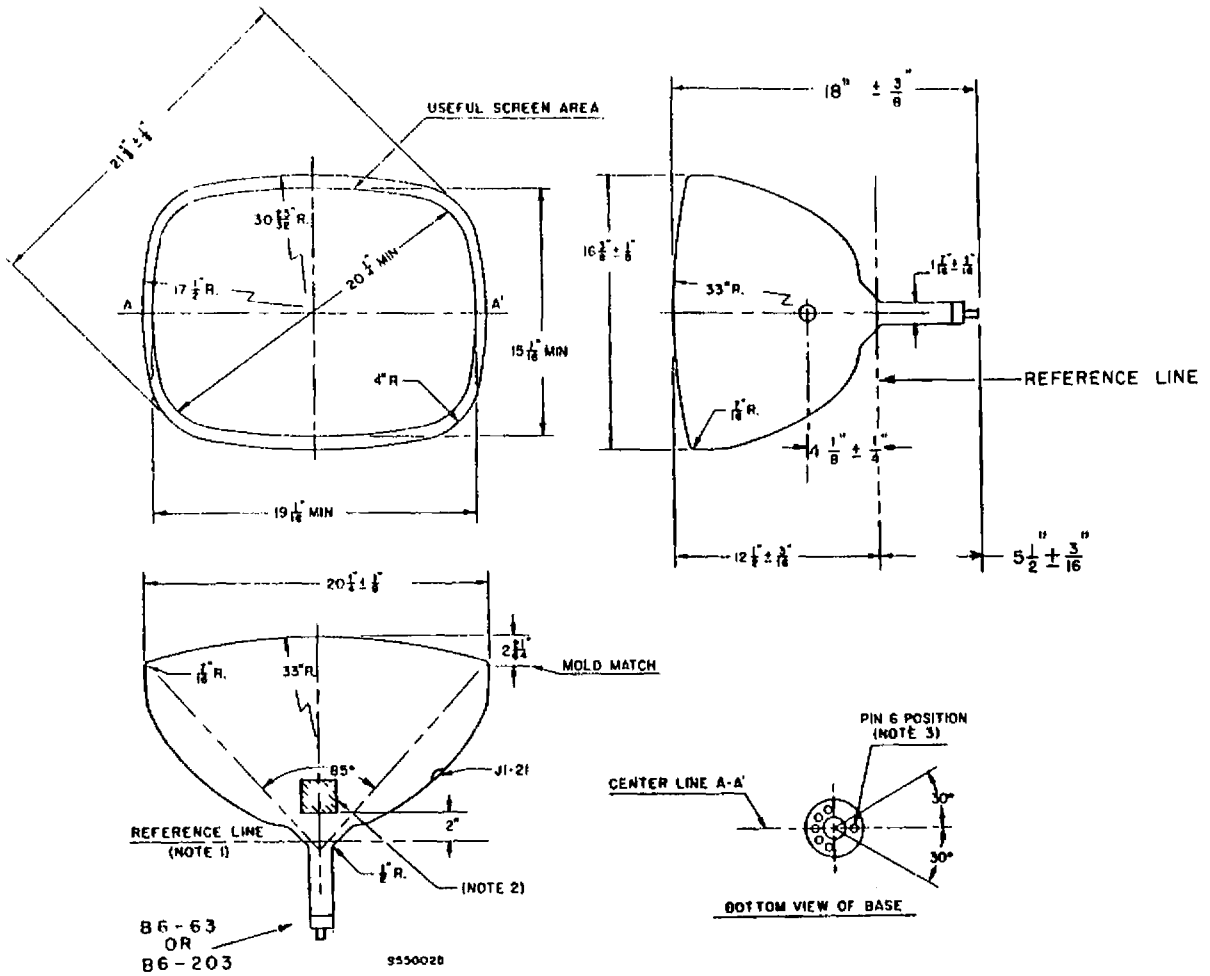

DIAGRAM NOTES:

1. Reference line is determined by the plane C-C' of JETEC No. 116 reference line gauge when the gauge is seated against the glass cone.

2. Contact area for external conductive coating, 2" x 2", located 90° counterclockwise from anode contact as viewed from base end of tube.

3. Pin position No. 6 aligns with horizontal centerline within 30° and is on same side as anode contact (J1-21).

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

SYLVANIA

engineering data service

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21DKP4

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA		
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (approx.)		
Horizontal	105	Degrees
Diagonal	110	Degrees
Vertical	87	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	76	Percent
ELECTRICAL DATA		
Heater Voltage	6.3	Volts
Heater Current	0.30 ±5%	Ampere
Heater Warm-up Time [1]	11	Seconds
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	6	μμf
External Conductive Coating to Anode [2]	2500	μμf Max.
	1700	μμf Min.
MECHANICAL DATA		
Minimum Useful Screen Dimensions (Maximum Assured)	19 1/16 x 15 1/16	Inches
Minimum Useful Screen Area	262	Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Bulb	J171-G1 or equivalent	
Base	B7-183	
Basing	8HR	
Weight (approx.)	20	Pounds

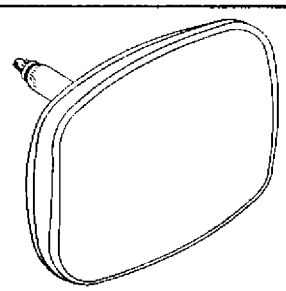
RATINGS

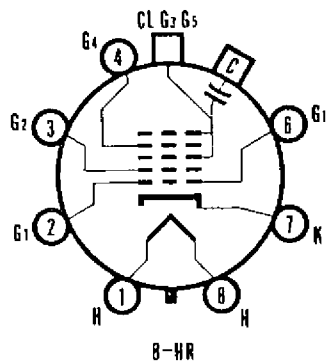
MAXIMUM RATINGS (Absolute Maximum Values)		
Anode Voltage	19,800	Volts dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts dc
Grid No. 2 Voltage	550	Volts dc
Grid No. 1 Voltage		
Negative Bias Value	154	Volts dc
Negative Peak Value	220	Volts
Positive Bias Value	0	Volts dc
Positive Peak Value	2	Volts

from JETEC release #2161, April 14, 1958

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1 1/8" Neck Diameter
No Ion Trap
External Conductive Coating
6.3 Volt, 300 Ma Heater





8-HR

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

March 17, 1958

MAXIMUM RATINGS (Absolute Maximum Values) (Cont'd.)

Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450	Volts
After Equipment Warm-up Period	200	Volts
Heater Positive with Respect to Cathode	200	Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000	Volts	dc
Grid No. 4 Voltage for Focus	0 to 400	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff [3]	-35 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

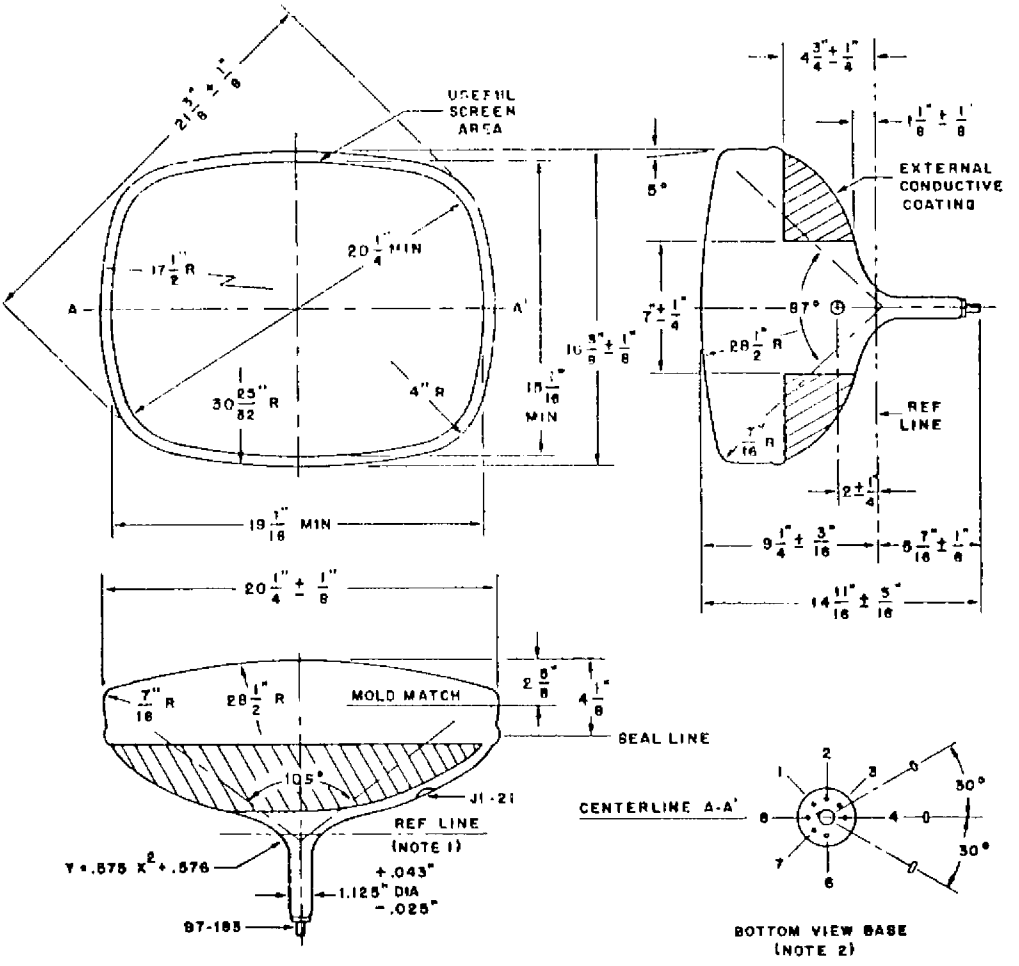


DIAGRAM NOTES:

1. Reference line is determined by plane C-C' of JETEC No. 126 Reference Line gauge when the gauge is seated against the bulb.

2. Base Pin No. 4 aligns with anode contact (J1-21) within 30°.

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	74 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ±5% Ampere
Heater Warm-up Time[1]	11 Seconds
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6 μμf
External Conductive Coating to Anode[2]	1500 μμf Max.
	1200 μμf Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	$19\frac{1}{16}$ x $15\frac{1}{16}$ Inches
Minimum Useful Screen Area	262 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	22,000 Volts dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts dc
Grid No. 2 Voltage	550 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	155 Volts dc
Negative Peak Value	220 Volts
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts dc
Grid No. 4 Voltage for focus	−64 to +352 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts dc
Ion Trap Magnet Current (Average)[4]	30 Ma dc
Field Strength of PM Ion Trap Magnet[5]	33 Gausses Min.

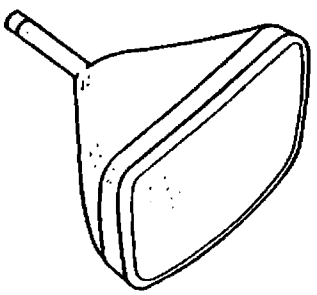
CIRCUIT VALUES

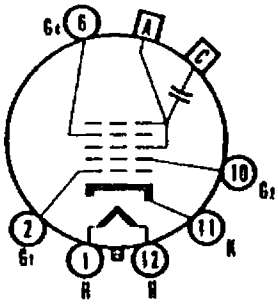
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

from JETEC release #2128, March 17, 1958

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
Single Field Ion Trap
External Conductive Coating
Aluminized Screen





12-1

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION

SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

February 11, 1958

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*
4. *For JETEC Ion Trap Magnet No. 117 with pole pieces centered over Grid No. 2 on mount, and rotated for maximum brightness.*
5. *For typical PM ion trap magnet with field strength tolerance of ±3 gausses.*

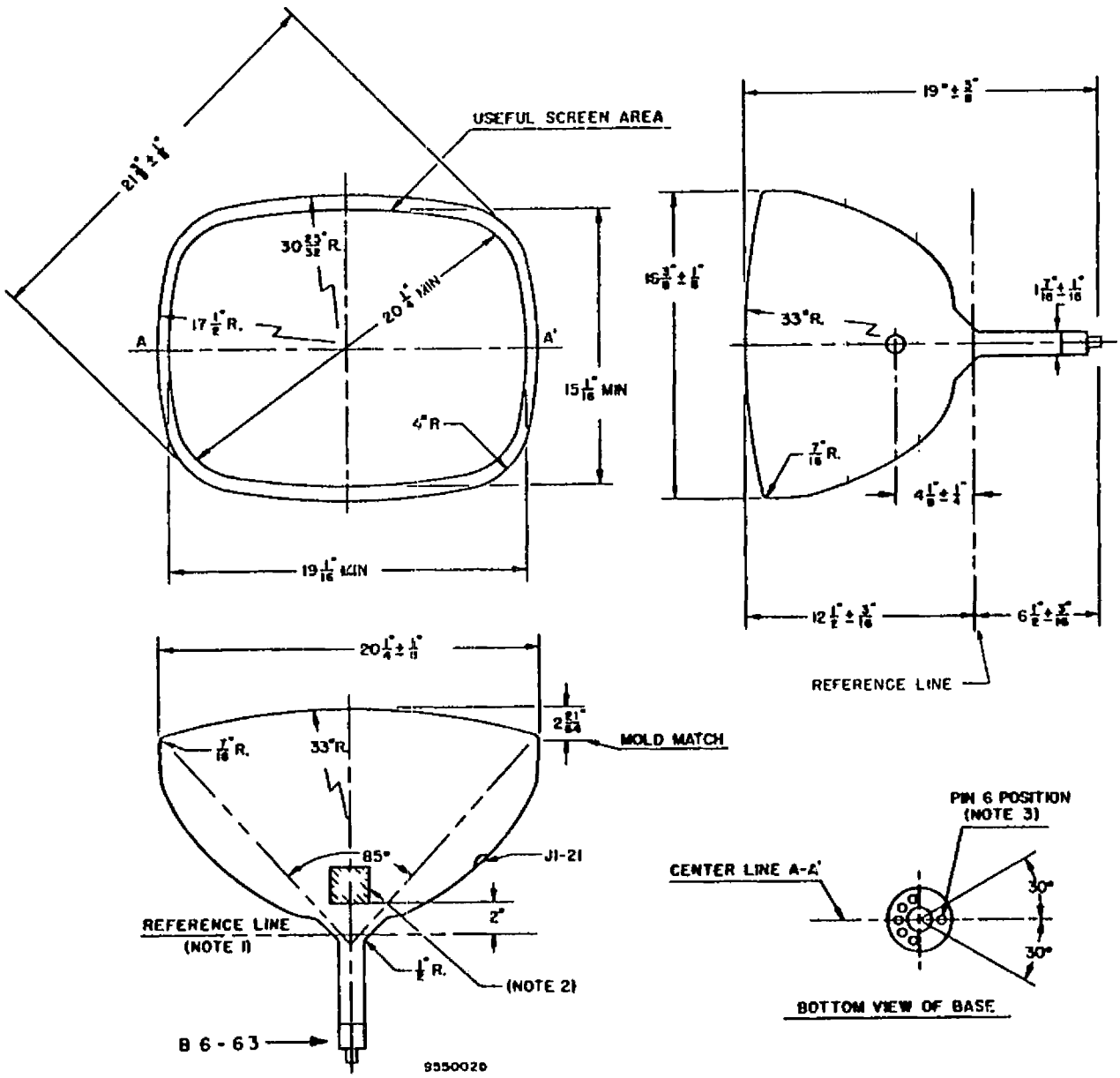


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone.*
2. *Contact area for external conductive coating, 2" x 2", located 90 degrees counterclockwise from anode contact as viewed from base end of tube.*
3. *Anode contact aligns with pin position No. 6 ± 30 degrees.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (approx.)		
Horizontal	85	Degrees
Diagonal	90	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	74	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 5%	Ampere
Heater Warm-up Time[1]	11	Seconds
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	6	μμf
External Conductive Coating to Anode[2]	2500	μμf Max.
	2000	μμf Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions	19 1/16 x 15 1/16	Inches
Minimum Useful Screen Area	262	Sq. Inches
Bulb	J171D or J171E	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duodecal 6-Pin)	B6-63 or B6-203	
Basing	12L	
Weight (approx.)	22 1/2	Pounds

RATINGS

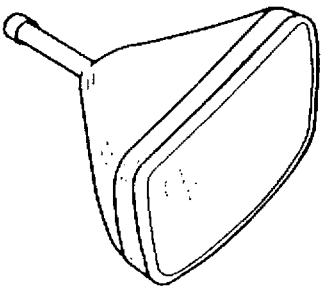
MAXIMUM RATINGS (Absolute Maximum Values)

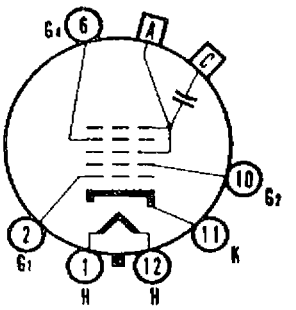
Anode Voltage	20,000	Volts dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts dc
Grid No. 2 Voltage	550	Volts dc
Grid No. 1 Voltage		
Negative Bias Value	155	Volts dc
Negative Peak Value	220	Volts
Positive Bias Value	0	Volts dc
Positive Peak Value	2	Volts

from JETEC release #2161, April 14, 1958

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Electrostatic Focus
No Ion Trap
90° Magnetic Deflection
External Conductive Coating
Aluminized Screen
5 Inch Neck Length





12-L

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

March 11, 1958

MAXIMUM RATINGS (Absolute Maximum Values) (Cont'd)

Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450	Volts
After Equipment Warm-up Period	200	Volts
Heater Positive with Respect to Cathode	200	Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000	Volts	dc
Grid No. 4 Voltage	-50 to +350	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	-35 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

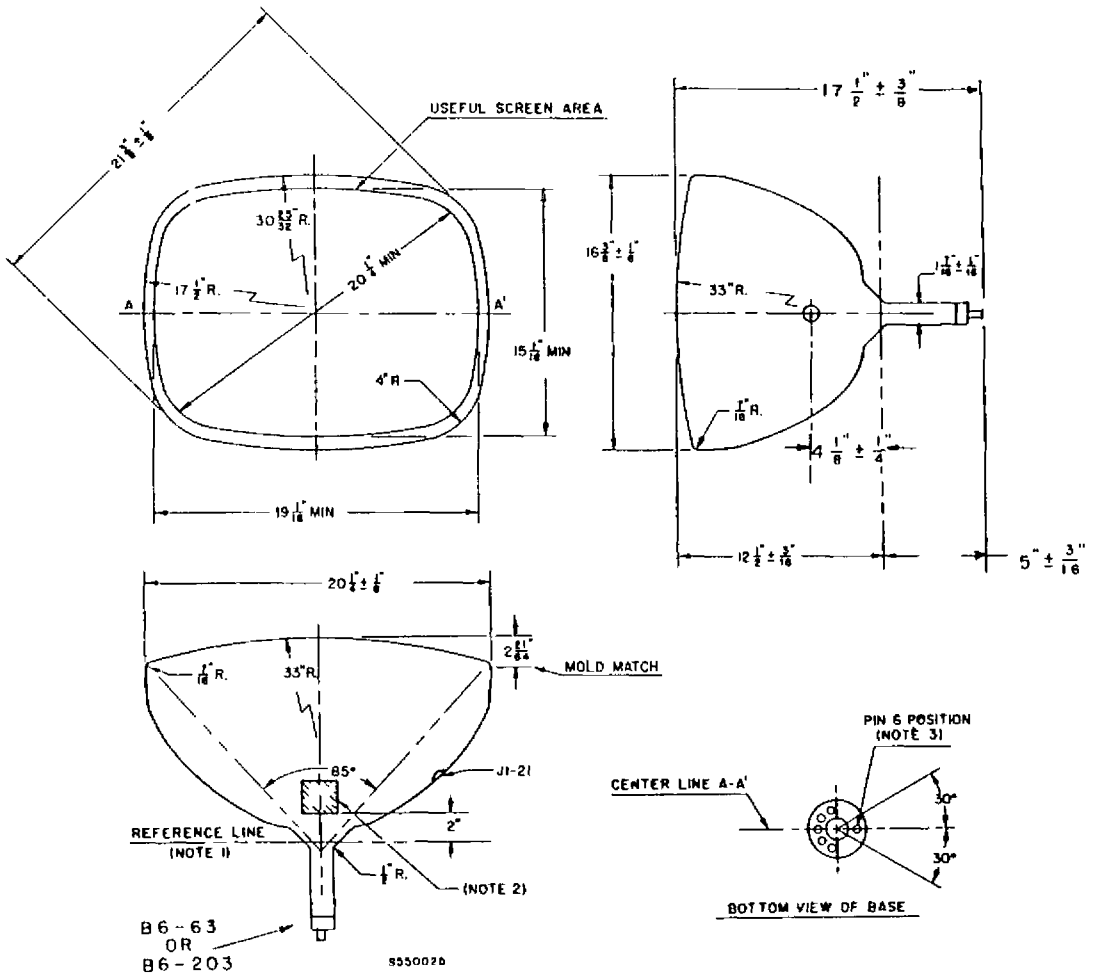


DIAGRAM NOTES:

1. Reference line is determined by the plane C-C' of JETEC No. 116 reference line gauge when the gauge is seated against the glass cone.

2. Contact area for external conductive coating, 2" X 2", located 90° counterclockwise from anode contact as viewed from base end of tube.

3. Pin position No. 6 aligns with horizontal centerline within 30° and is on same side as anode contact (J1-21).

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	85	Degrees
Diagonal	90	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (Approx.)	75	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.30 ± 5%	Ampere
Heater Warm-up Time[1]	11	Seconds
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5	µµf
Grid No. 1 to All Other Electrodes	6	µµf
External Conductive Coating to Anode[2]	2500	µµf Max.
	2000	µµf Min.
Ion Trap Magnet	External, Single Field Type	

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	19 1/16 x 15 1/16	Inches
Minimum Useful Screen Area	262	Sq. Inches
Bulb	J171D or J171E	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duodecal 6-Pin)	B6-63	
Basing	12L	
Weight (Approx.)	22 1/2	Pounds

RATINGS

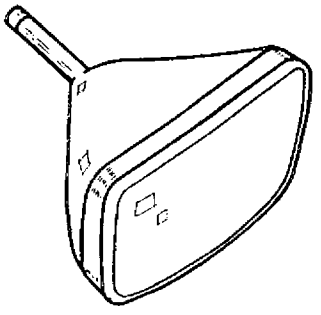
MAXIMUM RATINGS (Absolute Maximum Values)

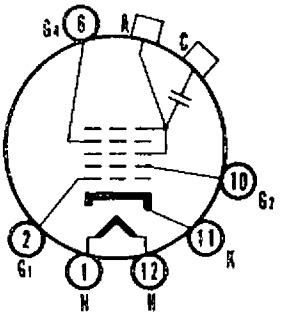
Anode Voltage	22,000	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts	dc
Grid No. 2 Voltage	550	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	155	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	

from JETEC release #2317, Nov. 17, 1958

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
90° Magnetic Deflection
Electrostatic Focus
Single Field Ion Trap
External Conductive Coating
Aluminized Screen
6.3 Volt, 300 Ma Heater





12-L

SYLVANIA ELECTRIC PRODUCTS INC.
Picture Tube Operations
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

October 17, 1958

MAXIMUM RATINGS (Absolute Maximum Values) (Cont'd)

Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450	Volts
After Equipment Warm-up Period	200	Volts
Heater Positive with Respect to Cathode	200	Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000	Volts	dc
Grid No. 4 Voltage for Focus	-64 to +352	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	-35 to -72	Volts	dc
Ion Trap Magnet Current (Average)[4]	30	Ma	dc
Field Strength of PM Ion Trap Magnet[5]	33	Gausses	Min.

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

4. For JETEC Ion Trap Magnet No. 117 with pole pieces centered over Grid No. 2 on mount, and rotated for maximum brightness.

5. For typical PM ion trap magnet with field strength tolerance of ±3 gausses.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

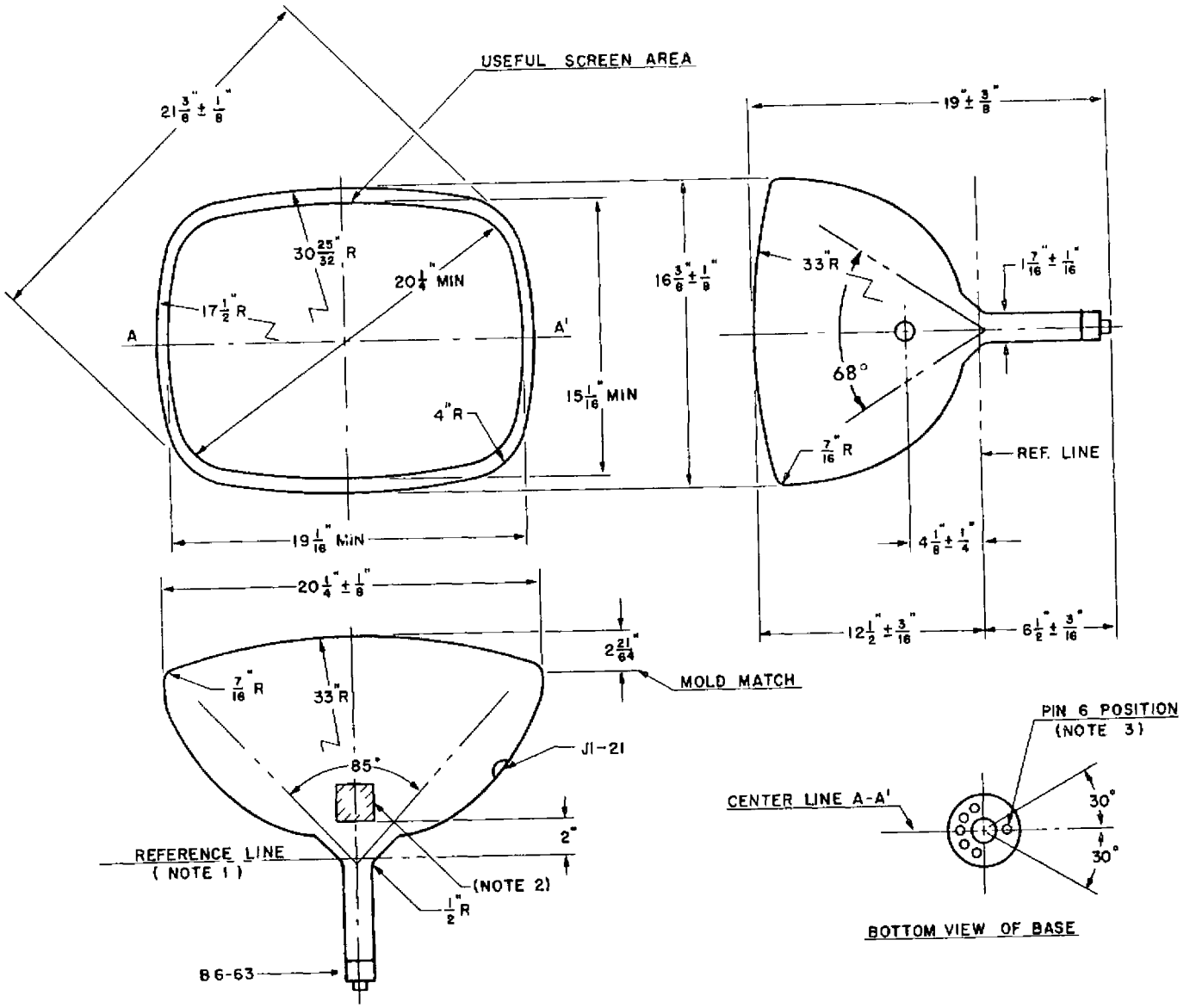


DIAGRAM NOTES:

1. Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is seated against the glass cone.

2. Contact area for external conductive coating, 2" x 2", located 90 degrees counterclockwise from anode contact as viewed from base end of tube.

3. Pin position No. 6 aligns with horizontal centerline within 30°, and is on same side as anode contact J1-21.

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Tri-Potential Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	105	Degrees
Diagonal	110	Degrees
Vertical	87	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (Approx.)	75	Percent

ELECTRICAL DATA

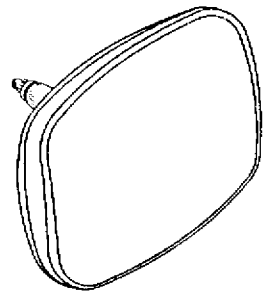
Heater Voltage	6.3	Volts
Heater Current	0.60 ± 5%	Ampere
Heater Warm-up Time[1]	11	Seconds
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	6	μμf
External Conductive Coating to Anode[2]	2000	μμf Max.
	1500	μμf Min.

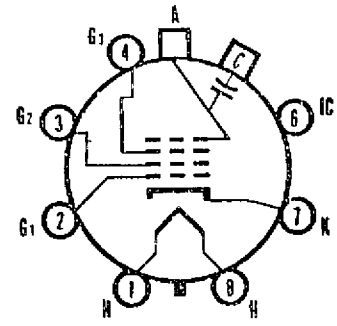
MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	15 1/16	Inches
Width	19 1/16	Inches
Diagonal	20 1/4	Inches
Area	262	Sq. Inches
Neck Length	3 9/16 ± 1/8	Inches
Overall Length	12 9/16 ± 5/16	Inches
Bulb	J171H or J171J	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-208	
Basing	8JR	
Weight (Approx.)	21	Pounds

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Tri-Potential
Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive
Coating
Short Neck





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SYLVANIA ELECTRIC PRODUCTS INC.

Picture Tube Operations

SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

October 15, 1958

FORM 146 (10-58)

from JETEC release #2317, Nov. 17, 1958

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values) Grid Drive Service

Anode Voltage	20,000	Volts	dc
Grid No. 3 Voltage (Focusing Electrode)	700	Volts	dc
Grid No. 2 Voltage	700	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	154	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	16,000	Volts	dc
Grid No. 3 Voltage for Focus	0 to +400	Volts	dc
Grid No. 2 Voltage[3]	500	Volts	dc
Grid No. 1 Voltage Required for Cutoff[4]	-43 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

2. External conductive coating must be grounded.

3. Brightness and resolution improve with increase in Grid No. 2 voltage. A minimum value of 400 volts is recommended.

4. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

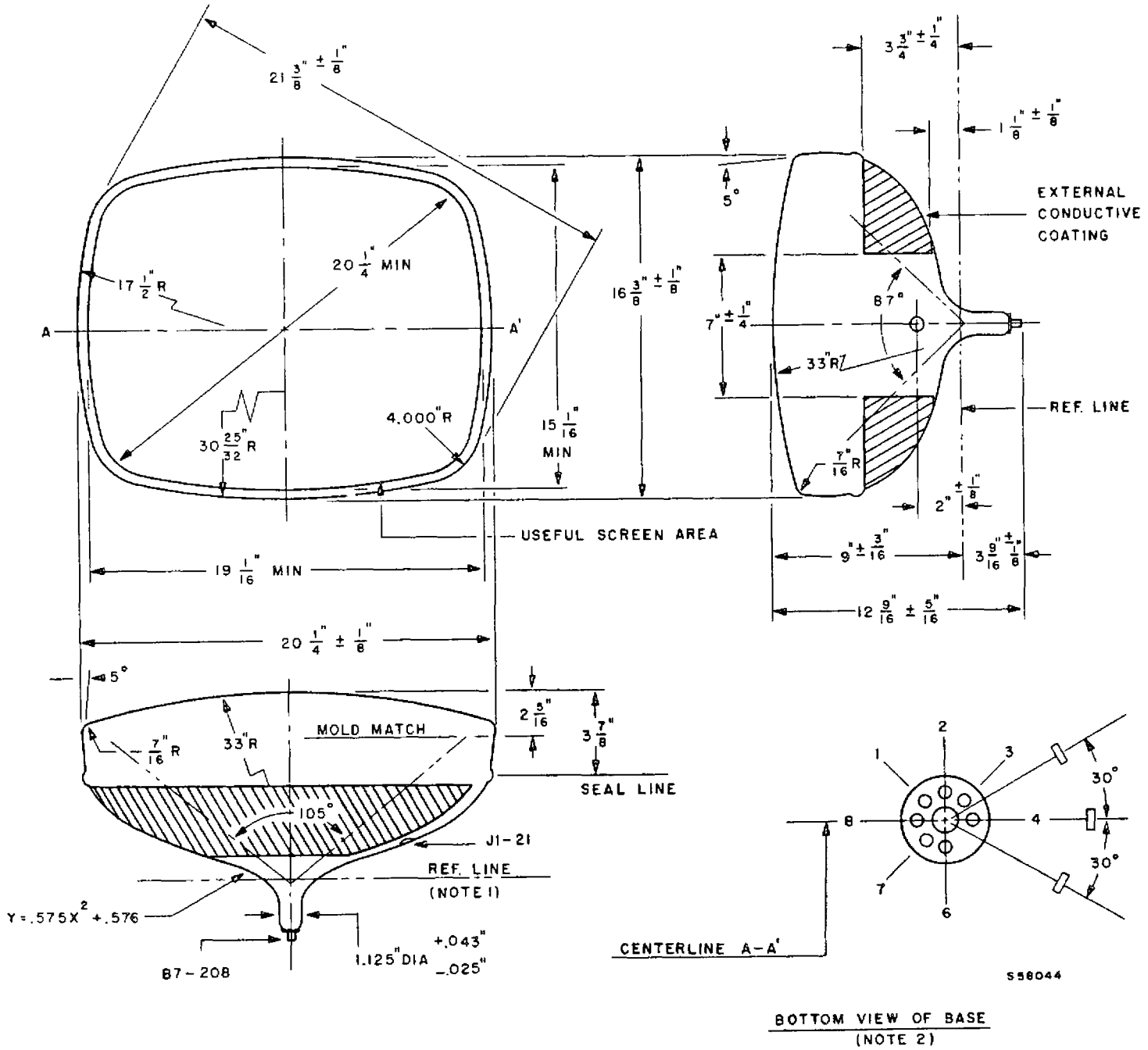


DIAGRAM NOTES:

1. Reference line is determined by plane C-C[1] of JETEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.

2. Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Tri-Potential Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (approx.)		
Horizontal	105	Degrees
Diagonal	110	Degrees
Vertical	87	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Gray Filter Glass Safety Plate Laminated Directly to Face of Tube		
Light Transmittance of Faceplate Assembly (approx.)	40	Percent
Safety Plate Surface Frosted to Reduce Specular Reflection		

ELECTRICAL DATA

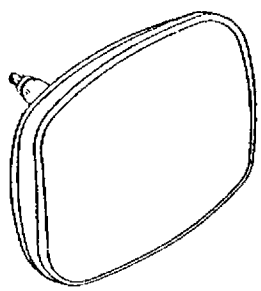
Heater Voltage	6.3	Volts
Heater Current	0.60 ± 5%	Ampere
Heater Warm-up Time[1]	11	Seconds
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	6	μμf
External Conductive Coating to Anode[2]	2000	μμf Max.
	1500	μμf Min.

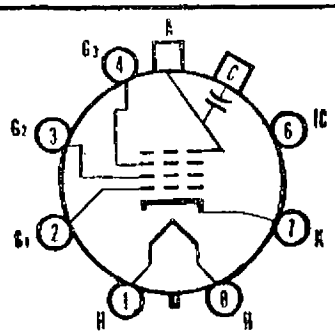
MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	15 1/16	Inches
Width	19 1/16	Inches
Diagonal	20 1/4	Inches
Area	262	Sq. Inches
Neck Length	3 9/16 ± 1/8	Inches
Overall Length	12 13/16 ± 7/16	Inches
Bulb	J171H or J171J	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-208	
Basing	8JR	
Weight (approx.)	27	Pounds

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Integral Safety Plate
Gray Filter Glass
Frosted Face
Aluminized Screen
Tri-Potential
Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive
Coating
Short Neck





8JR

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products, Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

December 23, 1958

FORM 146 (10-58)

from JEDEC release #2370, Feb. 2, 1959

RATINGS

MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Anode Voltage	20,000	Volts	dc
Grid No. 3 Voltage (Focusing Electrode)	700	Volts	dc
Grid No. 2 Voltage	600 ~~700~~	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	154	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	16,000	Volts	dc
Grid No. 3 Voltage for Focus	0 to +400	Volts	dc
Grid No. 2 Voltage[3]	500	Volts	dc
Grid No. 1 Voltage Required for Cutoff[4]	-43 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

2. External conductive coating must be grounded.

3. Brightness and resolution improve with increase in Grid No. 2 voltage. A minimum value of 400 volts is recommended.

4. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

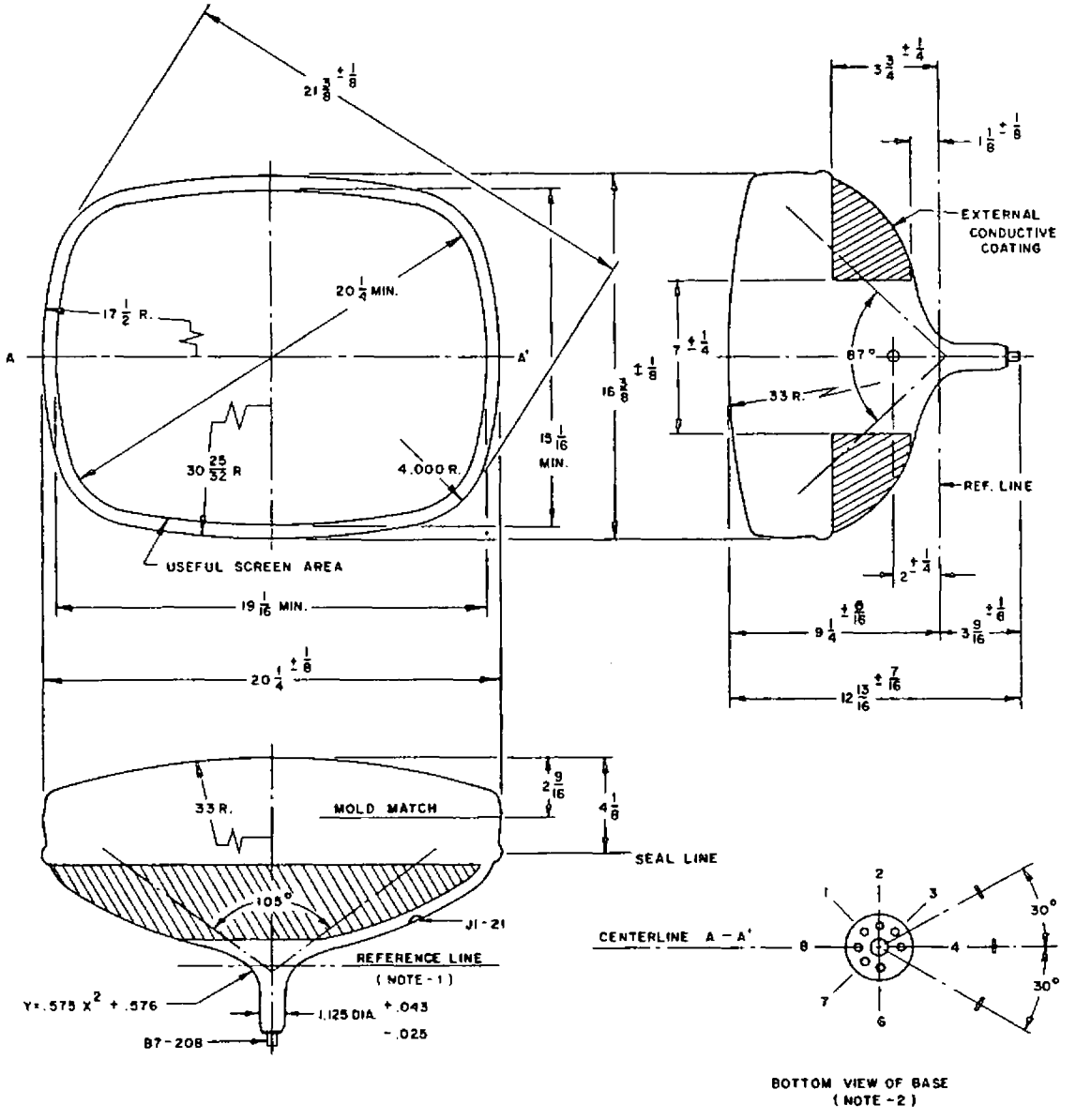


DIAGRAM NOTES:

1. Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.

2. Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Tri-Potential Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	105	Degrees
Diagonal	110	Degrees
Vertical	87	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (Approx.)	75	Percent

ELECTRICAL DATA

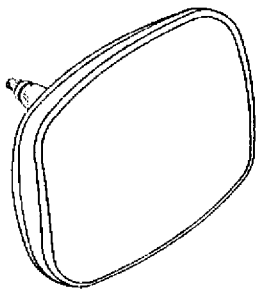
Heater Voltage	6.3	Volts
Heater Current	0.30 ± 5%	Ampere
Heater Warm-up Time[1]	11	Seconds
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	6	μμf
External Conductive Coating to Anode[2]	2500	μμf Max.
	2000	μμf Min.

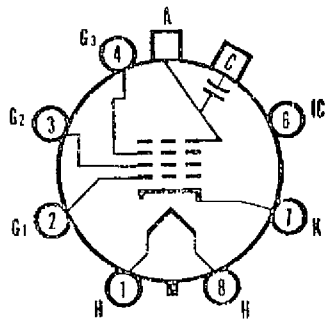
MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	15 1/16	Inches
Width	19 1/16	Inches
Diagonal	20 1/4	Inches
Area	262	Sq. Inches
Neck Length	3 9/16 ± 1/8	Inches
Overall Length	12 9/16 ± 5/16	Inches
Bulb	J171H or J171J	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-208	
Basing	8JR	
Weight (Approx.)	21	Pounds

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Tri-Potential
Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive
Coating
Short Neck
6.3 Volt, 300 Ma Heater





8JR

SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

March 23, 1959

FORM 146 (10-58)

from JEDEC release #2448, April 27, 1959

RATINGS

MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Anode Voltage	20,000	Volts	dc
Grid No. 3 Voltage (Focusing Electrode)	700	Volts	dc
Grid No. 2 Voltage	600	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	154	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	16,000	Volts	dc
Grid No. 3 Voltage for Focus	0 to +400	Volts	dc
Grid No. 2 Voltage[3]	500	Volts	dc
Grid No. 1 Voltage Required for Cutoff[4]	-43 to -78	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

2. External conductive coating must be grounded.

3. Brightness and resolution improve with increase in Grid No. 2 voltage. A minimum value of 400 volts is recommended.

4. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

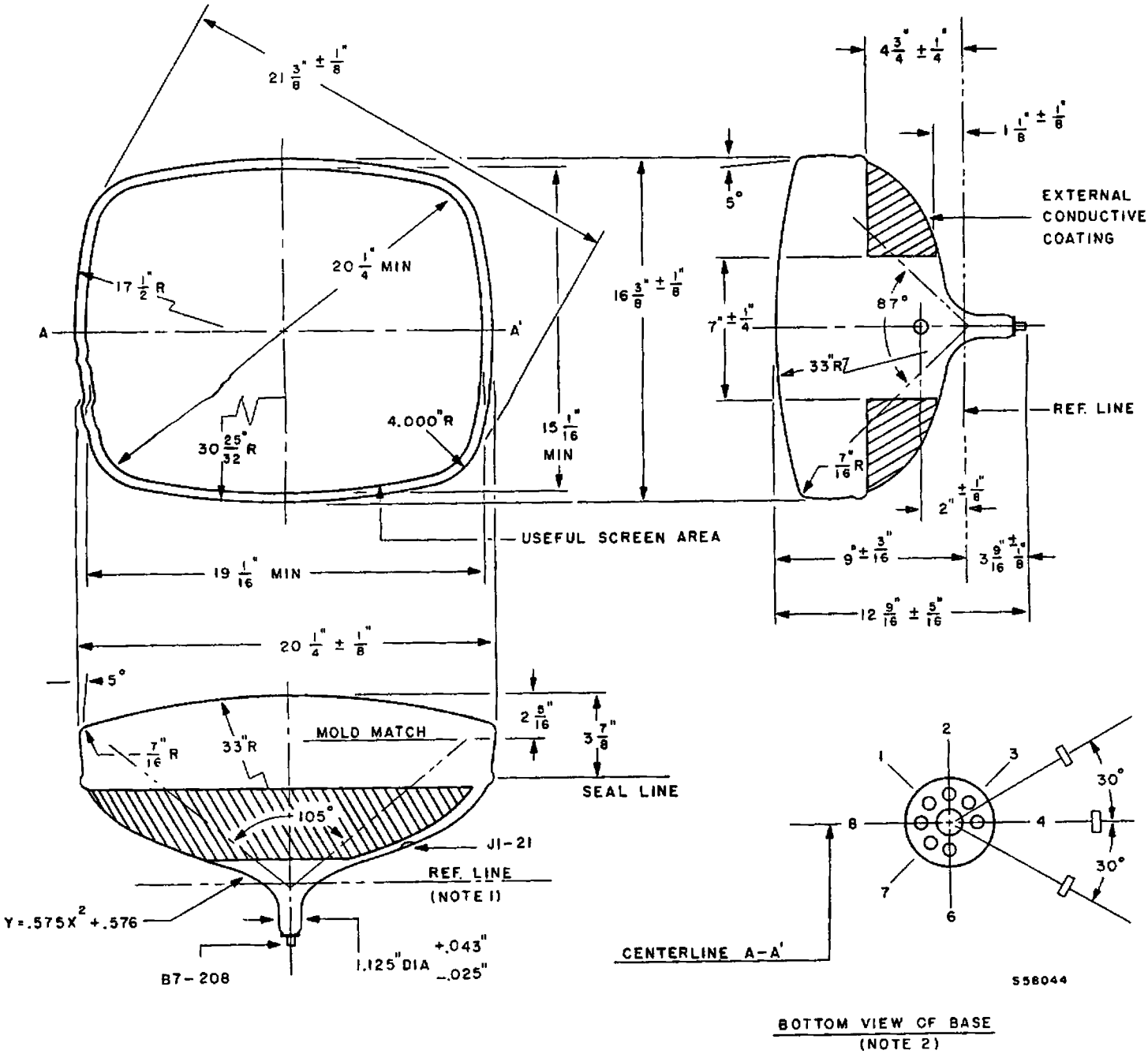


DIAGRAM NOTES:

1. Reference line is determined by plane C-C[1] of JETEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.

2. Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Tri-Potential Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	105 Degrees
Diagonal	110 Degrees
Vertical	87 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	76 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.60 ± 5% Ampere
Heater Warm-up Time[1]	11 Seconds
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
External Conductive Coating to Anode[2]	2500 $\mu\mu$f Max.
	2000 $\mu\mu$f Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15 1/16 Inches
Width	19 1/16 Inches
Diagonal	20 1/4 Inches
Area	262 Sq. Inches
Neck Length	3 9/16 ± 1/8 Inches
Overall Length	12 13/16 ± 5/16 Inches
Bulb	J171G or J171K
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8JR
Weight (Approx.)	20 Pounds

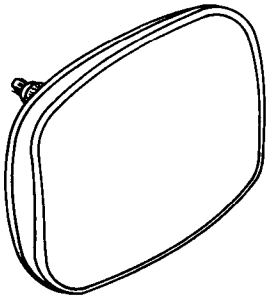
RATINGS

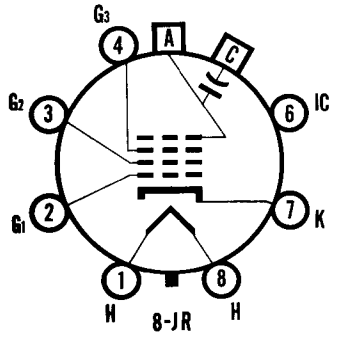
MAXIMUM RATINGS (Absolute Maximum Values) Grid Drive Service

Anode Voltage	22,000 Volts dc
Grid No. 3 Voltage (Focusing Electrode)	700 Volts dc
Grid No. 2 Voltage	600 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	154 Volts dc
Negative Peak Value	220 Volts
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period Not to Exceed 15 seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

QUICK REFERENCE DATA

Television Picture Tube
21" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Tri-Potential Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive Coating
Short Neck
Lightweight Tube





SYLVANIA
ELECTRONIC TUBES
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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

APRIL, 1960

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	16,000 Volts	dc
Grid No. 3 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage[3]	500 Volts	dc
Grid No. 1 Voltage Required for Cutoff[4]	−43 to −78 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Brightness and resolution improve with increase in Grid No. 2 voltage. A minimum value of 400 volts is recommended.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

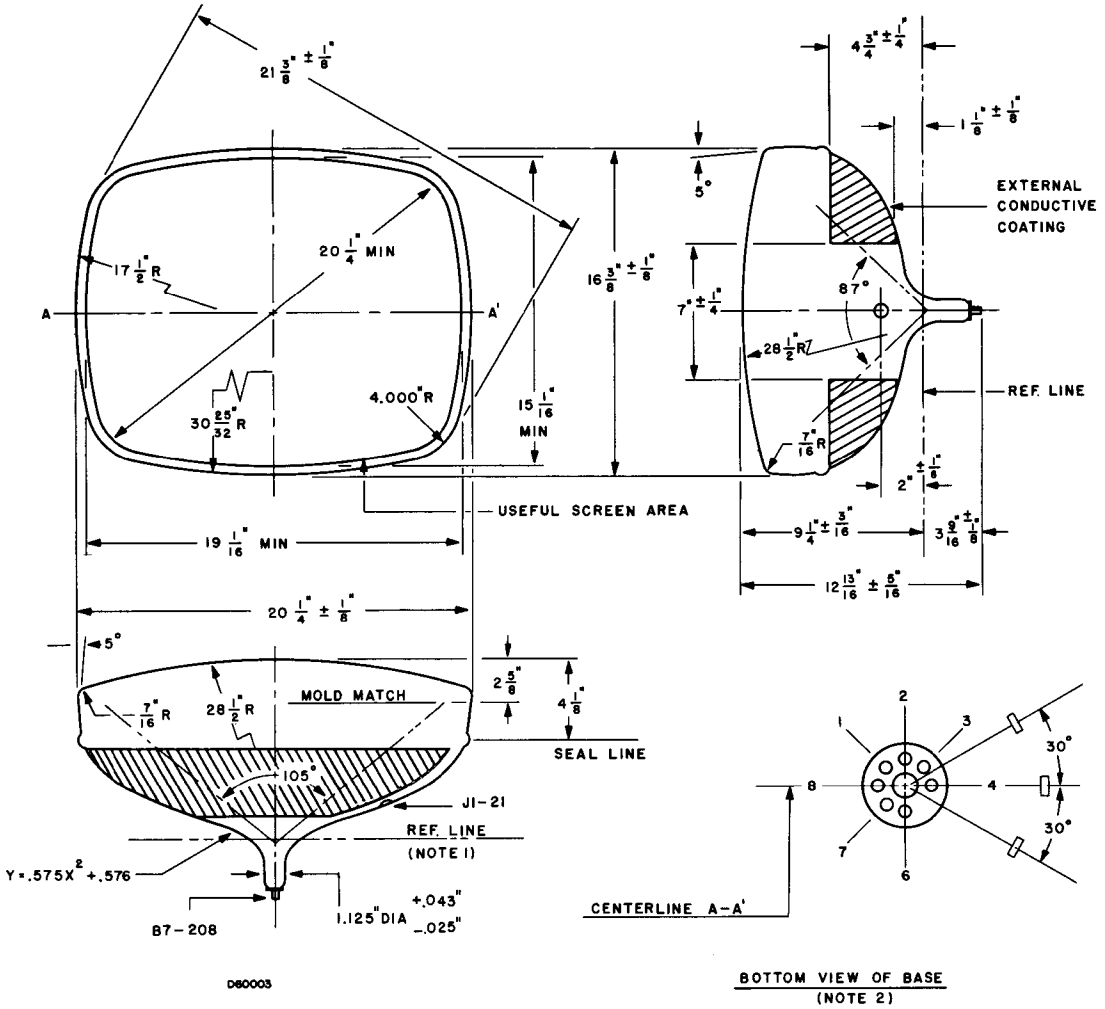
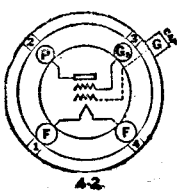


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

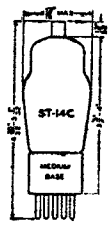


4-2

Sylvania

TYPE 22

AMPLIFICATEUR H. F. A GRILLE ECRAN



CARACTERISTIQUES

Tension filament CC	3,3 volts
Courant filament	0,132 ampère
Ampoule	ST 14C
Culot — Moyen 4 broches	4-K
Position de montage	Verticale

Capacités directes interélectrodes :

Grille à plaque (avec blindage)	0,02 $\mu\mu$F
Entrée	4,0 $\mu\mu$F
Sortie	10,0 $\mu\mu$F

Conditions de fonctionnement et caractéristiques :

Tension filament	3,3	3,3 volts
Tension plaque	135	135 volts
Tension grille	—1,5	—1,5 volts
Tension écran	45	67,5 volts max.
Courant plaque	1,7	3,7 ma.
Courant écran	0,6	1,3 ma. max.
Résistance interne	725,000	250,000 ohms
Conductance mutuelle	375	500 μmhos
Coefficient d'amplification	270	125

APPLICATION

Le tube Sylvania 22 est un amplificateur H.F. à grille écran, à chauffage direct. Ce tube était destiné à être utilisé sur des récepteurs alimentés par piles sèches. Il est employé actuellement comme tube de remplacement pour d'anciens récepteurs employant le type 22 comme amplificateur H.F. dans des circuits à étages multiples.

Ce tube peut également servir d'amplificateur de basse fréquence ; dans ce cas, la valeur de la résistance de couplage doit être comprise entre 0,1 et 0,25 mégohm.

SYLVANIA

engineering data service

SYLVANIA
23ACP4
23TP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)*		
Horizontal	76	Degrees
Diagonal	87	Degrees
Vertical	62	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Bonded Shield	
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)		
Light Transmittance of Faceplate Assembly (Approx.)	40	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts	
Heater Current	0.60 ± 5%	Ampere	
Heater Warm-up Time[1]	11	Seconds	
Direct Interelectrode Capacitances (Approx.)			
Cathode to All Other Electrodes	5	$\mu\mu$f	
Grid No. 1 to All Other Electrodes	6	$\mu\mu$f	
External Conductive Coating to Anode[2]	2500	$\mu\mu$f	Max.
	2000	$\mu\mu$f	Min.

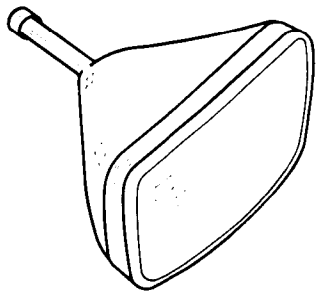
MECHANICAL DATA

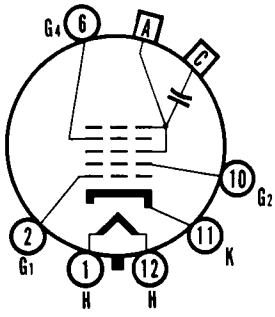
Minimum Useful Screen Dimensions (Maximum Assured)		
Height	15¼	Inches
Width	19 5/16	Inches
Diagonal	22 5/16	Inches
Area	282	Sq. Inches
Neck Length	5½ ± 3/16	Inches
Overall Length	19 11/32 ± 7/16	Inches
Bulb	C187 Exp. No. 2	
Safety Plate	FP198A or Equiv.	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B6-63	
Basing	12L	
Weight (Approx.)	35	Pounds

*Diagonal Deflection Angle is equal to that of earlier registered 21" tubes generally known as 90° types. Horizontal and vertical deflection angles are less.

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
90° Magnetic Deflection
No Ion Trap
External Conductive Coating





12-L

SYLVANIA
ELECTRONIC TUBES
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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

AUGUST, 1960

File Under
TELEVISION PICTURE TUBES

RATINGS

MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

	23TP4	23ACP4	
Maximum Anode Voltage	22,000	18,000 Volts	dc
Minimum Anode Voltage	12,000	8,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)		−550 to +1100 Volts	dc
Grid No. 2 Voltage		550 Volts	dc
Grid No. 1 Voltage			
Negative Bias Value		155 Volts	dc
Negative Peak Value		220 Volts	
Positive Bias Value		0 Volts	dc
Positive Peak Value		2 Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds		450 Volts	
After Equipment Warm-up Period		200 Volts	
Heater Positive with Respect to Cathode		200 Volts	

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

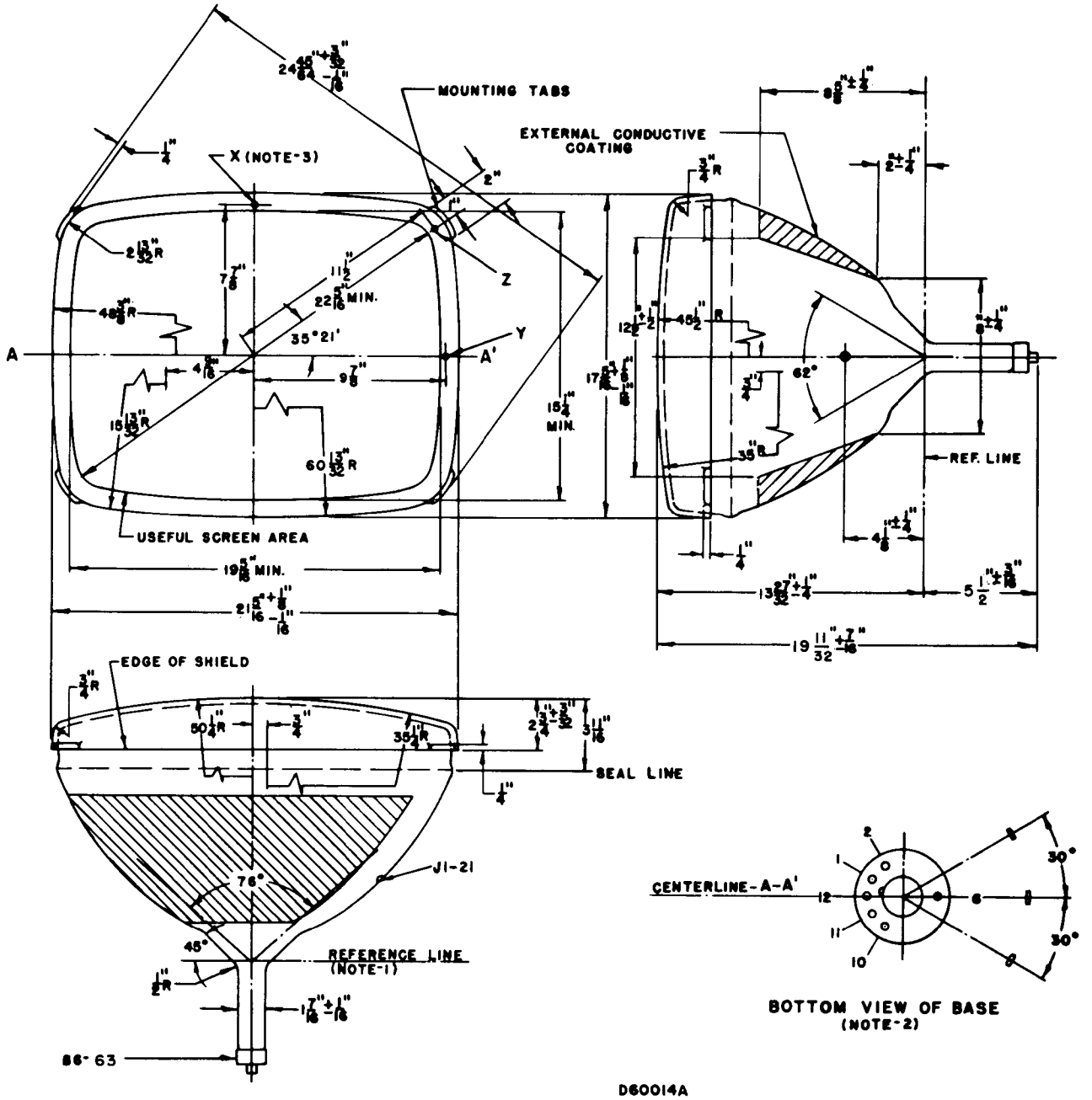


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 116 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 6 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through points X, Y and Z are located as follows:*

   Plane tangent to crown of face to plane of X: .758" Nom.

   Plane of X to plane of Y = .463" ± .030".

   Plane of X to plane of Z = .970" ± .030".

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	81	Degrees
Diagonal	92	Degrees
Vertical	66	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Bonded Shield	
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)		
Light Transmittance of Faceplate Assembly (Approx.)	40	Percent

ELECTRICAL DATA

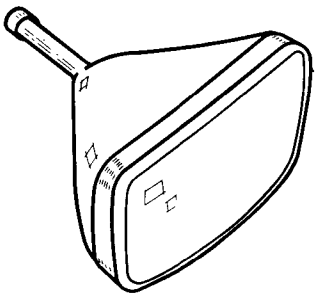
Heater Voltage	6.3	Volts	
Heater Current	0.60 ± 5%	Ampere	
Heater Warm-up Time[1]	11	Seconds	
Direct Interelectrode Capacitances (Approx.)	5	μμf	
Cathode to All Other Electrodes	6	μμf	
Grid No. 1 to All Other Electrodes	2500	μμf	Max.
External Conductive Coating to Anode[2]	2000	μμf	Min.

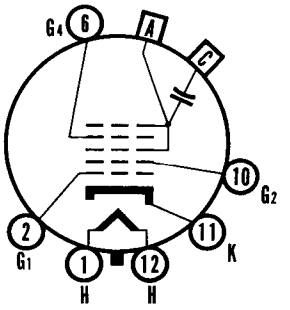
MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	15¼	Inches
Width	19 5/16	Inches
Diagonal	22 5/16	Inches
Area	282	Sq. Inches
Neck Length	6 ± 3/16	Inches
Overall Length	18 13/16 ± 7/16	Inches
Bulb	J187D or Equiv.	
Safety Plate	FP198A or Equiv.	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B6-203	
Basing	12L	
Weight (Approx.)	34½	Pounds

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
92° Magnetic Deflection
No Ion Trap
External Conductive Coating





12-L

SYLVANIA
ELECTRONIC TUBES
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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JUNE, 1961

File Under
TELEVISION PICTURE TUBES

RATINGS

MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Anode Voltage	Max. 25,000	Volts	dc
	Min. 12,000	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100	Volts	dc
Grid No. 2 Voltage	550	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	155	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	20,000	Volts	dc
Grid No. 4 Voltage for Focus	0 to +400	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

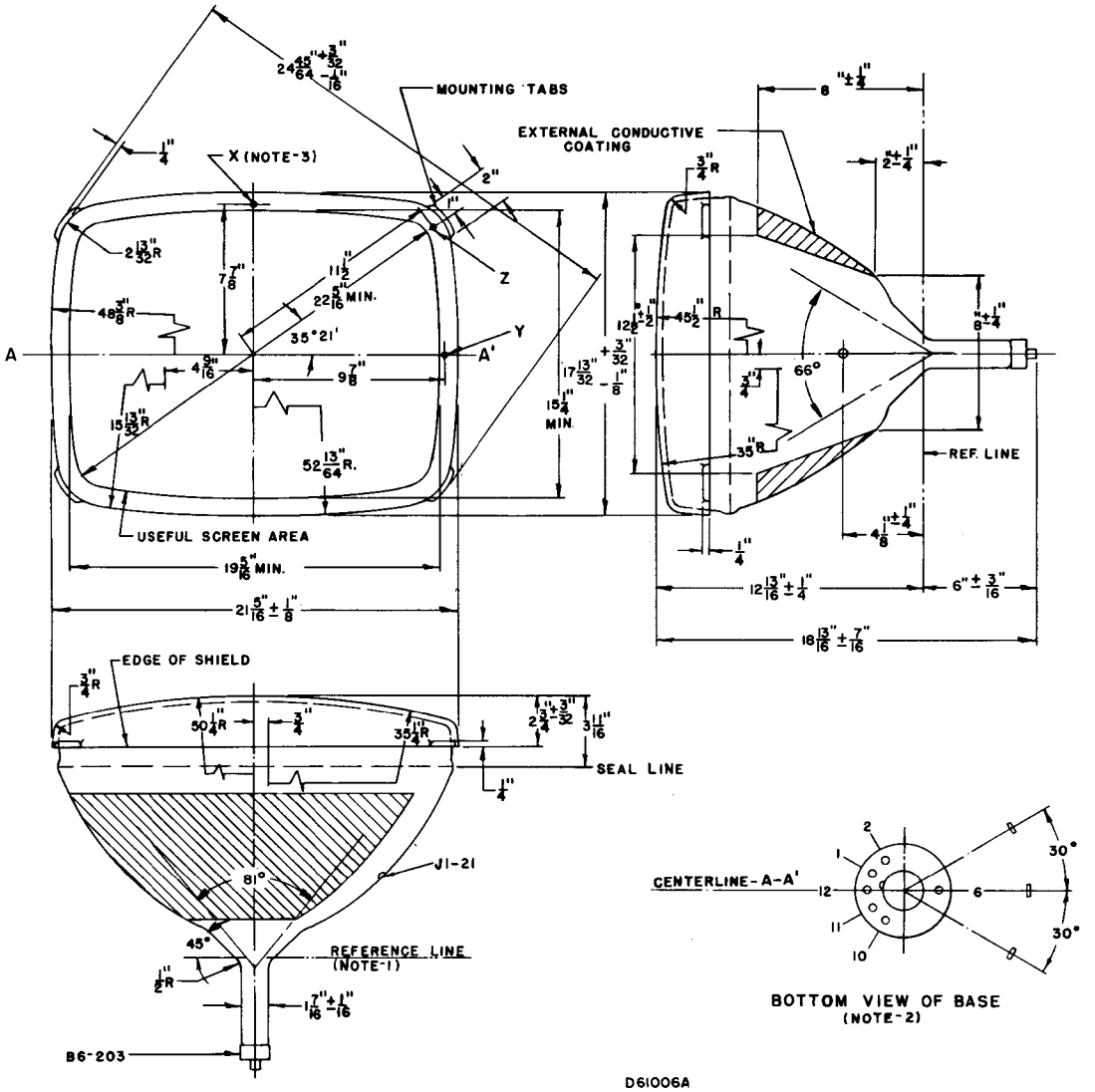

DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 116 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 6 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through points X, Y and Z are located as follows:*

   Plane tangent to crown of face to plane of X: .758" Nom.

   Plane of X to plane of Y = .463" ± .030".

   Plane of X to plane of Z = .970" ± .030".

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engineering data service

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23AHP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Horizontal	80	Degrees
Diagonal	92	Degrees
Vertical	65	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance at Center (Approx.)	78	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts	
Heater Current	0.60 ± 5%	Ampere	
Heater Warm-up Time[1]	11	Seconds	
Direct Interelectrode Capacitances (Approx.)			
Cathode to All Other Electrodes	5	μμf	
Grid No. 1 to All Other Electrodes	6	μμf	
External Conductive Coating to Anode[2]	2500	μμf	Max.
	1700	μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	15⅛	Inches
Width	19¼	Inches
Diagonal	22 5/16	Inches
Area	278	Sq. Inches
Neck Length	5½ ± 3/16	Inches
Overall Length	18 ± ⅜	Inches
Bulb	J187C	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B6-203	
Basing	12L	
Weight (Approx.)	27	Pounds

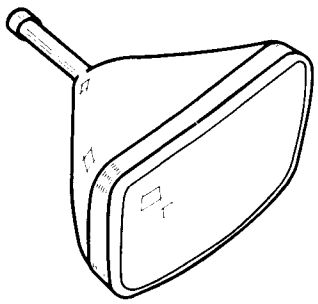
RATINGS

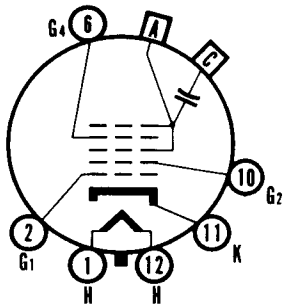
MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Maximum Anode Voltage	22,000	Volts	dc
Minimum Anode Voltage	12,000	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100	Volts	dc
Grid No. 2 Voltage	550	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	155	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Maximum Heater Voltage	6.9	Volts	
Minimum Heater Voltage	5.7	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode During			
Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
92° Magnetic Deflection
No Ion Trap
External Conductive Coating





12-L

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
MAY, 1961

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATION CONDITIONS (Grid Drive Service)

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

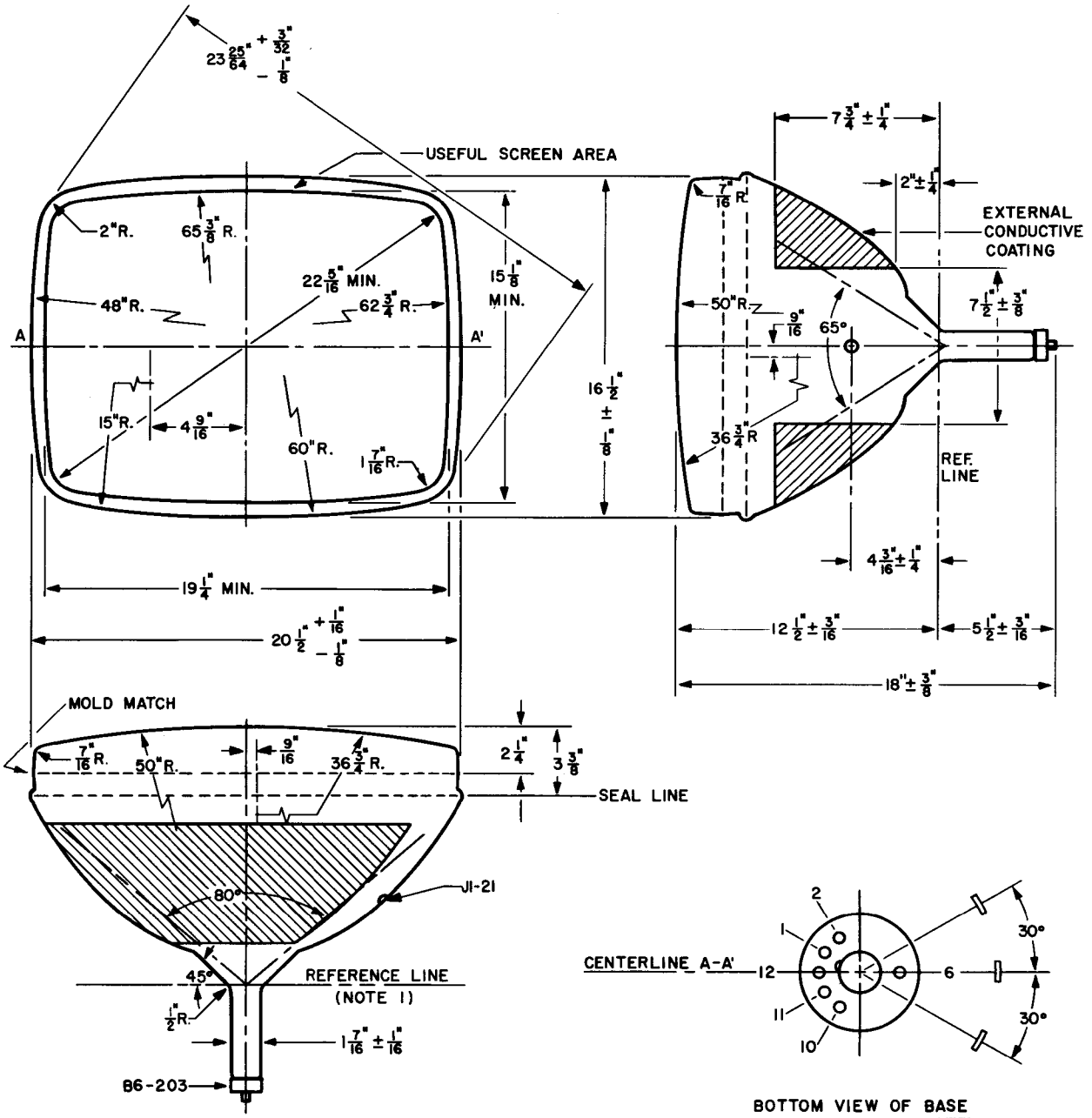


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 116 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 6 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Tri-Potential Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	102 Degrees
Diagonal	114 Degrees
Vertical	86 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	78 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 $\mu\mu$f	
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f	
External Conductive Coating to Anode[2]	2500 $\mu\mu$f	Max.
	2000 $\mu\mu$f	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15⅛ Inches
Width	19¼ Inches
Diagonal	22 5/16 Inches
Area	282 Sq. Inches
Neck Length	3 9/16 ± ⅛ Inches
Overall Length	12 13/16 ± 5/16 Inches
Bulb	J187B
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8JR
Weight (Approx.)	25 Pounds

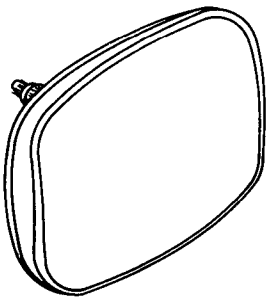
RATINGS

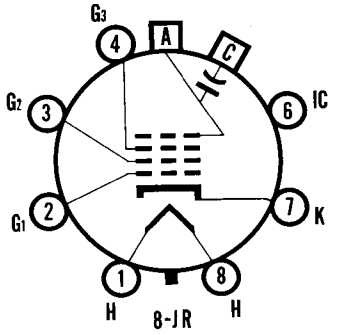
MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 3 Voltage (Focusing Electrode)	700 Volts	dc
Grid No. 2 Voltage	600 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Tri-Potential
Electrostatic Focus
114° Magnetic Deflection
No Ion Trap
External Conductive Coating
Short Neck





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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

FEBRUARY, 1961

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	16,000 Volts	dc
Grid No. 3 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage[3]	500 Volts	dc
Grid No. 1 Voltage Required for Cutoff[4]	−43 to −78 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Brightness and resolution improve with increase in Grid No. 2 Voltage. A minimum value of 400 volts is recommended.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts. more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

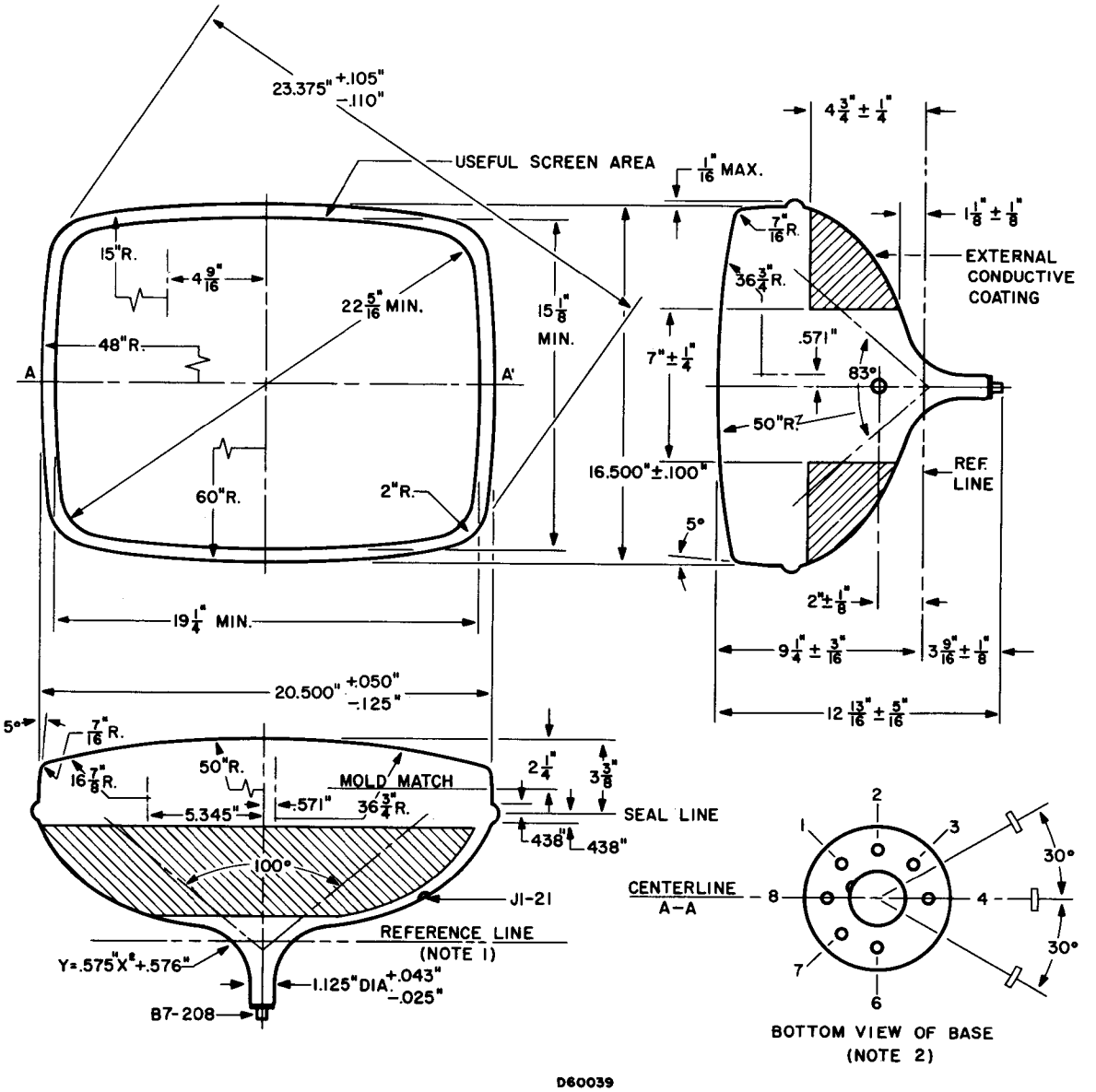


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	81 Degrees
Diagonal	92 Degrees
Vertical	66 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	40 Percent
23ATP4: External Surface of Safety Plate Treated to Reduce Specular Reflection	

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	2000 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15¼ Inches
Width	19 5/16 Inches
Diagonal	22 5/16 Inches
Area	282 Sq. Inches
Neck Length	5⅝ ± 3/16 Inches
Overall Length	18 7/16 ± 7/16 Inches
Bulb	J187D or J187G
Safety Plate	
23ANP4	FP198A
23ATP4	FP198B
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-203
Basing	12L
Weight (Approx.)	34½ Pounds

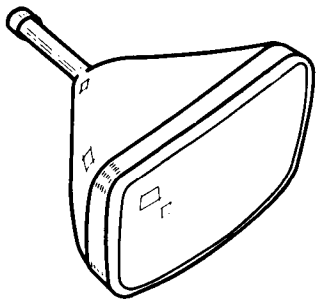
RATINGS

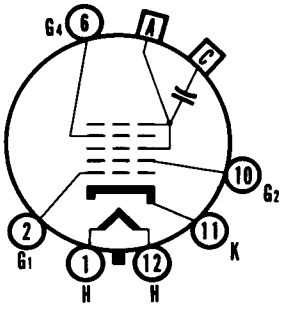
MAXIMUM RATINGS (Design Maximum Values) Cathode Drive Service[3]

Maximum Anode Voltage	25,000 Volts	dc
Minimum Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Maximum Grid No. 2 Voltage	70 Volts	dc
Minimum Grid No. 2 Voltage	40 Volts	dc
Cathode Voltage		
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	
Positive Bias Value	100 Volts	dc
Positive Peak Value	140 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	410 Volts	
After Equipment Warm-up Period	180 Volts	
Heater Positive with Respect to Cathode	180 Volts	

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
92° Magnetic Deflection
No Ion Trap
External Conductive Coating
Low Grid No. 2 Voltage
23ATP4: Anti-Reflection Treated





12-L

SYLVANIA
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PICTURE TUBE
OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
MARCH, 1962

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS (Cathode Drive Service)[3]

Anode Voltage	20,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +500 Volts	dc
Grid No. 2 Voltage	50 Volts	dc
Grid No. 1 Voltage Required for Cutoff[4]	+36 to +54 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Unless otherwise specified, voltages are positive and measured with respect to Grid No. 1.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more positive.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

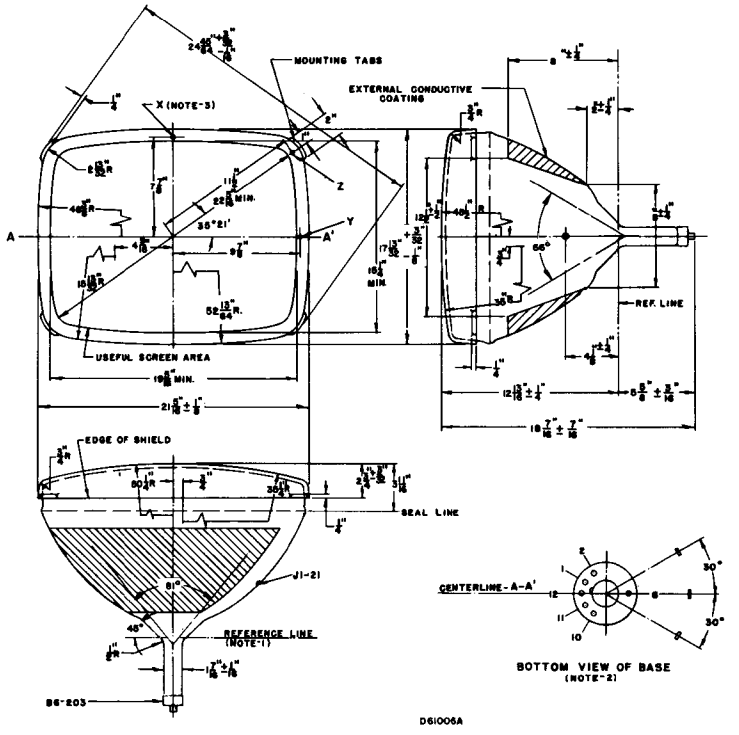


DIAGRAM NOTES:

1. *Reference line is determined by Plane C-C' of JEDEC No. 116 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 6 aligns with horizontal center line (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through Points X, Y and Z are located as follows:*
   Plane tangent to crown of face to Plane of X: .758" Nom.
   Plane of X to Plane of Y = .463" ± .030".
   Plane of X to Plane of Z = .970" ± .030".

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	99 Degrees
Diagonal	110 Degrees
Vertical	82 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	76 Percent

ELECTRICAL DATA

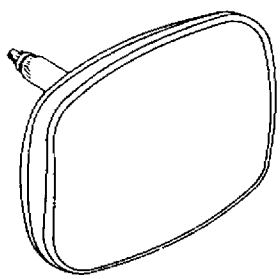
Heater Voltage	6.3 Volts
Heater Current	
23ARP4:	0.60 ± 5% Ampere
23BCP4:	0.30 ± 5% Ampere
Heater Warm-up Time[1]	11 Seconds
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6 μμf
External Conductive Coating to Anode[2]	2500 μμf Max.
	1700 μμf Min.

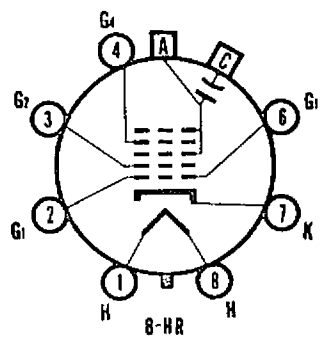
MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15 3/16 Inches
Width	19 1/4 Inches
Diagonal	22 5/16 Inches
Area	282 Sq. Inches
Neck Length	5 1/8 ± 1/8 Inches
Overall Length	14 7/8 ± 5/16 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (Approx.)	24 Pounds

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive Coating
23ARP4: 6.3 Volt, 600 Ma Heater
23BCP4: 6.3 Volt, 300 Ma Heater





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ELECTRONIC TUBES
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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

November 30, 1960

from JEDEC release #3094, Jan. 2, 1961

RATINGS

MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	-35 to -72 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

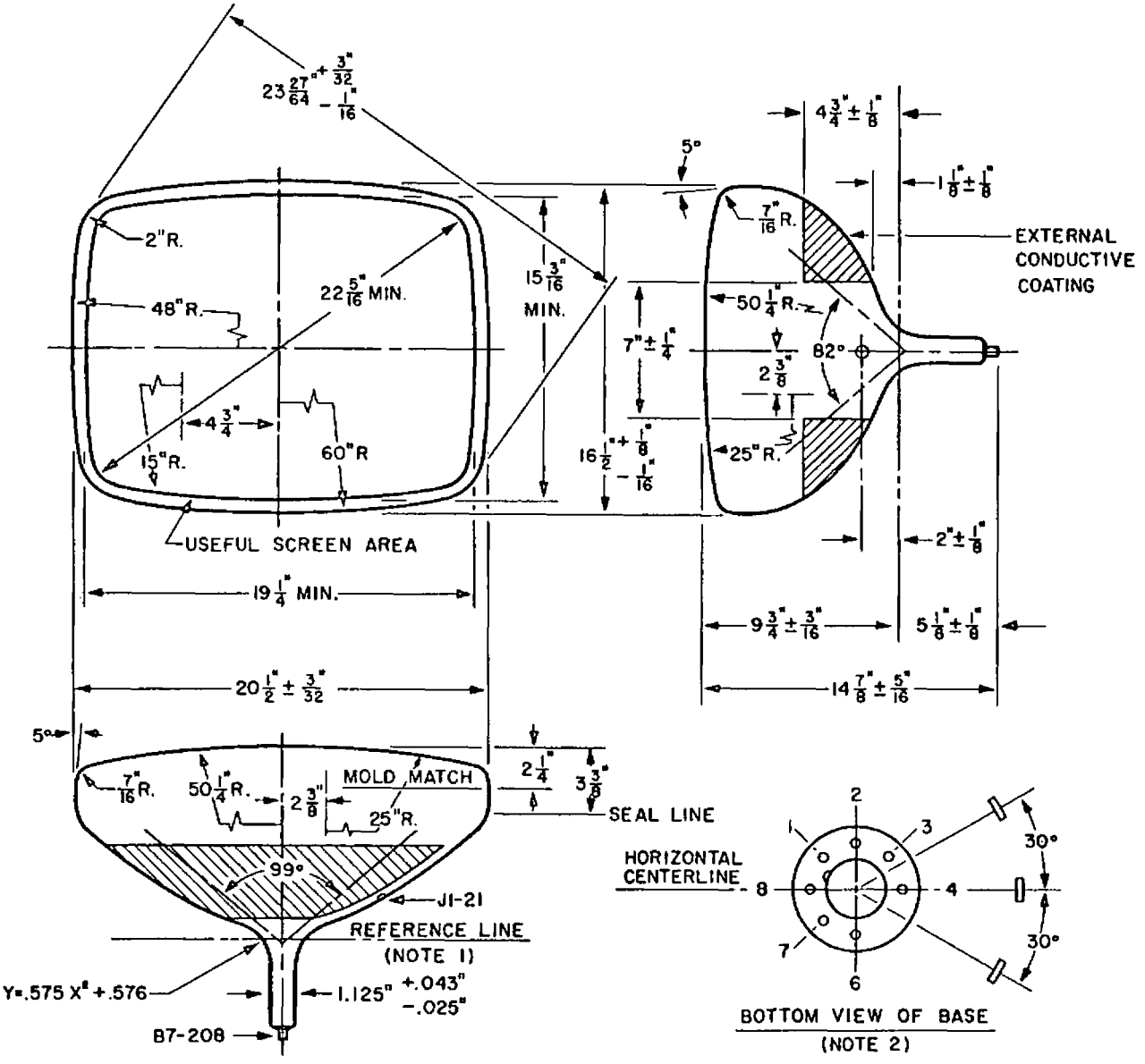


DIAGRAM NOTES:

1. Reference line is determined by Plane C-C' of JEDEC No. 126 Reference Line Gauge, when gauge is seated against the bulb.

2. Base pin No. 4 aligns with horizontal centerline of face of tube within 30°, and is on same side as anode contact cap, J1-21.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	80 Degrees
Diagonal	92 Degrees
Vertical	65 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	78 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	1700 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	19¼ x 15⅛ Inches
Minimum Useful Screen Area	282 Sq. Inches
Neck Length	4½ ± 3/16 Inches
Overall Length	17 ± ⅜ Inches
Bulb	J187C or J187F
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-203
Basing	12L
Weight	27 Lbs.

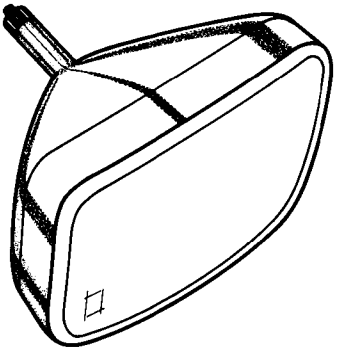
RATINGS

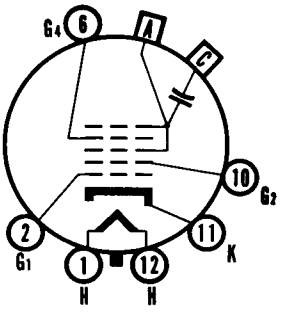
MAXIMUM RATINGS (Design Maximum Values)

Grid Drive Service		
Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Maximum Grid No. 2 Voltage	550 Volts	dc
Minimum Grid No. 2 Voltage	200 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	154 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
23″ Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
92° Magnetic Deflection
1 7/16″ Neck Diameter
No Ion Trap
External Conductive Coating
Short Neck





12-L

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SENECA FALLS, NEW YORK

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EMPORIUM, PENNSYLVANIA
MARCH, 1962

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (DESIGN MAXIMUM VALUES) Continued

Cathode Drive Service		
Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−400 to +1250 Volts	dc
Maximum Grid No. 2 Voltage	700 Volts	dc
Minimum Grid No. 2 Voltage	350 Volts	dc
Cathode Voltage		
Positive Bias Value	154 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service		
Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−48 to −96 Volts	dc
Cathode Drive Service		
Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Grid No. 1 Voltage	0 Volts	dc
Cathode Voltage	+46 to +80 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be increased by about 5 Volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

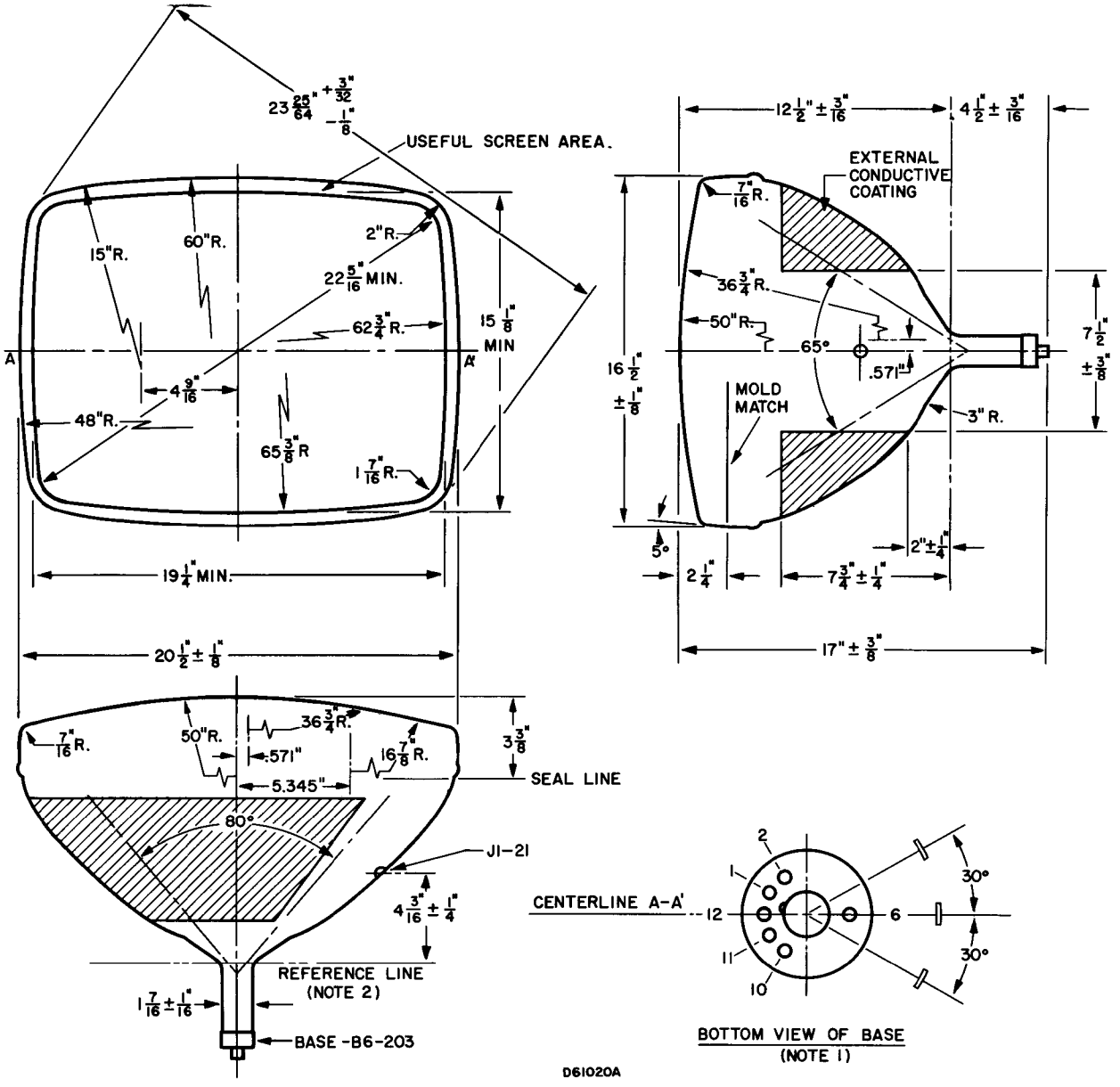


DIAGRAM NOTES:

1. *The plane through the tube axis and Pin No. 6 may vary from the plane through the tube axis and anode terminal by angular tolerance (measured about the tube axis) of ±30°. Anode terminal is on the same side as Pin No. 6.*
2. *With tube neck inserted through the flared end of the reference line gauge JEDEC No. G-116 and with the tube seated in gauge, the reference line is determined by the intersection of the Plane CC' of the gauge with the glass funnel.*

SYLVANIA engineering data service

SYLVANIA
23BGP4
23BHP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	99 Degrees
Diagonal	110 Degrees
Vertical	82 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx)	40 Percent
23BHP4: External Surface of Safety Plate Treated to Reduce Specular Reflection	

ELECTRICAL DATA

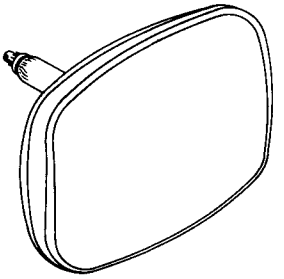
Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 $\mu\mu$f	
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f	
External Conductive Coating to Anode[2]	2500 $\mu\mu$f	Max.
	1700 $\mu\mu$f	Min.

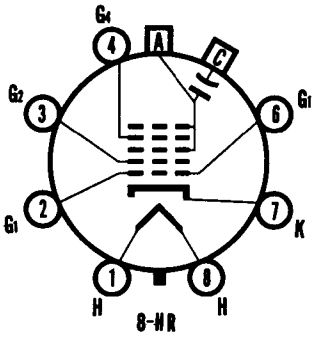
MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15¼ Inches
Width	19 5/16 Inches
Diagonal	22 5/16 Inches
Area	282 Sq. Inches
Neck Length	5⅛ ± ⅛ Inches
Overall Length	15 3/16 ± ⅜ Inches
Bulb	J187A or Equivalent
Safety Plate	
23BGP4	FP198A or Equivalent
23BHP4	FP198B or Equivalent
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (Approx.)	32½ Pounds

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Neck Length 5⅛"
Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive Coating
23BHP4: Anti Reflection Treated





SYLVANIA
ELECTRONIC TUBES
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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

OCTOBER, 1961

File Under
TELEVISION PICTURE TUBES

RATINGS

MAXIMUM RATINGS (Design Maximum Values)

Cathode Drive Service[3]

Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to + 1100 Volts	dc
Grid No. 2 Voltage	70 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS (Cathode Drive Service)[3]

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to + 400 Volts	dc
Grid No. 2 Voltage [3]	50 Volts	dc
Cathode Voltage Required for Cutoff[4]	+32 to +47 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more positive.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

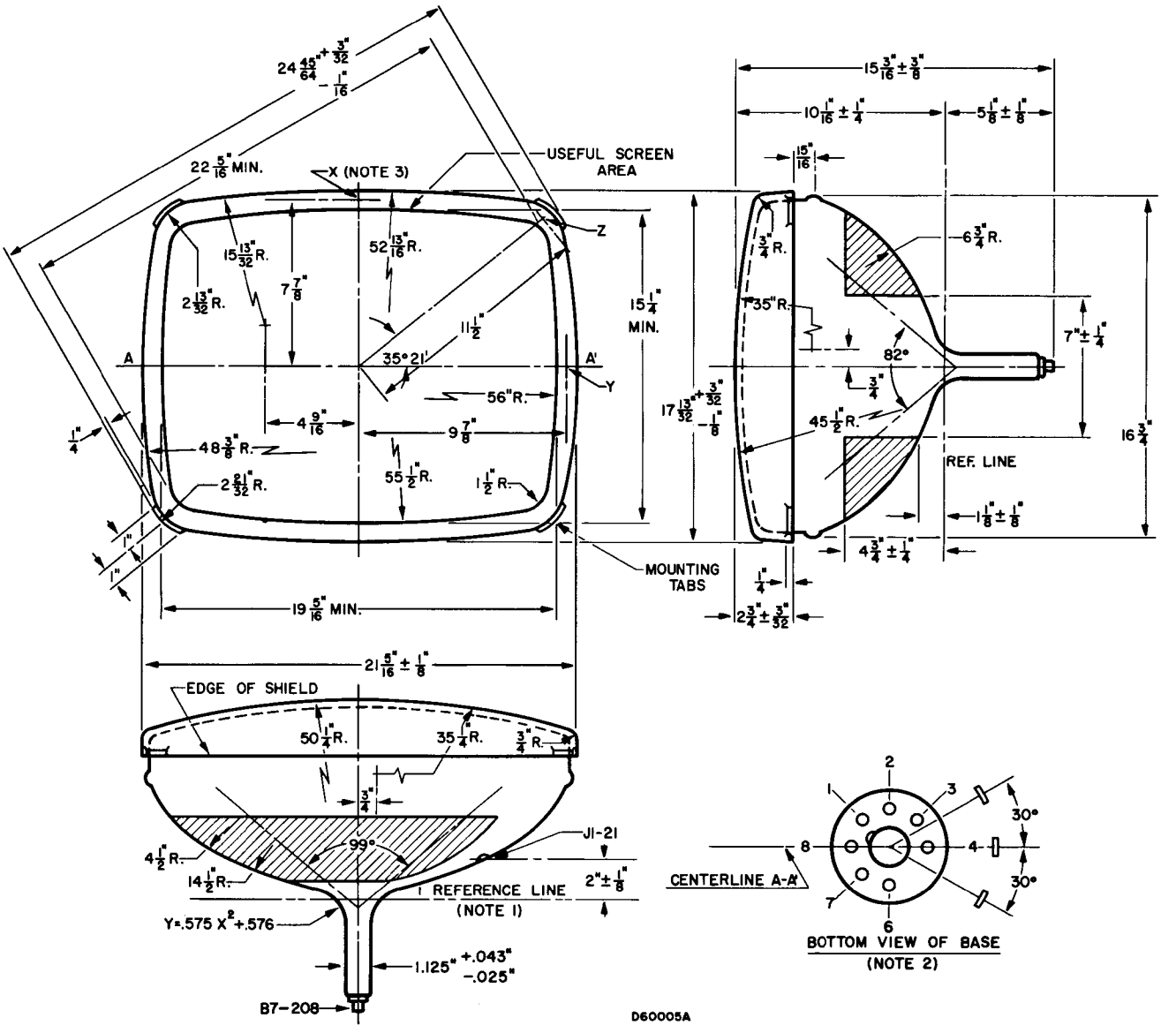


DIAGRAM NOTES:

1. *Reference line is determined by Plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to the axis and passing through Points X, Y and Z are located as follows:*

   Plane tangent to crown of face, to plane of X = 0.785" Nom.

   Plane of X to plane of Y = 0.463" ± .030

   Plane of X to plane of Z = 0.970" ± .030

CHARACTERISTICS

GENERAL DATA

Focusing Method	Tri-Potential Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	99 Degrees
Diagonal	110 Degrees
Vertical	82 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	40 Percent

23BRP4: External surface of safety plate treated to reduce specular reflection.

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.30 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	2000 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15 ¼ Inches
Width	19 5/16 Inches
Diagonal	22 5/16 Inches
Area	282 Sq. Inches
Neck Length	3 9/16 ± ⅛ Inches
Overall Length	13 5/8 ± ⅜ Inches
Bulb	J187A
Safety Plate (23RP4)	FP198A
Safety Plate (23BRP4)	FP198B
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8JR
Weight (Approx.)	32 ½ Pounds

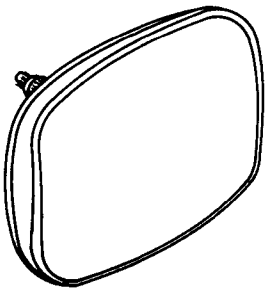
RATINGS

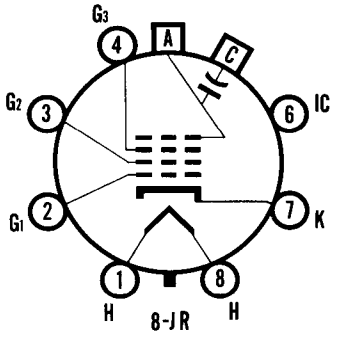
MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Anode Voltage	22,000 Volts	dc
Grid No. 3 Voltage (Focusing Electrode)	700 Volts	dc
Grid No. 2 Voltage	600 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tubes
23" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Tri-Potential Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive Coating
Short Neck
6.3 Volt, 300 Ma Heater
23BRP4: Anti-Reflection Treated





SYLVANIA
ELECTRONIC TUBES

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PICTURE TUBE
OPERATIONS

SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JUNE, 1962

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	16,000 Volts	dc
Grid No. 3 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage[3]	500 Volts	dc
Grid No. 1 Voltage Required for Cutoff[4]	−43 to −78 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Brightness and resolution improve with increase in Grid No. 2 Voltage. A minimum value of 400 volts is recommended.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

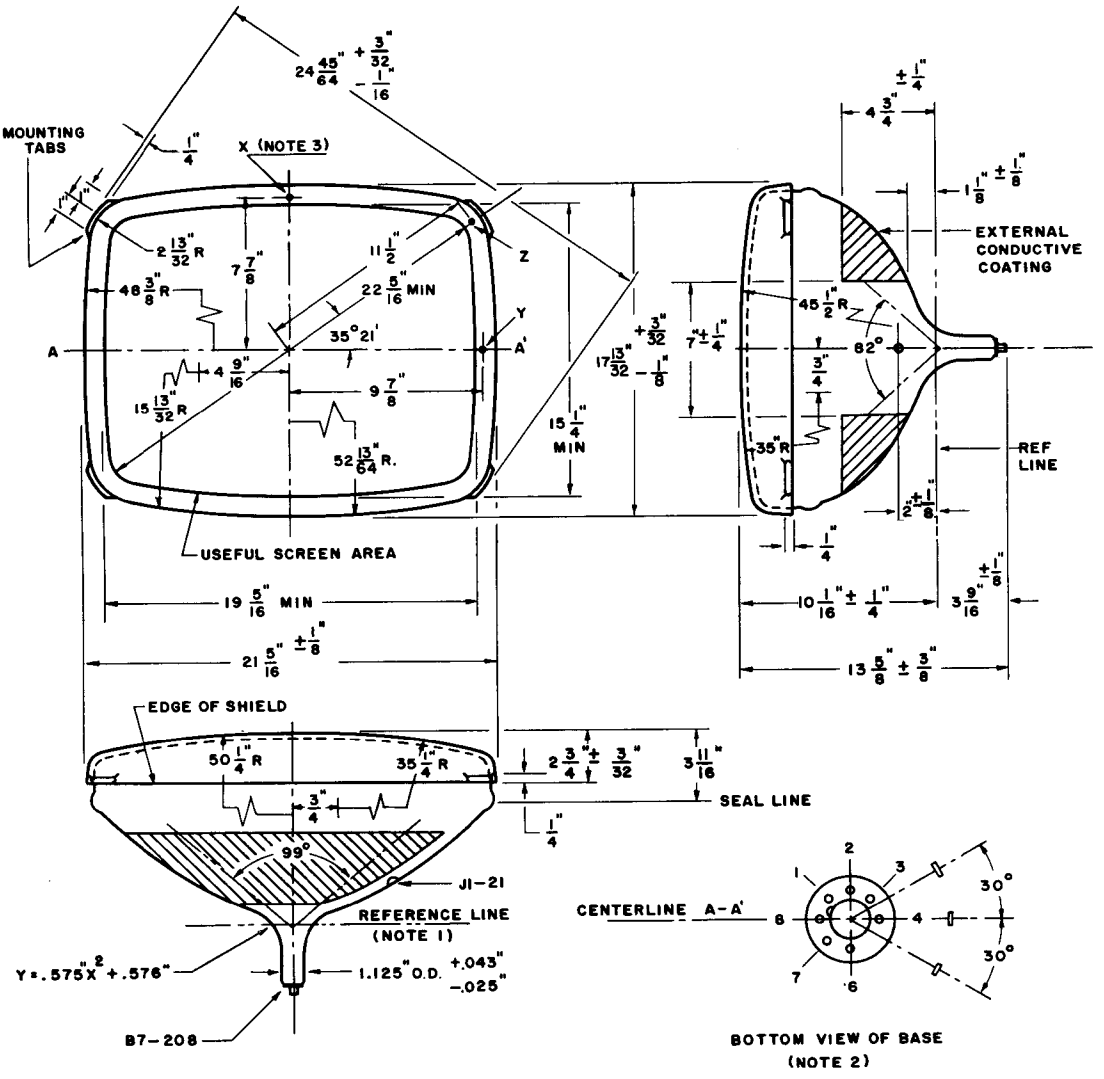


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-12.*
3. *Planes perpendicular to the tube axis and passing through points X, Y and Z are located as follows:*
   Plane Tangent to crown of face, to plane of X = 0.758" Nom.
   Plane of X to plane of Y = 0.463" ± .030".
   Plane of X to plane of Z = 0.970" ± .030".

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	99 Degrees
Diagonal	110 Degrees
Vertical	82 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Face plate Assembly (Approx.)	40 Percent
23 AVP4 and 23AYP4: External Surface of Safety Plate Treated to Reduce Specular Reflection	

ELECTRICAL DATA

	23AYP4 23SP4	23CP4 23AVP4	
Heater Voltage	6.3	6.3	Volts
Heater Current ± 5%	0.30	0.60	Ampere
Heater Warm-up Time[1]		11	Seconds
Direct Interelectrode Capacitances (Approx.)			
Cathode to All Other Electrodes		5	μμf
Grid No. 1 to All Other Electrodes		6	μμf
External Conductive Coating to Anode[2]		2500	μμf Max.
		2000	μμf Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15¼ Inches
Width	19 5/16 Inches
Diagonal	22 5/16 Inches
Area	282 Sq. Inches
Neck Length	5⅛ ± ⅛ Inches
Overall Length	15 3/16 ± ⅜ Inches
Bulb	J187A or Equiv.
Safety Plate (23CP4, 23SP4)	FP198A
Safety Plate (23AVP4, 23AYP4)	FP198B
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (Approx.)	32½ Pounds

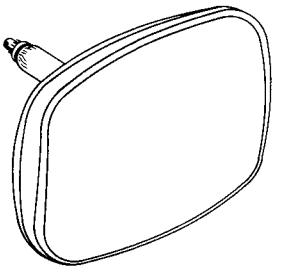
RATINGS

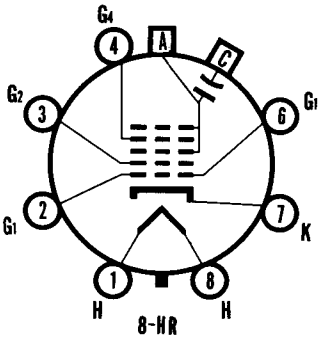
MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Anode Voltage	22,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	

QUICK REFERENCE DATA

Television Picture Tube
23″ Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive Coating
23 AVP4 & 23AYP4: Anti Reflection Treated
23SP4 & 23AYP4: 6.3 V, 300 Ma Heaters





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PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

MAY, 1961

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service (Continued)

Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

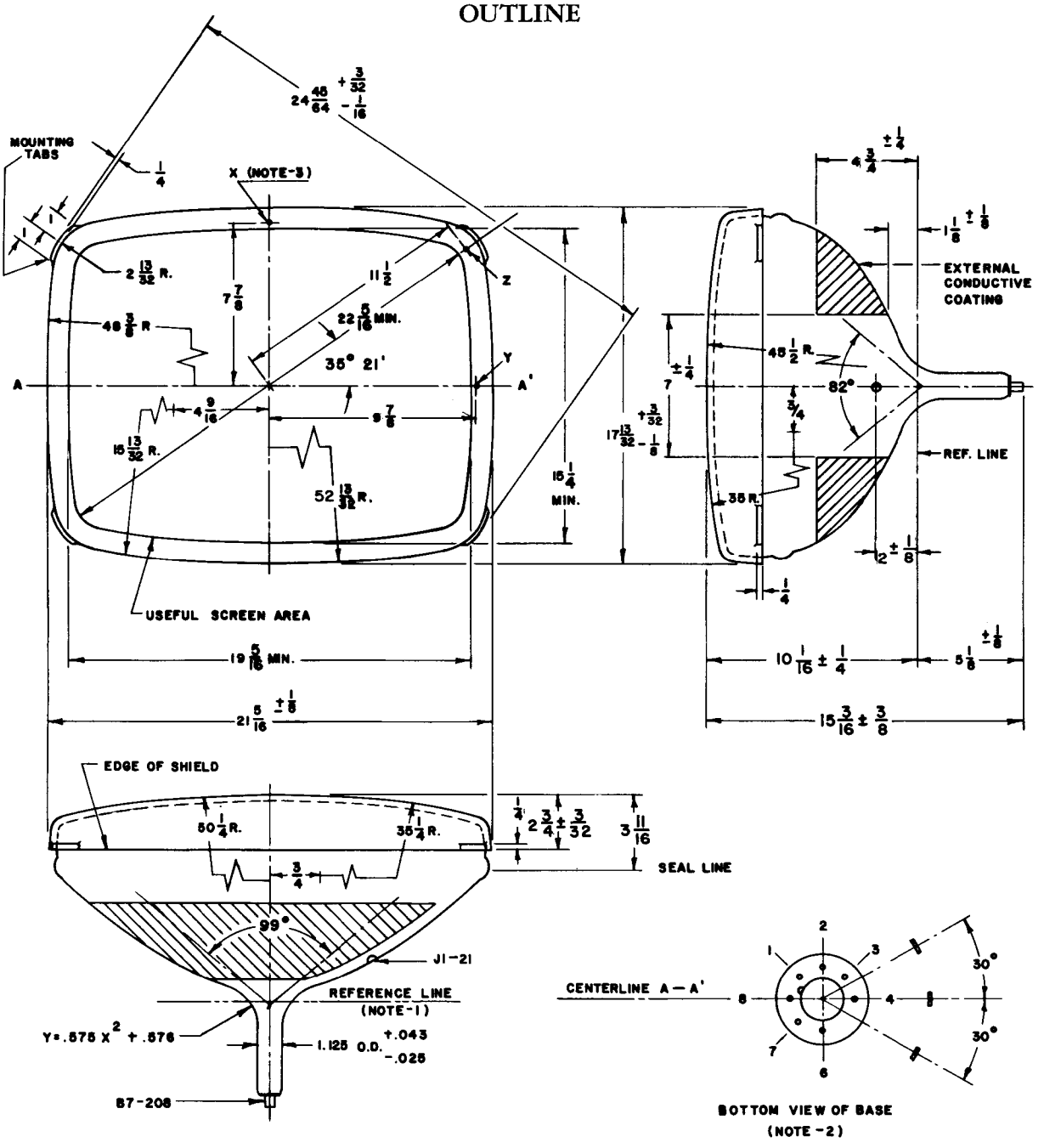


DIAGRAM NOTES:

D59028A

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through X, Y, and Z are located as follows:*
   Plane tangent to crown of face to plane of X: .758" Nom.
   Plane of X to plane of Y = .463" ± 030"
   Plane of X to plane of Z = .970" ± .030"
4. *Dimensions are in inches.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	81 Degrees
Diagonal	92 Degrees
Vertical	66 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	40 Percent
23EAP4 has external surface of safety plate treated to reduce specular reflection.	

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.45 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating to Anode[2]	2500 pf	Max.
	2000 pf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15 ¼ Inches
Width	19 5/16 Inches
Diagonal	22 5/16 Inches
Area	282 Sq. Inches
Neck Length	5 ½ ± 3/16 Inches
Overall Length	18 5/16 ± 7/16 Inches
Bulb	J187D or J187G
Safety Plate	
23CTP4	FP 198A
23EAP4	FP 198B
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-203
Basing	12L
Weight (Approx.)	34 ½ Pounds

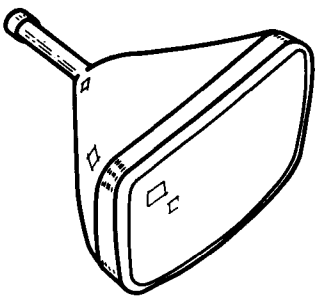
RATINGS

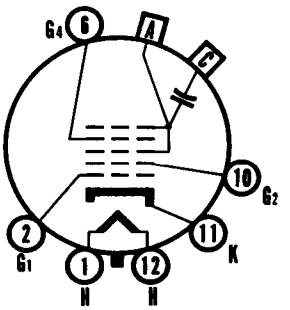
MAXIMUM RATINGS (Design Maximum Values)

	Grid Drive Service[3]	
Anode Voltage	22,000 Volts dc	Max.
	12,000 Volts dc	Min.
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts dc	
Grid No. 2 Voltage	550 Volts dc	
Grid No. 1 Voltage		
Negative Bias Value	155 Volts dc	
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts dc	
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Secs.	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tubes
23″ Direct Viewed
Rectangular Glass Types
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
92° Magnetic Deflection
No Ion Trap
External Conductive Coating
6.3 Volt, 450 Ma Heater
23EAP4: Anti-Reflection Treated





12-L

SYLVANIA
ELECTRONIC TUBES
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PICTURE TUBE
OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
JULY, 1963

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS

	Cathode Drive Service[4]	Grid Drive Service[3]
Anode Voltage	16,000	16,000 Volts dc
Grid No. 4 Voltage for Focus	0 to +400	0 to +400 Volts dc
Grid No. 2 Voltage	300	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[5]	—	−35 to −72 Volts dc
Cathode Voltage Required for Cutoff[5]	+33 to +59	— Volts dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to cathode unless otherwise indicated.*
4. *Voltages shown are positive with respect to Grid No. 1.*
5. *Visual extinction of focused raster. Extinction of stationary focused spot will require that the absolute value of the bias between cathode and Grid No. 1 be increased by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

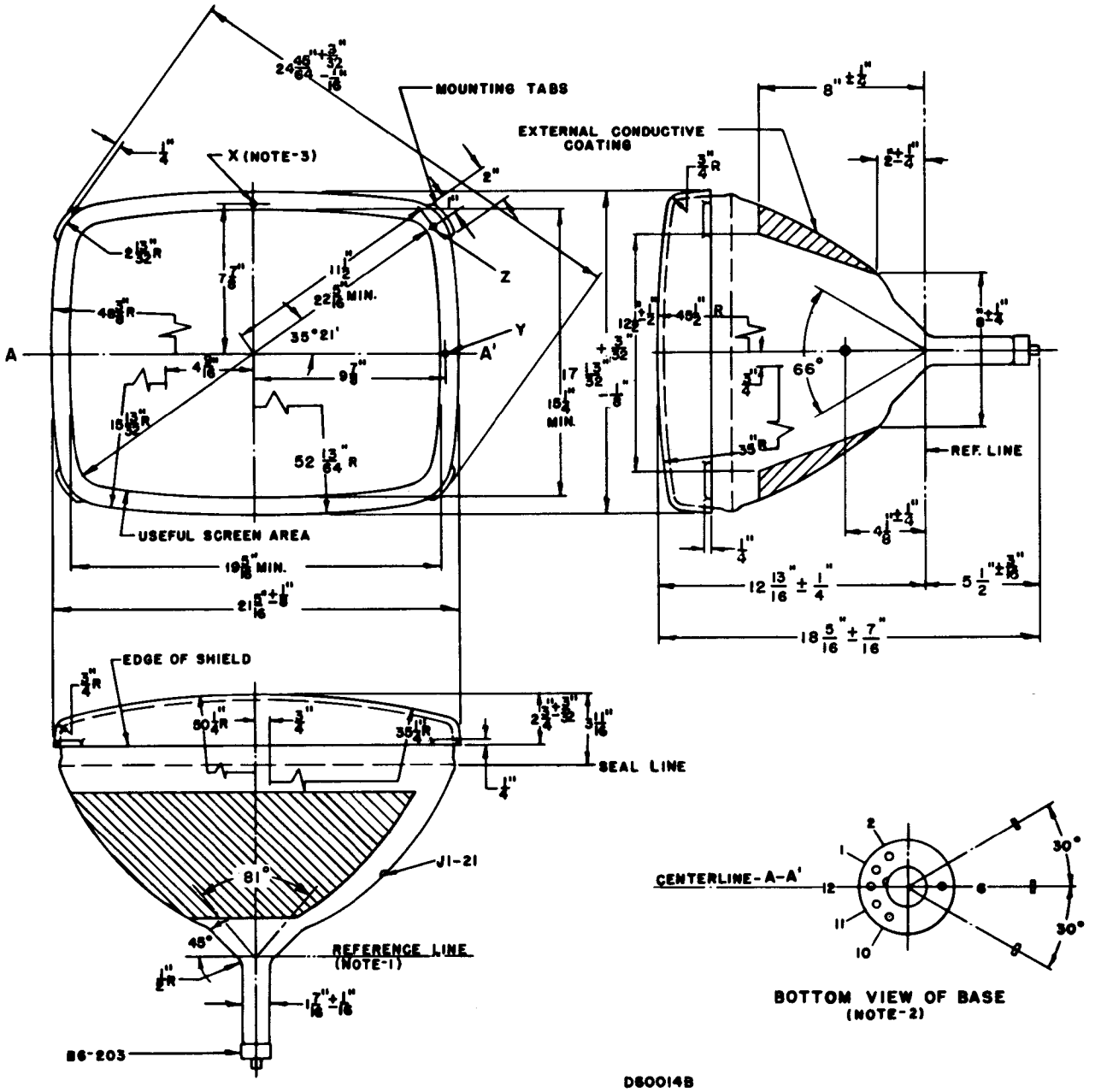


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 116 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 6 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through points X, Y and Z are located as follows:*

   Plane tangent to crown of face to plane of X: .758" Nom.
   Plane of X to plane of Y = .463" ± .030".
   Plane of X to plane of Z = .970" ± .030".

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	80 Degrees
Diagonal	92 Degrees
Vertical	65 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance at Center (Approx.)	78 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	2000 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15 1/8 Inches
Width	19 1/4 Inches
Diagonal	22 5/16 Inches
Area	282 Sq. Inches
Neck Length	6 ± 3/16 Inches
Overall Length	18 1/2 ± 3/8 Inches
Bulb	J187C or J187F
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-203
Basing	12L
Weight (Approx.)	27 Pounds

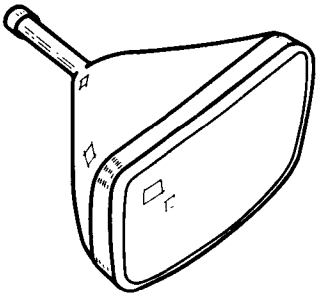
RATINGS

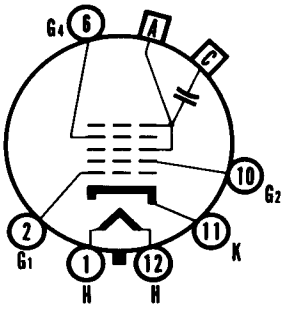
MAXIMUM RATINGS (Design Maximum Values)

Grid Drive Service[3]		
Maximum Anode Voltage	25,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 (Focusing Electrode) Voltage	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
92° Magnetic Deflection
No Ion Trap
External Conductive Coating





12-L

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OPERATIONS
SENECA FALLS, NEW YORK

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EMPORIUM, PENNSYLVANIA
MAY, 1962

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) Continued

Cathode Drive Service[4]

Maximum Anode Voltage	25,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 (Focusing Electrode) Voltage	−400 to +1250 Volts	dc
Grid No. 2 Voltage	700 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]

Anode Voltage	20,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−40 to −76 Volts	dc

Cathode Drive Service[4]

Anode Voltage	20,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Cathode Voltage Required for Cutoff[5]	+37 to +64 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to cathode unless otherwise indicated.*
4. *Voltages are positive with respect to Grid No. 1 unless otherwise indicated.*
5. *Visual extinction of focused raster. Extinction of stationary focused spot will require that the absolute value of the bias between cathode and grid No. 1 be increased by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

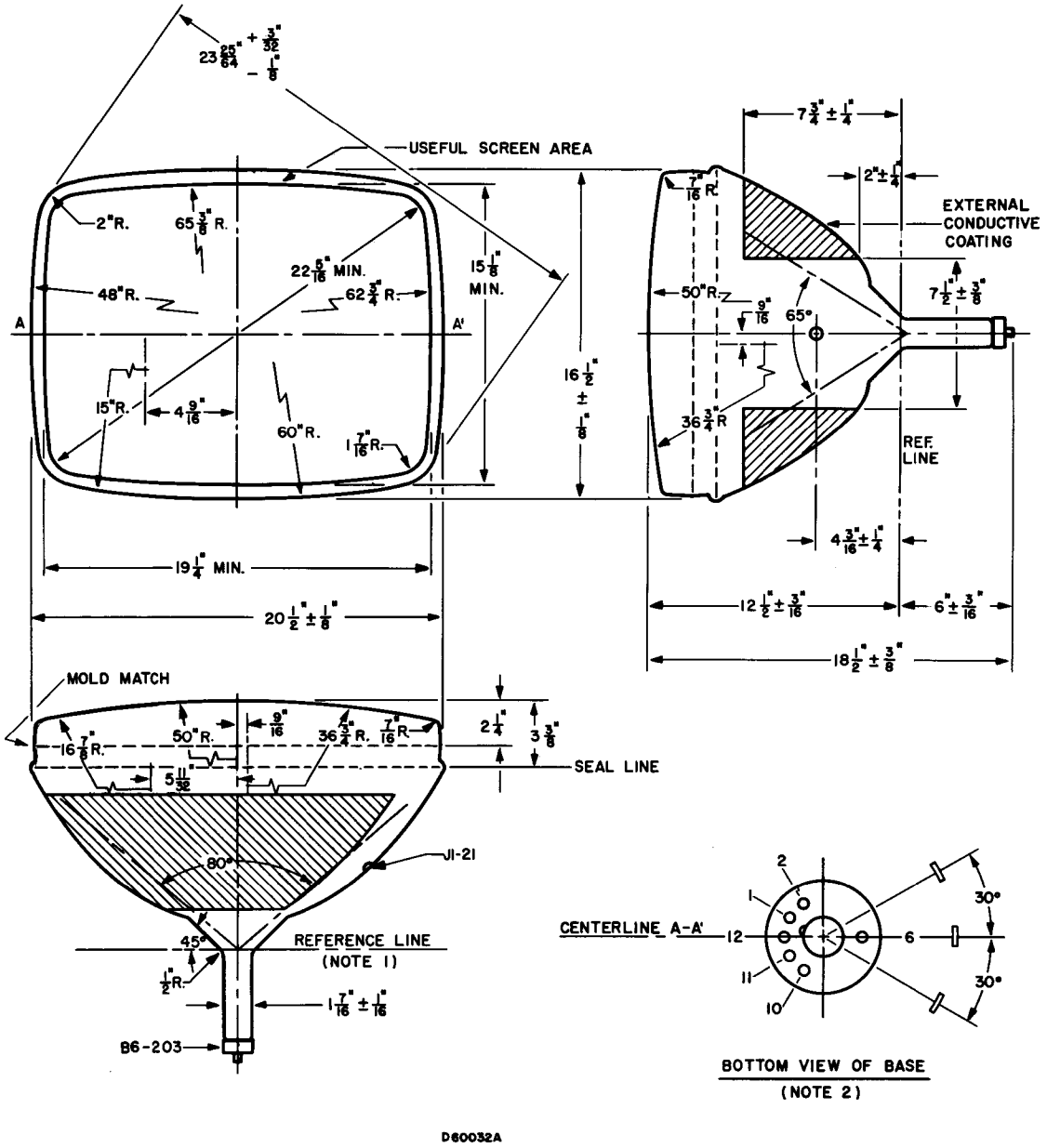


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 116 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 6 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	99 Degrees
Diagonal	110 Degrees
Vertical	82 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	40 Percent
23DJP4: External Surface of Safety Plate Treated to Reduce Specular Reflection	

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.30 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating to Anode[2]	2500 pf	Max.
	2000 pf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15 ¼ Inches
Width	19 5/16 Inches
Diagonal	22 5/16 Inches
Area	282 Sq. Inches
Neck Length	4 1/8 Inches
Overall Length	14 3/16 Inches
Bulb	J187A1 or Equiv.
Safety Plate	23DHP4-FP198A1 or Equiv. 23DJP4 - FP198B1 or Equiv.
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (Approx.)	32 ½ Pounds

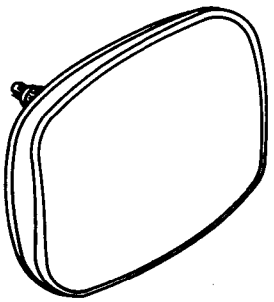
RATINGS

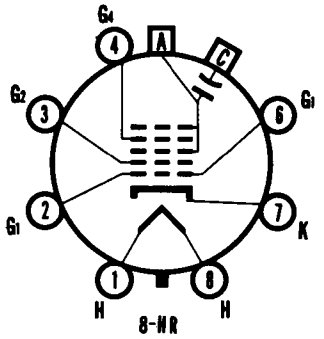
MAXIMUM RATINGS (Design Maximum Values)

Cathode Drive Service[3]		
Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	700 Volts	dc
Cathode Voltage:		
Maximum Negative Value	0 Volts	dc
Maximum Negative Peak Value	2 Volts	
Maximum Positive Value	155 Volts	dc
Maximum Positive Peak Value	220 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Secs.	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
23″ Direct Viewed
Rectangular Glass Type
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive Coating
6.3 Volt, 300 Ma Heater
23DJP4: Anti-Reflection Treated





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SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
APRIL, 1963

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS (Cathode Drive Service)[3]

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage[4]	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	+44 to +78 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
4. *Brightness and resolution improve with increase in Grid No. 2 voltage. A minimum value of 300 volts is recommended.*
5. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more positive.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

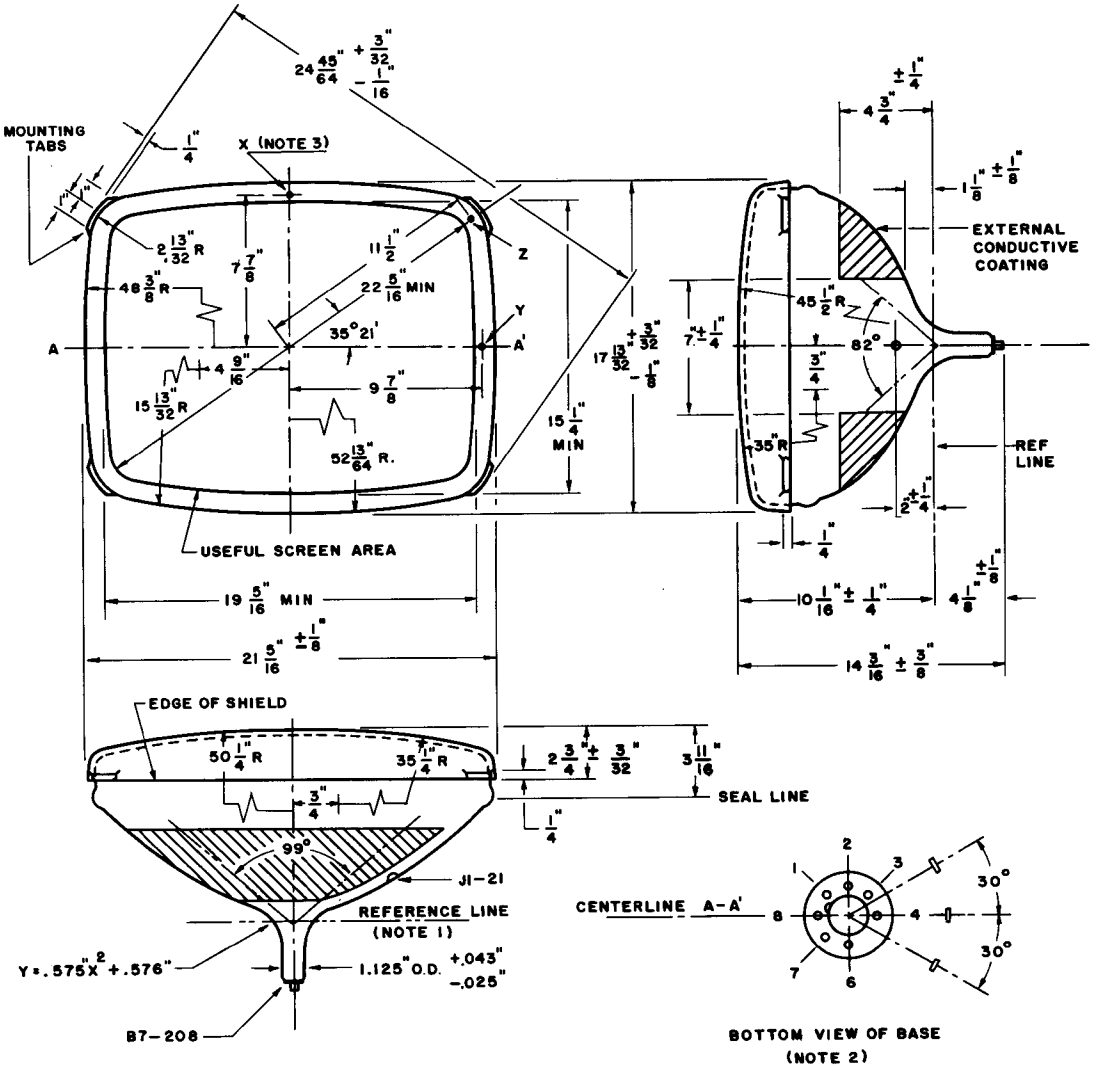


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through points X, Y, and Z are located as follows:*

   Plane tangent to crown of face to plane of X: .758" Nom.
   Plane of X to plane of Y = .463" ± .030".
   Plane of X to plane of Y = .463" ± .030".
   Plane of X to plane of Z = .970" ± .030".

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	80 Degrees
Diagonal	92 Degrees
Vertical	65 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Gray Filter Glass
Light Transmittance at Center (Approx.)	42 Percent

Type 23DKP4 is similar to Type 23AHP4 except that it employs the banded tube with coated funnel construction for integral implosion protection, and has reduced faceplate transmittance.

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating and Rim Band, to Anode[2]	2500 pf	Max.
	1700 pf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15 1/8 Inches
Width	19 1/4 Inches
Diagonal	22 5/16 Inches
Area	282 Sq. Inches
Neck Length	5 1/2 ± 3/16 Inches
Overall Length	18 ± 3/8 Inches
Bulb	J187J
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-203
Basing	12L
Weight (Approx.)	29 Pounds

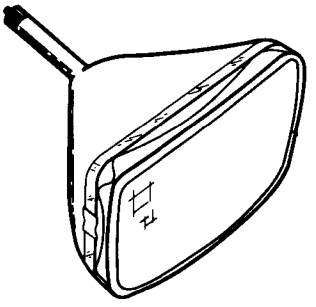
RATINGS

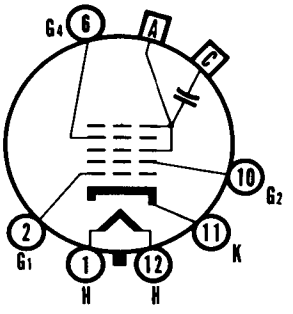
MAXIMUM RATINGS (Design Maximum Values)

Grid Drive Service[3]		
Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volt	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
92° Magnetic Deflection
No Ion Trap
External Conductive Coating
Banded Tube, Coated Funnel





12-L

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SEPTEMBER, 1963

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) (Cont'd)

Cathode Drive Service[4]		
Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−400 to +1250 Volts	dc
Grid No. 2 Voltage	700 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volt	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]		
Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−35 to −72 Volts	dc
Cathode Drive Service[4]		
Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Cathode Voltage Required for Cutoff[5]	+33 to +59 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

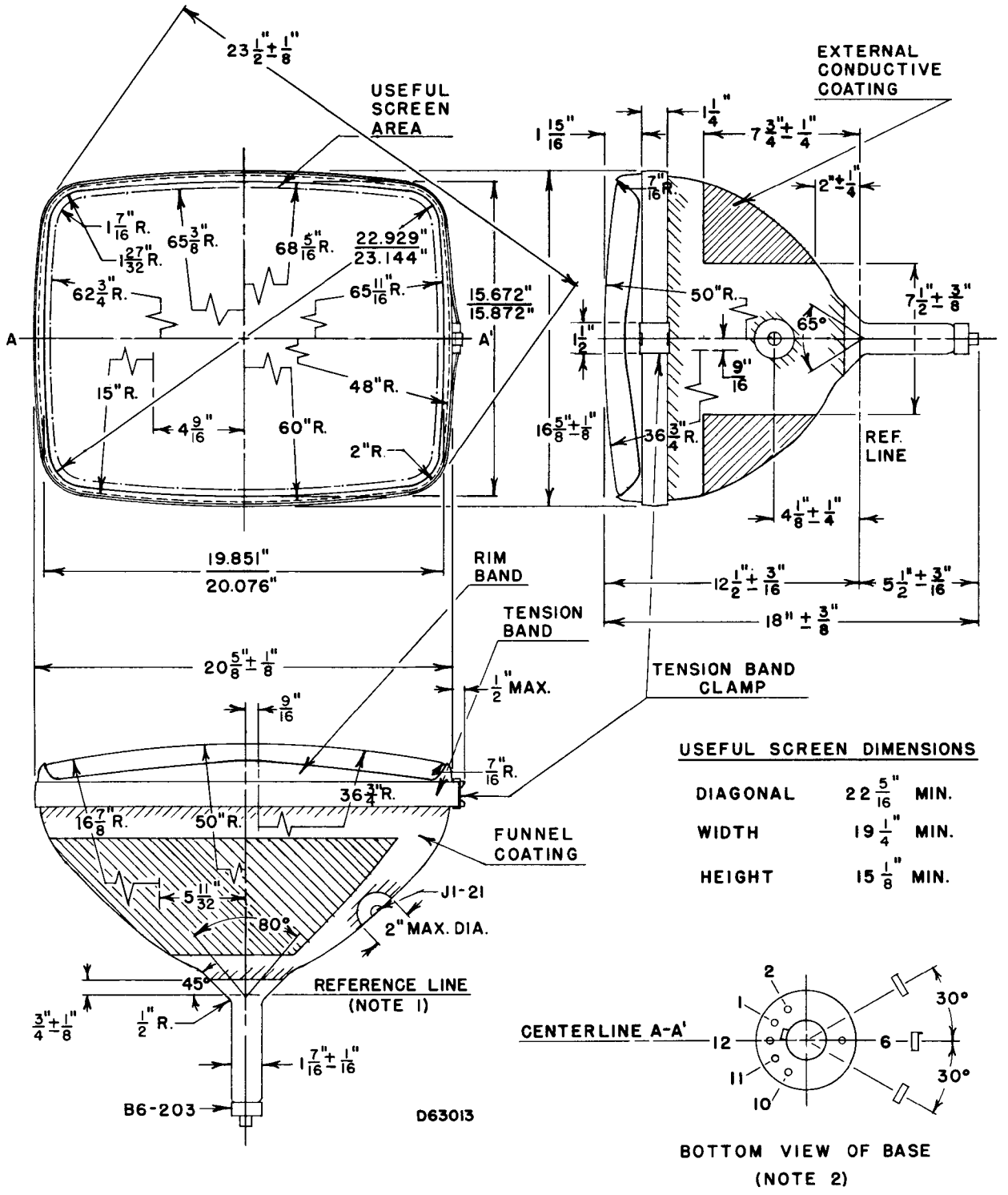
NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating and rim band must be grounded.*
3. *Voltages are positive with respect to cathode unless otherwise indicated.*
4. *Voltages are positive with respect to Grid No. 1 unless otherwise indicated.*
5. *Visual extinction of focused raster. Extinction of stationary focused spot will require that the absolute value of the bias between cathode and Grid No. 1 will be increased by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE



USEFUL SCREEN DIMENSIONS		
DIAGONAL	22 5/16"	MIN.
WIDTH	19 1/4"	MIN.
HEIGHT	15 1/8"	MIN.

DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 116 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 6 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Tri-Potential Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	99 Degrees
Diagonal	110 Degrees
Vertical	82 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (approx.)	40 Percent

ELECTRICAL DATA

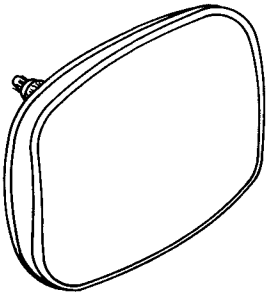
Heater Voltage	6.3 Volts
Heater Current	0.60 ±5% Ampere
Heater Warm-up Time[1]	11 Seconds
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
External Conductive Coating to Anode[2]	2500 $\mu\mu$f Max.
	2000 $\mu\mu$f Min.

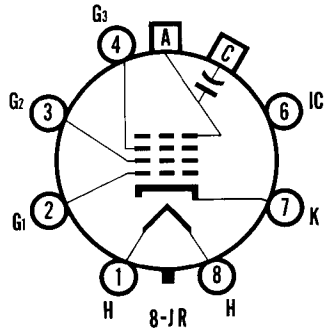
MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15 1/4 Inches
Width	19 5/16 Inches
Diagonal	22 5/16 Inches
Area	282 Sq. Inches
Neck Length	3 9/16 ± 1/8 Inches
Overall Length	13 5/8 ± 3/8 Inches
Bulb	J187A or Equiv.
Safety Plate	FP198A or Equiv.
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8JR
Weight (approx.)	32 1/2 Pounds

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Tri-Potential Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive Coating
Short Neck





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EMPORIUM, PENNSYLVANIA
MARCH, 1960

File Under
TELEVISION PICTURE TUBES

RATINGS

MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Anode Voltage	22,000	Volts	dc
Grid No. 3 Voltage (Focusing Electrode	700	Volts	dc
Grid No. 2 Voltage	600	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	154	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage	16,000	Volts	dc
Grid No. 3 Voltage for Focus	0 to +400	Volts	dc
Grid No. 2 Voltage[3]	500	Volts	dc
Grid No. 1 Voltage Required for Cutoff[4]	−43 to −78	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Brightness and resolution improve with increase in Grid No. 2 Voltage. A minimum value of 400 volts is recommended.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

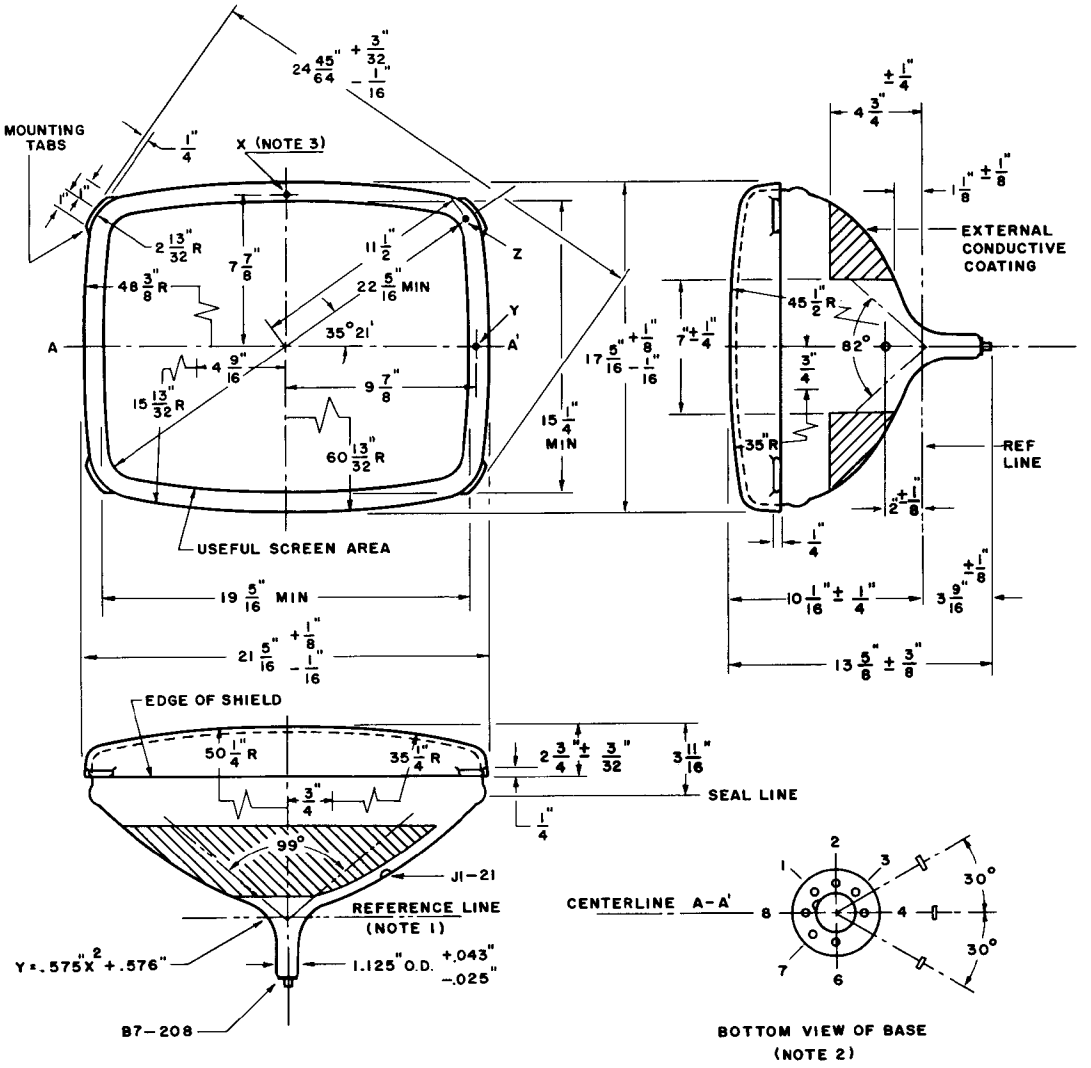


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to the tube axis and passing through points X, Y and Z are located as follows:*
   Plane Tangent to crown of face, to plane of X = 0.758" Nom.
   Plane of X to plane of Y = 0.463" ± .030".
   Plane of X to plane of Z = 0.970" ± .030".
   Plane of X to plane of edge of shield = 1.960" Nom.

CHARACTERISTICS

GENERAL DATA

Focusing	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	80 Degrees
Diagonal	92 Degrees
Vertical	65 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Gray Filter Glass
Light Transmittance at Center (Approx.)	42 Percent

Type 23DTP4 is similar to Type 23CZP4 except that it employs the banded tube with coated funnel construction for integral implosion protection and has reduced faceplate transmittance.

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating and Rim Band to Anode[2]	2500 pf	Max.
	1700 pf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15⅛ Inches
Width	19¼ Inches
Diagonal	22⅝ Inches
Area	282 Sq. Inches
Neck Length	6 ± 3/16 Inches
Overall Length	18½ ± ⅜ Inches
Bulb	J187J
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-203
Basing	12L
Weight (Approx.)	29 Pounds

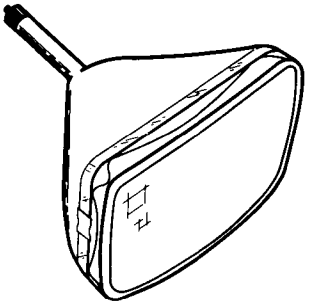
RATINGS

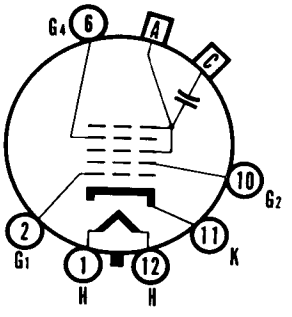
MAXIMUM RATINGS (Design Maximum Values)

Grid Drive Service[3]		
Maximum Anode Voltage	25,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 (Focusing Electrode) Voltage	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volt	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
92° Magnetic Deflection
No Ion Trap
External Conductive Coating
Banded Tube, Coated Funnel





12-L

SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

PICTURE TUBE
OPERATIONS

SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

SEPTEMBER, 1963

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) (Cont'd)

Cathode Drive Service[4]		
Maximum Anode Voltage	25,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 (Focusing Electrode) Voltage	−400 to +1250 Volts	dc
Grid No. 2 Voltage	700 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volt	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]		
Anode Voltage	20,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−40 to −76 Volts	dc
Cathode Drive Service[4]		
Anode Voltage	20,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Cathode Voltage Required for Cutoff[5]	+37 to +64 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

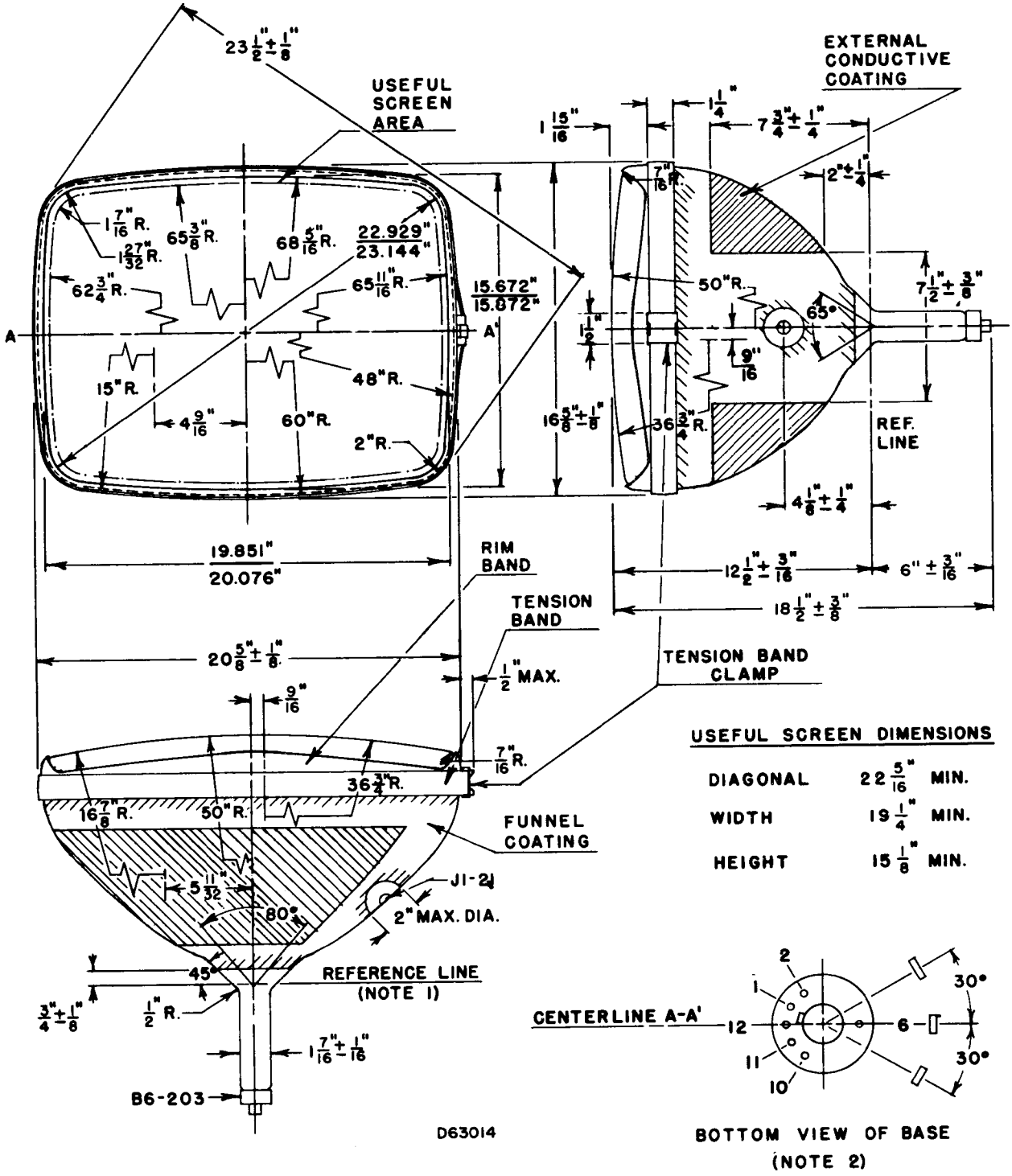
NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating and rim band must be grounded.*
3. *Voltages are positive with respect to cathode unless otherwise indicated.*
4. *Voltages are positive with respect to Grid No. 1 unless otherwise indicated.*
5. *Visual extinction of focused raster. Extinction of stationary focused spot will require that the absolute value of the bias between cathode and grid No. 1 be increased by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE



USEFUL SCREEN DIMENSIONS

DIAGONAL	22 5/16" MIN.
WIDTH	19 1/4" MIN.
HEIGHT	15 1/8" MIN.

DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 116 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 6 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	100 Degrees
Diagonal	114 Degrees
Vertical	83 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	42 Percent

Types 23DVP4 and 23DZP4 are similar to Types 23MP4 and 23ALP4 respectively, except that they employ the banded tube with coated funnel construction for integral implosion protection, and have reduced faceplate transmittance.

ELECTRICAL DATA

	23DZP4	23DVP4	
Heater Voltage	6.3	6.3 Volts	
Heater Current ± 5 %	0.45	0.60 Ampere	
Heater Warm-up Time[1]	11	11 Seconds	
Direct Interelectrode Capacitances (Approx.)			
Cathode to All Other Electrodes		5 pf	
Grid No. 1 to All Other Electrodes		6 pf	
External Conductive Coating and Rim Band to Anode[2]		2500 pf	Max.
		1700 pf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15⅛ Inches
Width	19¼ Inches
Diagonal	22⅝ Inches
Minimum Useful Screen Area	282 Sq. Inches
Neck Length	5⅛ ± ⅛ Inches
Overall Length	14 7/16 ± 5/16 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Bulb	J187L
Base	B7-208
Basing	8HR
Weight (Approx.)	28 Pounds

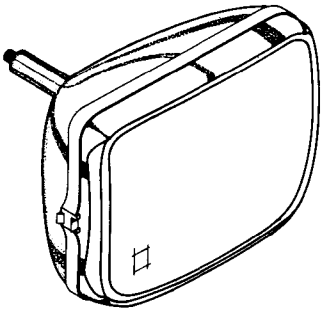
RATINGS

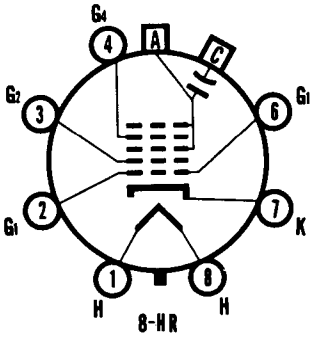
MAXIMUM RATINGS (Design Maximum Values)

Grid Drive Service[3]		
Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Maximum Grid No. 2 Voltage	550 Volts	dc
Minimum Grid No. 2 Voltage	200 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volt	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
1⅛" Neck Diameter
No Ion Trap
External Conductive Coating
Banded Tube, Coated Funnel
23DVP4: 6.3v/600 ma Heater
23DZP4: 6.3v/450 ma Heater





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SEPTEMBER, 1963

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) (Cont'd)

Cathode Drive Service[4]		
Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−400 to +1250 Volts	dc
Maximum Grid No. 2 Voltage	700 Volts	dc
Minimum Grid No. 2 Voltage	350 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volt	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]		
Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−46 to −94 Volts	dc
Cathode Drive Service[4]		
Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Cathode Voltage Required for Cutoff[5]	42 to 78 Volts	dc

CIRCUIT VALUES:

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

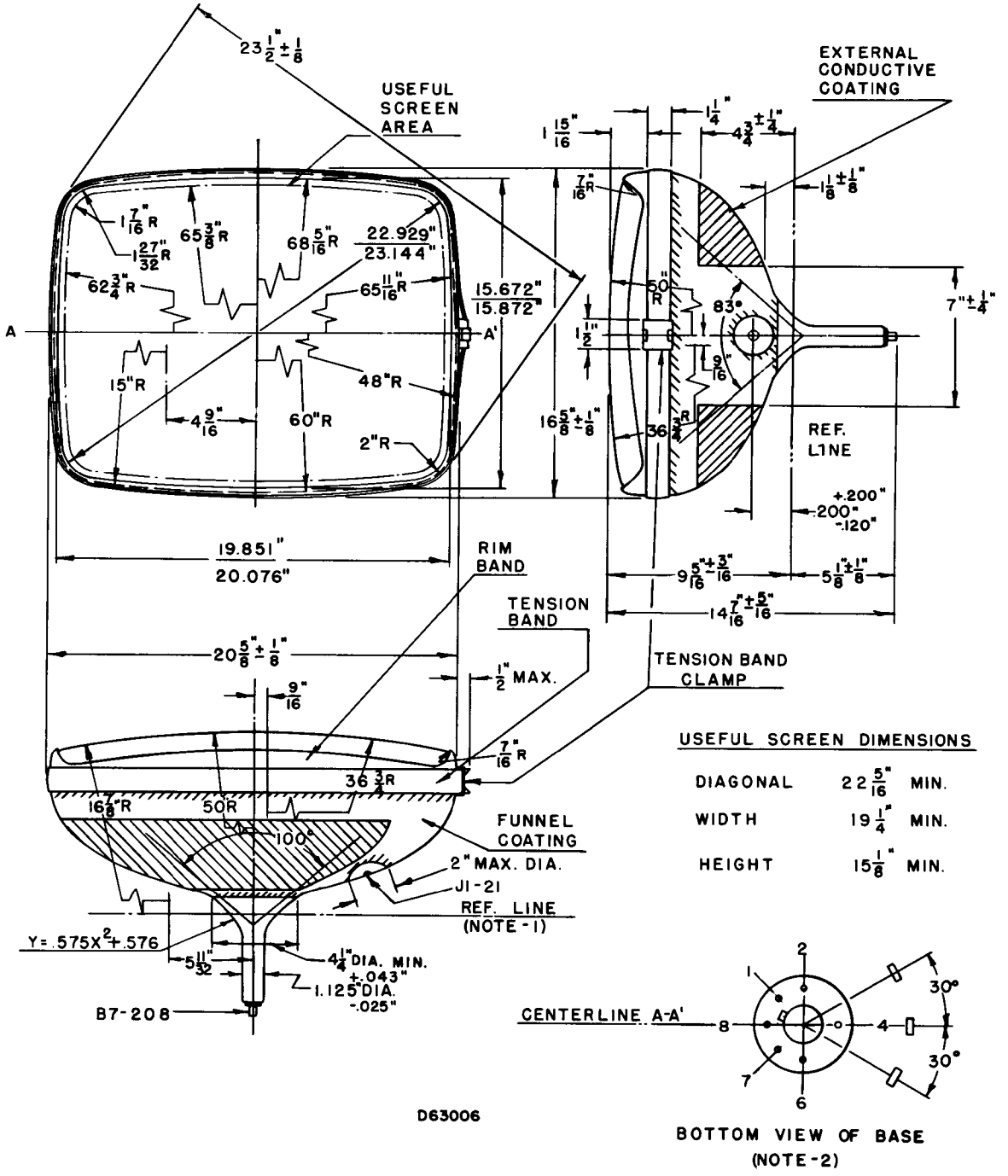
NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating and rim band must be grounded.*
3. *Voltages are positive with respect to Cathode unless indicated otherwise.*
4. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
5. *Visual extinction of focused raster. For cutoff of the undeflected spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE



USEFUL SCREEN DIMENSIONS

DIAGONAL	22 5/16" MIN.
WIDTH	19 1/4" MIN.
HEIGHT	15 1/8" MIN.

DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	99 Degrees
Diagonal	110 Degrees
Vertical	82 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	40 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	1700 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15¼ Inches
Width	19⁵⁄₁₆ Inches
Diagonal	22⁵⁄₁₆ Inches
Area	282 Sq. Inches
Neck Length	5⅛ Inches
Overall Length	15¾₁₆ Inches
Bulb	J187A or Equivalent
Safety Plate	FP198A or Equivalent
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-219
Basing	8KP
Weight (Approx)	32½ Pounds

RATINGS

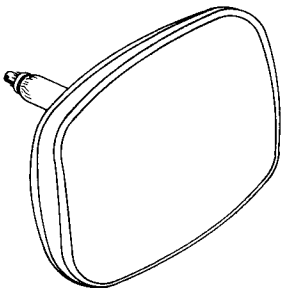
MAXIMUM RATINGS (Design Maximum Values)

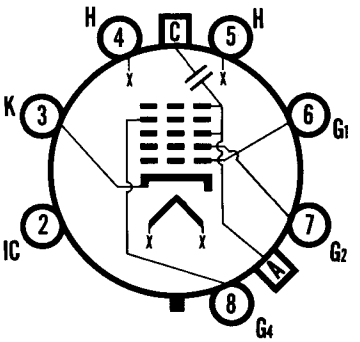
Cathode Drive Service[3]

Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	13,200 Volts	dc
Grid No. 3 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	70 Volts	dc
Cathode Voltage		
Positive Bias Value	154 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	

QUICK REFERENCE DATA

Television Picture Tube
23″ Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Neck Length 5⅛″
Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive Coating





8KP

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SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JULY, 1960

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) Cathode Drive Service[3] (Cont'd.)

Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

TYPICAL OPERATING CONDITIONS (Cathode Drive Service)[3]

Anode Voltage	16,000 Volts	dc
Grid No. 3 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage[3]	50 Volts	dc
Cathode Voltage Required for Cutoff[4]	+32 to +47 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more positive.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

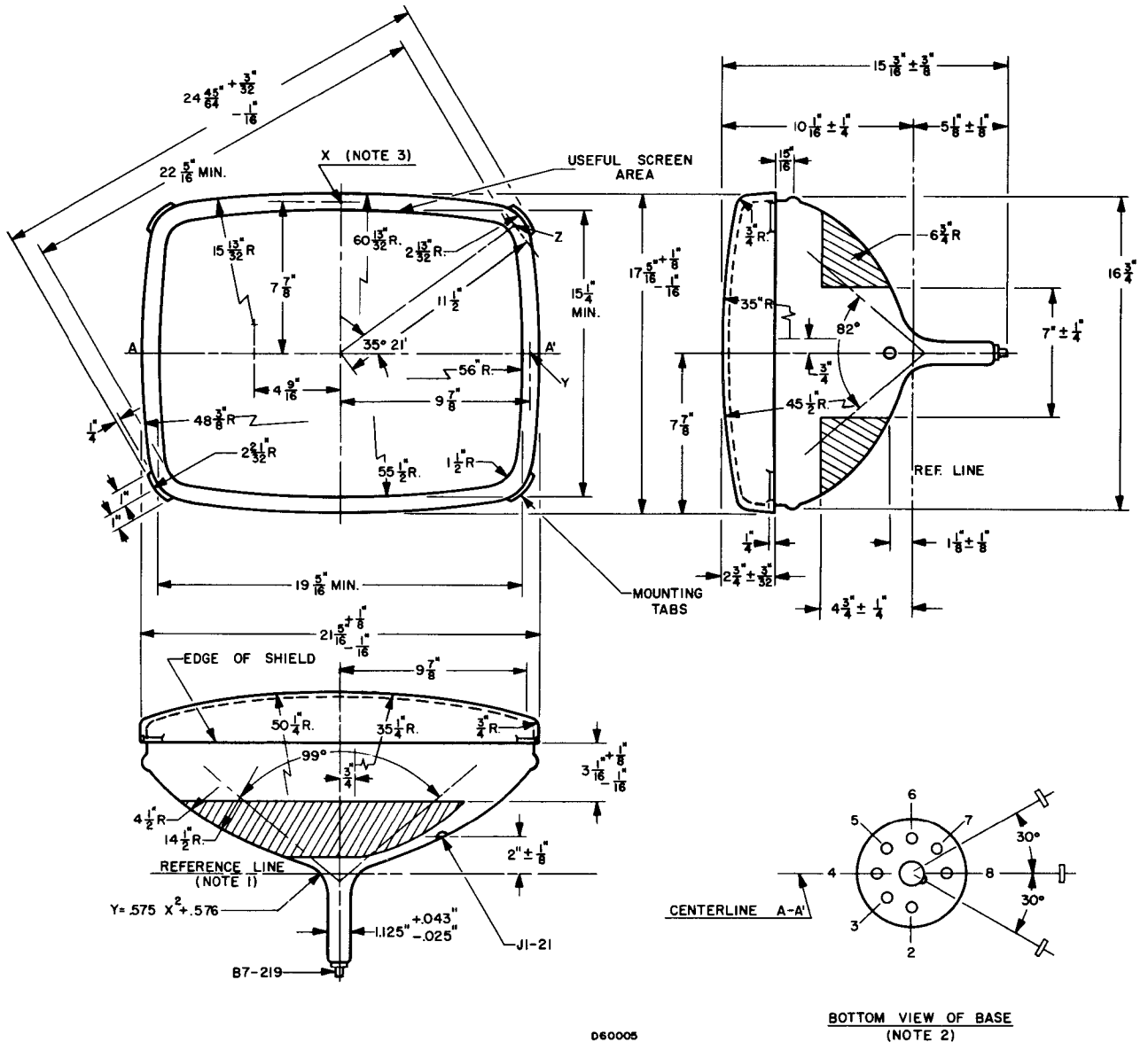


DIAGRAM NOTES:

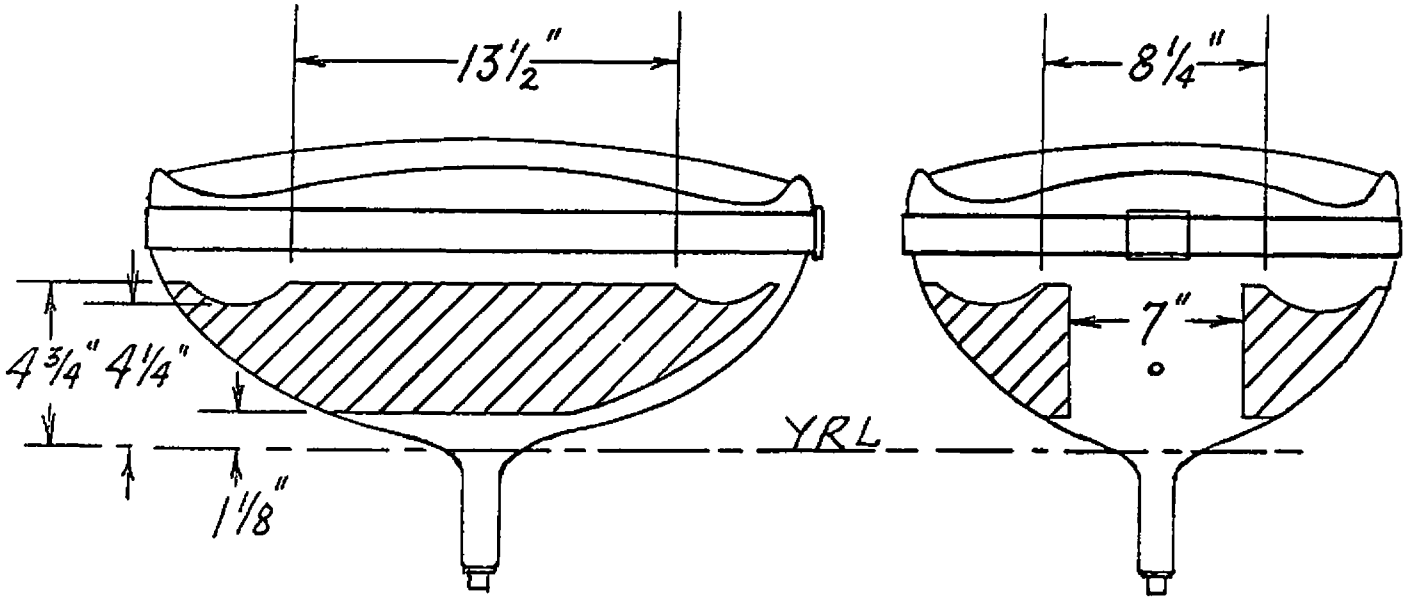
1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 8 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to the axis and passing through points X, Y and Z are located as follows:*

   Plane tangent to crown of face, to plane of X = 0.758" Nom.
   Plane of X to plane of Y = 0.463" ± .030
   Plane of X to plane of Z = 0.970" ± .030

JEDEC TYPE 23EWP4

SPONSOR: Sylvania

The 23EWP4 is identical to Type 23DZP4 as registered in Release No. 4232, dated April 22, 1963, except for a change in configuration of external conductive coating. (See below.)



CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	100 Degrees
Diagonal	114 Degrees
Vertical	83 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	42 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.45 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating and Rim Band to Anode[2]	2500 pf	Max.
	1700 pf	Min.
Resistance Between External Conductive Coating and Metal Band	50 Megohms	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15⅛ Inches
Width	19¼ Inches
Diagonal	22⅝ Inches
Minimum Useful Screen Area	282 Sq. Inches
Neck Length	5⅛ ± ⅛ Inches
Overall Length	14 17/32 ± 9/32 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Bulb	J187L
Base	B7-208
Basing	8HR
Weight (Approx.)	28 Pounds

RATINGS

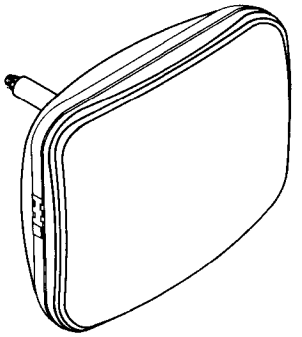
MAXIMUM RATINGS (Design Maximum Values)

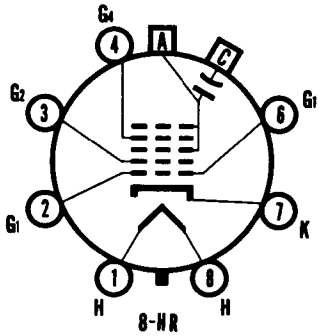
Grid Drive Service[3]

Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Maximum Grid No. 2 Voltage	550 Volts	dc
Minimum Grid No. 2 Voltage	200 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volt	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	300 Volts	
Heater Positive with Respect to Cathode	200 Volts	
DC Component	100 Volts	

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
1⅛" Neck Diameter
No Ion Trap
External Conductive Coating
Banded Tube Integral Implosion Protection





SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

JULY, 1965

File Under

TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) (Continued)

Cathode Drive Service[4]		
Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−400 to +1250 Volts	dc
Maximum Grid No. 2 Voltage	700 Volts	dc
Minimum Grid No. 2 Voltage	350 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volt	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	300 Volts	
Heater Positive with Respect to Cathode	200 Volts	
DC Component	100 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]		
Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	−200 to +200 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−48 to −96 Volts	dc
Cathode Drive Service[4]		
Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	−200 to +200 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Cathode Voltage Required for Cutoff[5]	44 to 80 Volts	dc

CIRCUIT VALUES:

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating and rim band must be grounded.*
3. *Voltages are positive with respect to Cathode unless indicated otherwise.*
4. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
5. *Visual extinction of focused raster. For cutoff of the undeflected spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

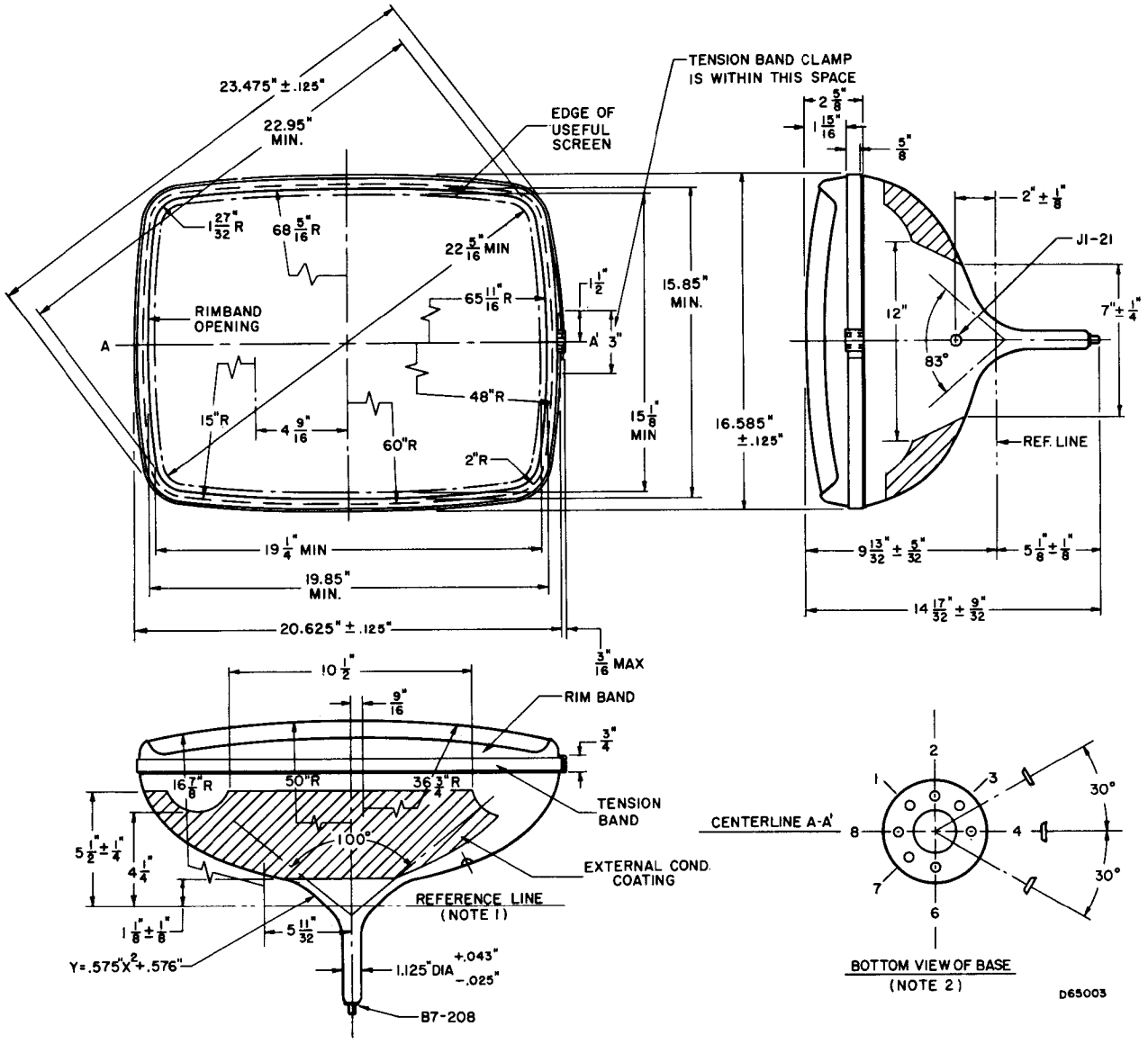


DIAGRAM NOTES:

1. *Reference Line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	100 Degrees
Diagonal	114 Degrees
Vertical	83 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	42 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating and Metal Frame to Anode[2]	2500 pf	Max.
	1700 pf	Min.
Resistance Between External Conductive Coating and Metal Frame	50 Megohms	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	15 1/8 Inches	
Width	19 1/4 Inches	
Diagonal	22 5/16 Inches	
Minimum Useful Screen Area	282 Sq. Inches	
Neck Length	5 1/8 ± 1/8 Inches	
Overall Length	14 17/32 ± 9/32 Inches	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Bulb	J187L	
Base	B7-208	
Basing	8HR	
Weight (Approx.)	28 Pounds	

RATINGS

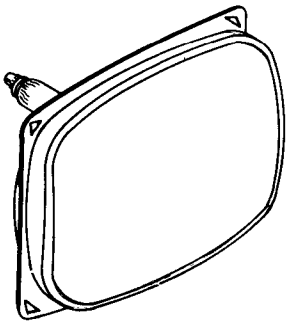
MAXIMUM RATINGS (Design Maximum Values)

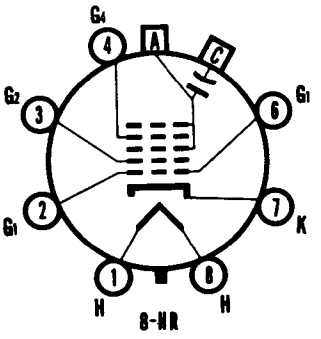
Grid Drive Service[4]

Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Maximum Grid No. 2 Voltage	550 Volts	dc
Minimum Grid No. 2 Voltage	200 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volt	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	300 Volts	
Heater Positive with Respect to Cathode	200 Volts	
DC Component	100 Volts	

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
1 1/8" Neck Diameter
No Ion Trap
External Conductive Coating
Bonded Frame (Filled Rim)
Implosion Protection





SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication
JULY, 1965

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) (Continued)

Cathode Drive Service[3]		
Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−400 to +1250 Volts	dc
Maximum Grid No. 2 Voltage	700 Volts	dc
Minimum Grid No. 2 Voltage	300 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	300 Volts	
Heater Positive with Respect to Cathode	200 Volts	
DC Component	100 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[4]		
Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	−200 to +200 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−48 to −96 Volts	dc
Cathode Drive Service[3]		
Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	−200 to +200 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Cathode Voltage Required for Cutoff[5]	44 to 80 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

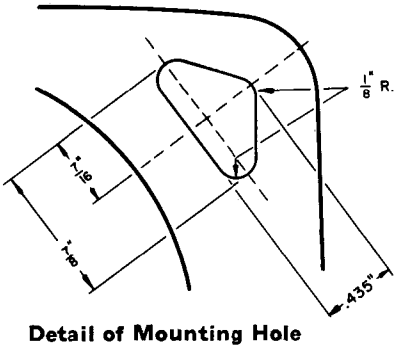
NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating and metal frame must be grounded.*
3. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
4. *Voltages are positive with respect to Cathode unless indicated otherwise.*
5. *Visual extinction of focused raster. For cutoff of the undeflected spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE



Detail of Mounting Hole

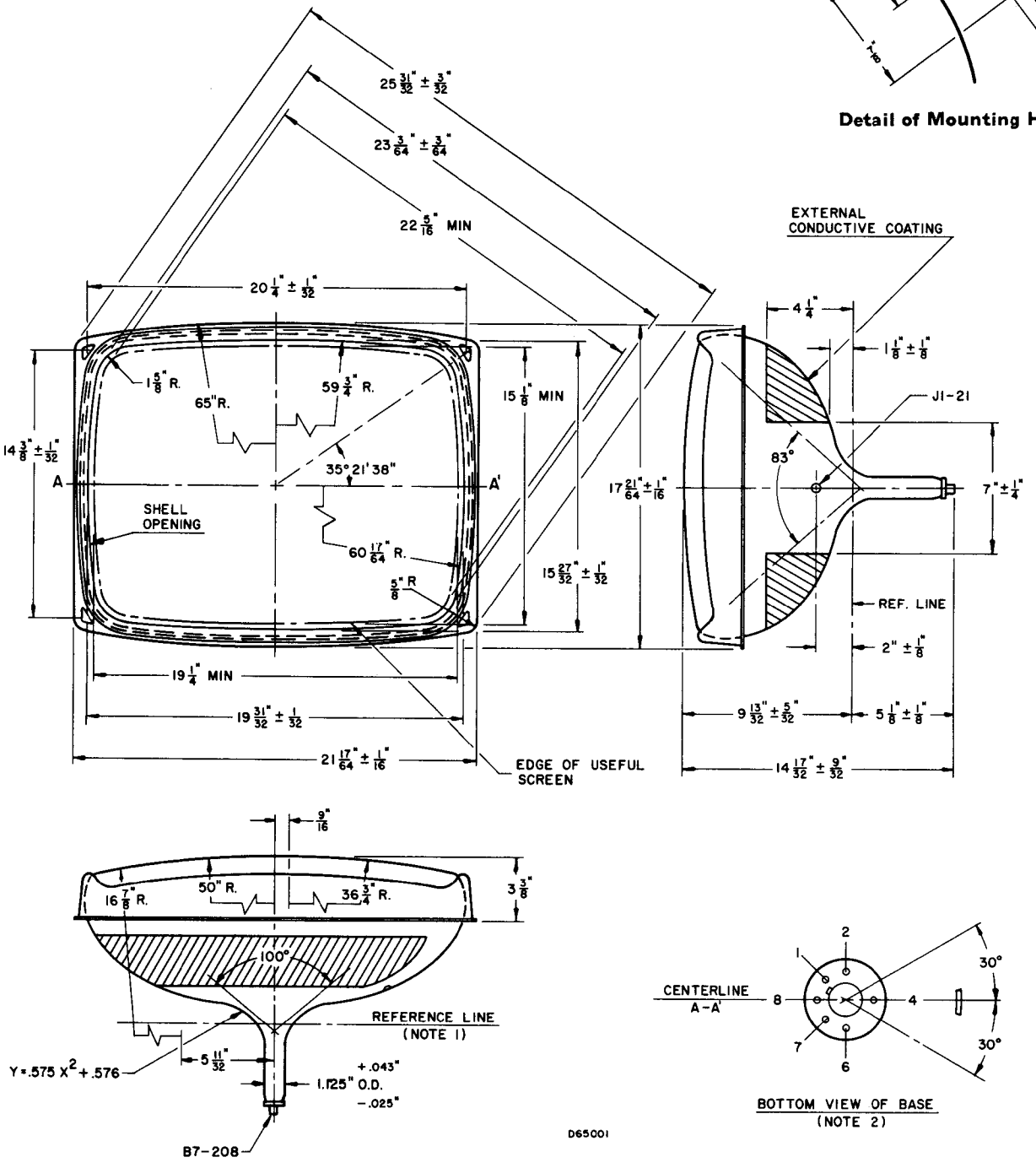


DIAGRAM NOTES:

1. *Reference Line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

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engineering data service

SYLVANIA

23JP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	99 Degrees
Diagonal	110 Degrees
Vertical	82 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	40 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.45 ± 5% Ampere	
Maximum Heater Voltage Range[1]	5.8 - 7.0 Volts	
Heater Warm-up Time[2]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 $\mu\mu$f	
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f	
External Conductive Coating to Anode[3]	2500 $\mu\mu$f	Max.
	2000 $\mu\mu$f	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15¼ Inches
Width	19$^{5}/_{16}$ Inches
Diagonal	22$^{5}/_{16}$ Inches
Area	282 Sq. Inches
Neck Length	5⅜ Inches
Overall Length	15$^{7}/_{16}$ Inches
Bulb	J187A1 or Equiv.
Safety Plate	FP198A1 or Equiv.
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-214
Basing	7FA
Weight (Approx.)	32½ Pounds

RATINGS

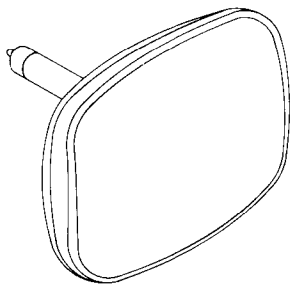
MAXIMUM RATINGS (Design Maximum Values)

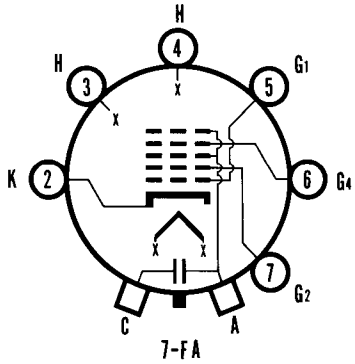
Cathode Drive Service[4]

Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	15,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Maximum Grid No. 2 Voltage	70 Volts	dc
Minimum Grid No. 2 Voltage	44 Volts	dc
Cathode Voltage	100 Volts	dc
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	410 Volts	
After Equipment Warm-up Period	180 Volts	
Heater Positive with Respect to Cathode	180 Volts	

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive Coating
Low Grid No. 2 Voltage
6.3 Volt, 450 Ma Heater





7-FA

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JULY, 1960

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS (Cathode Drive Service)[4]

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus[5 & 6]	250 Volts	dc
Grid No. 2 Voltage	50 Volts	dc
Grid No. 1 Voltage Required for Cutoff[7]	+35 to +50 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Design-Maximum Values.*
2. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
3. *External conductive coating must be grounded.*
4. *Unless otherwise specified, voltages are positive and measured with respect to Grid No. 1.*
5. *With the combined Grid No. 1 bias voltage and video signal voltage adjusted to give an anode current of 50 μa on a 19⁵⁄₁₆ x 15¼ pattern from an RCA 2F21 monoscope or equivalent.*
6. *Individual tubes will have satisfactory focus at some value between 0 and 500 volts.*
7. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more positive.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

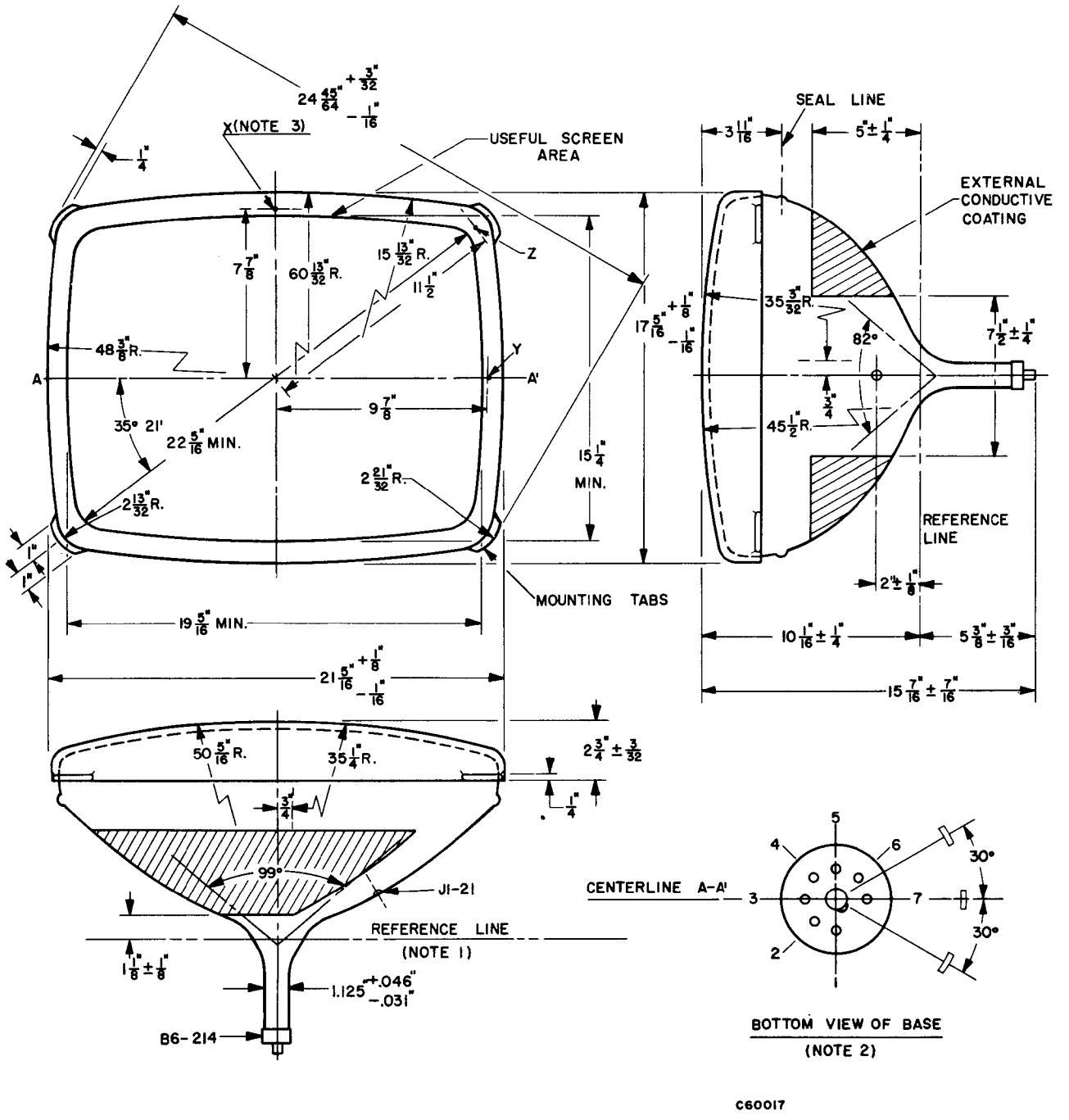


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 7 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through points X, Y, and Z are located as follows:*

   Plane tangent to crown of face to plane of X: .758" Nom.
   Plane of X to plane of Y = .463" ± .030".
   Plane of X to plane of Z = .970" ± .030".

SYLVANIA engineering data service

SYLVANIA
23MP4
23ALP4
23AMP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	100 Degrees
Diagonal	114 Degrees
Vertical	83 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	75 Percent

ELECTRICAL DATA

	23AMP4	23ALP4	23MP4		
Heater Voltage	6.3	6.3	6.3	Volts	
Heater Current ±5%	0.30	0.45	0.60	Ampere	
Heater Warm-up Time[1]	11	11	11	Seconds	
Direct Interelectrode Capacitances (Approx.)					
Cathode to All Other Electrodes			5	μμf	
Grid No. 1 to All Other Electrodes			6	μμf	
External Conductive Coating to Anode[2]			2500	μμf	Max.
			1700	μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	15	Inches
Width	19⅛	Inches
Diagonal	22-5/16	Inches
Minimum Useful Screen Area	276	Sq. Inches
Neck Length	5⅛ ± ⅛	Inches
Overall Length	14⅜ ± 5/16	Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Bulb	J187B1	
Base	B7-208	
Basing	8HR	
Weight (Approx.)	26	Pounds

RATINGS

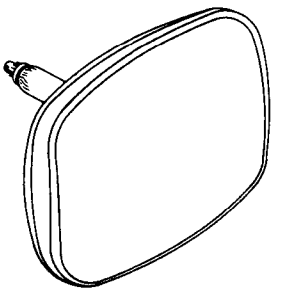
MAXIMUM RATINGS (Design Maximum Values)

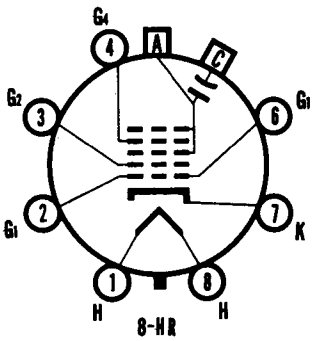
Grid Drive Service[4]

Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Maximum Grid No. 2 Voltage	550 Volts	dc
Minimum Grid No. 2 Voltage	200 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
114° Magnetic Deflection
1⅛" Neck Diameter
No Ion Trap
External Conductive Coating





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SENECA FALLS, NEW YORK
Prepared and Released By The
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EMPORIUM, PENNSYLVANIA
OCTOBER, 1961

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) (Continued)

Cathode Drive Service[3]

Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−400 to +1250 Volts	dc
Maximum Grid No. 2 Voltage	700 Volts	dc
Minimum Grid No. 2 Voltage	300 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During		
Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[4]

Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−46 to −94 Volts	dc

Cathode Drive Service[3]

Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Cathode Voltage Required for Cutoff[5]	42 to 78 Volts	dc

CIRCUIT VALUES

Grid No 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
4. *Voltages are positive with respect to Cathode unless indicated otherwise.*
5. *Visual extinction of focused raster. For cutoff of the undeflected spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

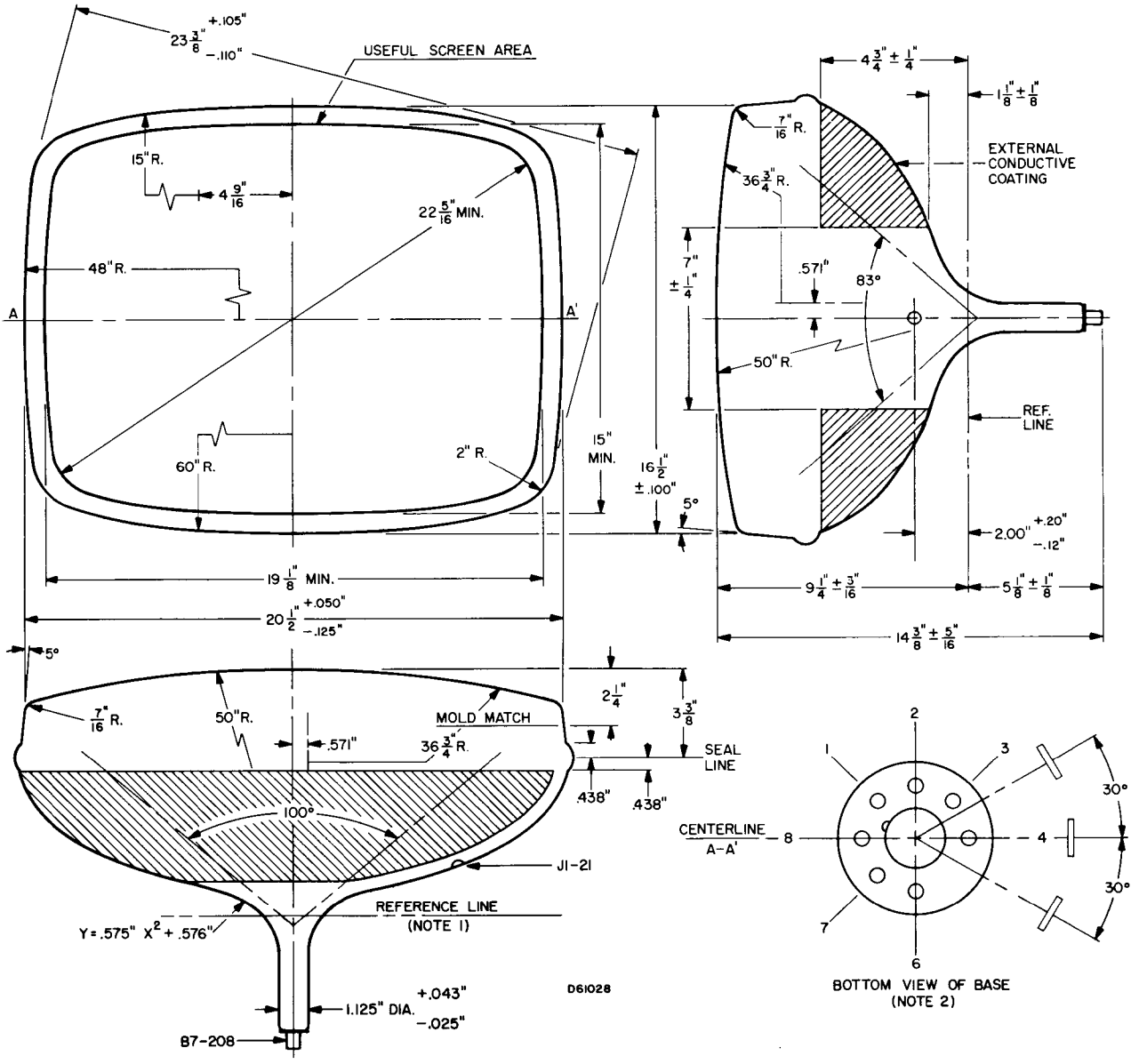

DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

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23UP4
23BQP4
23CBP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	99 Degrees
Diagonal	110 Degrees
Vertical	82 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	40 Percent

Type 23CBP4 has external surface of safety plate treated to reduce specular reflection.

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.45 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 $\mu\mu$f	
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f	
External Conductive Coating to Anode[2]	2500 $\mu\mu$f	Max.
	2000 $\mu\mu$f	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15¼ Inches
Width	19 5/16 Inches
Diagonal	22 5/16 Inches
Area	282 Sq. Inches
Neck Length	5⅛ ± ⅛ Inches
Overall Length	15 3/16 ± ⅜ Inches
Bulb	J187A
Safety Plate (23UP4, 23BQP4)	EP198A
Safety Plate (23CBP4)	FP198B
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight	32½ Pounds

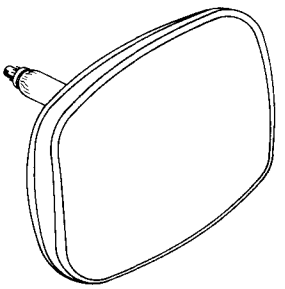
RATINGS

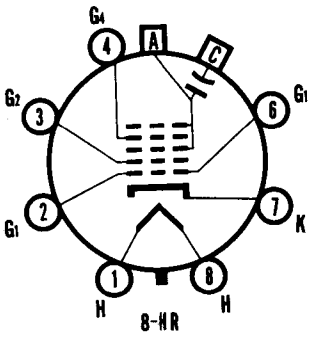
MAXIMUM RATINGS (Design Maximum Values)

Grid Drive Service[4]	23BQP4 23CBP4	23UP4		
Maximum Anode Voltage	23,000	18,000	Volts	dc
Minimum Anode Voltage	12,000	10,000	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100		Volts	dc
Maximum Grid No. 2 Voltage	550		Volts	dc
Minimum Grid No. 2 Voltage	200		Volts	dc
Grid No. 1 Voltage				
Negative Bias Value	155		Volts	dc
Negative Peak Value	220		Volts	
Positive Bias Value	0		Volts	dc
Positive Peak Value	2		Volts	
Peak Heater-Cathode Voltage				
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450		Volts	
After Equipment Warm-up Period	200		Volts	
Heater Positive with Respect to Cathode	200		Volts	

QUICK REFERENCE DATA

Television Picture Tube
23" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110 Magnetic Deflection
No Ion Trap
External Conductive Coating
6.3 Volts, 450 Ma Heater





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SENECA FALLS, NEW YORK

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OCTOBER, 1961

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) (Continued)

	23BQP4 23CBP4	23UP4	
Cathode Drive Service[3]			
Maximum Anode Voltage	23,000	18,000 Volts	dc
Minimum Anode Voltage	12,000	10,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)		−400 to +1250 Volts	dc
Grid No. 2 Voltage		700 Volts	dc
Cathode Voltage			
Positive Bias Value		155 Volts	dc
Positive Peak Value		220 Volts	
Negative Bias Value		0 Volts	dc
Negative Peak Value		2 Volts	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode During			
Warm-up Period Not to Exceed 15 Seconds		450 Volts	
After Equipment Warm-up Period		200 Volts	
Heater Positive with Respect to Cathode		200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[4]		
Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−46 to −94 Volts	dc
Cathode Drive Service[3]		
Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Cathode Voltage Required for Cutoff[5]	42 to 78 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating must be grounded.*
3. *Voltages are positive with respect to Grid No. 1 unless indicated otherwise.*
4. *Voltages are positive with respect to Cathode unless indicated otherwise.*
5. *Visual extinction of focused raster. For cutoff of the undeflected spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

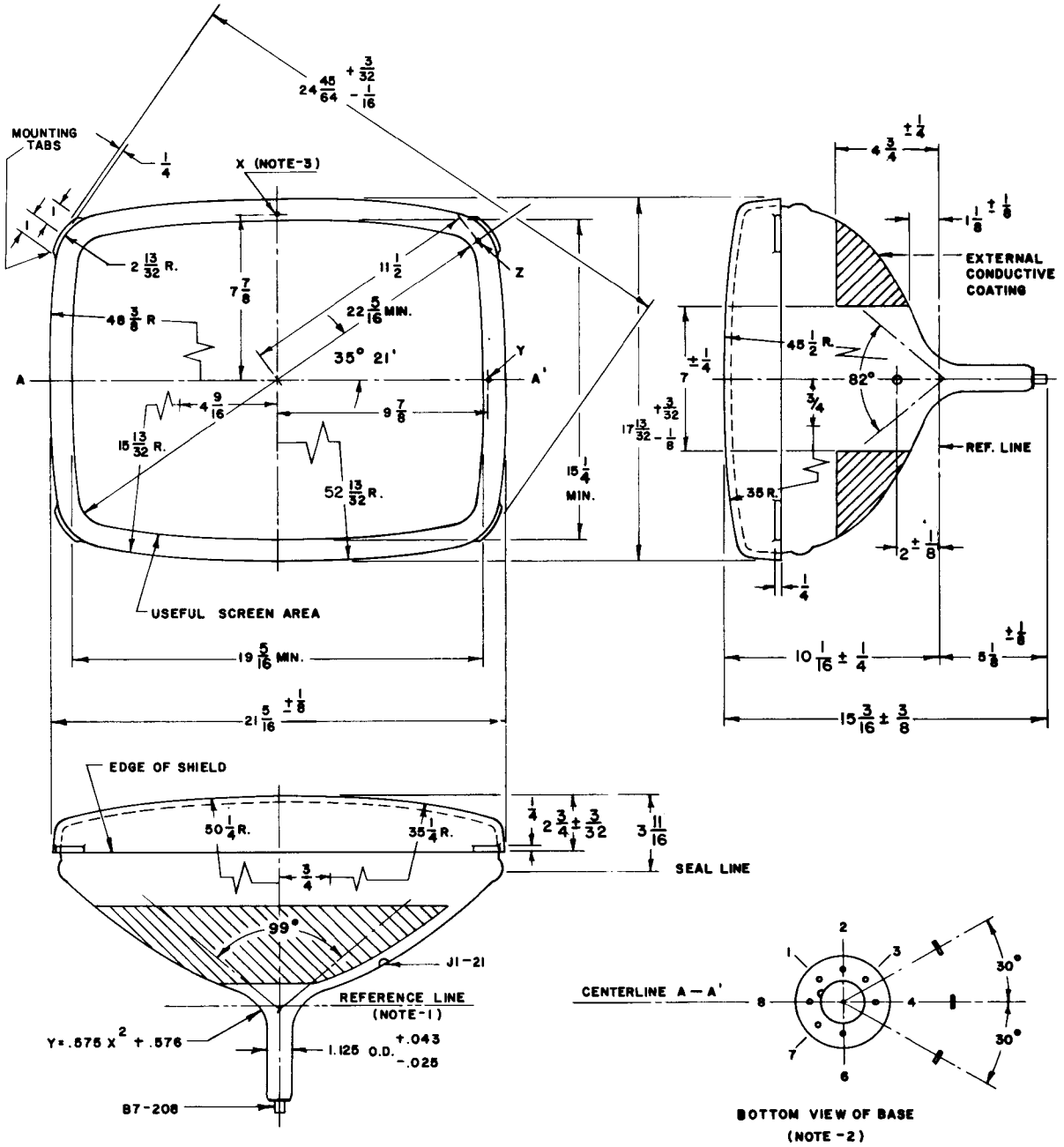


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through points X, Y, and Z are located as follows:*
   Plane tangent to crown of face to plane of X: .758" Nom.
   Plane X to plane of Y = .463" ± .030"
   Plane X to plane of Z = .970 ± .030"
4. *Dimensions are in inches.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	81 Degrees
Diagonal	92 Degrees
Vertical	66 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
(Gray Filter Glass Safety Plate Laminated Directly to Face of Tube)	
Light Transmittance of Faceplate Assembly (Approx.)	40 Percent

ELECTRICAL DATA

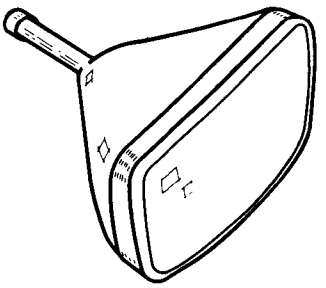
Heater Voltage	6.3 Volts	
Heater Current	0.60 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	2000 μμf	Min.

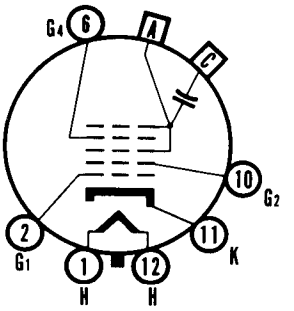
MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	15 ¼ Inches
Width	19 5/16 Inches
Diagonal	22 5/16 Inches
Area	282 Sq. Inches
Neck Length	5 ½ ± 3/16 Inches
Overall Length	18 5/16 ± 7/16 Inches
Bulb	J187D or J187G
Safety Plate	
23BTP4, 23XP4, 23YP4	FP198A
23BDP4	FP198B
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-203
Basing	12L
Weight (Approx.)	34 ½ Pounds

QUICK REFERENCE DATA

Television Picture Tubes
23XP4: Low Voltage
23BDP4, 23BTP4, 23YP4: High Voltage
23" Direct Viewed
Rectangular Glass Types
Spherical Faceplate
Bonded Shield
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
92° Magnetic Deflection
No Ion Trap
External Conductive Coating
23BDP4: Anti-Reflection Treated





12-L

SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

PICTURE TUBE
OPERATIONS

SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JUNE, 1962

File Under
TELEVISION PICTURE TUBES

RATINGS

MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

	23BDP4	23BTP4	23XP4	23YP4	
Maximum Anode Voltage	22,000	25,000	18,000	22,000 Volts	dc
Minimum Anode Voltage	12,000	15,000	8,000	12,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)			−550 to +1100	Volts	dc
Grid No. 2 Voltage	700			550 Volts	dc
Grid No. 1 Voltage					
Negative Bias Value				155 Volts	dc
Negative Peak Value				220 Volts	
Positive Bias Value				0 Volts	dc
Positive Peak Value				2 Volts	
Peak Heater-Cathode Voltage					
Heater Negative with Respect to Cathode					
During Warm-up Period Not to Exceed 15 Seconds				450 Volts	
After Equipment Warm-up Period				200 Volts	
Heater Positive with Respect to Cathode				200 Volts	

TYPICAL OPERATING CONDITIONS

	23BDP4 Cathode Drive Service[4]	23BTP4, 23XP4, 23YP4 Grid Drive Service	
Anode Voltage	16,000	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400	0 to +400 Volts	dc
Grid No. 2 Voltage	500	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]		−35 to −72 Volts	dc
Cathode Voltage required for Cutoff[3]	45 to 95	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be increased about 5 volts.*
4. *Voltages shown are positive with respect to Grid No. 1.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

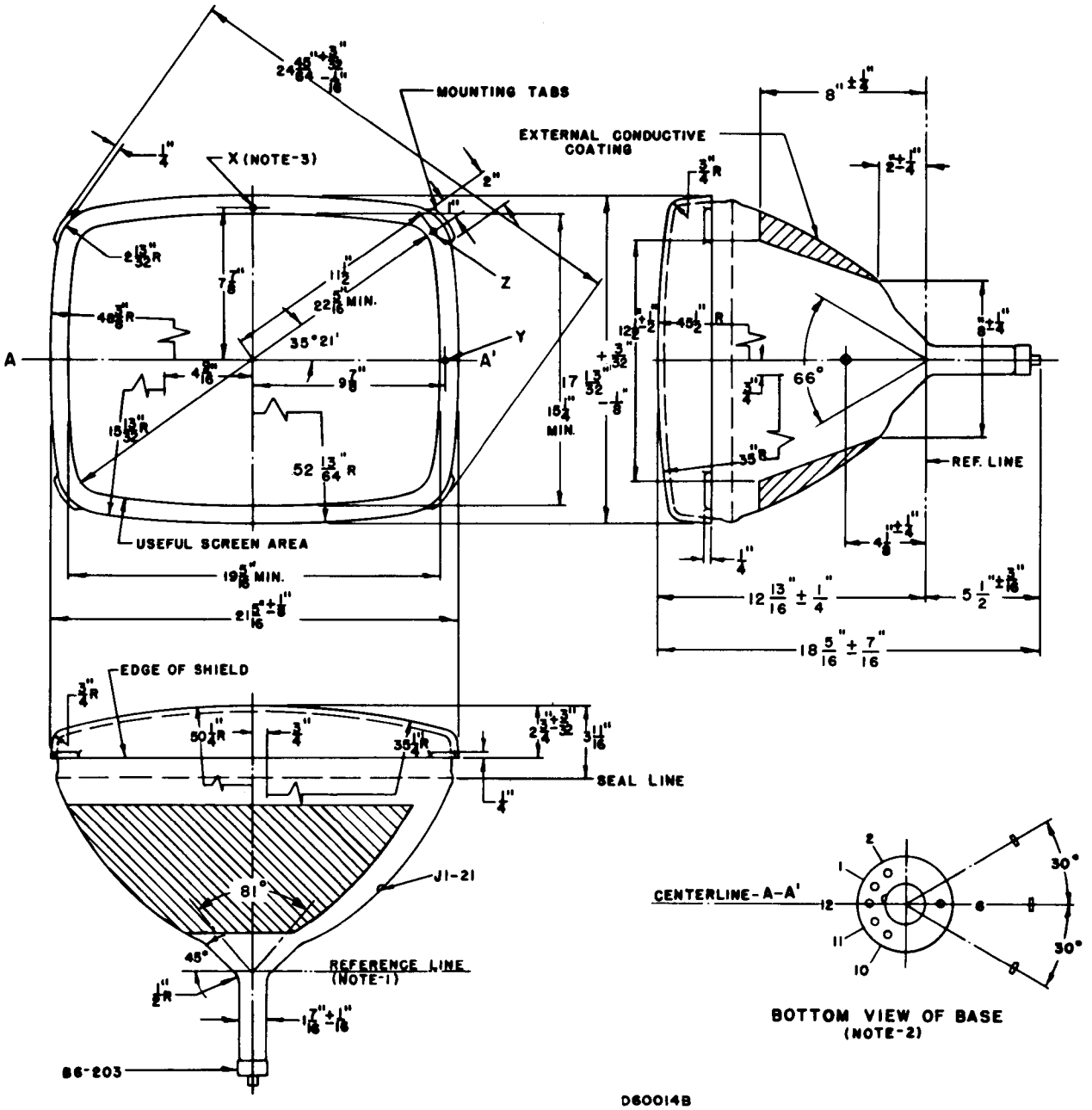
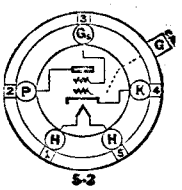


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No. 116 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 6 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*
3. *Planes perpendicular to tube axis and passing through points X, Y and Z are located as follows:*
   Plane tangent to crown of face to plane of X: .758" Nom.
   Plane of X to plane of Y = .463" ± .030".
   Plane of X to plane of Z = .970" ± .030".

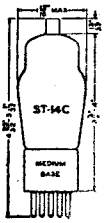


5-2

Sylvania

TYPE 24A

AMPLIFICATEUR H. F. A GRILLE ECRAN



CARACTERISTIQUES

Tension de chauffage CA	2,5 volts
Courant de chauffage	1,75 ampère
Ampoule	ST-14C
Culot — Moyen 5 broches	5-E
Position de montage	Toutes

Capacités directes interélectrodes :

Grille à plaque (avec blindage)	0,007 $\mu\mu$F **max.**
Entrée	5,3 $\mu\mu$F
Sortie	10,5 $\mu\mu$F

Conditions de fonctionnement et caractéristiques :

Tension de chauffage*	2,5	2,5 volts
Tension plaque	180	250 volts
Tension grille	—3	—3 volts
Tension écran	90	90 volts max.
Courant plaque	4	4 ma.
Courant écran	1,7	1,7 ma. max.
Résistance interne	0,4	0,6 mégohm
Conductance mutuelle	1,000	1,050 μmhos
Coefficient d'amplification	400	630

* Une pratique recommandée est de ne pas avoir de différence de potentiel entre filament et cathode. Si cette pratique n'est pas suivie le filament peut avoir une tension négative inférieure à 45 volts par rapport à la cathode.

APPLICATION

Le tube Sylvania 24A est un amplificateur H.F. à grille écran à chauffage indirect. Il est employé dans des récepteurs anciens, principalement comme amplificateur H.F. Il peut également être utilisé comme amplificateur B.F. ou comme détecteur. Le tube 24A est fabriqué principalement pour le remplacement.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflection Angles (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	75 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ±5% Ampere
Heater Warm-up Time[1]	11 Seconds
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6 μμf
External Conductive Coating to Anode[2]	2500 μμf Max.
	2000 μμf Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	$21\frac{7}{16}$ x 16⅞ Inches
Minimum Useful Screen Area	332 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12N

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	24,200 Volts dc
Grid No. 2 Voltage	660 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	155 Volts dc
Negative Peak Value	220 Volts
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	18,000 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[3]	−28 to −72 Volts dc
Focusing Coil Current[4]	125 ±15% Ma dc
Ion Trap Magnet Current (Average)[5]	32 Ma dc
Field Strength of PM Ion Trap Magnet[6]	36 Gausses Min.

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

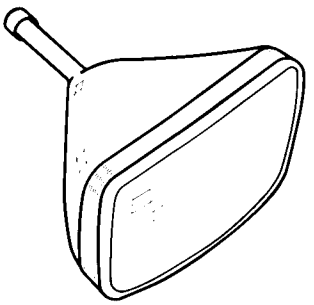
NOTES:

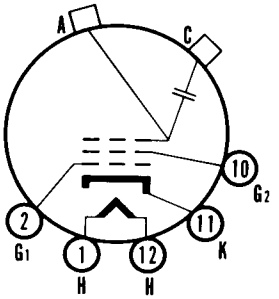
(Continued on Page 2)

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*
2. *External conductive coating must be grounded.*

QUICK REFERENCE DATA

Television Picture Tube
24" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Magnetic Focus
Single Field Ion Trap
External Conductive Coating
Aluminized Screen





12-N

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION

SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

APRIL 1956

3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*
4. *For JETEC focusing coil 109 or equivalent three inches from reference line, bias adjusted to 30 foot lamberts on a 21 7/16 x 16 7/8 inch picture area sharply focused at center of screen.*
5. *For JETEC Ion Trap Magnet No. 117 with pole pieces centered over Grid No. 2 on mount, and rotated for maximum brightness.*
6. *For typical PM ion trap magnet with field strength tolerance of ±3 gausses.*

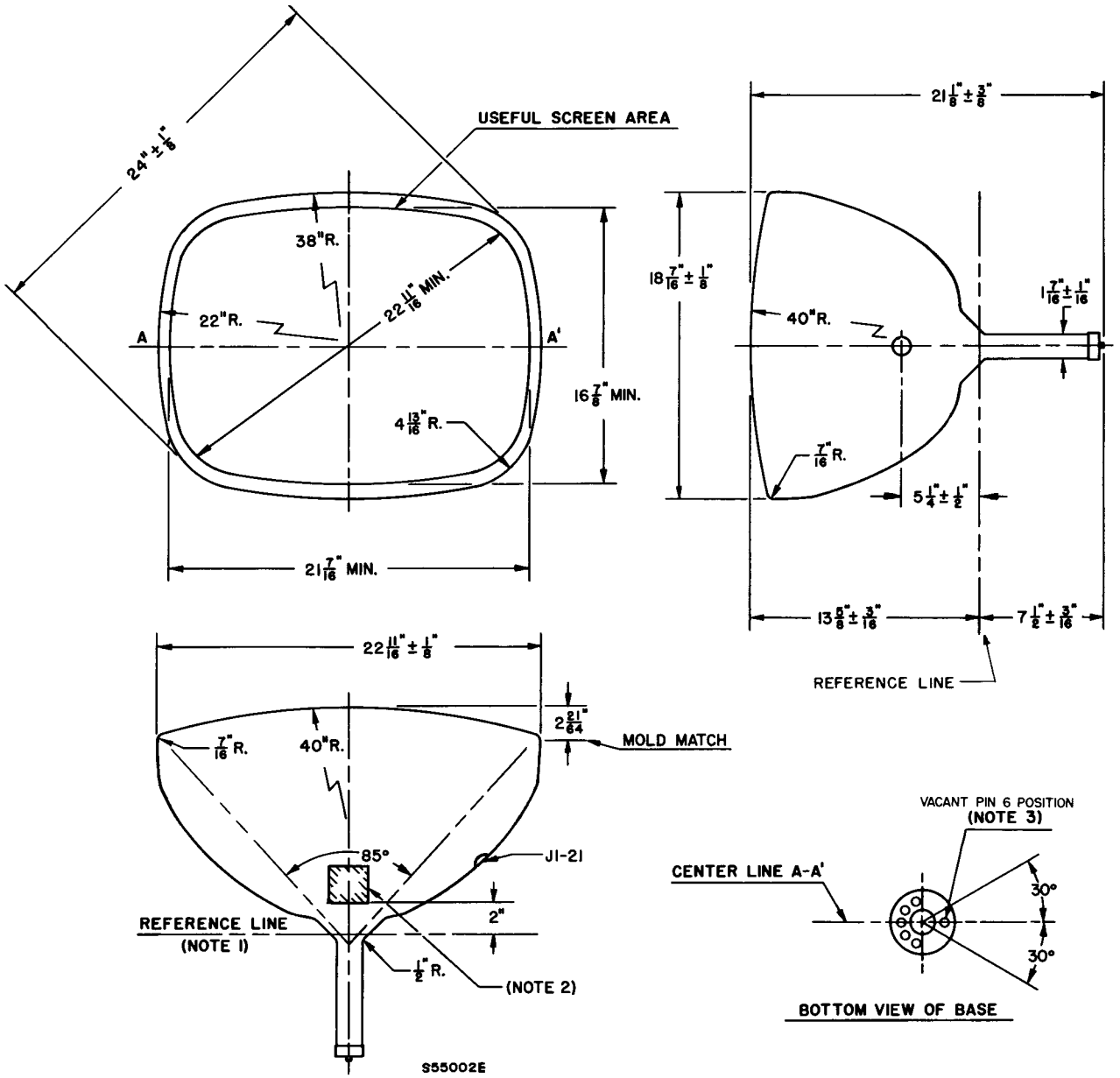


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone.*
2. *Contact area for external conductive coating, 2" x 2", located 90 degrees counterclockwise from anode contact as viewed from base end of tube.*
3. *Anode contact aligns with vacant pin position No. 6 ±30 degrees.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

SYLVANIA

engineering data service

24AEP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	70 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	2000 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Max. assured)	
Width	21 7/16 Inches
Height	16 7/8 Inches
Diagonal	22 13/16 Inches
Minimum Useful Screen Area	332 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-63
Basing	12L

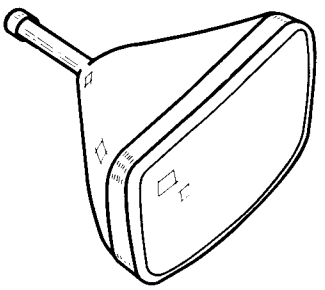
RATINGS

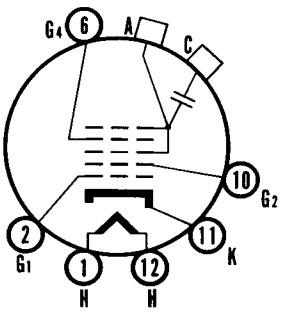
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	22,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
24" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
90° Magnetic Deflection
Short Neck Tube
No Ion Trap
External Conductive Coating





12-L

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JULY, 1957

TYPICAL OPERATING CONDITIONS

Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	−50 to +350 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

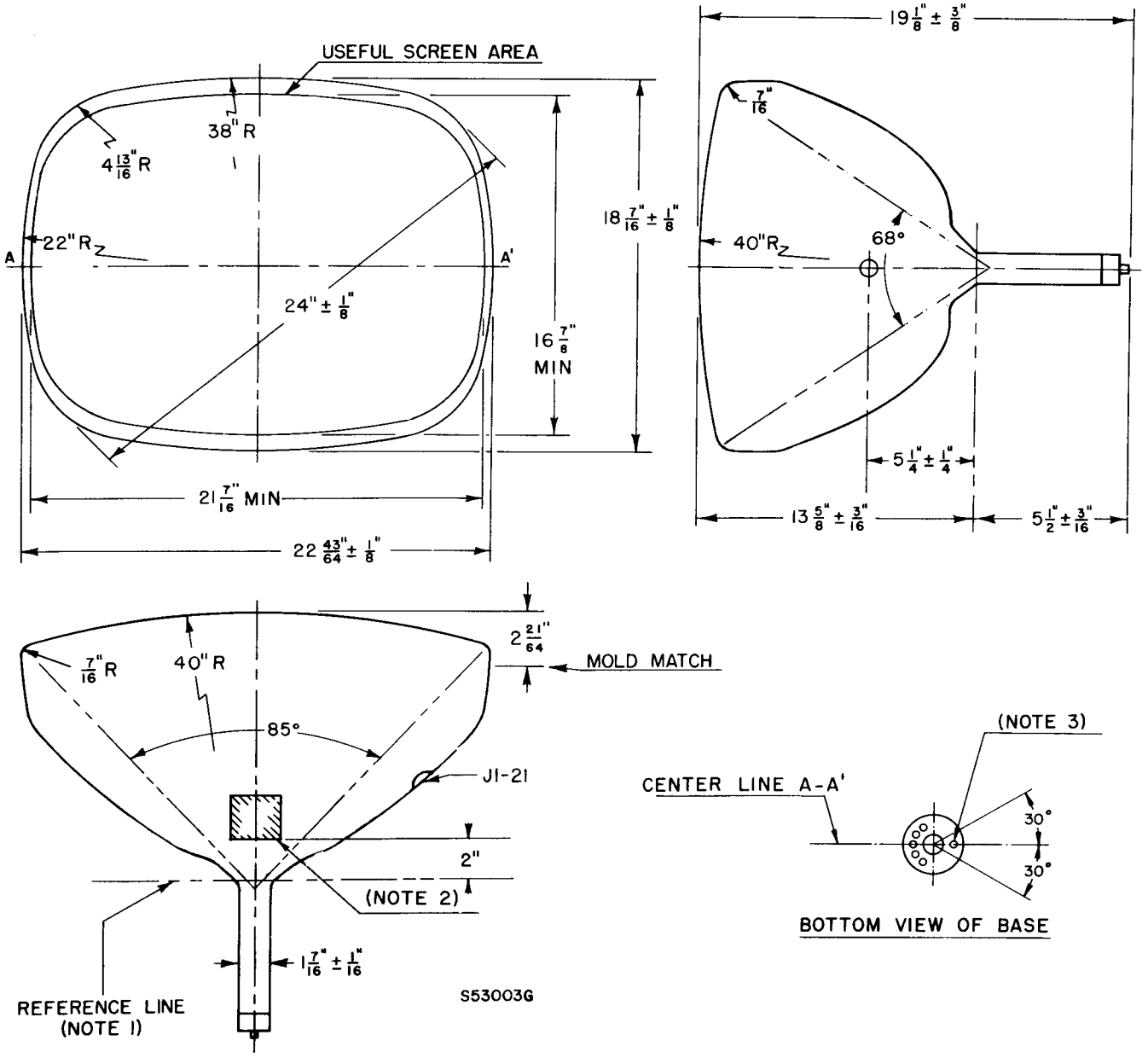


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C¹ of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone. The neck diameter near the cone may exceed 1.500" but is limited by the internal contour of the yoke reference line gauge.*
2. *Useful screen area.*
3. *Anode contact aligns with pin No. 6 ±30 degrees.*

SYLVANIA

engineering data service

SYLVANIA

24AJP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	74 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	2000 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	16 7/8
Width	21 7/16
Diagonal	22 13/16
Minimum Useful Screen Area	332 Sq. Inches
Bulb	J192A or J192B
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)[3]

Anode Voltage	22000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	70 Volts	dc
Cathode Voltage		
Positive Bias Value	150 Volts	dc
Negative Peak Value	0 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period		
Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS (Cathode Drive Service)[3]

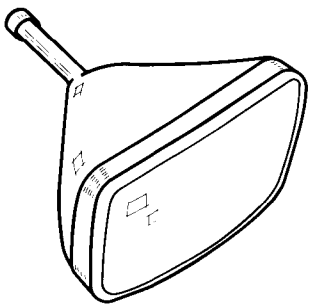
Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 350 Volts	dc
Grid No. 2 Voltage	50 Volts	dc
Cathode Voltage for Cutoff[4]	35 to 50 Volts	dc

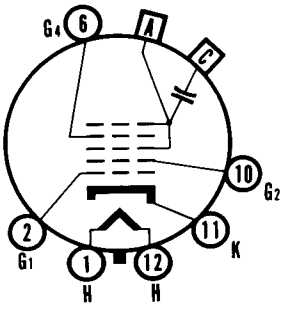
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Television Picture Tube
24" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
90° Magnetic Deflection
Cathode Drive Design
Low Grid No. 2 Voltage
No Ion Trap
Short Neck Tube
External Conductive Coating





12-L

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
DECEMBER, 1957

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating must be grounded.*
3. *This type is designed for cathode-drive service. Voltages shown are positive with respect to Grid No. 1 Voltage unless otherwise indicated.*
4. *For visual extinction of the undeflected focused spot.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

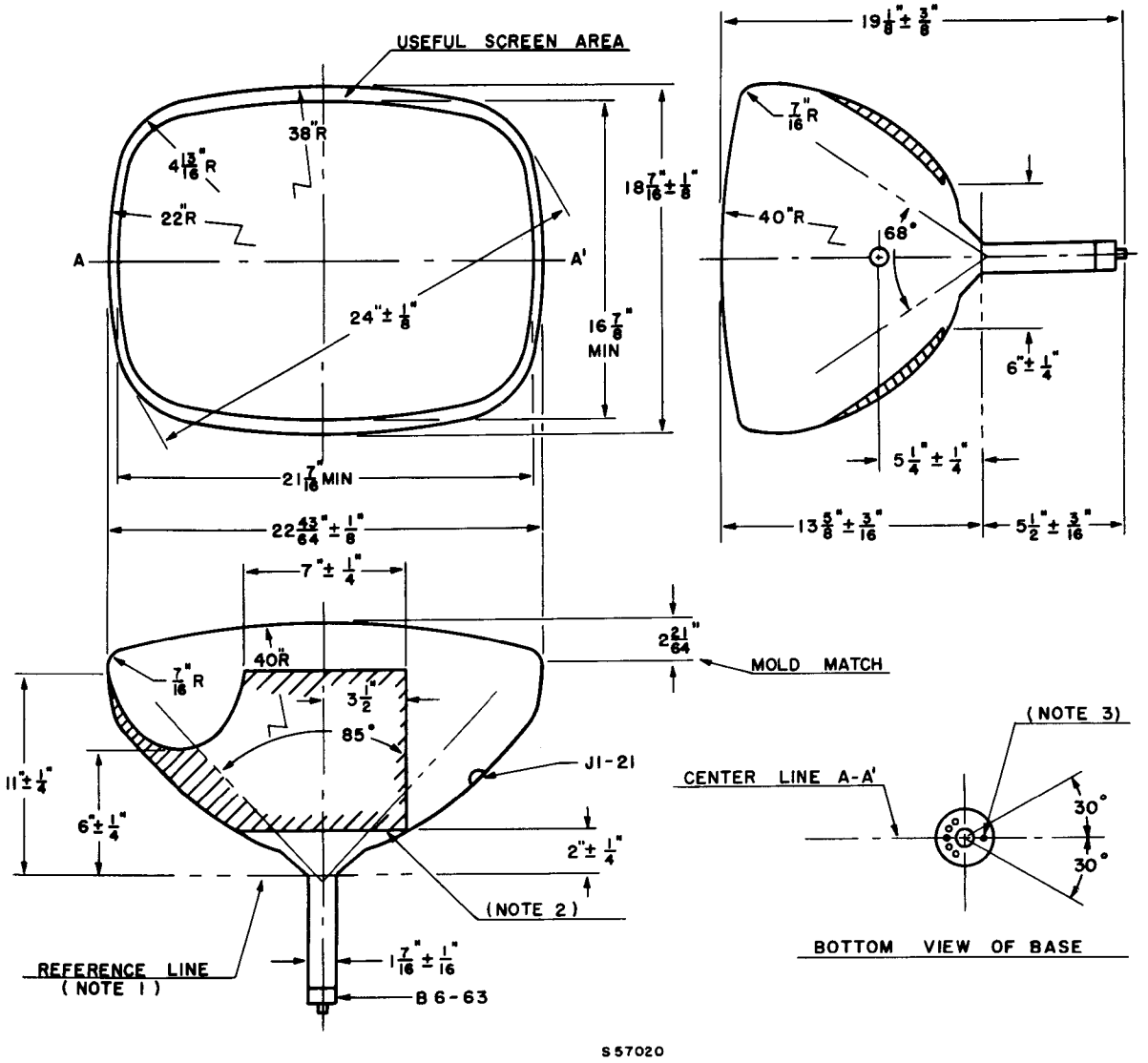


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is seated on the glass cone.*
2. *External conductive coating. Coating extends to near mold match line as dimensioned, on both long sides of bulb and on the short side opposite the anode contact.*
3. *Pin No. 6 aligns with horizontal centerline of tube, within 30°, and is on same side as anode contact.*

A Technical Publication of

SYLVANIA ELECTRIC
PRODUCTS INC.

EMPORIUM, PA.



CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	105 Degrees
Diagonal	110 Degrees
Vertical	87 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	74 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	2000 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	16 7/8 Inches
Width	21 7/16 Inches
Diagonal	22 13/16 Inches
Area	332 Sq. Inches
Bulb	J192C1 or Equivalent
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-185
Basing	7FA
Weight (approx.)	26½ Pounds

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	22,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	154 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

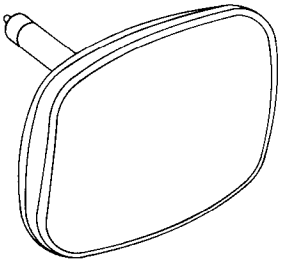
Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts	dc

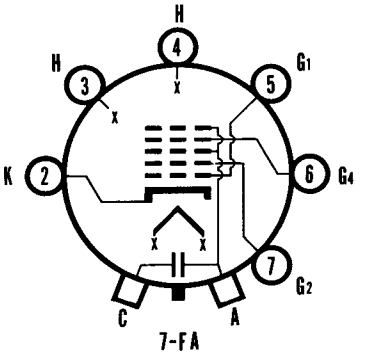
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Television Picture Tube
24" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1⅛" Neck Diameter
No Ion Trap
External Conductive Coating





SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

NOVEMBER, 1957

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

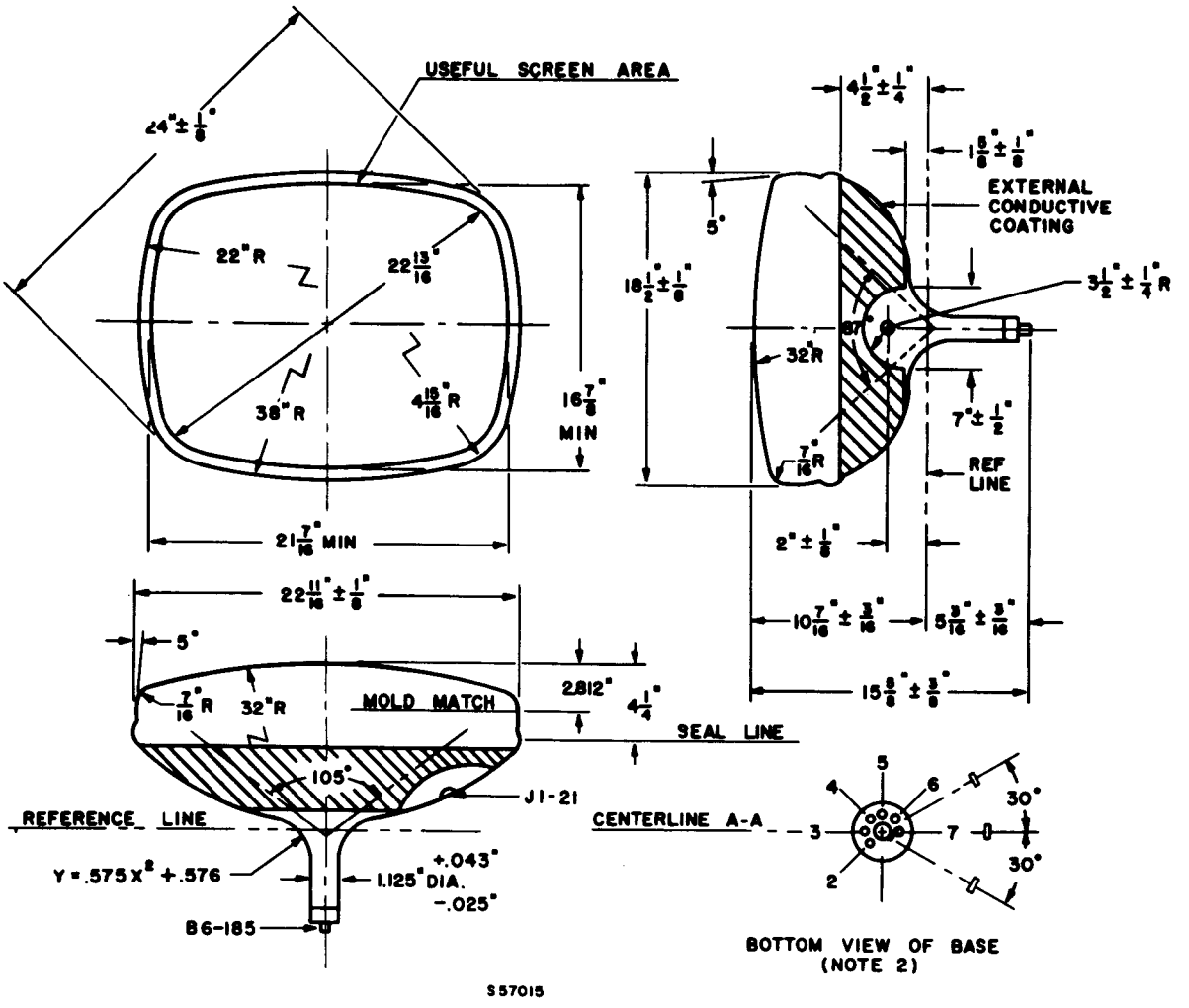


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C of JETEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base pin No. 7 aligns with horizontal centerline within 30°, and is on same side as anode contact (J1-21).*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	74 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 5% Ampere
Heater Warm-up Time[1]	11 Seconds
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
External Conductive Coating to Anode[2]	2500 $\mu\mu$f Max.
	1700 $\mu\mu$f Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	$21\frac{7}{16}$" x $16\frac{7}{8}$" Inches
Minimum Useful Screen Area	332 Sq. Inches
Bulb	J192A or J192B
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	22,000 Volts dc
Grid No. 4 Voltage (Focusing Electrode)	—550 to +1100 Volts dc
Grid No. 2 Voltage	550 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	155 Volts dc
Negative Peak Value	220 Volts
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

TYPICAL OPERATING CONDITIONS

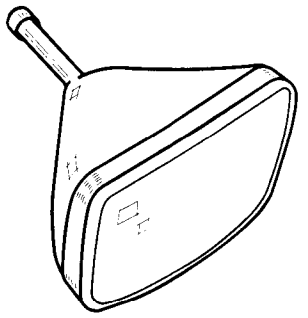
Anode Voltage	18,000 Volts dc
Grid No. 4 Voltage	—72 to +396 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[3]	—35 to —72 Volts dc
Ion Trap Magnet Current (Average)[4]	33 Ma dc
Field Strength of PM Ion Trap Magnet[5]	37 Gausses Min.

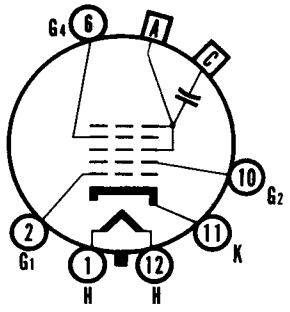
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Television Picture Tube
24" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
Single Field Ion Trap
External Conductive Coating
Aluminized Screen





12-L

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
APRIL, 1958

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*
4. *For JETEC Ion Trap Magnet No. 117 with pole pieces centered over Grid No. 2 on mount and rotated for maximum brightness.*
5. *For typical PM ion trap magnet with field strength tolerance of ±3 gausses.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

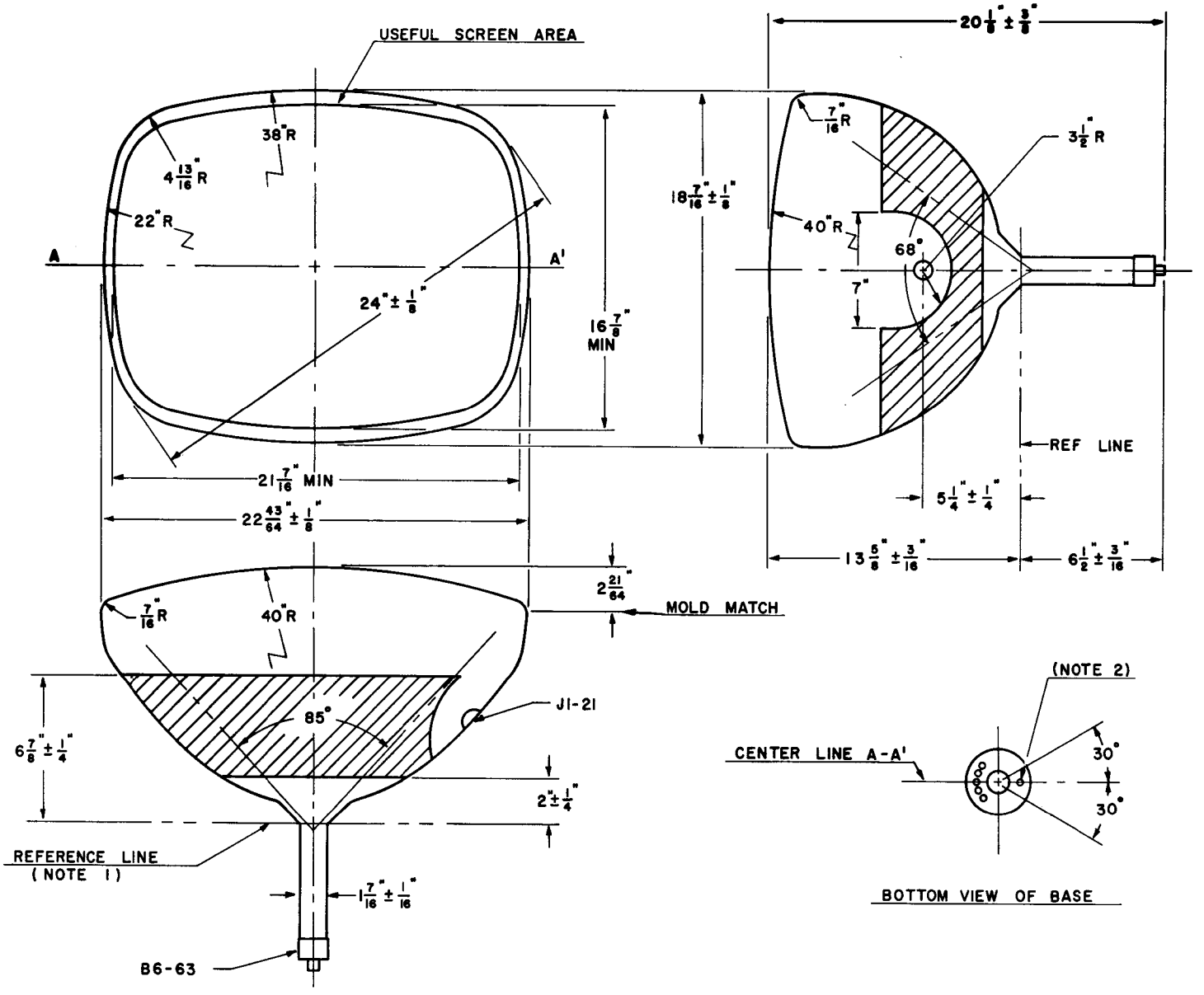


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone.*
2. *Pin No. 6 aligns with horizontal centerline of tube within 30° and is on same side as anode contact.*

A Technical Publication of
SYLVANIA ELECTRIC
PRODUCTS INC.
EMPORIUM, PA.



CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	105 Degrees
Diagonal	110 Degrees
Vertical	87 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	76 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.45 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5 $\mu\mu$f	
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f	
External Conductive Coating to Anode[2]	2500 $\mu\mu$f	Max.
	1700 $\mu\mu$f	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	16 7/8 Inches
Width	21-7/16 Inches
Diagonal	22-13/16 Inches
Area	332 Sq. Inches
Bulb	J192C or J192D
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-183
Basing	8HR
Weight (approx.)	26 1/2 Pounds

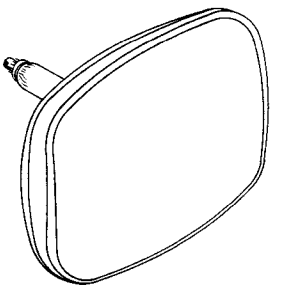
RATINGS

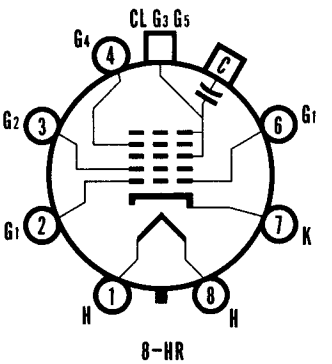
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	22,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	154 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
24" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1 1/8" Neck Diameter
No Ion Trap
External Conductive Coating
6.3 Volt, 450 Ma. Heater





8-HR

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
SEPTEMBER, 1958

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

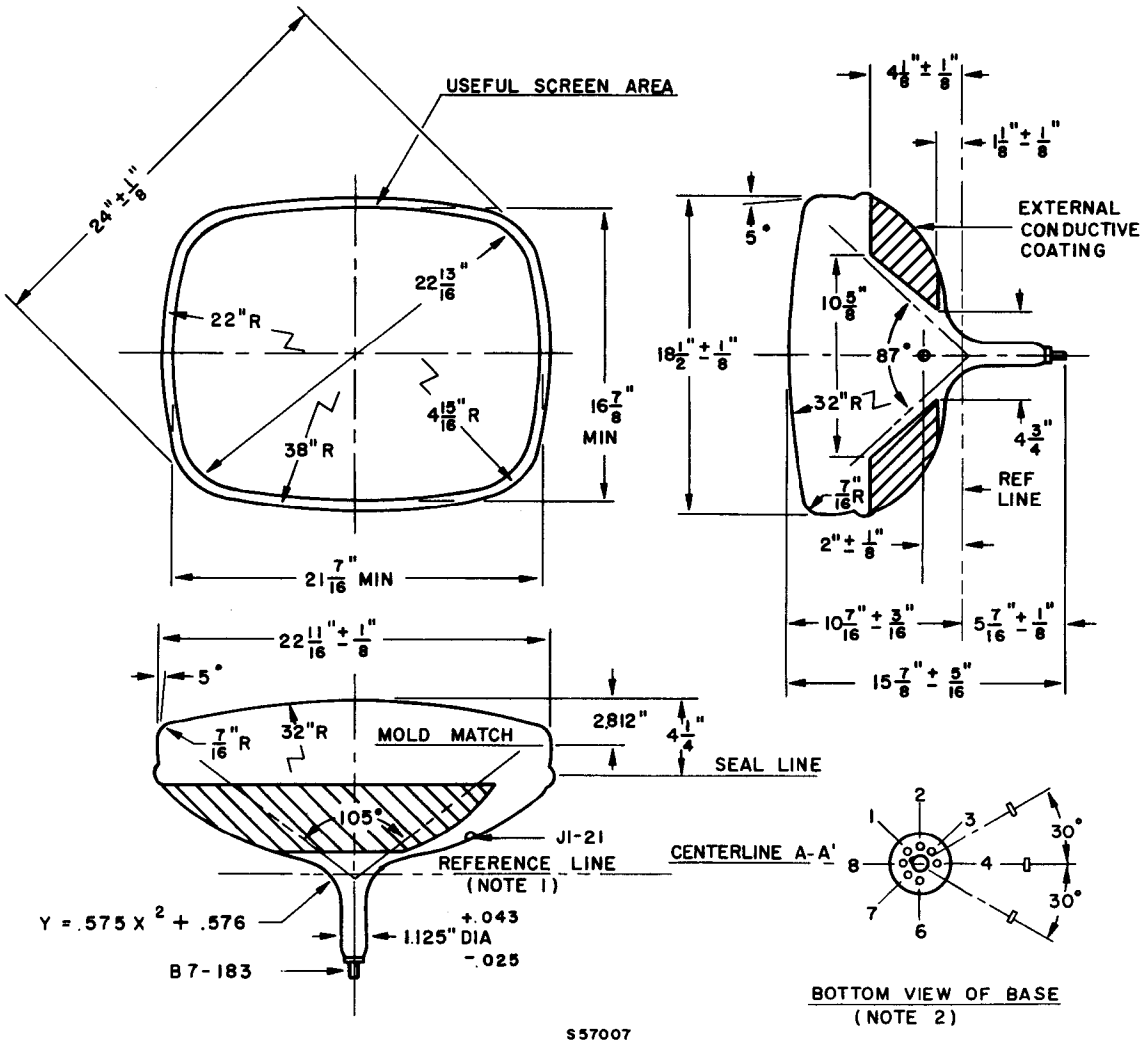


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JETEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base pin No. 4 aligns with horizontal centerline within 30°, and is on same side as anode contact (J1-21).*

A Technical Publication of
SYLVANIA ELECTRIC
PRODUCTS INC.
EMPORIUM, PA.



ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (approx.)		
Horizontal	85	Degrees
Diagonal	90	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	74	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts	
Heater Current	0.30 ± 5%	Ampere	
Heater Warm-up Time [1]	11	Seconds	
Direct Interelectrode Capacitances (approx.)			
Cathode to All Other Electrodes	5	μμf	
Grid No. 1 to All Other Electrodes	6	μμf	
External Conductive Coating to Anode [2]	2500	μμf	Max.
	1700	μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	21 7/16 x 16 7/8	Inches
Minimum Useful Screen Area	332	Sq. Inches
Bulb	J192A or J192B	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B6-63	
Basing	12L	

RATINGS

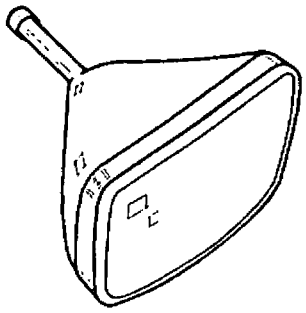
MAXIMUM RATINGS (Absolute Maximum Values)

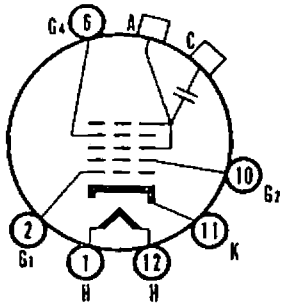
Anode Voltage	22,000	Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts	dc
Grid No. 2 Voltage	550	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	155	Volts	dc
Negative Peak Value	220	Volts	
Positive Bias Value	0	Volts	dc
Positive Peak Value	2	Volts	
Peak Heater-Cathode Voltage			
Heater Negative with respect to Cathode			
During Warm-up Period not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up Period	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

from JETEC release #2095, Feb. 3, 1958

QUICK REFERENCE DATA

Television Picture Tube
24" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
90° Magnetic Deflection
Short Neck Tube
No Ion Trap
External Conductive Coating
6.3 Volt, 300 Ma Heater





12-L

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

January 13, 1958

TYPICAL OPERATING CONDITIONS

Anode Voltage	18,000	Volts	dc
Grid No. 4 Voltage for Focus	0 to +400	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff [3]	-35 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is the time required for the voltage across the heater terminals to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times rated heater voltage divided by rated heater current.
2. External conductive coating must be grounded.
3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

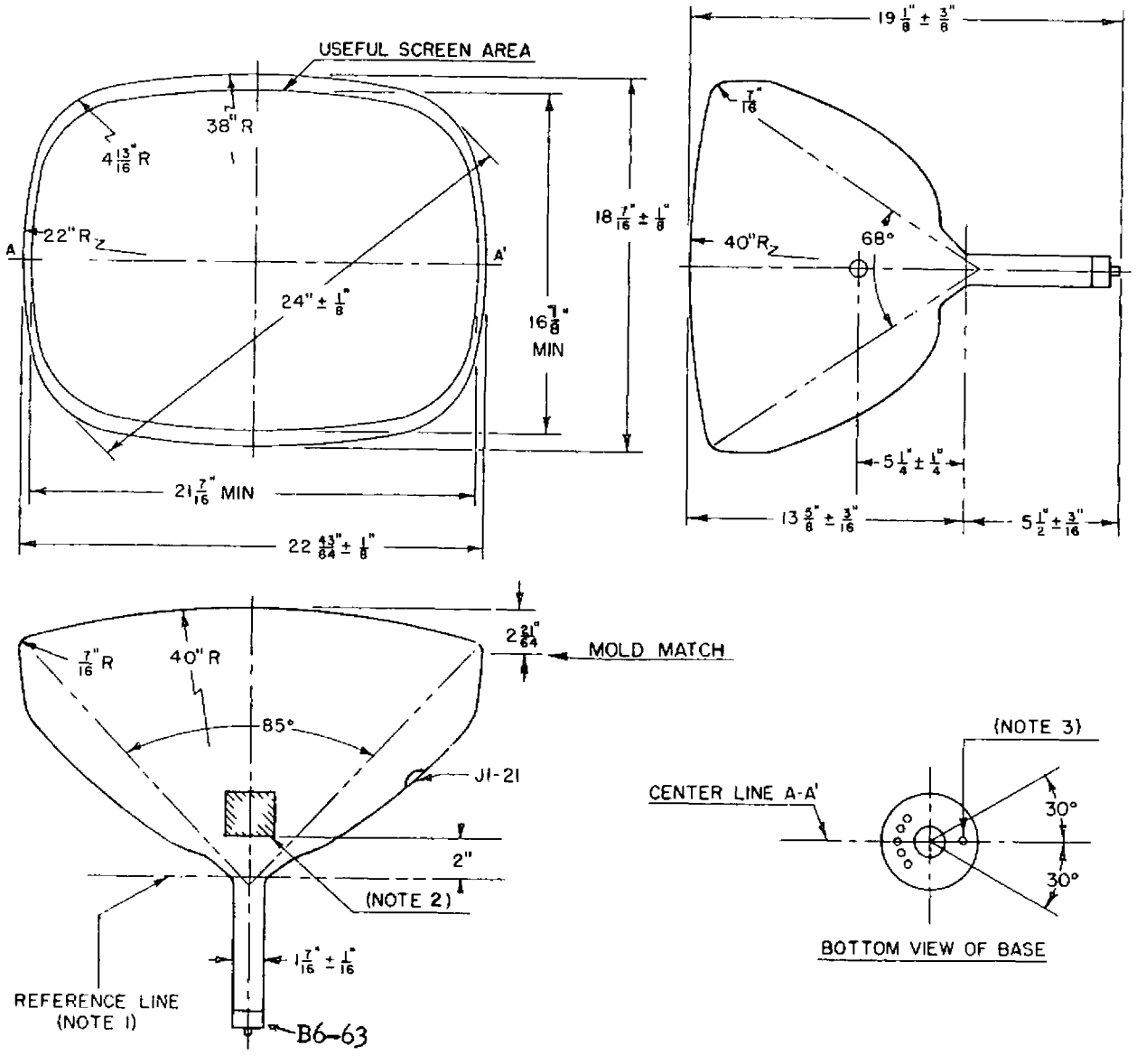


DIAGRAM NOTES:

1. Reference line is determined by the plane C-C1 of the reference line gauge (JETEC No. 116) when the gauge is seated against the bulb.

2. Contact area for external conductive coating, 2" x 2", located 90° counterclockwise from anode contact as viewed from base end of tube.

3. Anode contact aligns with pin position No. 6 ±30 degrees.

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engineering data service

SYLVANIA

24AVP4

from JETEC release #2242, July 7, 1958

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (approx.)		
Horizontal	105	Degrees
Diagonal	110	Degrees
Vertical	87	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	76	Percent

ELECTRICAL DATA

Heater Voltage	2.35	Volts
Heater Current	0.6 ± 5%	Ampere
Heater Warm-up Time[1]	11	Seconds
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	3.5	μμf
Grid No. 1 to All Other Electrodes	4	μμf
External Conductive Coating to Anode[2]	2500	μμf Max.
	1700	μμf Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	16 7/8	Inches
Width	21 7/16	Inches
Diagonal	22 13/16	Inches
Area	332	Sq. Inches
Bulb	J192C or J192D	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-208	
Basing	8JK	
Weight (approx.)	26 1/2	Pounds

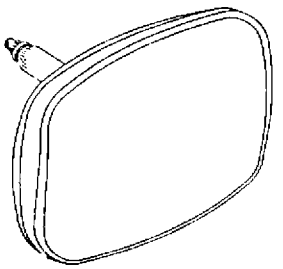
RATINGS

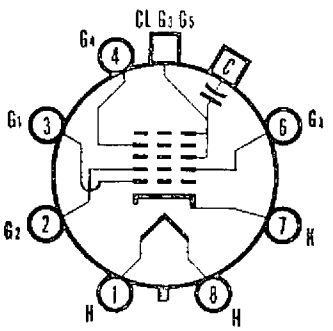
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	20,000	Volts dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts dc
Grid No. 2 Voltage	550	Volts dc
Grid No. 1 Voltage		
Negative Bias Value	154	Volts dc
Negative Peak Value	220	Volts
Positive Bias Value	0	Volts dc
Positive Peak Value	2	Volts

QUICK REFERENCE DATA

Television Picture Tube
24" Direct Viewed
Rectangular Glass Type
Short Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1 1/8" Neck Diameter
No Ion Trap
External Conductive Coating
2.35 Volt, 600 Ma. Heater





8-JK

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

June 11, 1958

Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450	Volts
After Equipment Warm-up Period	200	Volts
Heater Positive with Respect to Cathode	200	Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000	Volts	dc
Grid No. 4 Voltage for Focus	-100 to +300	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	-35 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

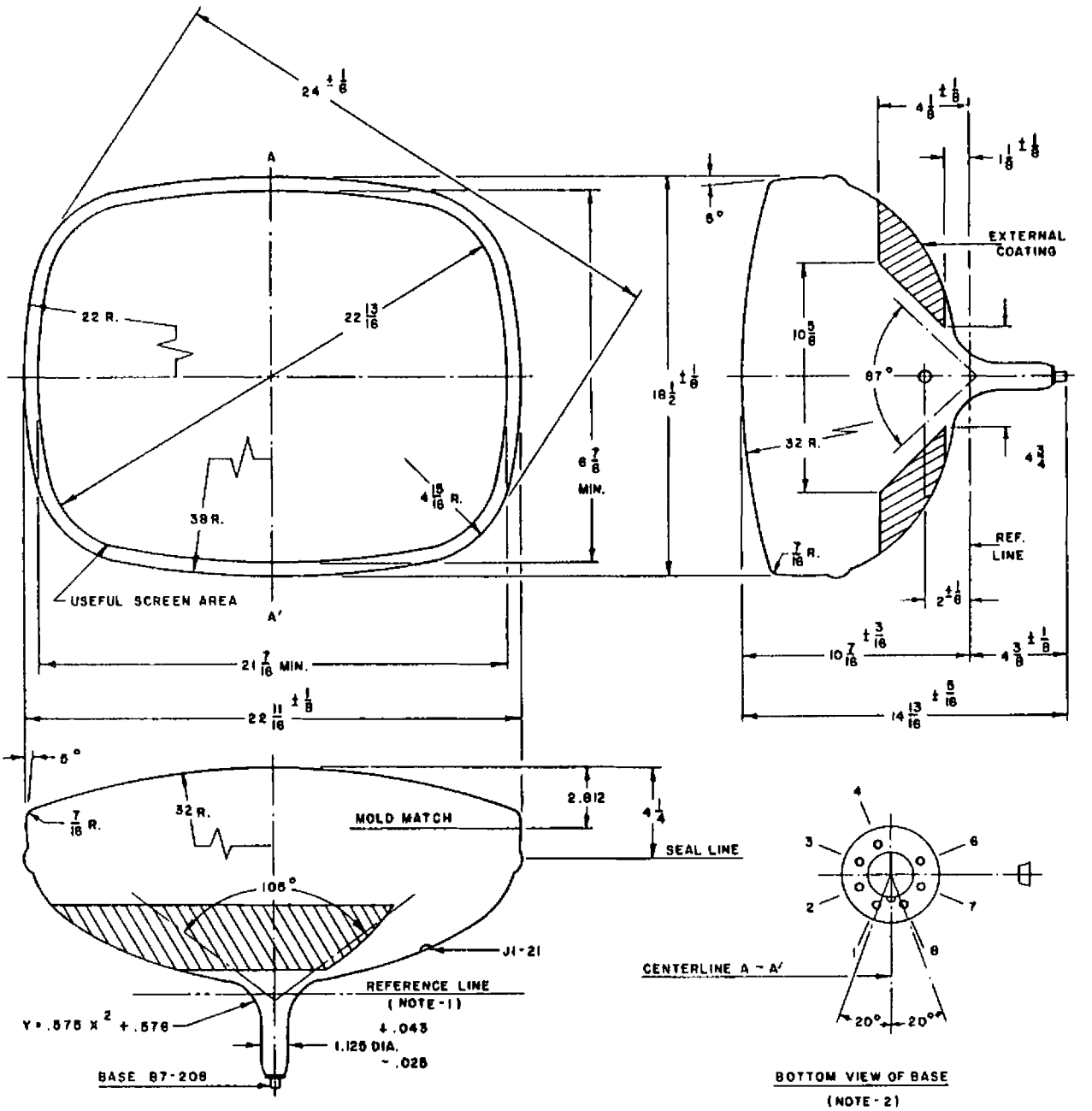


DIAGRAM NOTES:

1. Reference line is determined by plane C-C' of JETEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.

2. Base index key aligns with vertical centerline within 20°. Pins No. 6 and 7 are on same side as anode contact (J1-21).

3. Dimensions are in inches.

from JETEC release #2271, Sept. 2, 1958

ADVANCE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (approx.)		
Horizontal	105	Degrees
Diagonal	110	Degrees
Vertical	87	Degrees
Phosphor	Aluminized P4	
Fluorescence	White	
Persistence	Short to Medium	
Faceplate	Gray Filter Glass	
Light Transmittance (approx.)	75	Percent

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.30 ± 5%	Ampere
Heater Warm-up Time[1]	11	Seconds
Direct Interelectrode Capacitances (approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	6	μμf
External Conductive Coating to Anode[2]	2500	μμf Max.
	1700	μμf Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)		
Height	16 7/8	Inches
Width	21 7/16	Inches
Diagonal	22 13/16	Inches
Area	332	Sq. Inches
Bulb	J192C or J192D	
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base	B7-183	
Basing	8HR	
Weight (approx.)	26 1/2	Pounds

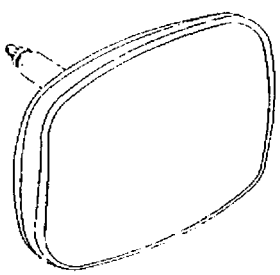
RATINGS

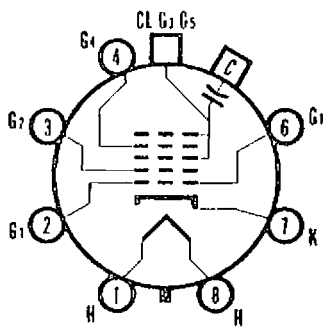
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	22000	Volts dc
Grid No. 4 Voltage (Focusing Electrode)	-550 to +1100	Volts dc
Grid No. 2 Voltage	550	Volts dc
Grid No. 1 Voltage		
Negative Bias Value	154	Volts dc
Negative Peak Value	220	Volts
Positive Bias Value	0	Volts dc
Positive Peak Values	2	Volts

QUICK REFERENCE DATA

Television Picture Tube
24" Direct Viewed
Rectangular Glass Type
Lightweight Tube
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1 1/8" Neck Diameter
No Ion Trap
External Conductive Coating
6.3 Volt, 300 Ma. Heater





8-HR

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

August 6, 1958

Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450	Volts
After Equipment Warm-up Period	200	Volts
Heater Positive with Respect to Cathode	200	Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000	Volts	dc
Grid No. 4 Voltage for Focus	0 to +400	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	-35 to -72	Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.

2. External conductive coating must be grounded.

3. Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

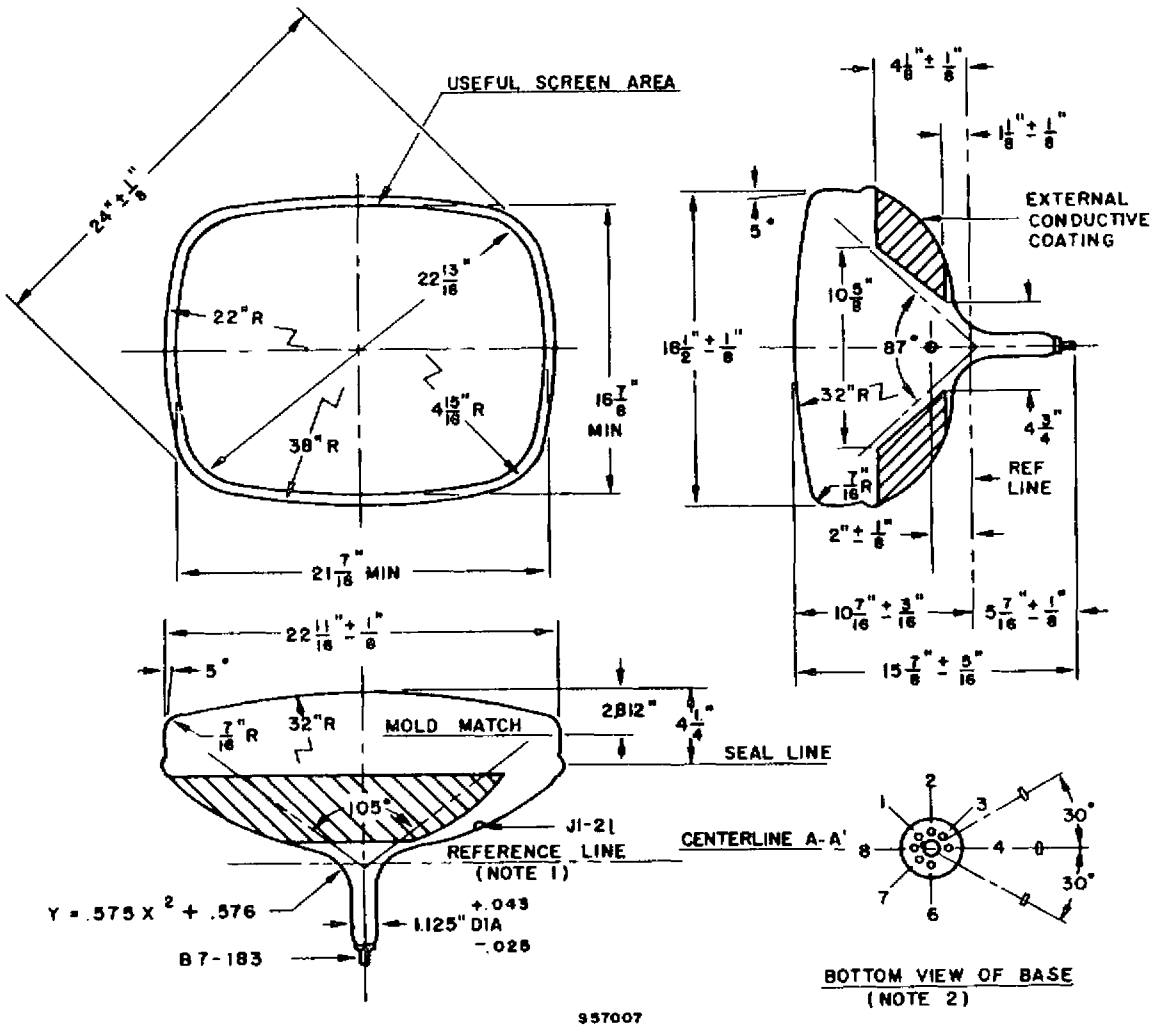


DIAGRAM NOTES:

1. Reference line is determined by plane C-C' of JETEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.

2. Base pin No. 4 aligns with horizontal centerline within 30°, and is on same side as anode contact (J1-21).

SYLVANIA

engineering data service

SYLVANIA
24CP4
24CP4A

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflection Angle (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	68 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
External Conductive Coating to Anode[1]	750 $\mu\mu$f Max.
	500 $\mu\mu$f Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	21¼ x 16¾ Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12N

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	20,000 Volts dc
Grid No. 2 Voltage	500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period Not to Exceed 15 Seconds	410 Volts
After Equipment Warm-up Period	180 Volts
Heater Positive with Respect to Cathode	180 Volts

RECOMMENDED OPERATING CONDITIONS

Anode Voltage	18,000 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	-28 to -72 Volts dc
Focusing Coil Current[3]	125 ± 20% Ma dc
Ion Trap Magnet Strength (approx.)	40 Gausses

CIRCUIT VALUES

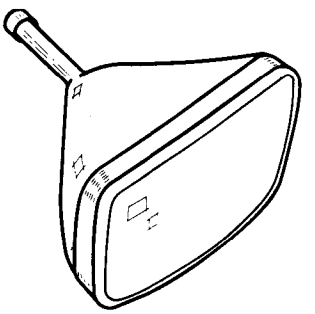
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

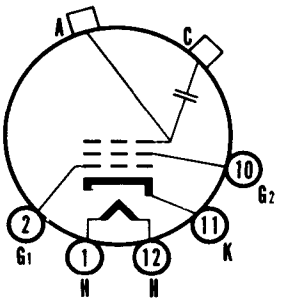
NOTES:

1. *External Conductive Coating must be grounded.*
2. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*
3. *For JETEC focusing coil 109 or equivalent three inches from reference line, bias adjusted to 30 foot lamberts on a 21¼ x 16¾ inch picture area sharply focused at center of screen.*

QUICK REFERENCE DATA

Television Picture Tube
24" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Magnetic Focus
Single Field Ion Trap
External Conductive Coating
(24CP4A has an Aluminized Screen)





12-N

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

OCTOBER 1953

SYLVANIA

24CP4

24CP4A

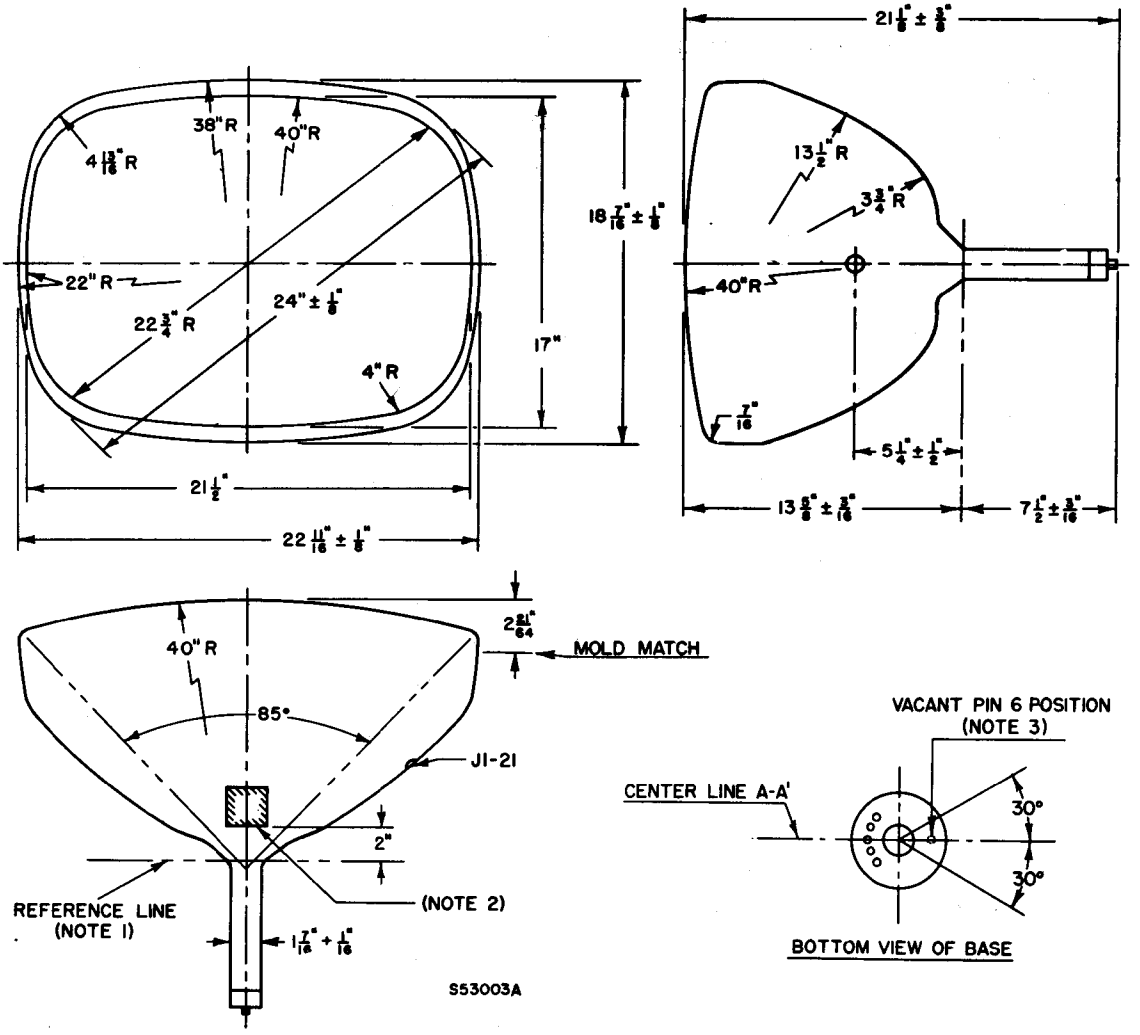


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C1 of the reference line gauge (JETEC No. 110) when the gauge is resting on the glass cone. The neck diameter near the cone may exceed 1.500" but is limited by the internal contour of the yoke reference line gauge.*
2. *In the interest of reducing the number of potential types due to different external coating shapes; only the 2" x 2" contact point is defined on the picture tube as shown in the drawing. The external coating may take any configuration above the reference line to produce the desired capacitance.*
3. *Anode contact aligns with vacant pin position No. 6 ± 30 degrees.*

24CP4A

The Sylvania Type 24CP4A is identical to Type 24CP4 except it has an aluminized screen.

The aluminized screen of Type 24CP4A increases its picture brightness and contrast. While the 18 kv operating condition is recommended for optimum picture quality, this type will operate satisfactorily at substantially lower voltages.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

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engineering data service

SYLVANIA
24DP4
24DP4A

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	68 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6 μμf
External Conductive Coating to Anode[1]	750 μμf Max.
	500 μμf Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	21¼ x 16¾ Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	20,000 Volts dc
Grid No. 4 Voltage (Focusing Electrode)	−500 to +1000 Volts dc
Grid No. 2 Voltage	500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-Up Period Not to Exceed 15 Seconds	410 Volts
After Equipment Warm-Up Period	180 Volts
Heater Positive with Respect to Cathode	180 Volts

RECOMMENDED OPERATING CONDITIONS

Anode Voltage	18,000 Volts dc
Grid No. 4 Voltage	−72 to +396 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	−28 to −72 Volts dc
Ion Trap Magnet Strength (approx.)	40 Gausses

CIRCUIT VALUES

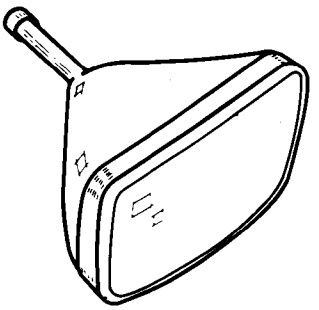
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

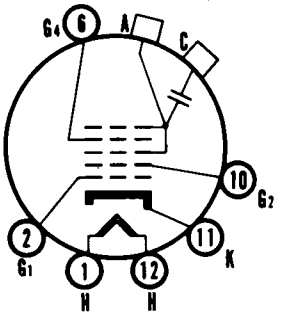
NOTES:

1. *External conductive coating must be grounded.*
2. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

QUICK REFERENCE DATA

Television Picture Tube
24" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
Single Field Ion Trap
External Conductive Coating
(24DP4A has an Aluminized Screen)





12-L

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

MAY 1954

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24DP4

24DP4A

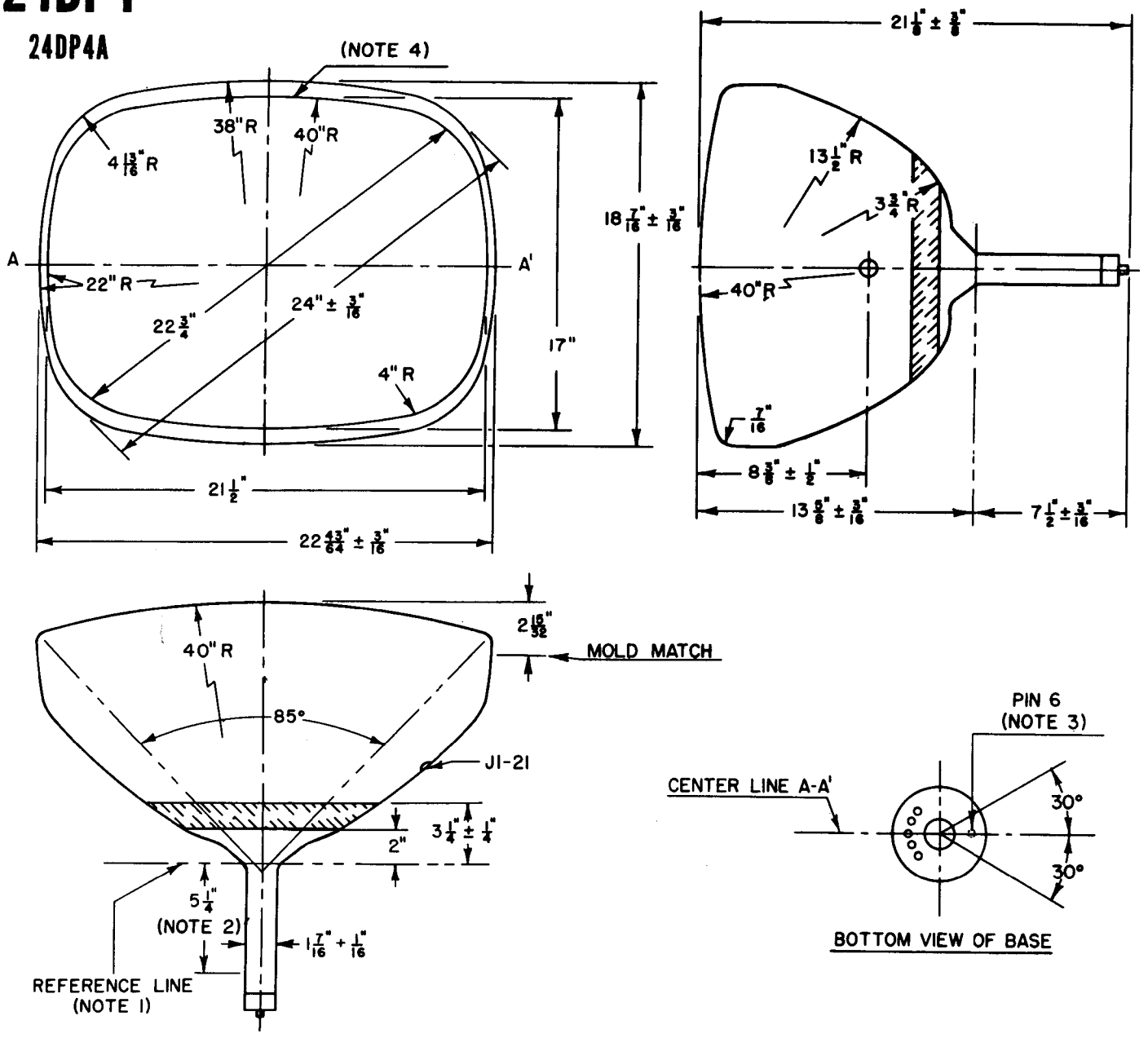

DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C1 of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone. The neck diameter near the cone may exceed 1.500" but is limited by the internal contour of the yoke reference line gauge.*
2. *Nominal position of ion trap magnet.*
3. *Anode contact aligns with pin position No. 6 ±30 degrees.*
4. *Suggested mask opening.*

24DP4A

The Sylvania Type 24DP4A is identical to the Type 24DP4 except it has an aluminized screen.

The aluminized screen of Type 24DP4A increases its picture brightness and contrast. While the 18 Kv operating condition is recommended for optimum picture quality, this type will operate satisfactorily at substantially lower voltages.

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

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engineering data service

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24YP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	68 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 5% Ampere
Heater Warm-up Time[1]	11 Seconds
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	6 μμf
External Conductive Coating to Anode[2]	1500 μμf Max.
	1200 μμf Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	21¼ x 16¾ Inches
Useful Screen Area (approx.)	325 Sq. Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	20,000 Volts dc
Grid No. 4 Voltage (Focusing Electrode)	−500 to +1000 Volts dc
Grid No. 2 Voltage	500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-Up Period Not to Exceed 15 Seconds	410 Volts
After Equipment Warm-Up Period	180 Volts
Heater Positive with Respect to Cathode	180 Volts

RECOMMENDED OPERATING CONDITIONS

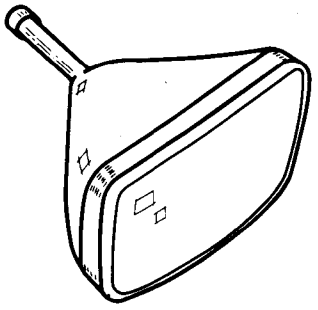
Anode Voltage	18,000 Volts dc
Grid No. 4 Voltage	−72 to +396 Volts dc
Grid No 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[3]	−28 to −72 Volts dc
Ion Trap Magnet Strength (approx.)	40 Gausses

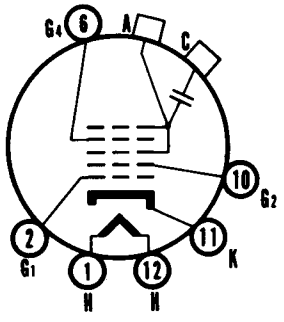
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Television Picture Tube
24" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
Single Field Ion Trap
External Conductive Coating
Aluminized Screen





12-L

SYLVANIA ELECTRIC PRODUCTS INC.
TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

MAY 1955

SYLVANIA

24YP4

NOTES:

1. *Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 31.5 ohms.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*
4. *Because of the combination of high external coating capacitance and high anode rating on Type 24YP4, equipment designers using 24YP4 should be familiar with those paragraphs dealing with shock hazard, of Underwriters Laboratories "Requirements for Television Receiving Appliances".*

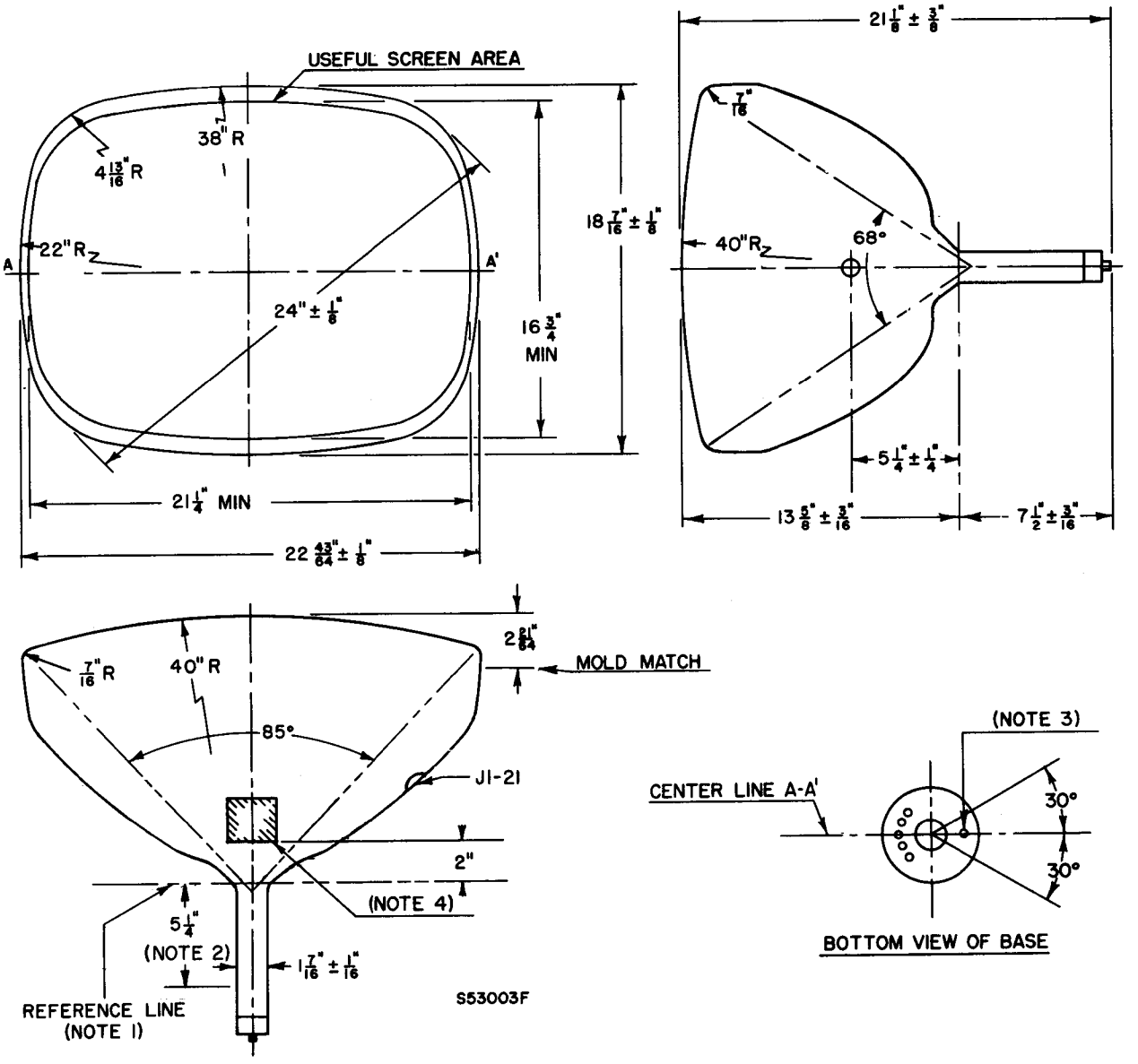
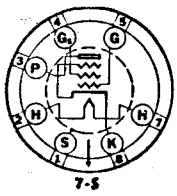


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C1 of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone. The neck diameter near the cone may exceed 1.500" but is limited by the internal contour of the yoke reference line gauge.*
2. *Nominal position of ion trap magnet.*
3. *Anode contact aligns with pin position No. 6 ±30 degrees.*
4. *Contact area for external conductive coating, 2" x 2", located 90° counterclockwise from anode contact as viewed from base end of tube.*

WARNING:

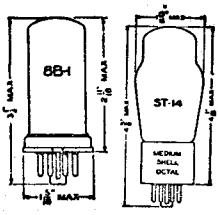
X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.



Sylvania

TYPE 25A6
TYPE 25A6G

AMPLIFICATEURS DE PUISSANCE PENTODES



CARACTERISTIQUES

	25A6	25A6G
Tension de chauffage CA ou CC	25,0	25,0 volts
Courant de chauffage	0,3	0,3 ampère
Ampoule	8B-I	ST-14
Culot — Petit octal 7 broches	7-S	7-S
Position de montage	Toutes	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension de chauffage CA ou CC	25,0 volts
Courant chauffage	0,3 ampère
Tension plaque	160 volts max.
Tension écran	135 volts max.
Dissipation plaque	5,3 watts max.
Dissipation écran	1,9 watts max.

Conditions de fonctionnement et caractéristiques :

Tension chauffage CA ou CC ...	25.0	25.0	25.0 volts
Tension plaque	95	135	160 volts
Tension écran	95	135	120 volts
Tension grille	—15	—20	—18 volts
Tension pointe signal B. F. ...	15	20	18 volts
Courant plaque (signal zéro) ...	20	37	33 ma.
Courant plaque (signal max.) ...	22	39	36 ma.
Courant écran (signal zéro) ...	4	8	6,5 ma.
Courant écran (signal max.) ...	8	14	12 ma.
Résistance interne	45.000	35.000	42.000 ohms
Conductance mutuelle	2.000	2.450	2.375 μmhos
Impédance de charge	4.500	4.000	5.000 ohms
Puissance modulée	0,9	2	2,2 watts
Distorsion harmonique totale ...	11	9	10 pour cent

APPLICATION

Les types Sylvania 25A6 et 25A6G sont les équivalents du type 43 et peuvent être utilisés dans les mêmes circuits.

L'utilisation du tube 25A6 ou 25A6G dans l'étage de sortie, réduit le bruit de fond et le ronflement de secteur généralement présent dans un récepteur pour courant continu employant des pentodes à chauffage direct. Ce tube peut fonctionner seul ou en montage push-pull classe A, aucune puissance n'étant demandée dans ce cas à l'étage pilote. Tout tube fournissant une tension suffisante aux grilles, peut être utilisé comme étage intermédiaire de basse fréquence.

Comme pour les autres montages push-pull, l'impédance de charge par tube peut être un peu plus faible, afin de réduire le troisième harmonique, le second harmonique étant annulé grâce à la symétrie du montage.

Dans le cas de couplage par résistance, la résistance de grille du tube 25A6 ou 25A6G ne peut dépasser 250.000 ohms.

Lorsque le tube 25A6 ou 25A6G a son filament connecté en série avec les filaments d'autres tubes, une différence de potentiel importante peut exister entre filament et cathode ; ceci peut provoquer des fuites de courant souvent préjudiciables. La disposition des éléments du circuit récepteur doit être soigneusement étudiée pour éviter les difficultés provenant de cette fuite.

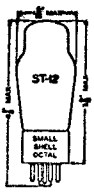


8-F

Sylvania

TYPE 25A7G

PENTODE REDRESSEUR COMBINE



CARACTERISTIQUES

Tension de chauffage CC ou CA	25 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12
Culot : octal 8 broches	8-F
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

SECTION REDRESSEUR

Tension de chauffage	25 volts
Courant redressé	60 ma. max.
Tension efficace CA de plaque	125 volts max.
Chute tension dans le tube (courant plaque 120 ma.)	20 volts

SECTION PENTODE

Tension de chauffage	25 volts
Tension plaque	100 volts
Tension grille	—15 volts
Tension grille écran	100 volts
Courant plaque	20,5 ma.
Courant écran	4,0 ma.
Résistance interne	50,000 ohms
Conductance mutuelle	1,800 μmhos
Cœfficient d'amplification	90
Résistance de charge	4,500 ohms
Puissance modulée	0,77 watts

APPLICATION

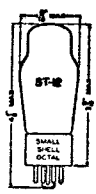
Le type Sylvania 25A7G comprend une section pentode et une section redresseuse dans une même ampoule. Il est principalement destiné aux récepteurs universels où un faible encombrement est nécessaire. La puissance de la pentode n'est pas aussi élevée que celle de la plupart des autres pentodes, à cause de la faible tension plaque maximum. Il faut bien noter que le débit de la section redresseuse doit être limité à 75 ma.



Sylvania

TYPE 25AC5G

TRIODE AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension de chauffage CA ou CC	25 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12
Culot : petit octal 6 broches	6-Q
Position de montage	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension de chauffage CA ou CC	25 volts
Courant de chauffage	0,3 ampère
Tension plaque	180 volts max.
Dissipation plaque	10 watts max.

Caractéristiques statistiques et dynamiques :

Tension de chauffage	25 volts
Tension plaque	110 volts
Tension grille	+15 volts
Courant plaque	45 ma.
Courant grille	7 ma.
Résistance interne	15,200 ohms
Conductance mutuelle	3,800 μmhos
Facteur d'amplification	58

Conditions de fonctionnement et caractéristiques :

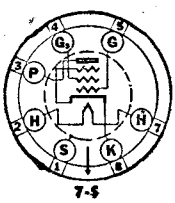
AMPLIFICATEUR DE PUISSANCE A COUPLAGE DYNAMIQUE CLASSE A AVEC TUBE PILOTE 6AF5G

Tension de chauffage	25 volts
Source tension plaque	165 volts
Tension grille	Voir « application ».
Dissipation plaque	10 watts
Courant plaque	46 ma.
Courant plaque du tube pilote	6,6 ma.
Signal d'entrée tube pilote	18 volts effic.
Impédance de charge	3,500 ohms
Puissance modulée	3,3 watts
Distorsion harmonique totale	10 pour cent

APPLICATION

Sylvania type 25AC5G est un amplificateur triode classe A, destiné à donner un rendement optimum dans les circuits classe A à couplage dynamique utilisant un tube pilote tel que le 6AF5G.

La tension de polarisation pour les deux tubes est développée automatiquement par le couplage dynamique assuré en connectant la cathode du type 6AF5G à la grille du 25AC5G. Une résistance de 25.000 ohms doit être intercalée entre grille et cathode du type 25AC5G. La fonction principale de cette résistance est d'éviter une surtension pendant le chauffage du 25AC5G. La résistance totale dans le circuit grille du type 6AF5G ne doit pas dépasser 1,0 mégohm.



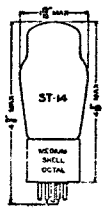
7-S

Sylvania

TYPE 25B6G

PENTODE

DE PUISSANCE



CARACTERISTIQUES

Tension de chauffage CA ou CC	25 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-14
Culot : moyen octal 7 broches	7-S
Position de montage	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension de chauffage CA ou CC	25 volts
Courant de chauffage	0.3 ampère
Courant plaque	180 volts max.
Courant écran	135 volts max.
Dissipation plaque	9,5 watts max.
Dissipation écran	2.0 watts max.

Conditions de fonctionnement et caractéristiques :

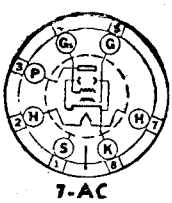
AMPLIFICATEUR CLASSE A

Tension de chauffage	25	25 volts
Tension plaque	105	135 volts
Tension écran	105	135 volts
Tension grille	—16	—22 volts
Tension pointe signal BF	16	22 volts
Courant plaque (signal zéro)	48	61 ma.
Courant plaque (signal max.)	55	69 ma.
Courant écran (signal zéro)	2,0	2,5 ma.
Courant écran (signal max.)	10	14 ma.
Résistance interne (approx.)	15,500	15,000 ohms
Conductance mutuelle	4,800	5,000 μmhos
Impédance de charge	1,700	1,700 ohms
Puissance modulée	2,4	4,3 watts
Distorsion harmonique totale	12.5	14 pour cent

APPLICATION

Le type Sylvania 25B6G est un amplificateur de puissance pentode qui comme les tubes 25A6G et 43 est spécialement destiné à l'étage de sortie des récepteurs universels et C.C. 110 volts. Les tensions de fonctionnement sont les mêmes que pour ces deux types, mais des différences considérables existent dans les caractéristiques.

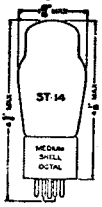
Dans le cas de couplage par résistance, la résistance de grille ne peut pas dépasser 0,25 mégohm en polarisation automatique et 0,1 mégohm en polarisation fixe.



Sylvania

TYPE 25C6G

AMPLIFICATEUR DE PUISSANCE A FAISCEAUX D'ELECTRONS DIRIGES



CARACTERISTIQUES

Tension de chauffage CA ou CC	25 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-14
Culot : moyen octal 7 broches	7-AC
Position de montage	Verticale

Conditions limites de fonctionnement :

Tension de chauffage CA ou CC	25 volts
Courant de chauffage	0,3 ampère
Tension plaque	200 volts max.
Tension écran	135 volts max.
Dissipation plaque	12,5 watts max.
Dissipation écran	1,75 watt max.

Conditions de fonctionnement et caractéristiques :

(Voir 6Y6G : identique, à l'exception des tension et courant de chauffage.)

APPLICATION

Sylvania type 25C6G est un tube amplificateur de puissance à faisceaux d'électrons dirigés dont les caractéristiques et applications sont identiques à celles du type 6Y6G, à l'exception des tension et courant chauffage. Si la polarisation fixe est utilisée, la résistance du circuit grille ne peut pas dépasser 1,0 mégohm. Avec la polarisation cathodique, cette résistance maximum sera de 0,5 mégohm. La différence de potentiel entre filament et cathode sera maintenue aussi basse que possible. Il est recommandé d'utiliser ce tube en position verticale. Le montage horizontal est possible si les broches 2 et 4 sont dans un plan vertical.

Type 25C6G comporte les mêmes principes généraux de conception que ceux incorporés dans les types 6L6G et 6V6G.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	100 Degrees
Diagonal	110 Degrees
Vertical	83 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium Short
Faceplate	Gray Filter Glass
Light Transmittance at Center (Approx.)	40 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.3 ± 5 % Ampere	
Heater Warm-up Time[1]	14 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 pf	
Grid No. 1 to All Other Electrodes	6 pf	
External Conductive Coating and Metal Frame to Anode[2]	2500 pf	Max.
	2000 pf	Min.
Resistance Between External Conductive Coating and Metal Frame	50 Megohms	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	$16\frac{7}{16}$ Inches
Width	$20\frac{15}{16}$ Inches
Diagonal	$24\frac{1}{4}$ Inches
Area	327 Sq. Inches
Neck Length	
25DP4	$4\frac{3}{8} \pm \frac{1}{8}$ Inches
25EP4	$5\frac{1}{8} \pm \frac{1}{8}$ Inches
Overall Length	
25DP4	$15\frac{1}{16} \pm \frac{5}{16}$ Inches
25EP4	$15\frac{13}{16} \pm \frac{5}{16}$ Inches
Bulb	C204 Exp. No. 1
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B7-208
Basing	8HR
Weight (Approx.)	36 Pounds

RATINGS

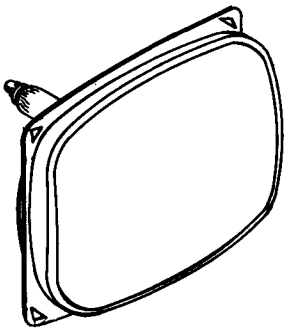
MAXIMUM RATINGS (Design Maximum Values)

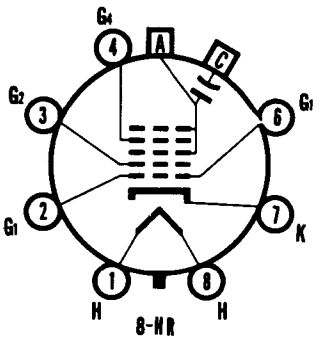
Grid Drive Service[3]

Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 (Focusing Electrode) Voltage	−550 to +1100 Volts	dc
Maximum Grid No. 2 Voltage	700 Volts	dc
Minimum Grid No. 2 Voltage	200 Volts	
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	200 Volts	
Positive Bias Value	0 Volt	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	300 Volts	
Heater Positive with Respect to Cathode DC Component	200 Volts	
	100 Volts	

QUICK REFERENCE DATA

Television Picture Tube
25" Direct Viewed
Rectangular Glass Type
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
No Ion Trap
External Conductive Coating
Bonded Frame (Filled Rim)
Implosion Protection
25DP4: Short Neck





SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication
MARCH, 1965

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]		
Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus[6]	0 Volt	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for cutoff[5]	−35 to −72 Volts	dc
Cathode Drive Service[4]		
Anode Voltage	16,000 Volts	dc
Grid No. 4 Voltage for Focus[6]	0 Volt	dc
Grid No. 2 Voltage	300 Volts	dc
Cathode Voltage Required for Cutoff[5]	+32 to +60 Volts	dc

CIRCUIT VALUES

Grid No. 1 Resistance	1.5 Megohms Max.

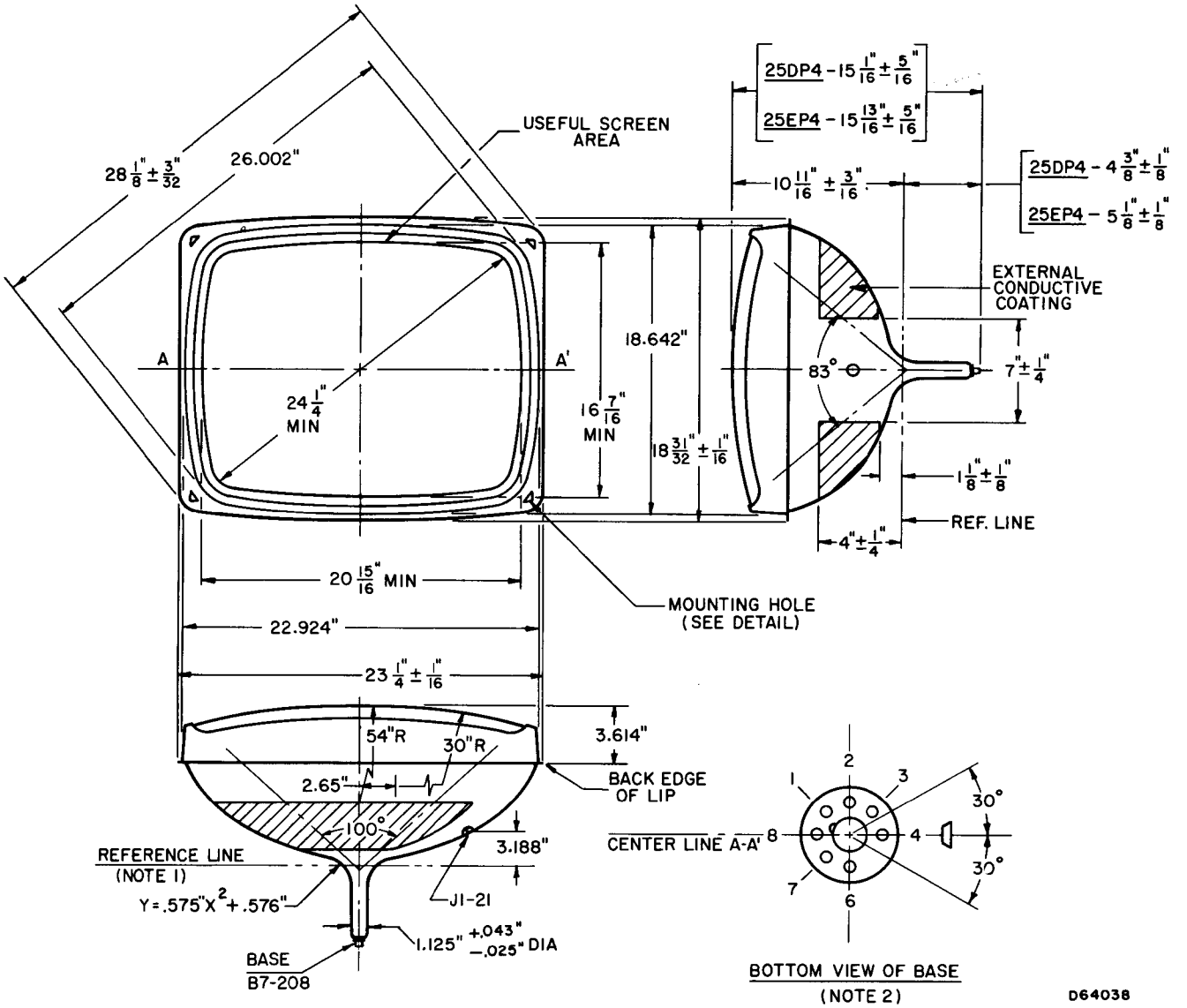
NOTES:

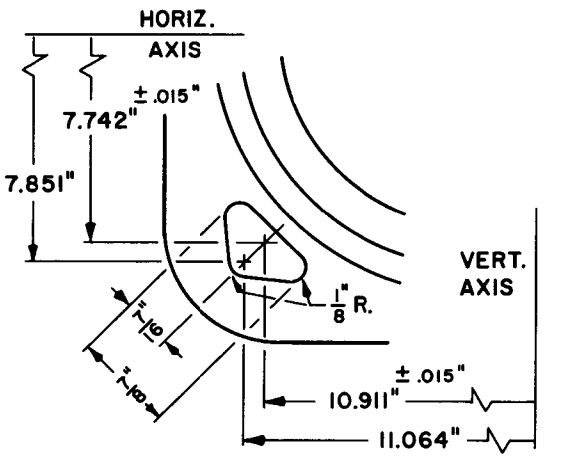
1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating and rim band must be grounded.*
3. *Voltages are positive with respect to cathode unless otherwise indicated.*
4. *Voltages are positive with respect to Grid No. 1 unless otherwise indicated.*
5. *Visual extinction of focused raster. Extinction of stationary focused spot will require that the absolute value of the bias between cathode and grid No. 1 be increased by about 5 volts.*
6. *Tubes will have satisfactory focus at some value between −200 and +200 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE





Detail of Mounting Hole (1 hole in each corner)

DIAGRAM NOTES:

1. *Reference Line is determined by plane C-C' of JEDEC No. 126 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.*

MECHANICAL DATA

Bulb	T-5 ½
Base	E7-1, Miniature Button 7-Pin
Outline	5-3
Basing	7CV
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	25.0 Volts
Heater Current	150 Ma
Heater-Cathode Voltage (Design Center Values)	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
DC	100 Volts Max.
Total DC and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCE (Unshielded)

Grid to Plate	0.57 μμf
Input	12.0 μμf
Output	6.0 μμf

RATINGS (Design Center Values)

Plate Voltage	135 Volts Max.
Grid No. 2 Voltage	117 Volts Max.
Plate Dissipation	4.5 Watts Max.
Grid No. 2 Dissipation	1.0 Watt Max.
Grid No. 1 Circuit Resistance	
Fixed Bias	0.1 Megohm Max.
Cathode Bias	0.5 Megohm Max.

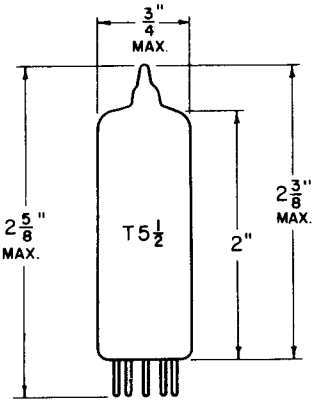
CHARACTERISTICS AND TYPICAL OPERATION (Single Tube)

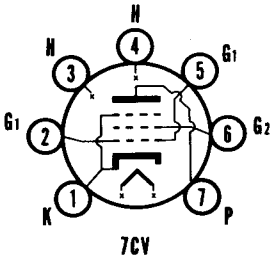
Class A_1 Amplifier

Plate Voltage	110 Volts
Grid No. 2 Voltage	110 Volts
Grid No. 1 Voltage	-7.5 Volts
Peak AF Grid No. 1 Voltage	7.5 Volts
Zero Signal Plate Current	36 Ma
Maximum Signal Plate Current	37 Ma
Zero Signal Grid No. 2 Current	3.0 Ma
Maximum Signal Grid No. 2 Current	7.0 Ma
Plate Resistance (approx.)	16000 Ohms
Transconductance	5800 μmhos
Load Resistance	2,500 Ohms
Maximum Signal Power Output	1.2 Watts
Total Harmonic Distortion (approx.)	10 Percent

QUICK REFERENCE DATA

The Sylvania Type 25F5 is a miniature beam power amplifier featuring high sensitivity and high efficiency at plate and screen voltage normally available in ac/dc receivers.





7CV

SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

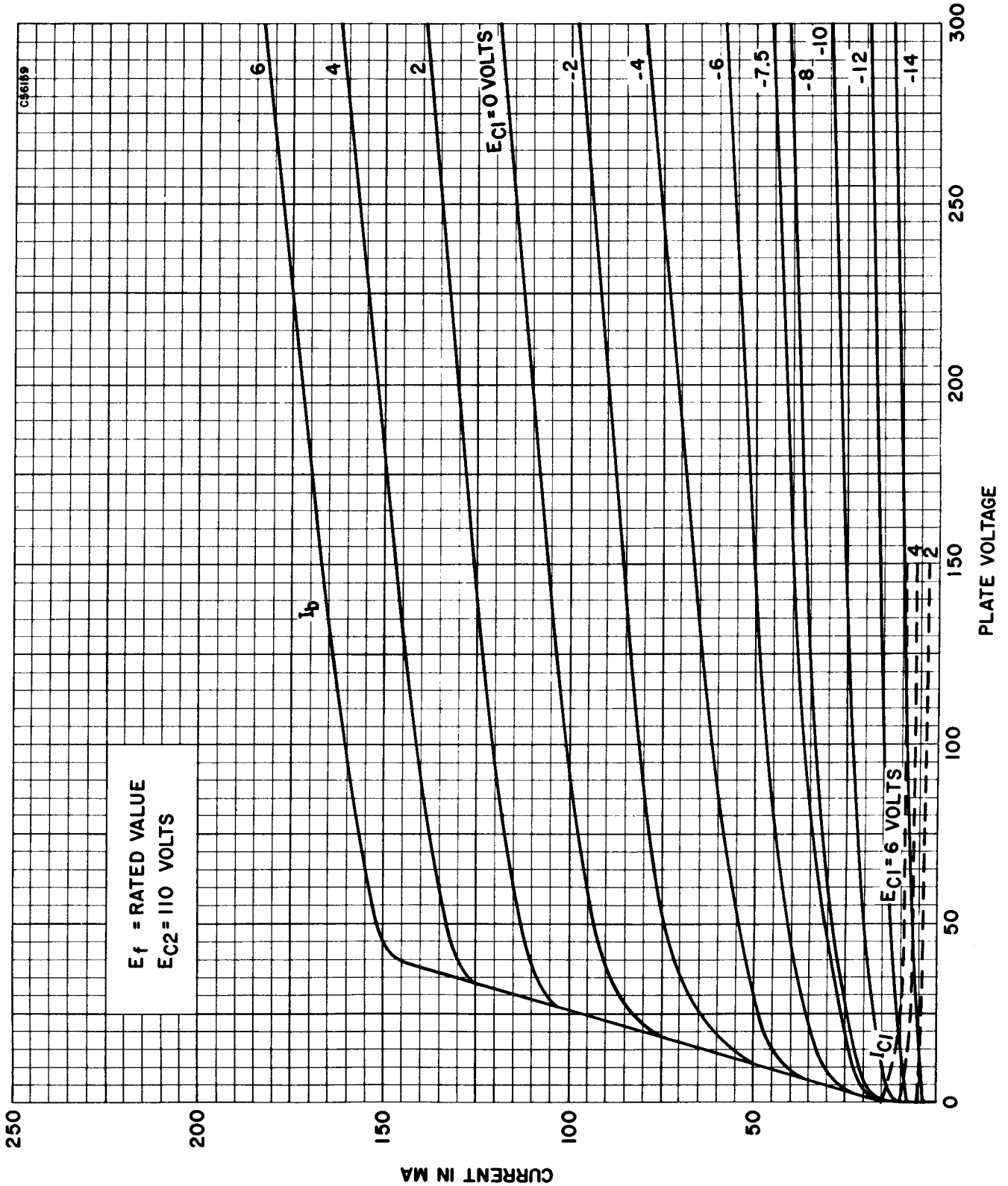
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

DEC. 1956

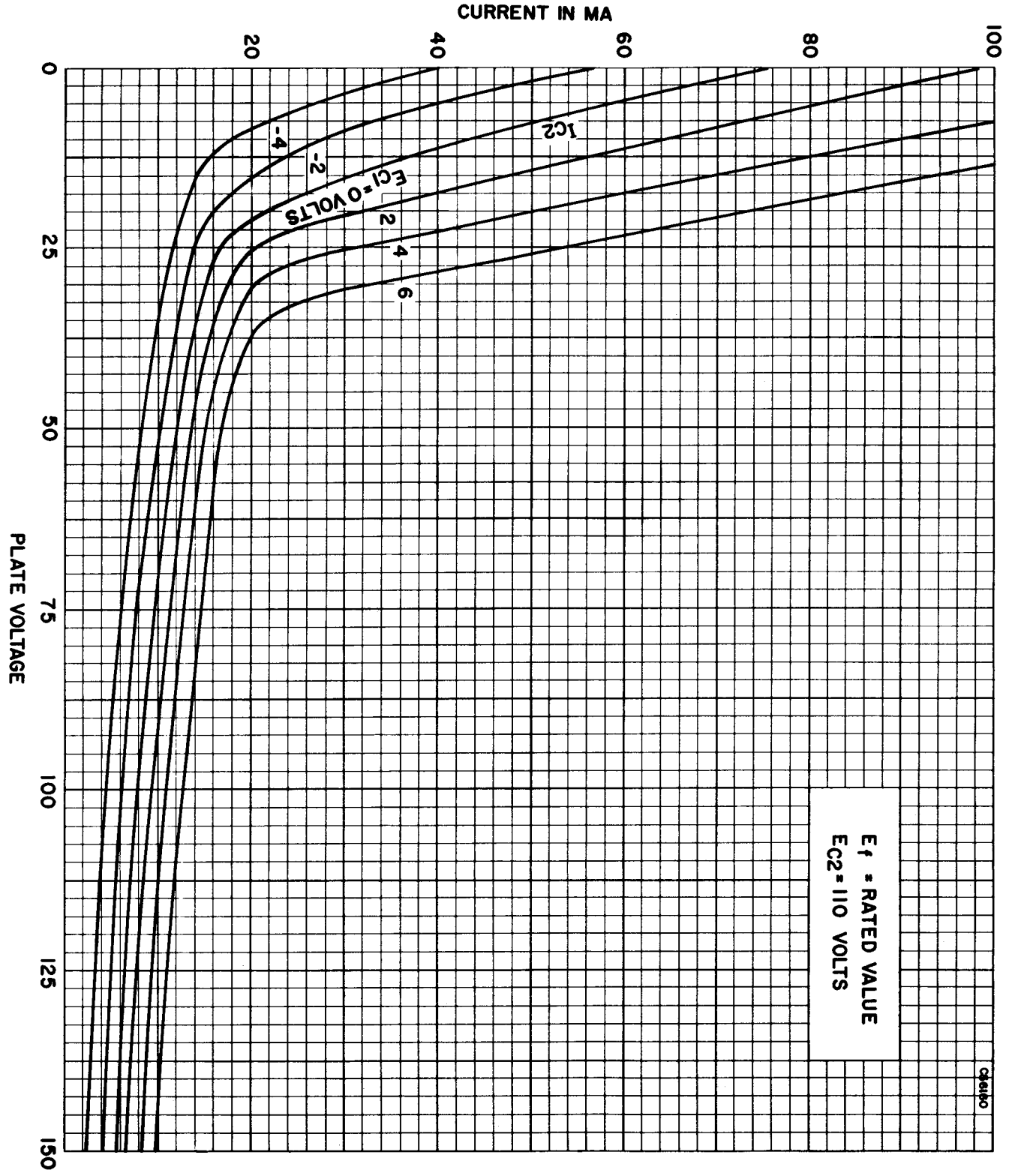
Class A_1 Amplifier (two tubes in push-pull)

Plate Voltage	110 Volts
Grid No. 2 Voltage	110 Volts
Grid No. 1 Voltage	-8.0 Volts
Peak AF Grid to Grid Voltage	16 Volts
Zero Signal Plate Current	70 Ma
Maximum Signal Plate Current	78 Ma
Zero Signal Grid No. 2 Current	7.5 Ma
Maximum Signal Grid No. 2 Current	13.6 Ma
Load Resistance	4500 Ohms
Maximum Signal Power Output	2.9 Watts
Total Harmonic Distortion	2.6 Percent

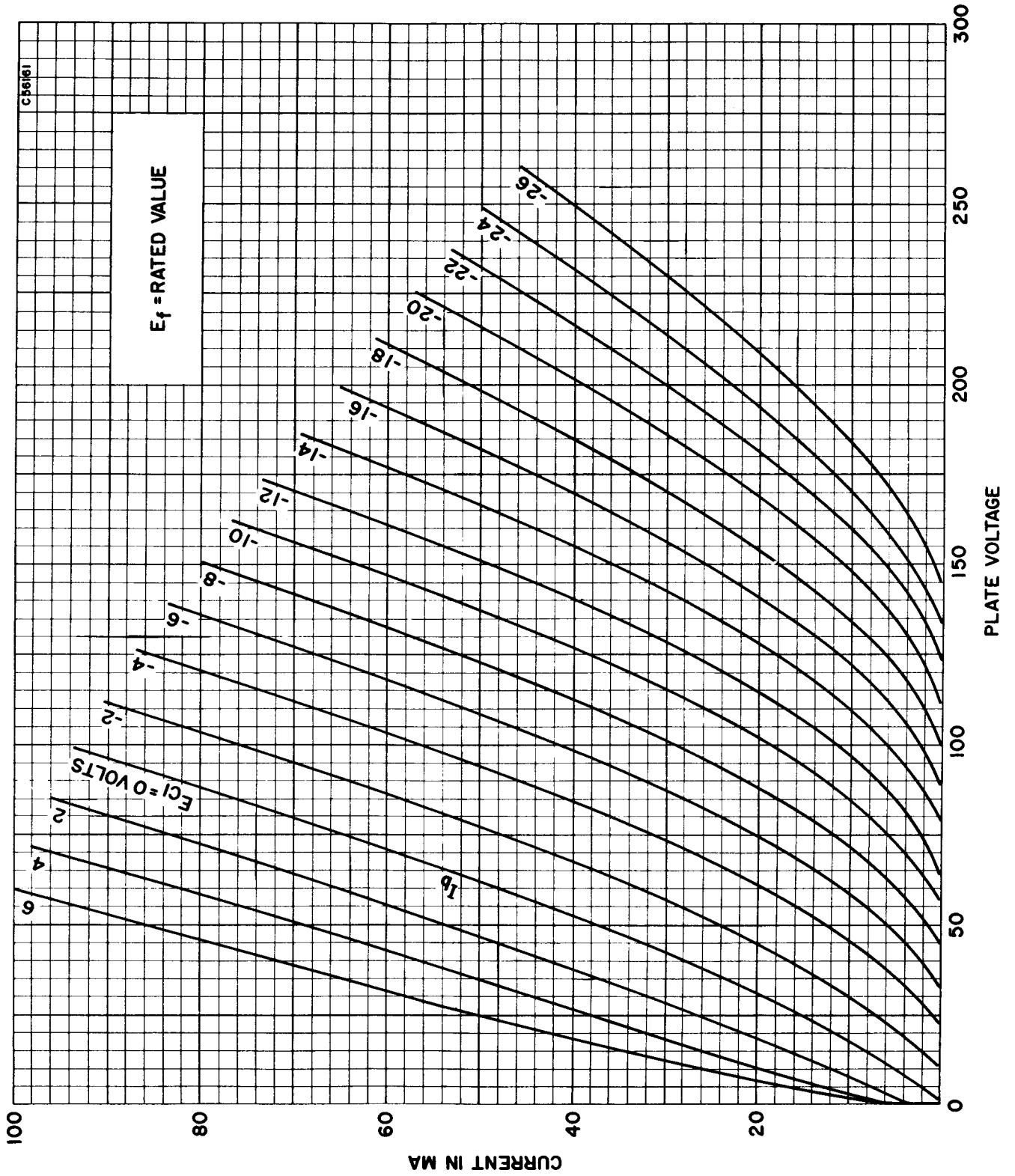
AVERAGE PLATE CHARACTERISTICS

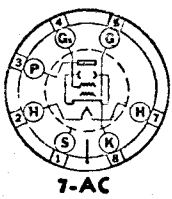


AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS
(TRIODE CONNECTED)



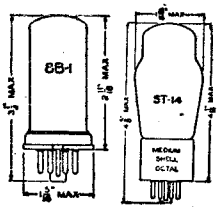


7-AC

Sylvania

TYPE 25L6
TYPE 25L6G

AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

	25L6	25L6G
Tension de chauffage CA ou CC... ...	25,0	25,0 volts
Courant de chauffage	0,3	0,3 ampère
Ampoule	8B-1	ST-14
Culot — Petit octal 7 broches	7-AC	7-AC
Position de montage	Toutes	Toutes

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A1.

Tension de chauffage	25,0	25,0 volts
Tension plaque	110	110 volts max.
Tension écran	110	110 volts max.
Tension grille	—7,5	—7,5 volts
Courant plaque (signal zéro)	49	49 ma.
Courant plaque (signal max.)	54	50 ma.
Courant écran (signal zéro)	4	4 ma.
Courant écran (signal max.)	9	11 ma.
Résistance interne	10.000	10.000 ohms
Conductance mutuelle	8.200	8.200 μmhos
Impédance de charge	1.500	2.000 ohms
Distorsion totale	11	10 pour cent
Second harmonique	10	3,5 pour cent
Troisième harmonique	4	8,5 pour cent
Puissance modulée	2,1	2,2 watts

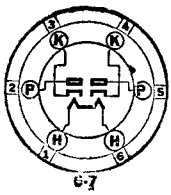
APPLICATION

Le type Sylvania 25L6 ou 25L6G est un amplificateur à faisceaux d'électrons spécialement destiné à l'étage de sortie des récepteurs universels et C.C. sur secteur 110 volts. Ce tube procure une puissance modulée élevée pour les tensions de plaque et d'écran relativement faibles dont on dispose dans de tels récepteurs.

La conception de ce tube repose sur le même principe que le tube 6L6 et utilise la charge spatiale de faisceaux d'électrons de grande densité pour éviter l'émission secondaire.

La sensibilité de ce tube est grande ; le rendement de plaque est élevé.

Les systèmes de couplage par transformateur ou impédance sont recommandés pour le circuit d'entrée. Si l'on utilise la polarisation fixe, la résistance du circuit de grille ne peut pas dépasser 1,0 mégohm. Cette résistance maximum avec polarisation automatique est de 0,5 mégohm, pourvu que la tension chauffage ne dépasse pas de plus de 10 % le taux fixé.

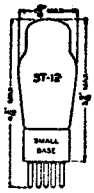


6-7

Sylvania

TYPE 25Y5
TYPE 25Z5

REDRESSEURS ET DOUBLEURS DE TENSION A VIDE PARFAIT



CARACTERISTIQUES

Tension de chauffage CA ou CC	25 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12
Culot : petit modèle 6 broches	6-E
Position de montage	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension de chauffage CA ou CC	25 volts
Courant de chauffage	0,3 ampère
Potentiel CC filament à cathode	350 volts max.
Tension inverse de pointe	700 volts max.
Chute tension dans tube (150 ma. par plaque) :	
Type 25Y5	25 volts
Type 25Z5	22 volts

Conditions de fonctionnement et caractéristiques :

DOUBLEUR DE TENSION (Type 25Z5 seulement)

Tension de chauffage	25,0 volts
Tension CA plaque, par plaque	117 volts efficaces max.
Courant plaque de pointe	450 ma. max.
Courant redressé	75 ma. max.
Source impédance de charge (min.) ...	* ohms

* Suffisante pour limiter le maximum de courant plaque de pointe à la valeur fixée. De l'impédance additionnelle peut être requise lorsqu'un filtre de plus de 40 mfd. est utilisé.

REDRESSEUR DEMI-ONDE :

	25Y5		25Z5			
Tension chauffage ...	25,0	25,0	25,0	25,0	25,0	volts
Tension plaque CA (par plaque)	150	235*	117	150	235*	volts efficaces
Courant redressé (par plaque)	75*	75*	75*	75*	75*	ma.
Source impédance de charge	0	0	0	40	100	ohms

* Maximum.

(Pour les courbes de redressement, voir fin du volume).

APPLICATION

Les tubes Sylvania 25Z5 et 25Y5 sont des redresseurs à chauffage indirect spécialement destinés à redresser directement la tension des secteurs alternatifs ordinaires.

Ils peuvent fonctionner comme redresseurs d'une alternance ou comme doubleurs de tension et sont donc particulièrement adaptés à l'utilisation sur récepteur sans transformateur réseau.

Type 25Y5 est un type 25Z5 renforcé, spécialement conçu comme redresseur demi-onde sur réseau 220 volts sans qu'il soit nécessaire d'intercaler de résistance en série.

Redresseur d'une alternance :

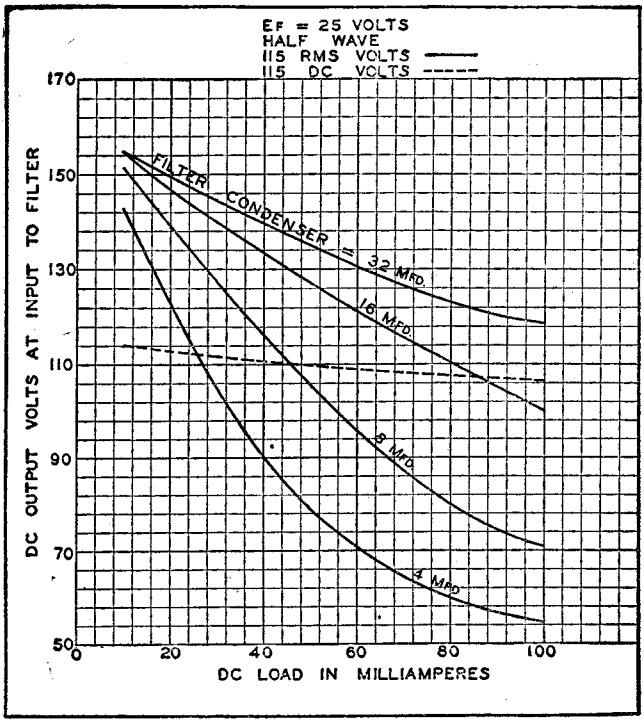
Pour ce service, les deux plaques et les deux cathodes sont reliées ensemble. Un filtre à condensateur d'entrée doit être utilisé pour obtenir une tension redressée suffisante; la capacité recommandée pour ce condensateur est 16 mfd.

Fonctionnement en doubleur de tension :

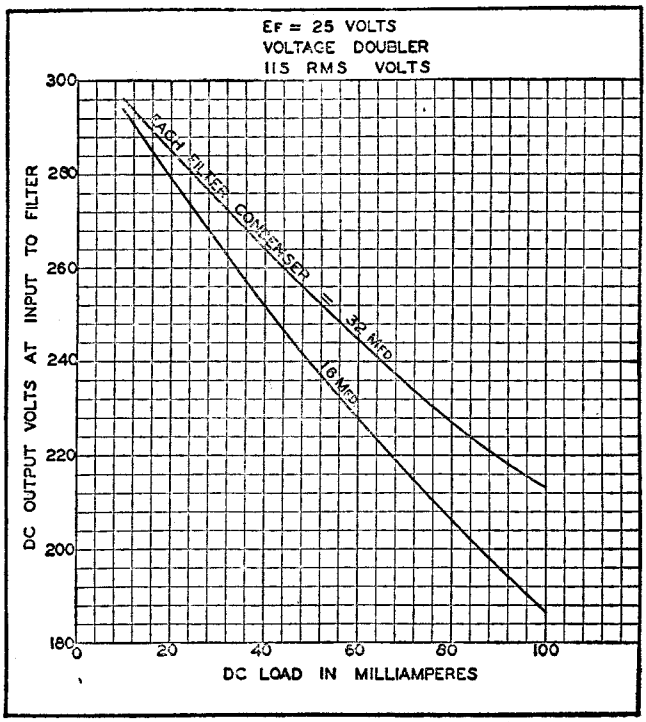
Les récepteurs sans transformateur réseau destinés à fonctionner sur réseau alternatif, peuvent utiliser le tube 25Z5 comme doubleur de tension. Dans ce cas, les deux sections diodes sont reliées en série, une étant inversée, par rapport à l'autre, la cathode No 1 reliée à la plaque No 2 par exemple. La plaque No 1 et la cathode No 2 sont reliées chacune à une extrémité libre de deux condensateurs montés en série. La tension secteur est appliquée entre le point commun des condensateurs et le point commun des diodes. Ce schéma utilise les deux alternances, chacun des condensateurs se chargeant pendant que l'autre se décharge. La tension aux bornes de la résistance de charge est la somme des tensions aux bornes des condensateurs, donc à peu près le double de celle fournie par un redresseur d'une alternance. Le filtrage est plus économique, la fréquence à éliminer étant doublée, grâce au redressement des deux alternances.

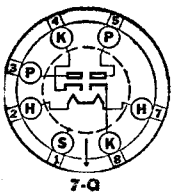
Contrairement au redresseur des deux alternances ordinaires, le schéma ci-dessus décrit ne demande que deux connexions au réseau, de telle sorte qu'un transformateur n'est plus nécessaire.

TYPE 25Z5, 25Z6, 25Z6G, 25Z6GT



TYPE 25Z5, 25Z6, 25Z6G, 25Z6GT

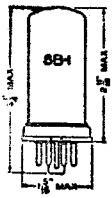


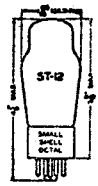


Sylvania

TYPE 25Z6
TYPE 25Z6G

REDRESSEUR ET DOUBLEUR DE TENSION A VIDE PARFAIT





CARACTERISTIQUES

	25Z6	25Z6G
Tension de chauffage CA ou CC	25,0	25,0 volts
Courant de chauffage	0,3	0,3 ampère
Ampoule	8-B1	ST-12
Culot — Petit octal 7 broches	7-Q	7-Q
Position de montage	Toutes	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension chauffage CA ou CC	25,0 volts
Courant chauffage	0,3 ampère
Potentiel CC Filament à cathode	350 volts max.
Tension inverse de pointe	700 volts max.
Chute tension dans tube (150 ma. par plaque) ...	22 volts

Conditions de fonctionnement et caractéristiques :

DOUBLEUR DE TENSION

Tension chauffage CA ou CC	25,0 volts
Tension efficace par plaque CA	117 volts max.
Courant plaque de pointe (par plaque)	450 ma. max.
Courant redressé	75 ma. max.
Source impédance de plaque	* ohms min.

* Suffisante pour limiter le maximum de courant plaque de pointe à la valeur fixée. De l'impédance additionnelle peut être requise lorsqu'un filtre de plus de 40 mfd est utilisé.

REDRESSEUR DEMI-ONDE :

Tension de chauffage	25,0	25,0	25,0 volts
Tension plaque CA (par plaque) ...	117	150	235° volts effic.
Courant redressé par plaque	75°	75°	75° ma.
Source impédance de plaque	0.	40	100 ohms

° Maximum.

(Pour les courbes de redressement, voir en fin de volume).

APPLICATION

Le type Sylvania 25Z6 ou 25Z6G est l'équivalent du tube 25Z5; il peut être utilisé dans les circuits pour le redressement d'une alternance ou pour le doublage de la tension, et est particulièrement adapté au service sur récepteurs sans transformateur réseau.

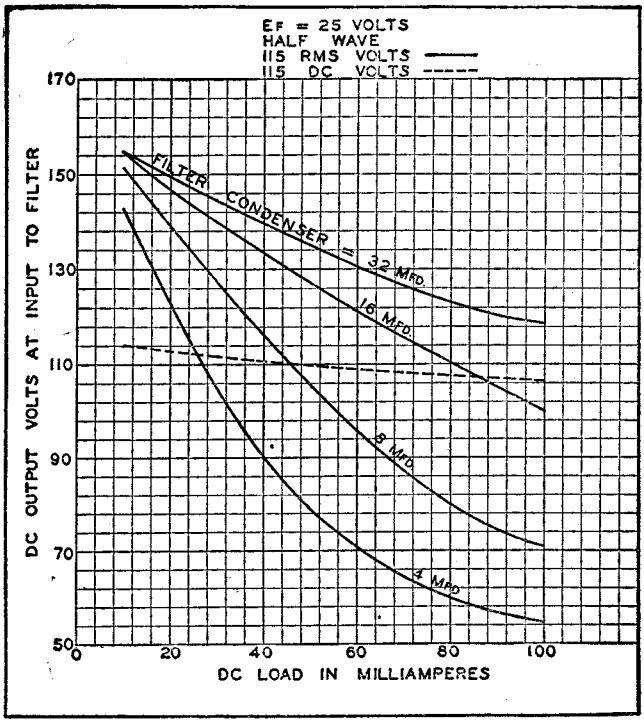
Lorsqu'il est utilisé sur un récepteur universel, son filament est relié en série avec les filaments des autres tubes. La tension de chauffage de 25 volts est une particularité intéressante en ce qu'elle diminue la chaleur que dissipe la résistance en série dans les circuits des filaments.

En redresseur d'une alternance, les deux diodes sont connectées en parallèle, plaque à plaque, cathode à cathode. Un filtre à condensateur d'entrée d'une capacité de 16 mfd. est nécessaire pour obtenir une tension redressée suffisante.

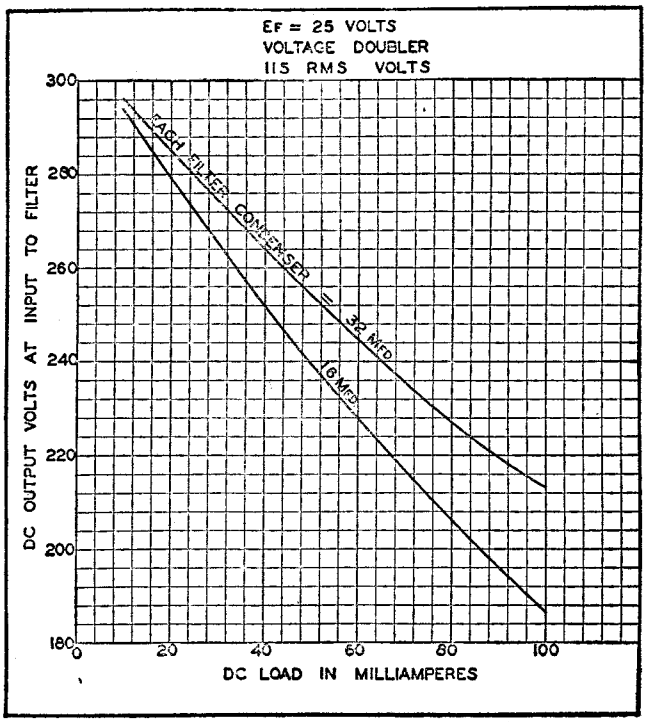
On peut se référer aux courbes concernant le tube 25Z5, qui sont également applicables aux tubes 25Z6 et 25Z6G.

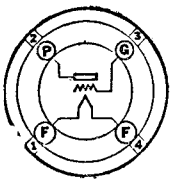
Pour le fonctionnement en doubleur de tension, voir sous le titre 25Z5.

TYPE 25Z5, 25Z6, 25Z6G, 25Z6GT



TYPE 25Z5, 25Z6, 25Z6G, 25Z6GT

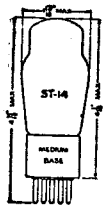




Sylvania

TYPE 26

AMPLIFICATEUR TRIODE



CARACTERISTIQUES

Tension filament CA	1,5 volts
Courant filament	1,05 ampère
Ampoule	ST-14
Culot — Moyen 4 broches	4-D
Position de montage	Verticale

Capacités directes interélectrodes :

Grille à plaque	8,1 $\mu\mu$f
Entrée	2,8 $\mu\mu$f
Sortie	2,5 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension filament	1,5	1,5	1,5 volts
Tension plaque	90	135	180 volts max.
Tension grille*	—7	—10	—14,5 volts
Courant plaque	2,9	5,5	6.2 ma.
Résistance interne	8,900	7,600	7,300 ohms
Conductance mutuelle	935	1.100	1.150 μmhos
Coefficient d'amplification	8,3	8,3	8,3

* Mesurée à partir du point milieu du filament.

APPLICATION

Le tube Sylvania 26 est destiné à être utilisé dans les étages haute fréquence ou basse fréquence de récepteurs pour courant alternatif employant le type 27 comme détecteur. Le tube 26 ne peut pas être utilisé comme détecteur. Le tube 26 n'est plus utilisé que pour le remplacement dans les vieux récepteurs.

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 26BK6

DOUBLE-DIODE TRIODE

MECHANICAL DATA

Style	miniature
Cathode	coated, unipotential
Bulb	T-5 1/2
Base	E7-1, miniature button 7-pin
Outline	5-3
Maximum Diameter	3/4 inch
Maximum Overall Length	2 5/8 inches
Maximum Seated Height	2 3/8 inches
Basing	7BT-0-2

Pin Connections:

Pin 1 .. grid	Pin 5 .. #2 diode plate
Pin 2 .. cathode, diode shield	Pin 6 .. #1 diode plate
Pin 3 .. heater	Pin 7 .. triode plate
Pin 4 .. heater	

Mounting Position ..... any

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES

	without shield	*with shield*(1)	
#2 Diode Input: #2p to (h+k+i.s.)	1.0	1.0	μμf
#1 Diode Input: #1p to (h+k+i.s.)	1.0	1.0	μμf
#1 Diode Plate to Grid, maximum	.013	.01	μμf

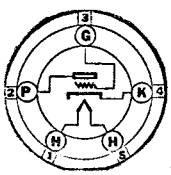
RATINGS -- *Design Center Values*

Heater Voltage (ac or dc)	26.5	volts
Maximum Heater-Cathode Voltage	90	volts
Maximum Plate Voltage (dc)	300	volts
Maximum Positive Grid Voltage (dc)	0	volts
Maximum Continuous Diode Current (each plate)	1.0	milliamp

CHARACTERISTICS

Heater Voltage	26.5	26.5	volts
Heater Current	70	70	milliamps
Plate Voltage (dc)	100	250	volts
Grid Voltage (dc)	-1	-2	volts
Plate Resistance	80,000	62,500	ohms
Plate Current	0.5	1.2	milliamps
Transconductance	1,250	1,600	micromhos
Amplification Factor	100	100	
Diode Current, at 10 volts dc (each plate)			
Minimum		1.5	milliamps
Average		4.0	milliamps

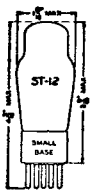
(1) External shield #316 connected to Pin 2.



Sylvania

TYPE 27

AMPLIFICATEUR DETECTEUR



CARACTERISTIQUES

Tension de chauffage CA	2,5 volts
Courant de chauffage	1,75 ampère
Ampoule	ST 12
Culot — Moyen 5 broches	5-A
Position de montage	Toutes

Capacités directes interélectrodes :

Grille à plaque	3,3 $\mu\mu$f max.
Entrée	3,1 $\mu\mu$f
Sortie	2,8 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension de chauffage ...	2,5	2,5	2,5	2,5 volts
Tension plaque	90	135	180	250 volts
Tension grille	—6	—9	—13,5	—21 volts
Courant plaque	3	4,7	5,0	5.2 ma.
Résistance interne	10.000	9.000	9.000	9.250 ohms
Conductance mutuelle ...	900	1.000	1.000	975 μmhos
Coefficient d'amplification	9	9	9	9

APPLICATION

Sylvania 27 est un tube pour usage général, comme amplificateur, détecteur ou oscillateur. Il est actuellement fabriqué pour le remplacement dans les vieux récepteurs.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Vertical	68 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
Gray Filterglass Safety Plate Laminated Directly to Face of Tube	
Light Transmittance of Faceplate Assembly (Approx.)	45 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	2000 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	24 1/4 x 18 5/8 Inches
Minimum Useful Screen Area	425 Square Inches
Neck Length	6 ± 3/16 Inches
Overall Length	21 13/16 ± 7/16 Inches
Bulb	J214 ½A
Faceplate	FP-214 ½A1
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base	B6-203
Basing	12L
Weight (Approx.)	54 Pounds

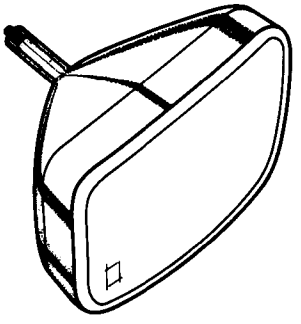
RATINGS

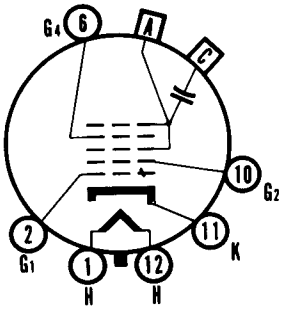
MAXIMUM RATINGS (Design Maximum Values)

Grid Drive Service[3]		
Maximum Anode Voltage	25,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Maximum Grid No. 2 Voltage	550 Volts	dc
Minimum Grid No. 2 Voltage	200 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	dc
Positive Bias Value	0 Volts	
Positive Peak Value	2 Volts	
Peak-Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Sec.	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
27″ Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
90° Magnetic Deflection
1 7/16″ Neck Diameter
No Ion Trap
External Conductive Coating
Bonded Shield





12-L

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE
OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
DECEMBER, 1962

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) Continued

Cathode Drive Service[4]		
Maximum Anode Voltage	25,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−400 to +1250 Volts	dc
Maximum Grid No. 2 Voltage	700 Volts	dc
Minimum Grid No. 2 Voltage	350 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During		
Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]		
Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−48 to −96 Volts	dc
Cathode Drive Service[4]		
Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Cathode Voltage Required for Cutoff[5]	+46 to +80 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating must be grounded.*
3. *Unless otherwise specified, voltages are positive with respect to cathode.*
4. *Unless otherwise specified, voltages are positive with respect to Grid No. 1.*
5. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be increased by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

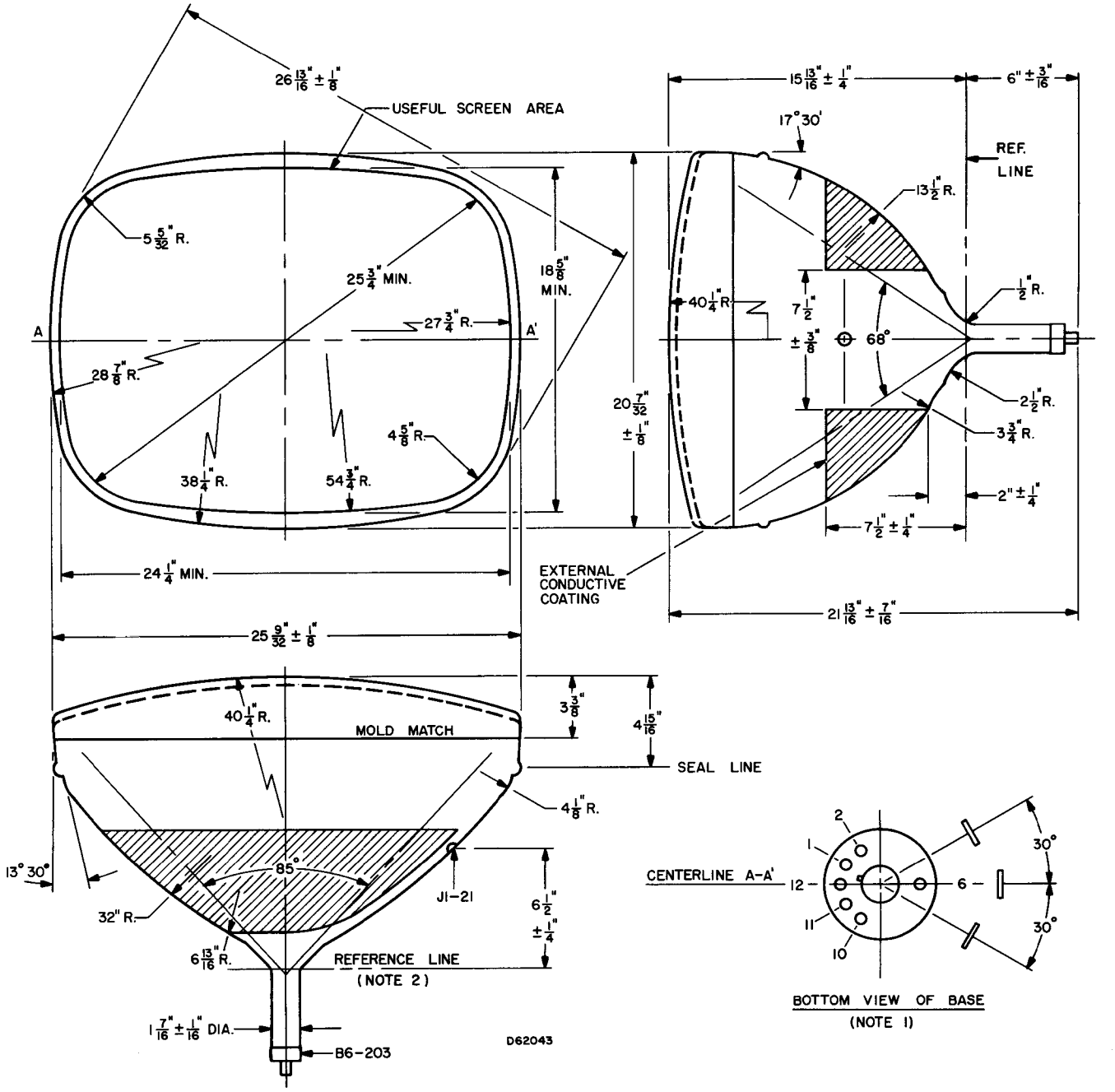


DIAGRAM NOTES:

1. *The plane through the tube axis and Pin No. 6 may vary from the plane through the tube axis and anode terminal by an angular tolerance (measured about the tube axis) of ±30°. Anode terminal is on same side as Pin No. 6.*
2. *With tube neck inserted through flared end of reference line gauge JEDEC No. G-116 and with tube seated in gauge, the reference line is determined by the intersection of the Plane CC' of the gauge with the glass funnel.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	104 Degrees
Diagonal	110 Degrees
Vertical	85 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Bonded Shield
Gray Filterglass Safety Plate Laminated Directly to Face of Plate	
Light Transmittance of Faceplate Assembly (Approx.)	45 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current—27ADP4	0.6 ± 5 % Ampere	
Heater Current—27AFP4	0.3 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	2000 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Max. Assured)	
Height	18 5/8 Inches
Width	24 1/4 Inches
Diagonal	25 3/4 Inches
Minimum Useful Screen Area	425 Square Inches
Neck Length	5 3/8 ± 3/16 Inches
Overall Length	17 9/16 ± 7/16 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Bulb	J214 ½B
Safety Plate	FP-214 ½A1
Base	B7-208
Basing	8HR
Weight (Approx.)	51 Pounds

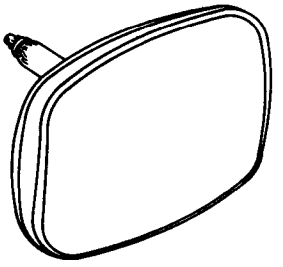
RATINGS

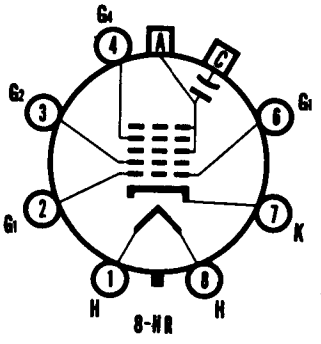
MAXIMUM RATINGS (Design Maximum Values)

Grid Drive Service[3]		
Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Maximum Grid No. 2 Voltage	550 Volts	dc
Minimum Grid No. 2 Voltage	200 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
27″ Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Bonded Shield
27ADP4: 6.3V/600 Ma Heater
27AFP4: 6.3V/300 Ma Heater
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1⅛″ Neck Diameter
No Ion Trap
External Conductive Coating





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EMPORIUM, PENNSYLVANIA
DECEMBER, 1962

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) Continued

Cathode Drive Service[4]		
Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−400 to +1250 Volts	dc
Maximum Grid No. 2 Voltage	700 Volts	dc
Minimum Grid No. 2 Voltage	350 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]		
Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−37 to −74 Volts	
Cathode Drive Service[4]		
Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Cathode Voltage Required for Cutoff[5]	+37 to +62 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating must be grounded.*
3. *Unless otherwise specified, voltages are positive with respect to cathode.*
4. *Unless otherwise specified, voltages are positive with respect to Grid No. 1.*
5. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be increased by about 5 volts.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

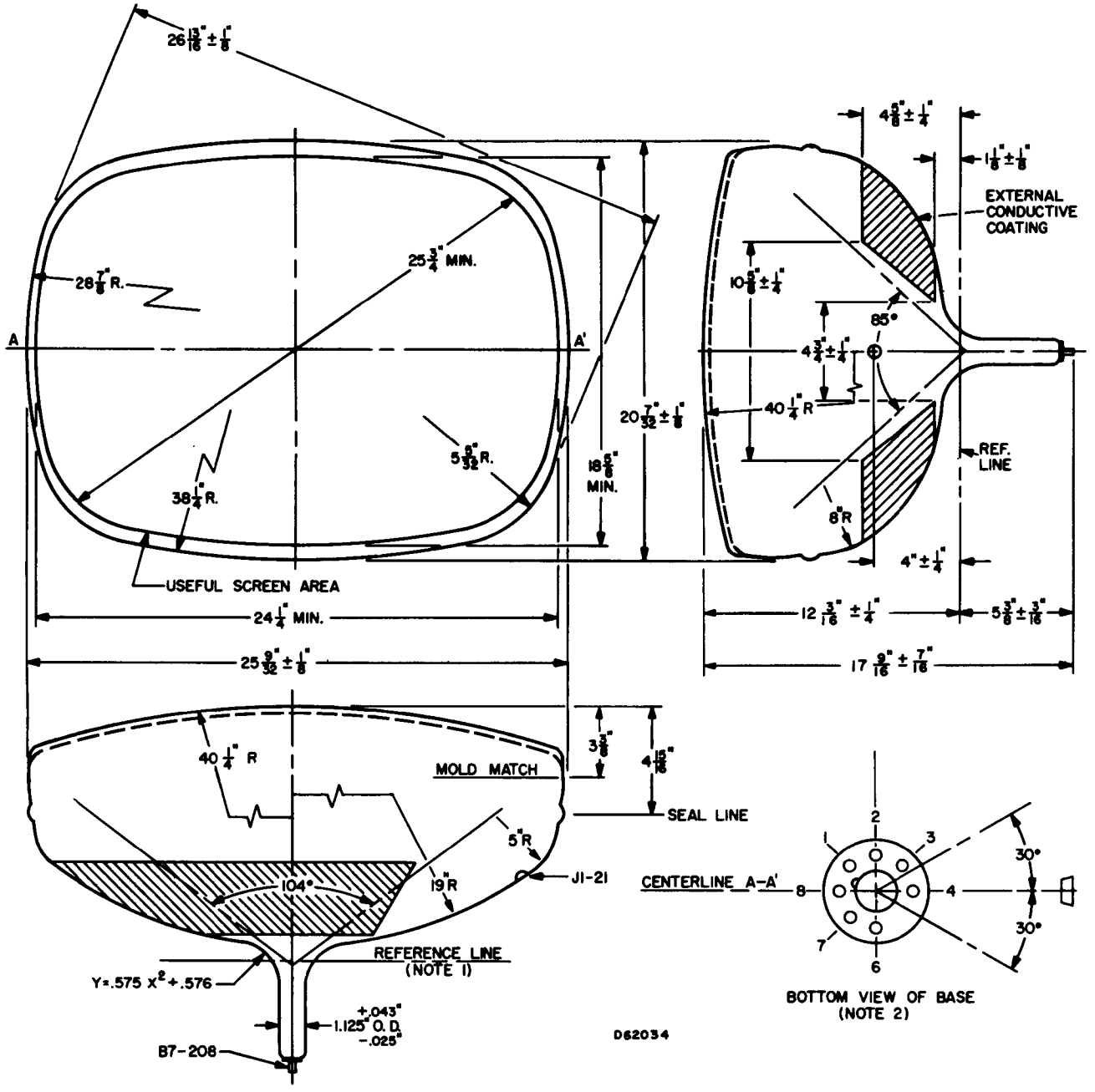


DIAGRAM NOTES:

1. *Reference Line is determined by Plane C-C' of JEDEC No. 126. Reference Line Gauge, when gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline of tube within 30°, and is on same side as anode contact, J1-21.*

SYLVANIA

engineering data service

SYLVANIA

27GP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflection Angle (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	68 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to all Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	24¼ x 18½ Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12D

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	22,500 Volts dc
Grid No. 2 Voltage	500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period Not to Exceed 15 Seconds	410 Volts
After Equipment Warm-up Period	180 Volts
Heater Positive with Respect to Cathode	180 Volts

RECOMMENDED OPERATING CONDITIONS

Anode Voltage[1]	20,000 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage[2] Required for Cutoff	−28 to −72 Volts dc
Focusing Coil Current[3]	125 ± 20% Ma dc
Ion Trap Magnet Strength (approx.)	40 Gausses

CIRCUIT VALUES

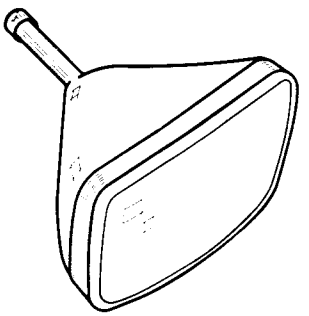
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

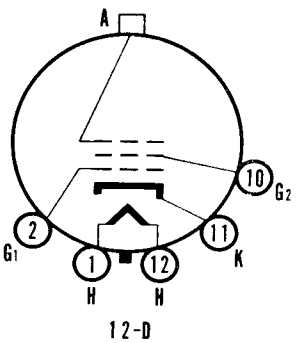
NOTES:

1. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than this value.*
2. *Visual extinction of focused raster. Extinction of the stationary focused spot will require that these values be about 5 volts more negative.*
3. *For JETEC focusing coil No. 109 or equivalent 3 inches from reference line with the combined grid No. 1 bias voltage and video signal voltage adjusted to produce a highlight brightness of 20 foot lamberts on a picture area of 24¼ x 18½ inches.*

QUICK REFERENCE DATA

Television Picture Tube
27" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Magnetic Focus
Single Field Ion Trap





12-D

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

OCTOBER 1953

SYLVANIA

27GP4

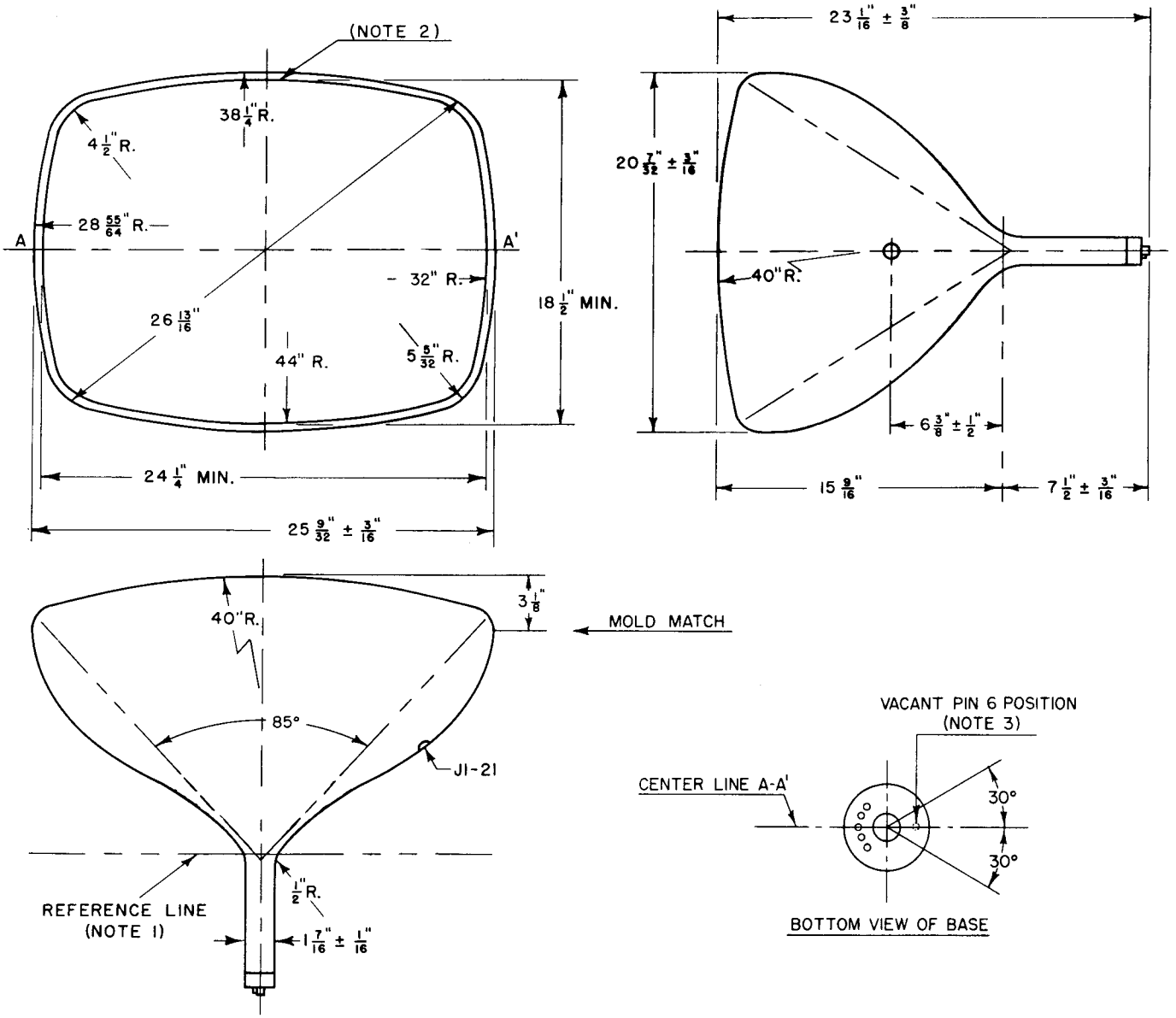


DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C1 of the reference line gauge (JETEC No. 116) when the gauge is resting on the cone. The neck diameter near the cone may exceed 1.500" but is limited by the internal contour of the yoke reference line gauge.*
2. *Suggested mask opening.*
3. *Bulb contact aligns with vacant pin position No. 6 ± 30 degrees.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

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engineering data service

SYLVANIA

27NP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflection Angle (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	68 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
External Conductive Coating to Anode[1]	750 $\mu\mu$f Max.
	500 $\mu\mu$f Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	24¼ x 18½ Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12N

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	18,000 Volts dc
Grid No. 2 Voltage	500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period Not to Exceed 15 Seconds	410 Volts
After Equipment Warm-up Period	180 Volts
Heater Positive with Respect to Cathode	180 Volts

RECOMMENDED OPERATING CONDITIONS

Anode Voltage[2]	16,000 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage[3] Required for Cutoff	-28 to -72 Volts dc
Focusing Coil Current[4]	95 ± 20% Ma dc
Ion Trap Magnet Strength (approx.)	35 Gausses

CIRCUIT VALUES

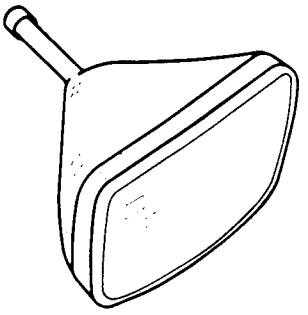
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

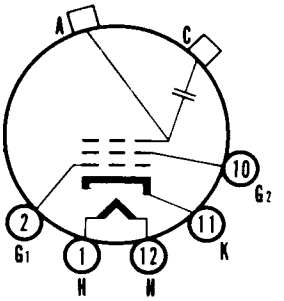
NOTES:

1. *Conductive Coating must be grounded.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than this value.*
3. *Visual extinction of focused raster. Extinction of the stationary focused spot will require that these values be about 5 volts more negative.*
4. *For JETEC focusing coil No. 109 or equivalent 3 inches from reference line with the combined grid No. 1 bias voltage and video signal adjusted to produce a highlight brightness of 20 foot lamberts on a picture area of 24¼ x 18½ inches.*

QUICK REFERENCE DATA

Television Picture Tube
27" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Magnetic Focus
Single Field Ion Trap
External Conductive Coating





12-N

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

OCTOBER 1953

SYLVANIA

27NP4

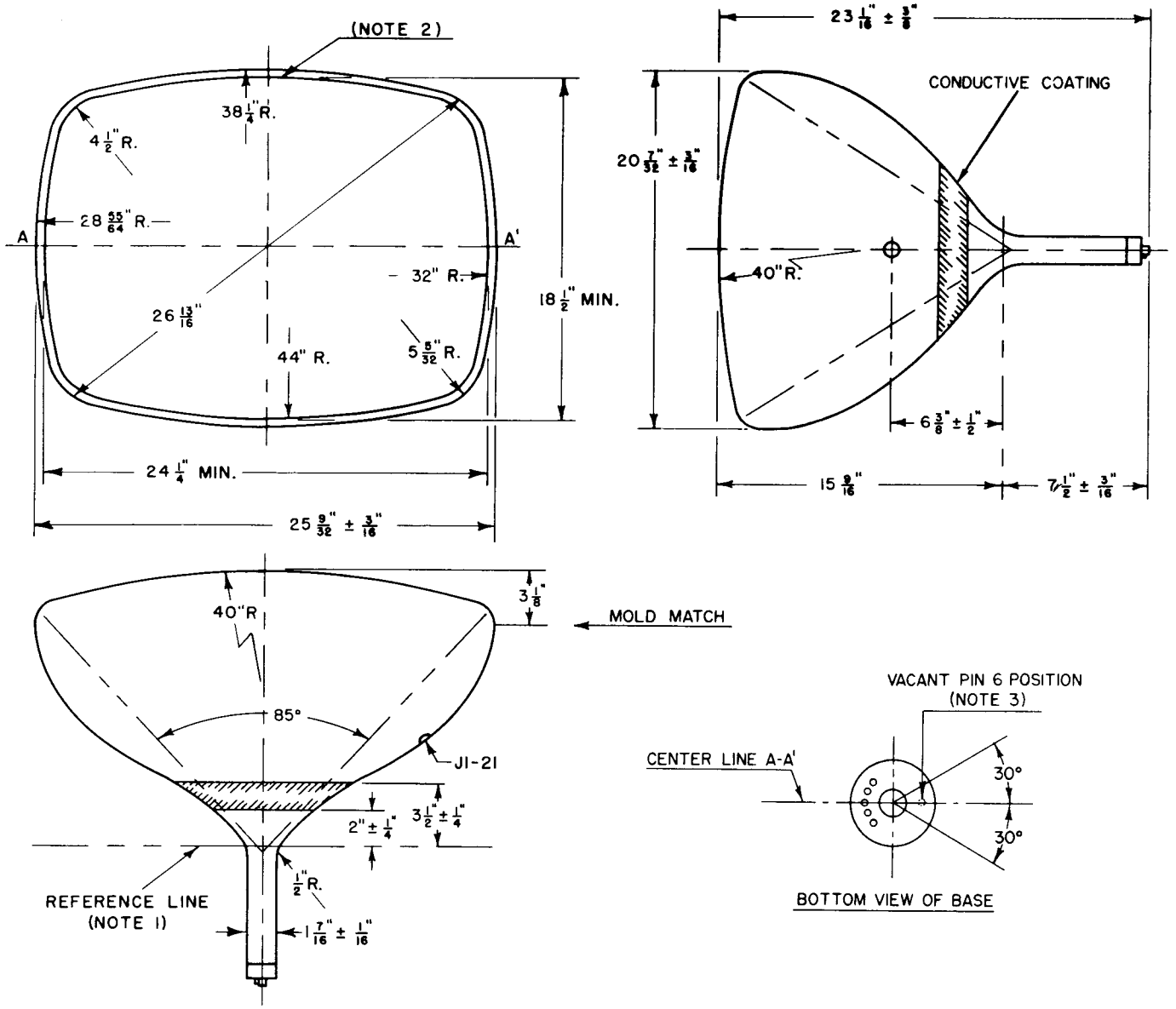


DIAGRAM NOTES

1. *Reference line is determined by the plane C-C1 of the reference line gauge (JETEC No. 116) when the gauge is resting on the cone. The neck diameter near the cone may exceed 1.500" but is limited by the internal contour of the yoke reference line gauge.*
2. *Suggested mask opening.*
3. *Bulb contact aligns with vacant pin position No. 6 ± 30 degrees.*

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

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27SP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	68 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (approx.)	0.6 Ampere
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 $\mu\mu$f
Grid No. 1 to All Other Electrodes	6 $\mu\mu$f
External Conductive Coating to Anode[1]	750 $\mu\mu$f Max.
	500 $\mu\mu$f Min.
Ion Trap Magnet	External, Single Field Type

MECHANICAL DATA

Minimum Useful Screen Dimensions	24 x 18½ Inches
Bulb Contact, (Recessed Small Cavity Cap)	J1-21
Base, (Small Shell Duodecal 6-Pin)	B6-63
Basing	12L

RATINGS

MAXIMUM RATINGS (Design Center Values)

Anode Voltage	20,000 Volts dc
Grid No. 4 Voltage (Focusing Electrode)	−500 to +1000 Volts dc
Grid No. 2 Voltage	500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	125 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period Not to Exceed 15 Seconds	410 Volts
After Equipment Warm-up Period	180 Volts
Heater Positive with Respect to Cathode	180 Volts

RECOMMENDED OPERATING CONDITIONS

Anode Voltage[2]	18,000 Volts dc
Grid No. 4 Voltage	−72 to +396 Volts dc
Grid No. 2 Voltage	300 Volts dc
Grid No. 1 Voltage Required for Cutoff[3]	−28 to −72 Volts dc
Ion Trap Magnet Strength (approx.)	40 Gauss

CIRCUIT VALUES

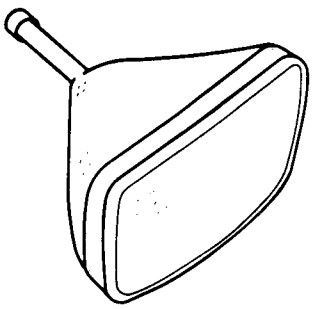
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

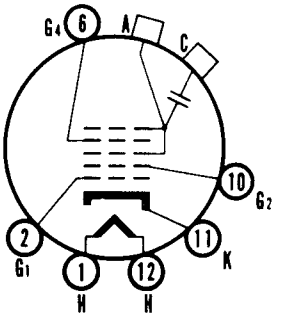
NOTES:

1. *External conductive coating must be grounded.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than this value.*
3. *Visual extinction of focused raster. Extinction of the stationary focused spot will require that these values be about 5 volts more negative.*

QUICK REFERENCE DATA

Television Picture Tube
27" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Magnetic Deflection
Electrostatic Focus
Single Field Ion Trap
Aluminized Screen
External Conductive Coating





12-L

SYLVANIA ELECTRIC PRODUCTS INC.

TELEVISION PICTURE TUBE DIVISION
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JUNE 1954

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27SP4

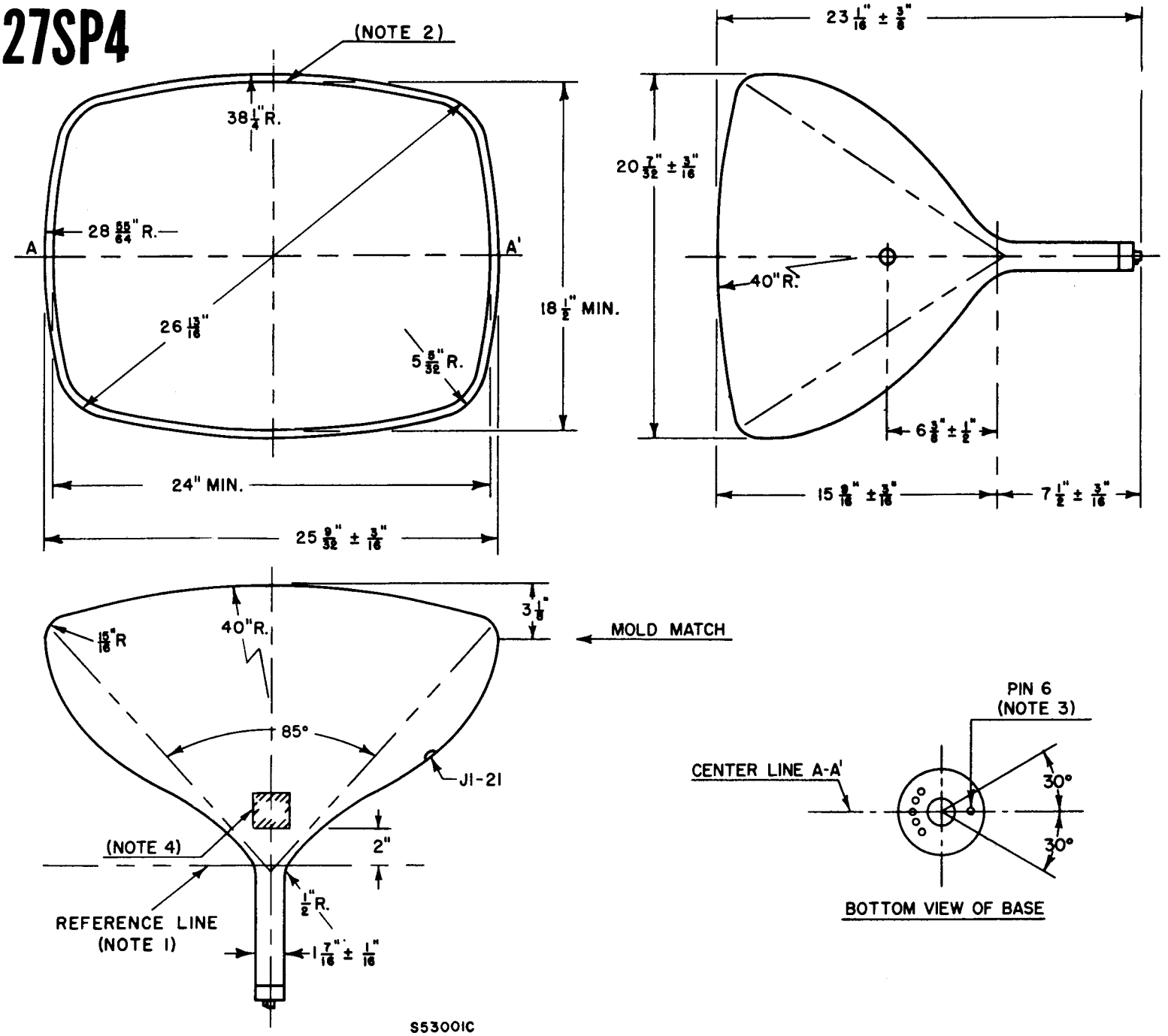

DIAGRAM NOTES:

1. *Reference line is determined by the plane C-C1 of the reference line gauge (JETEC No. 116) when the gauge is resting on the cone. The neck diameter near the cone may exceed 1.500" but is limited by the internal contour of the yoke reference line gauge.*
2. *Useful screen area.*
3. *Anode contact aligns with pin No. 6 ±30 degrees.*
4. *In the interest of reducing the number of potential types due to different external coating shapes, only the 2" x 2" contact point is defined on the picture tube as shown in the drawing. The external coating may take any configuration above the reference line to produce the desired capacitance.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

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27XP4

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Vertical	68 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	70 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5% Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	1700 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	24¼ x 18⅜	Inches
Minimum Useful Screen Area	425	Sq. Inches
Neck Length	4½ ± 3/16	Inches
Overall Length	20 1/16 ± ⅜	Inches
Bulb	J214-½A	
Bulb Contact (Recessed Small Caviety Cap	J1-21	
Base	B6-203	
Basing	12L	
Weight (Approx.)	44	Lbs.

RATINGS

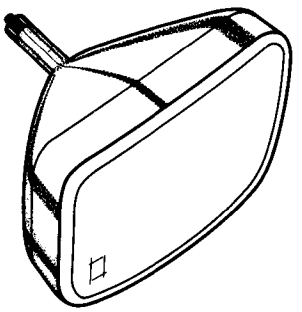
MAXIMUM RATINGS (Design Maximum Values)

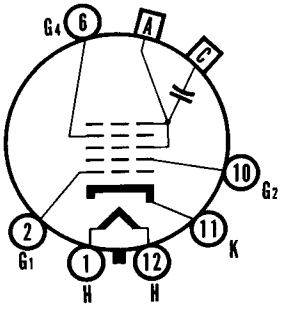
Grid Drive Service[3]

Maximum Anode Voltage	23,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to + 1100 Volts	dc
Maximum Grid No. 2 Voltage	550 Volts	dc
Minimum Grid No. 2 Voltage	200 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
27" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
90° Magnetic Deflection
1 7/16" Neck Diameter
No Ion Trap
External Conductive Coating
Short Neck





12-L

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

OCTOBER, 1961

File Under
TELEVISION PICTURE TUBES

MAXIMUM RATINGS (Design Maximum Values) (Continued)

Cathode Drive Service[4]

Maximum Anode Voltage	23,000 Volts	dc
Minimum Anode Voltage	11,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−400 to + 1250 Volts	dc
Maximum Grid No. 2 Voltage	700 Volts	dc
Minimum Grid No. 2 Voltage	350 Volts	dc
Cathode Voltage		
Positive Bias Value	155 Volts	dc
Positive Peak Value	220 Volts	
Negative Bias Value	0 Volts	dc
Negative Peak Value	2 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

Grid Drive Service[3]

Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Grid No. 1 Voltage Required for Cutoff[5]	−36 to −94 Volts	dc

Cathode Drive Service[4]

Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	400 Volts	dc
Cathode Voltage Required for Cutoff[5]	+36 to +78 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times rated heater voltage divided by rated heater current.*
2. *External conductive coating must be grounded.*
3. *Unless otherwise specified, voltages are positive with respect to cathode.*
4. *Unless otherwise specified, voltages are positive with respect to Grid No. 1.*
5. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be increased by about 5 volts.*

WARNING:

X-ray radiatation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

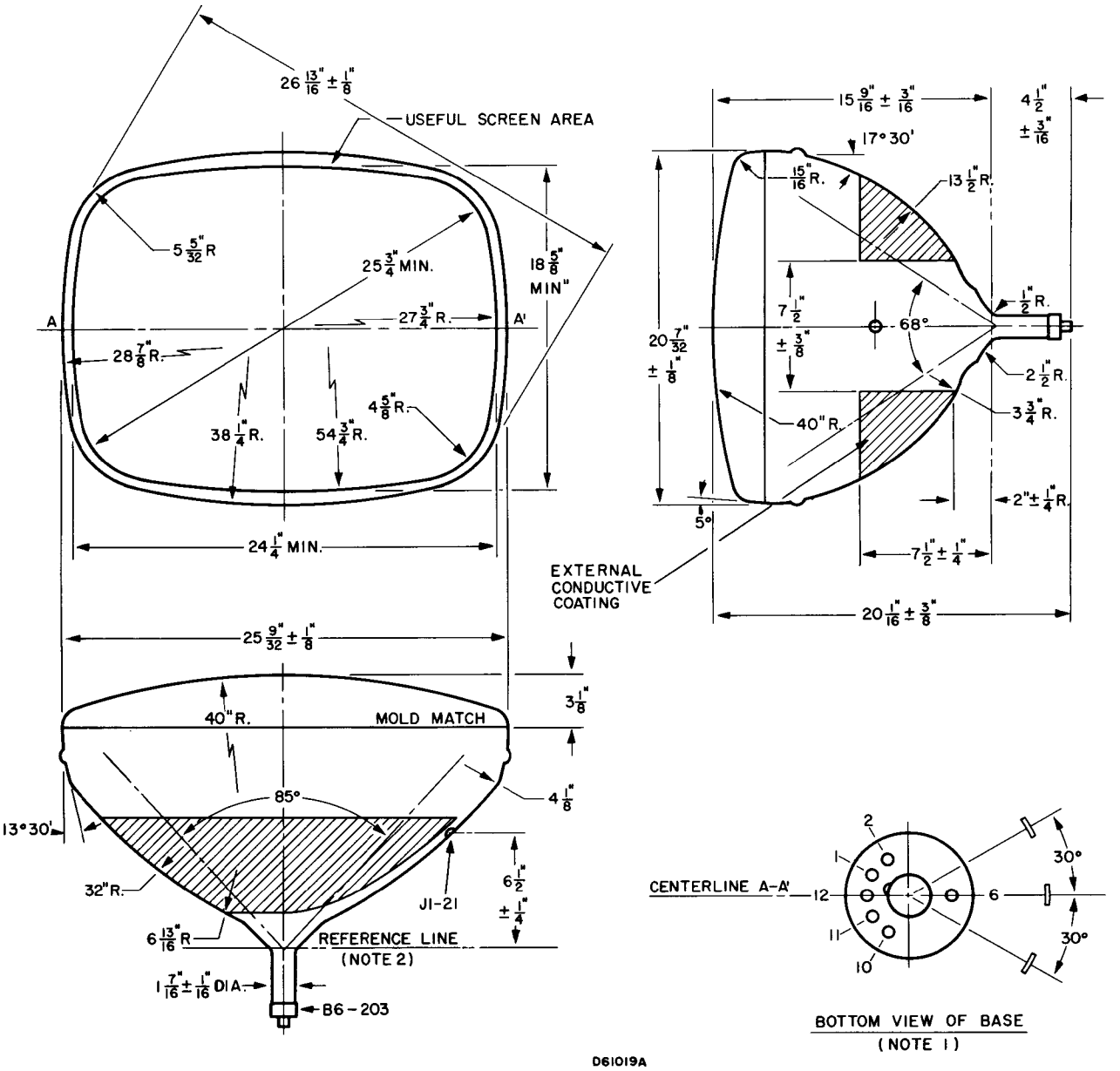


DIAGRAM NOTES:

1. *The plane through the tube axis and Pin No. 6 may vary from the plane through the tube axis and anode terminal by an angular tolerance (measured about the tube axis) of ±30°. Anode terminal is on same side as Pin No. 6.*
2. *With tube neck inserted through flared end of reference line gauge JEDEC No. G-116 and with tube seated in gauge, the reference line is determined by the intersection of the Plane CC' of the gauge with the glass funnel.*

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	104 Degrees
Diagonal	110 Degrees
Vertical	85 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	70 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 5 % Ampere	
Heater Warm-up Time[1]	11 Seconds	
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5 μμf	
Grid No. 1 to All Other Electrodes	6 μμf	
External Conductive Coating to Anode[2]	2500 μμf	Max.
	2000 μμf	Min.

MECHANICAL DATA

Minimum Useful Screen Dimensions (Maximum Assured)	
Height	18⅝ Inches
Width	24 ¼ Inches
Diagonal	25 ¾ Inches
Minimum Useful Screen Area	425 Sq. Inches
Neck Length	5⅜ ± 3/16 Inches
Overall Length	17 5/16 ± ⅜ Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Bulb	J214 ½B
Base	B7-208
Basing	8HR
Weight (Approx.)	41 Pounds

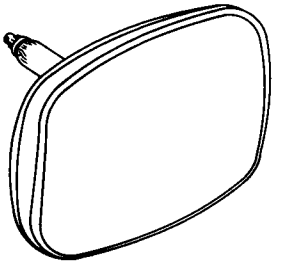
RATINGS

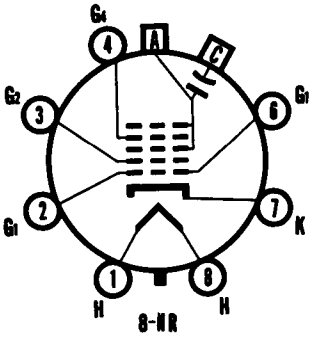
MAXIMUM RATINGS (Design Maximum Values) Grid Drive Service

Maximum Anode Voltage	22,000 Volts	dc
Minimum Anode Voltage	12,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts	dc
Grid No. 2 Voltage	550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	155 Volts	dc
Negative Peak Value	220 Volts	
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Maximum Heater Voltage	6.9 Volts	
Minimum Heater Voltage	5.7 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up Period	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Television Picture Tube
27" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Aluminized Screen
Electrostatic Focus
110° Magnetic Deflection
1⅛" Neck Diameter
No Ion Trap
External Conductive Coating





SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

PICTURE TUBE
OPERATIONS

SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

MAY, 1962

File Under
TELEVISION PICTURE TUBES

TYPICAL OPERATING CONDITIONS, Grid Drive Service

Anode Voltage	18,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to 400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[3]	−35 to −72 Volts	dc

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

NOTES:

1. *Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 % of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.*
2. *External conductive coating must be grounded.*
3. *Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

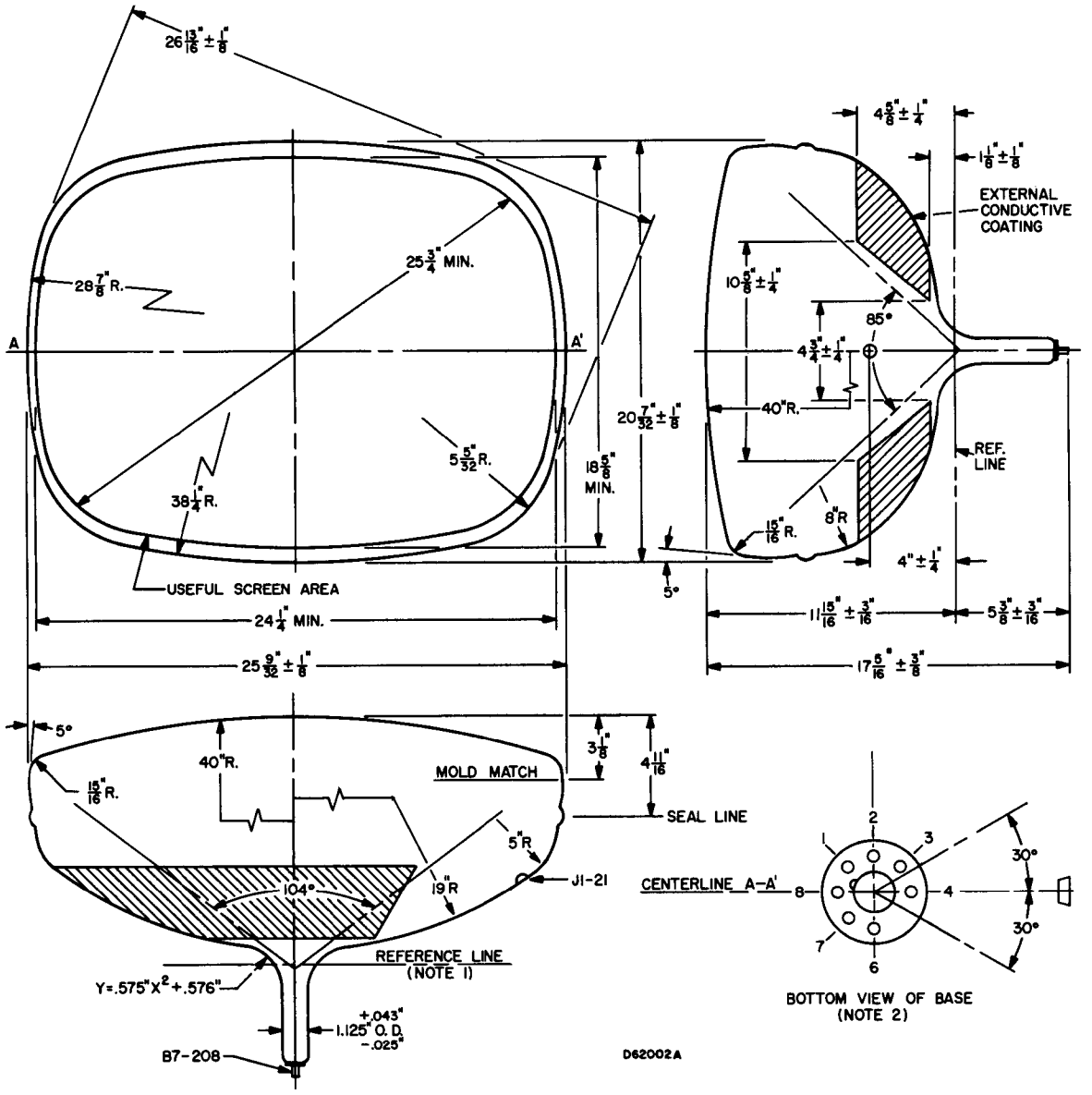


DIAGRAM NOTES:

1. *Reference line is determined by Plane C-C' of JEDEC No. 126 Reference Line Gauge, when gauge is seated against the bulb.*
2. *Base Pin No. 4 aligns with horizontal centerline of tube within 30°, and is on same side as anode contact, J1-21.*

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28D7W

MECHANICAL DATA

Bulb	T-9
Base	Lockin 8-Pin
Basing	8BS
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS

Shock (Intermittent Service-Abs. Max.)	350	g
Vibration (Continuous Service-Design Center)	2.5	g
Mechanical Resonance	None Below 100	cps

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (Avg.)	28	Volts
Heater Voltage (Abs. Max.)	30	Volts
Heater Voltage (Design Center)	28	Volts
Heater Current (Avg.)	400	Ma
Heater Current (Max.)[1]	435	Ma
Heater Current (Min.)[1]	365	Ma

RATINGS (Each Section)

	Absolute Max.	Design Center	
Plate Voltage	100	100	Volts
Screen Voltage	67.5	67.5	Volts
Plate Dissipation	3.0	3.0	Watts
Screen Dissipation	0.5	0.5	Watt
Heater-Cathode Voltage	100	90	Volts

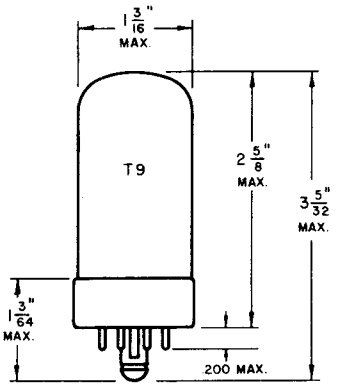
CHARACTERISTICS AND TYPICAL OPERATION

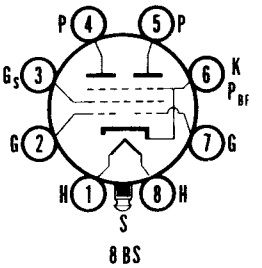
Resistance Coupled Class A_2 Amplifier (Each Section)[2]

	Self Bias	Fixed Bias			
		Min.[1]	Avg.	Max.[1]	
Plate Voltage[3]	28.0	—	28.0	—	Volts
Screen Voltage	28.0	—	28.0	—	Volts
Grid Voltage	—	—	-3.5	—	Volts
Cathode Bias Resistor	390	—	—	—	Ohms
Plate Current (Zero Signal)	9.0	8.0	12.5	17.5	Ma
Plate Current (Maximum Signal)	6.5	—	8.1	—	Ma
Screen Current (Zero Signal)	0.7	0.2	1.0	2.2	Ma
Screen Current (Maximum Signal)	1.6	—	1.9	—	Ma
Transconductance	—	2800	3400	4800	μmhos
Plate Resistance	—	—	4200	—	Ohms
Peak A F Signal Voltage	4.9	—	4.9	—	Volts
Control Grid Resistor	0.5	—	0.2	—	Megohm
Load Resistance	4000	—	4000	—	Ohms
Power Output	80	65	100	—	Mw
Total Harmonic Distortion	10	—	10	—	Percent
Heater-Cathode Leakage at ±100 Volts	—	—	—	150	μa
Grid Current	—	—	—	2.0	μa

QUICK REFERENCE DATA

Rugged double beam power tube designed for use in amplifiers or control devices in airplane or mobile service where the equipment is subjected to shock and vibration.





SYLVANIA ELECTRIC PRODUCTS INC.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

APRIL 1953

SYLVANIA

28D7W

Push Pull Resistance Coupled Class A_2 Amplifier (Both Sections)

	Self Bias	Fixed Bias	
Plate Voltage[3]	28.0	28.0	Volts
Screen Voltage	28.0	28.0	Volts
Grid Voltage	—	-3.5	Volts
Cathode Bias Resistor	180	—	Ohms
Plate Current (Zero Signal)	18.5	25.0	Ma
Plate Current (Maximum Signal)	14.5	19.0	Ma
Screen Current (Zero Signal)	1.2	2.0	Ma
Screen Current (Maximum Signal)	2.5	3.0	Ma
Peak A F Signal Voltage (Grid to Grid)	9.8	9.8	Volts
Control Grid Resistor (Each Section)	0.5	0.2	Megohm
Load Resistance (Plate to Plate)	6000	6000	Ohms
Total Harmonic Distortion	2.5	2.0	Percent
Power Output	175	225	Mw

Parallel Resistance Coupled Class A_2 Amplifier (Both Sections)

Plate Voltage[3]	28.0	28.0	Volts
Screen Voltage	28.0	28.0	Volts
Grid Voltage	—	-3.5	Volts
Cathode Bias Resistor	180	—	Ohms
Plate Current (Zero Signal)	18.5	25.0	Ma
Plate Current (Maximum Signal)	13.1	16.0	Ma
Screen Current (Zero Signal)	1.3	2.0	Ma
Screen Current (Maximum Signal)	2.8	3.5	Ma
Peak A F Signal Voltage	4.9	4.9	Volts
Control Grid Resistor	0.2	0.1	Megohm
Load Resistance	2000	2000	Ohms
Total Harmonic Distortion	9.5	8.0	Percent
Power Output	160	200	Mw

Push Pull Transformer Coupled Class A_2 Amplifier (Both Sections)

Plate Voltage[3]	28.0	Volts
Screen Voltage	28.0	Volts
Grid Voltage[4]	0	Volts
Cathode Bias Resistor	0	Ohms
Plate Current (Zero Signal)	64.0	Ma
Plate Current (Maximum Signal)	58.0	Ma
Screen Current (Zero Signal)	4.0	Ma
Screen Current (Maximum Signal)	17.0	Ma
Peak A F Signal Voltage (Grid to Grid)	17.8	Volts
Load Resistance (Plate to Plate)	1500	Ohms
Total Harmonic Distortion	11.0	Percent
Power Output	600	Mw

NOTES:

1. *Limits given here are the extremes which may be found in production.*
2. *When operating or testing one section only, the grid of the other section must be biased to -40 volts.*
3. *These ratings may be realized, provided the d c plate circuit resistance does not exceed 50 ohms per section.*
4. *Any unnecessary grid circuit resistance provides additional self bias and is not recommended if rated output is desired.*

CIRCUIT APPLICATION

The two sections of the Sylvania Type 28D7W tube may be operated separately, connected in parallel, or in a push-pull circuit. Two different recommended loads per section are specified, the choice depending upon whether both sections are to function as single-ended amplifiers or in push-pull.

In general, self-bias will probably be employed and under such conditions power outputs exceeding 150 milliwatts can readily be obtained from a single tube operating in push-pull from a resistance coupled driver. If a separate bias voltage supply can be provided, fixed-bias operation will furnish additional power output since it permits utilization of the total supply voltage. An increase in effective B voltage of about 3.5 volts is an important factor in low voltage operation. In some applications bias voltage may be obtained from an oscillator, thus making it unnecessary to provide a separate battery for grid bias and also permitting the use of the total plate supply voltage. The dc resistance of the output transformer plate winding should be as low as possible to minimize the voltage drop. Grid circuit resistance should also be kept close to the specified values.

Inasmuch as the plate, screen and heater supply of the equipment will be subjected to whatever voltage variations occur in the supply voltage, it is important to know how the performance will be affected by such changes. The operating supply may vary from 32 volts to as low as 22 volts.

Power output and distortion data on Type 28D7W are given in the following table with the heater, plate and screen voltages varied from 22 volts to 30 volts under fixed-bias and self-bias conditions. Values shown are for resistance coupled operation with both sections connected in parallel.

R_L = 2000 Ohms
FIXED BIAS
R_g = 100,000 Ohms, E_c = -3.5 Volts

$E_h = E_b = E_{c2}$	P. O.	% Distortion
22 Volts	112 Mw	15
24	135	12
26	170	10
28	200	8
30	235	8

E_{sig} = 3.5 Volts RMS
SELF BIAS
R_g = 200,000 Ohms, R_k = 180 Ohms, C_k = 10 μf

$E_h = E_b = E_{c2}$	P. O.	% Distortion
22 Volts	90 Mw	16
24	109	14
26	130	12
28	160	10
30	175	9

In applications where the tube is required to operate for any extended period at heater voltages in excess of 28 volts, a resistor should be inserted in series with the heater supply voltage and the heater.

Several methods of driving the Type 28D7W tube are very satisfactory for applications where a 28 volt power supply is the only source of operating voltage. Considerably higher power outputs than those mentioned previously are possible with push-pull transformer drive when another Type 28D7W is employed as a driver with both sections connected in parallel. At 500 milliwatts output the driving power is less than 45 milliwatts and the grid-to-grid signal on the output tube is approximately 10.5 volts RMS. At 600 milliwatts output these figures are 80 milliwatts and 12.8 volts respectively.

In order to make a tube providing good power output with only 28 volts plate supply, it is necessary to provide more cathode power than is customary in power output tubes. This results in a high operating temperature which should be considered in the selection of the tube socket and the placement of parts.

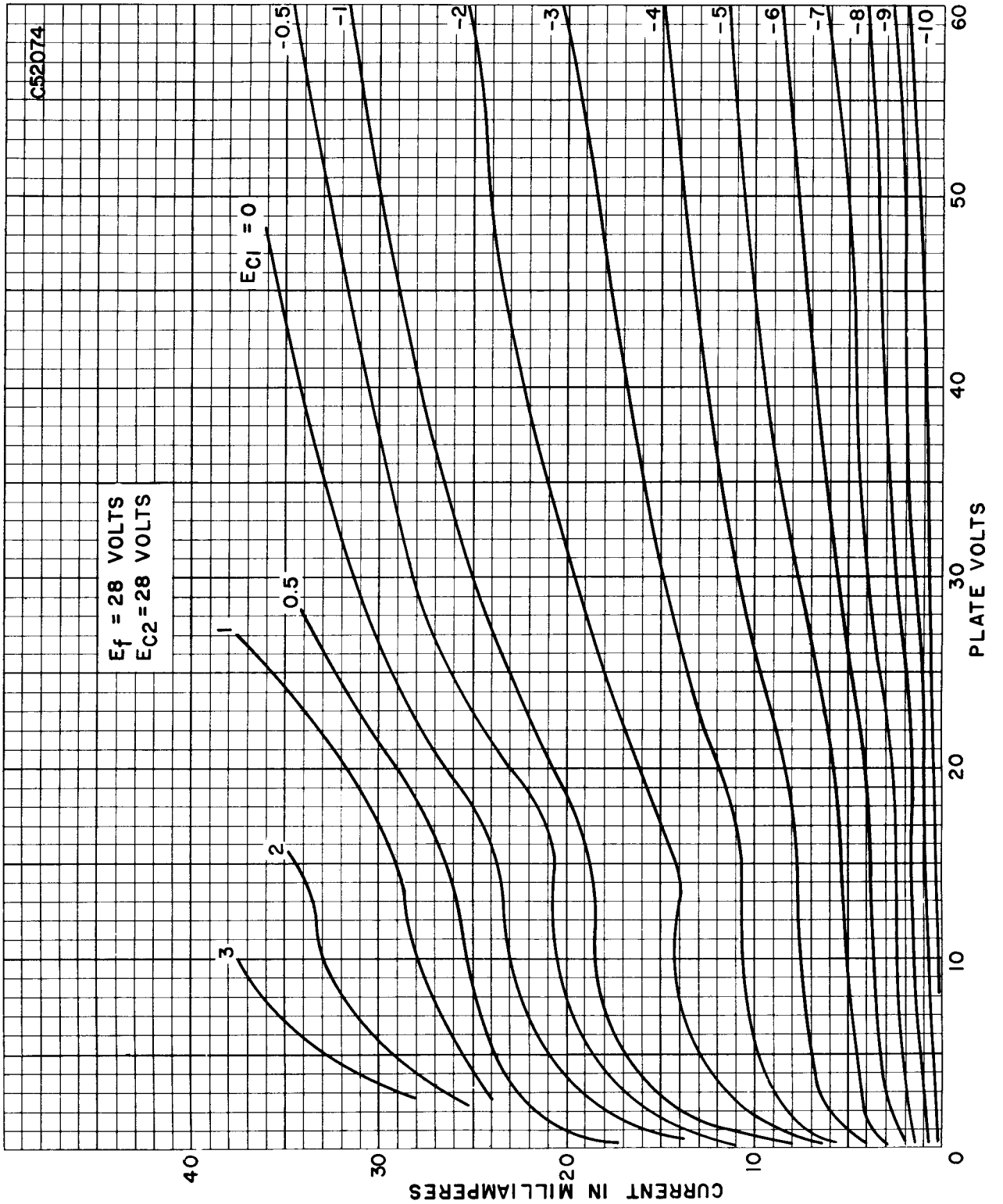
A special application is for supplying dc power up to 725 milliwatts at medium voltages of 50 to 250 volts and output voltages of 500 to 600 volts for lower power requirements. This is done by rectifying and filtering the voltage developed across a coil coupled to the tank circuit of the Sylvania Type 28D7W tube as a self-excited oscillator with only 28 volts supply. This may be added in series to the 28 volt source for the maximum values given or can be used as an isolated supply if required. Additional data for this service is available on request.

SYLVANIA

28D7W

AVERAGE PLATE CHARACTERISTICS

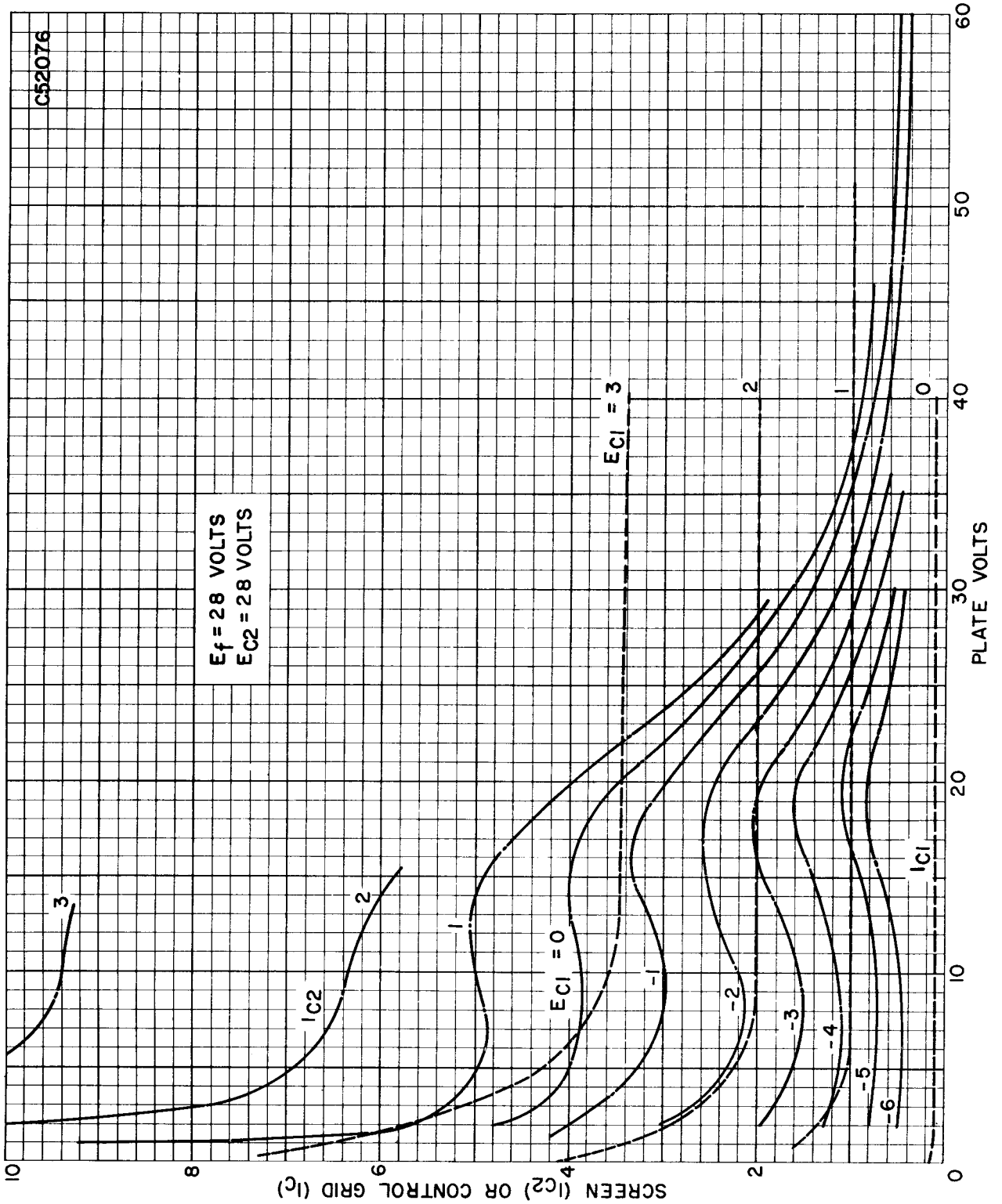
EACH SECTION



28D7W

AVERAGE CHARACTERISTICS

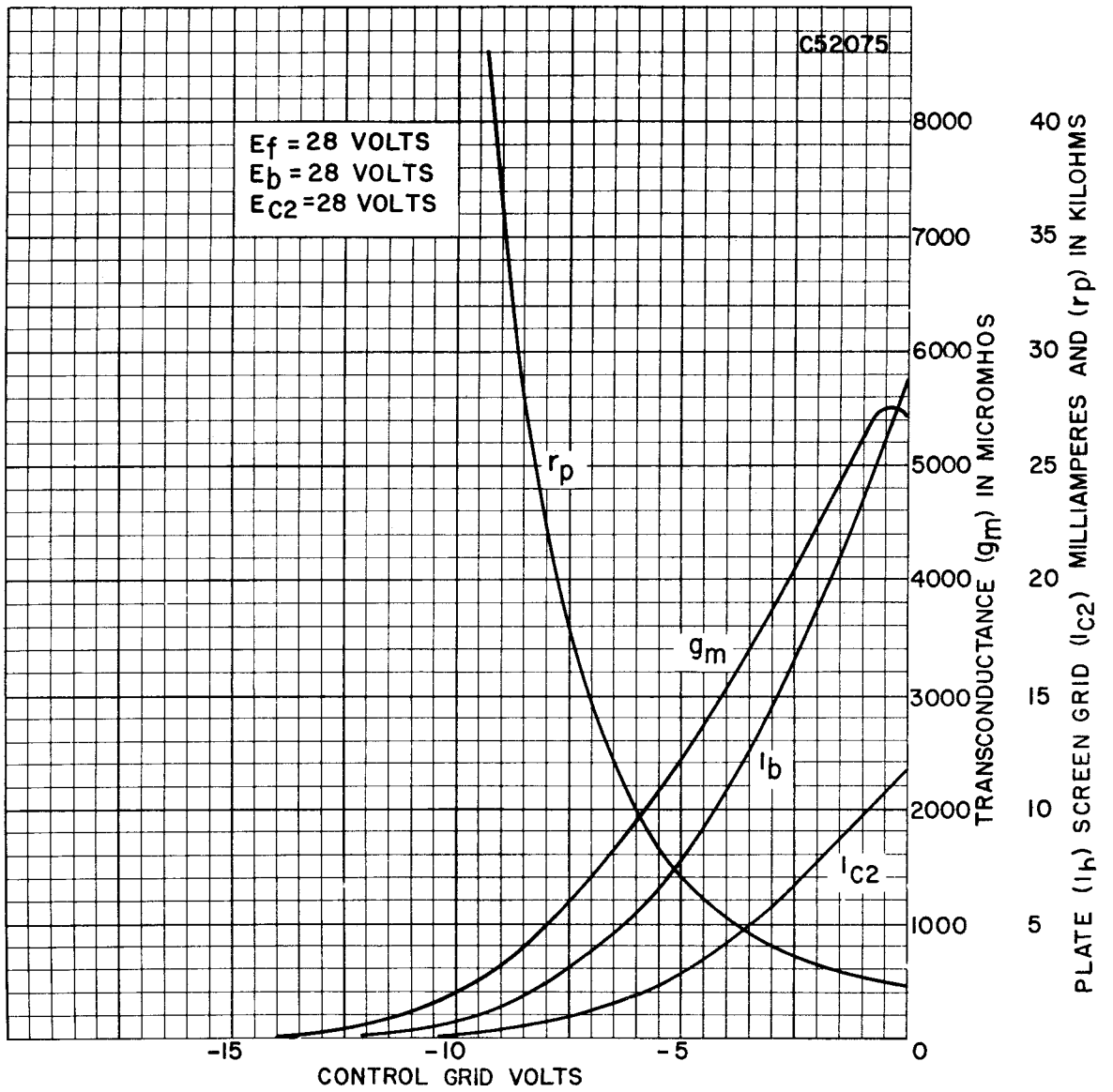
EACH SECTION



SYLVANIA

28D7W

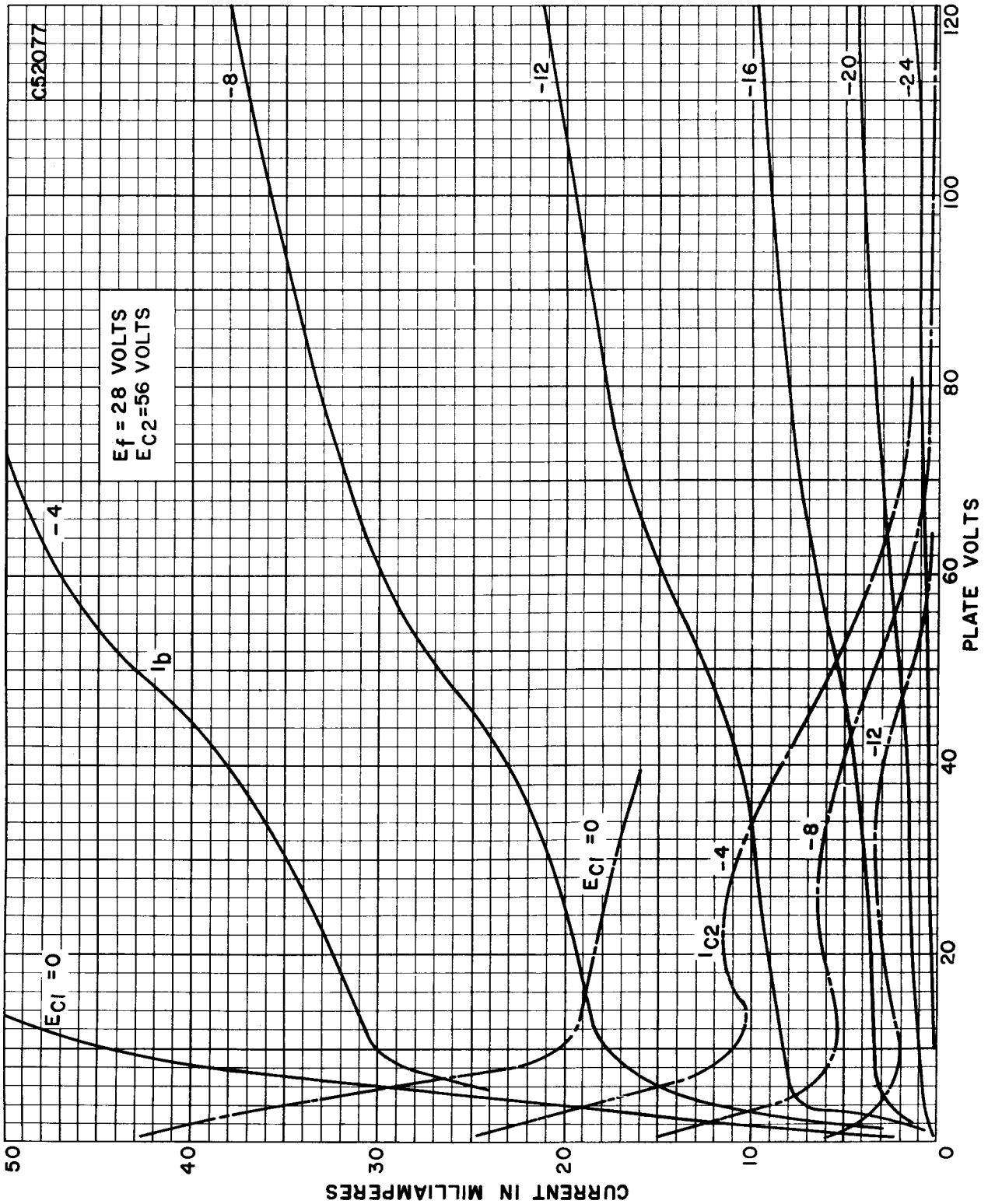
AVERAGE TRANSFER CHARACTERISTICS



28D7W

AVERAGE PLATE CHARACTERISTICS

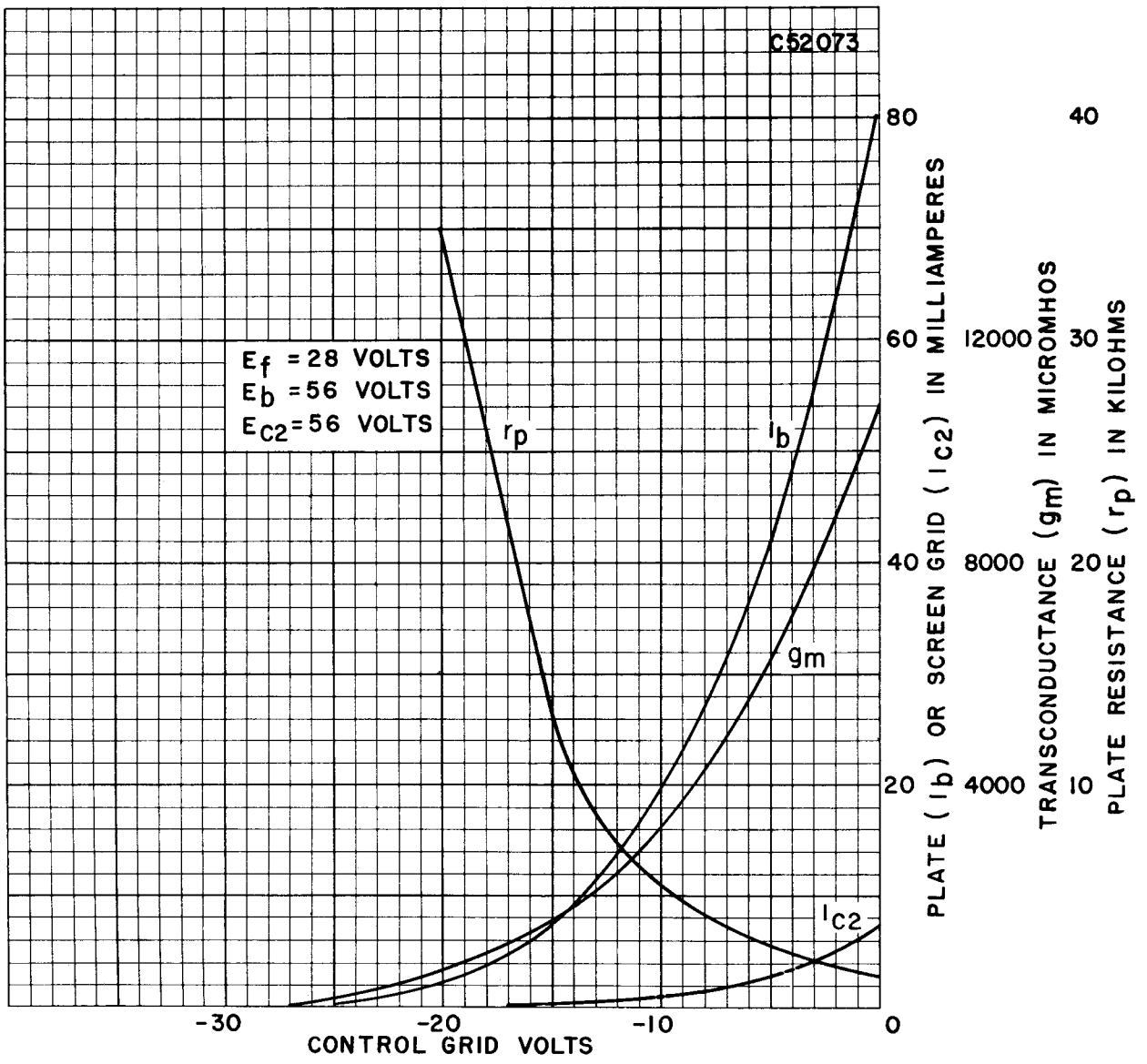
EACH SECTION



SYLVANIA

28D7W

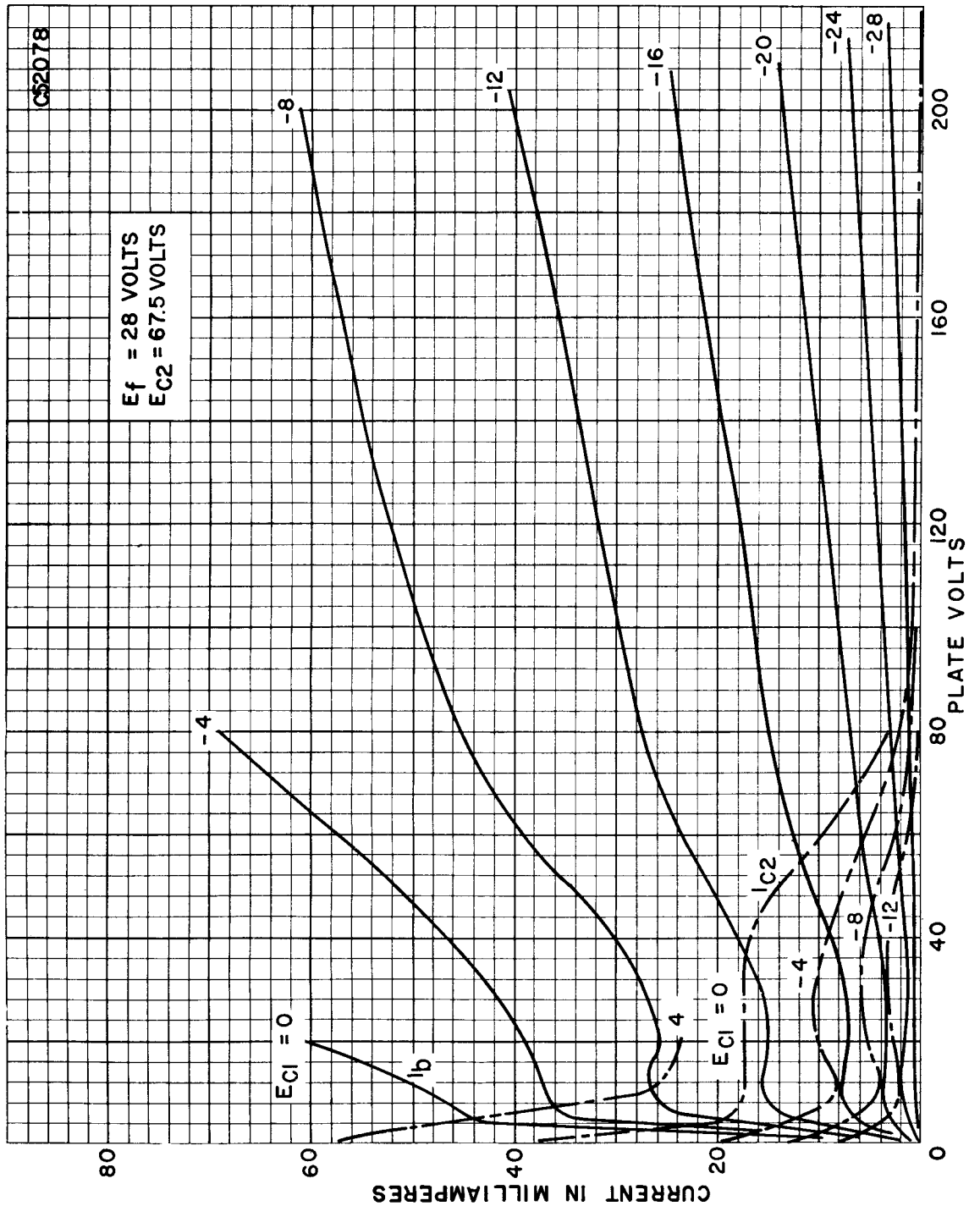
AVERAGE TRANSFER CHARACTERISTICS



28D7W

AVERAGE PLATE CHARACTERISTICS

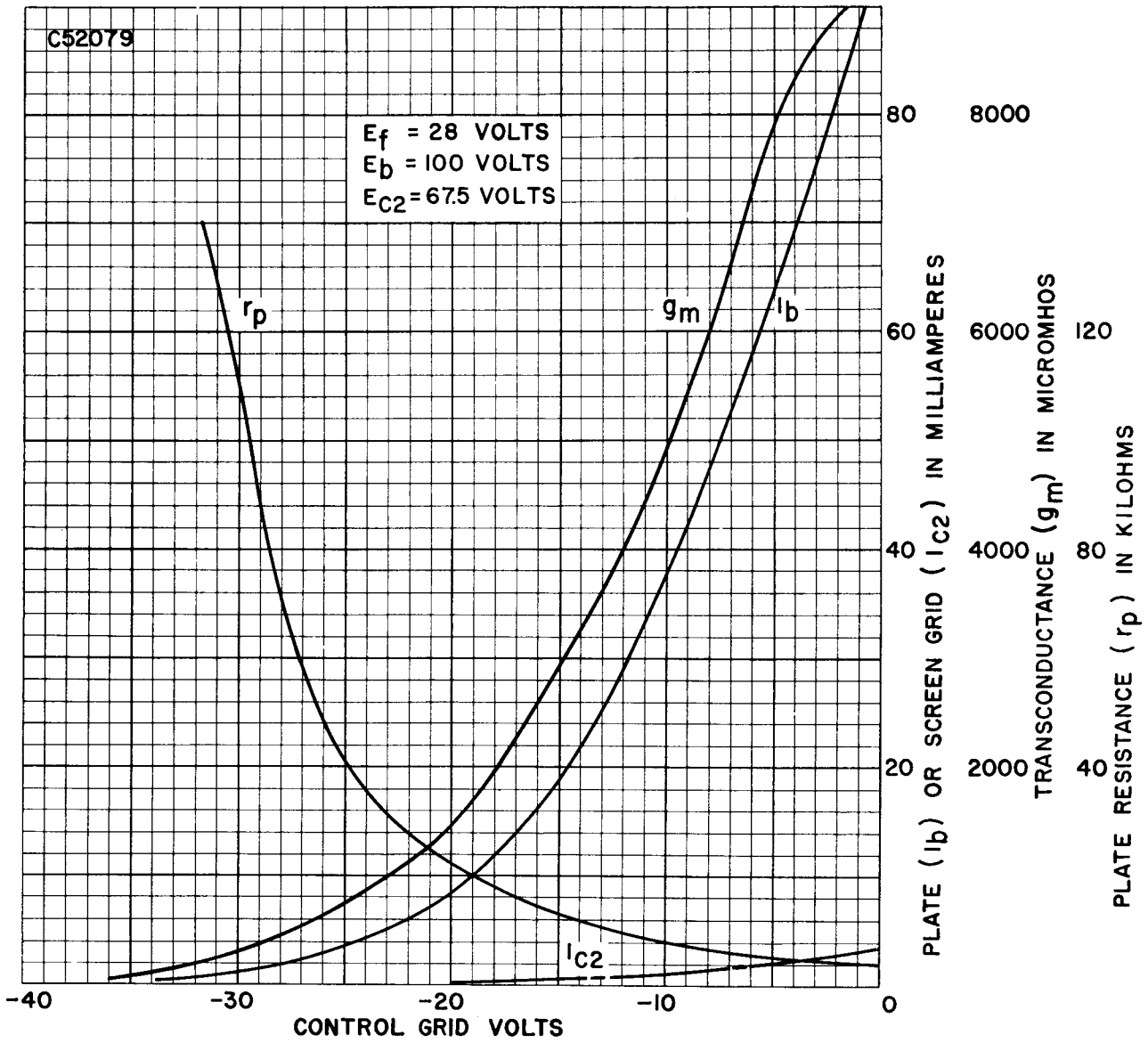
EACH SECTION



SYLVANIA

28D7W

AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA ELECTRIC PRODUCTS INC.

Technical Data

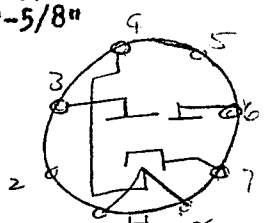
TYPE 28Z5
Full Wave Rectifier

Physical Specifications:

Coated Unipotential Cathode	
Base	Locking In 8-pin
Bulb	T-9
Maximum Diameter	1-3/16"
Maximum Overall Length	3-5/32"
Maximum Seated Height	2-5/8"

Pin Connections:

Pin 1 = Heater	Pin 5 = No connection
Pin 2 = No connection	Pin 6 = Plate #1
Pin 3 = Plate #2	Pin 7 = Cathode
Pin 4 = Heater Center tap	Pin 8 = Heater



Mounting Position: Any

Ratings:

Heater Voltage	28.0	Volts
Heater Current	0.240	Ampere
Maximum AC Plate Voltage (RMS) Condenser Input	325	Volts
Maximum AC Plate Voltage (RMS) Choke Input	450	Volts
Maximum Peak Inverse Voltage	1250	Volts
Maximum DC Heater to Cathode Potential	450	Volts
Maximum Steady-State Peak Plate Current Per Plate	300	Ma.
Tube Voltage Drop: Measured with applied DC at 100 ma. per plate.	40	Volts

Typical Operating Conditions: Full Wave Rectifier

Condenser Input to Filter:

Heater Voltage	28.0	Volts
AC Plate voltage per Plate (RMS)	325	Volts
DC Output Current	100	Ma.
Total Effective Plate Supply Impedance per plate‡	75	Ohms

Choke Input to Filter:

Heater Voltage	28.0	Volts
AC Plate Voltage per Plate (RMS)	450	Volts
DC Output Current	100	Ma.
Minimum Value of Input Choke	6	Henrys

‡ When filter condenser larger than 40 mfds are used, it may be necessary to add additional plate supply impedance.

GHK:dd
9-24-42

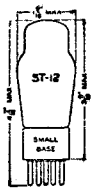
from RMA release #307, Oct. 1, 1942



Sylvania

TYPE 30

AMPLIFICATEUR DETECTEUR



CARACTERISTIQUES

Tension filament CC	2,0 volts
Courant filament	0,060 ampère
Ampoule	ST 12
Culot — Petit modèle 4 broches	4-D
Position de montage	Verticale

Capacités directes interélectrodes :

Grille à plaque	6,0 $\mu\mu$f
Entrée	3,0 $\mu\mu$f
Sortie	2,1 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension filament	2,0	2,0	2,0 volts
Tension plaque	90	135	180 volts
Tension grille*	—4,5	—9,0	—13,5 volts
Courant plaque	2,5	3,0	3,1 ma.
Résistance interne	11.000	10.300	10.300 ohms
Conductance mutuelle	850	900	900 μmhos
Coefficient d'amplification ...	9,3	9,3	9,3

* La résistance CC dans le circuit de grille ne dépassera pas 2 mégohms.

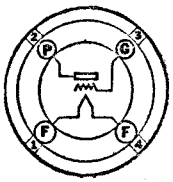
APPLICATION

Sylvania 30 est un tube à usage général, destiné aux récepteurs portables, sur accus. Les caractéristiques de ce tube sont semblables à celles du type 99 et le tube 30 peut remplacer un tube 99, si la tension filament est réduite à 2 volts. Il est possible qu'un récepteur à étages H.F. accordés, doive être neutralisé lorsqu'un tube 30 est utilisé dans les étages H.F.

Le tube 30 peut être utilisé dans les circuits classiques aussi bien comme amplificateur de haute fréquence que comme détecteur ou amplificateur basse fréquence intermédiaire ; avant l'étage de sortie classe A ou classe B. Les retours de grille et de plaque se font à l'extrémité négative du filament, par l'intermédiaire de batteries de polarisation convenables, sauf dans le cas du détecteur à fuite de grille, dans lequel le retour de grille est fait directement à l'extrémité positive.

Dans des circuits utilisant un amplificatur classe B, le type 30 peut être utilisé comme tube d'attaque. Avec 135 volts plaque et une polarisation de —9 volts, il débite assez de puissance pour attaquer un tube 19 devant fournir une puissance modulée de 1,25 watt. Si la tension plaque du tube 30 est portée à 180 volts et sa polarisation à —13,5 volts, il fournit assez de puissance pour attaquer un tube 19 et lui faire rendre 1,6 watt. Ceci n'est possible que si la tension d'entrée du tube 30 est suffisante pour faire rendre à ce tube son maximum de puissance de sortie. Lorsque cette condition n'est pas remplie, un étage basse fréquence supplémentaire équipé d'un tube 30 est nécessaire.

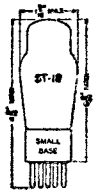
Le « G » équivalent est le type 1H4G.



Sylvania

TYPE 31

TRIODE DE SORTIE



CARACTERISTIQUES

Tension filament CC	2,0 volts
Courant filament	0,130 ampère
Ampoule	ST-12
Culot — Petit modèle 4 broches	4-D
Position de montage	verticale

Capacités directes interélectrodes :

Grille à plaque	5,7 $\mu\mu$F
Entrée	3,5 $\mu\mu$F
Sortie	2,7 $\mu\mu$F

Conditions de fonctionnement et caractéristiques :

Tension filament	2,0	2,0 volts
Tension plaque	135	180 volts max.
Tension grille	—22,5	— 30 volts
Courant plaque	8	12,3 ma.
Résistance interne	4,100	3,600 ohms
Conductance mutuelle	925	1,050 μmhos
Coefficient d'amplification	3,8	3,8
Impédance de charge	7,000	5,700 ohms
Puissance de sortie	185	375 mw.

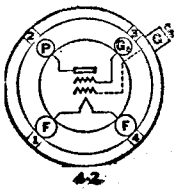
APPLICATION

Sylvania 31 est un tube de sortie destiné aux récepteurs portables où l'économie de courant est essentielle.

Le filament, en forme de V, est oxydé. Il demande une tension de 2 volts et un courant de 130 ma. La tension filament peut varier entre 1,9 et 2,1 volts, cette dernière valeur ne pouvant être dépassée.

La tension de plaque maximum est 180 volts. Il est recommandé d'employer cette tension chaque fois que c'est possible. Avec une tension plus faible, la puissance de sortie est plus faible. La polarisation grille qui convient pour une tension plaque de 135 volts est —22,5 volts. Il est important que la polarisation soit maintenue à cette valeur, sinon le courant plaque peut atteindre une valeur élevée qui diminue les qualités du tube. Le retour de grille va à l'extrémité négative du filament.

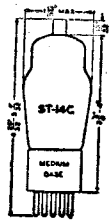
Lorsque la polarisation correcte est appliquée, il n'est pas nécessaire d'employer un filtre ou un transformateur de haut-parleur comme avec les autres tubes, le courant plaque étant relativement faible.



Sylvania

TYPE 32

AMPLIFICATEUR H. F. A GRILLE ECRAN



CARACTERISTIQUES

Tension filament CC	2,0 volts
Courant filament	0,06 ampère
Ampoule	ST-14C
Culot	4-K
Position de montage	verticale

Capacités directes interélectrodes :

Grille à plaque (avec blindage)	0,015 $\mu\mu$f
Entrée	5,3 $\mu\mu$f
Sortie	10,5 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension filament	2,0	2,0 volts
Tension plaque	135	180 volts
Tension grille	—3	—3 volts
Tension écran	67,5	67,5 volts
Courant plaque	1,7	1,7 ma.
Courant écran	0,4	0,4 ma.
Résistance interne	0,95	1,2 mégohm
Conductance mutuelle	640	650 μmhos
Coefficient d'amplification	610	780

APPLICATION

Sylvania **32** est un tube à grille écran utilisé comme amplificateur de haute fréquence ou de basse fréquence, ou comme détecteur. Il est principalement utilisé dans les étages H.F. et détecteur.

Le filament oxydé est semblable à celui du tube 30.

Amplificateur de haute fréquence:

Le tube 32, dans les conditions normales de fonctionnement, exige une polarisation de grille de contrôle de —3 volts. Cette tension peut être obtenue par une batterie ou par polarisation automatique. Cette dernière méthode est préférable, parce que la tension s'ajuste automatiquement et permet au tube de continuer à fonctionner convenablement pendant que la batterie s'épuise graduellement.

Le tube 32 a une grande impédance et doit fonctionner avec une grande impédance dans la plaque, si on désire une amplification raisonnable. Le couplage par transformateur ou par impédance est généralement utilisé avec ce tube.

Il est nécessaire d'employer un bon blindage pour réduire le couplage électrostatique et magnétique au minimum. Les circuits d'entrée et de sortie de chaque tube seront isolés aussi bien que possible l'un de l'autre.

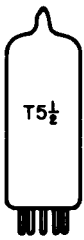
Détecteur:

Le tube **32** peut être utilisé comme détecteur couplé par résistance au premier amplificateur basse fréquence. La résistance de charge de plaque est comprise entre 150.000 et 300.000 ohms.

La grille écran peut être alimentée à travers une résistance en série, puisque le courant écran est réduit à une très faible valeur. La résistance sera de valeur telle qu'elle permettra que la tension grille écran soit moindre que la moitié de la tension plaque.

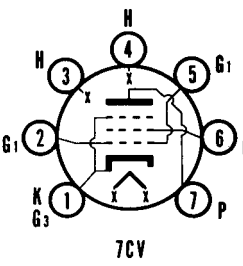
Amplificateur de basse fréquence:

Le tube 32 peut être utilisé en amplificateur B.F. à couplage par résistance. La résistance de charge ne doit pas dépasser 250.000 ohms. Il est indispensable que la tension écran ne soit pas supérieure à la moitié de la tension plaque, sinon le tube ne fonctionne pas convenablement.



SYLVANIA TYPE 32ET5A

BEAM POWER AMPLIFIER



7CV

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-3
Basing	7CV
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

	Series Operation
Heater Voltage	32 Volts
Heater Current[1]	100 Ma
Heater Warm-up Time[2]	20 Seconds

Ratings (Design Maximum Values)

	Min-Max
Heater Current[3]	94-106 Ma
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts
Heater Positive with Respect to Cathode	
D C	100 Volts
Total D C and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.6 μμf
Input: g to (h+k+g2+g3)	12 μμf
Output: p to (h+k+g2+g3)	6.0 μμf

RATINGS (Design Maximum System)

Plate Voltage	150 Volts Max.
Grid No. 2 Voltage	130 Volts Max.
Plate Dissipation	5.4 Watts Max.
Grid No. 2 Dissipation	1.2 Watts Max.
Grid No. 1 Circuit Resistance	
Fixed Bias	0.1 Megohm Max.
Cathode Bias	0.5 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

Plate Voltage	110 Volts
Grid No. 2 Voltage	110 Volts
Grid No. 1 Voltage	−7.5 Volts
Peak AF Grid No. 1 Voltage	7.5 Volts
Zero-Signal Plate Current	30 Ma
Zero-Signal Grid No. 2 Current	2.8 Ma
Transconductance	5500 μmhos
Plate Resistance (approx.)	21,500 Ohms
Load Resistance	2800 Ohms
Maximum-Signal Power Output	1.2 Watts
Total Harmonic Distortion (approx.)	10 Percent

NOTES:

1. For series operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current.
2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
3. Heater voltage supply variations shall be restricted to maintain heater current within the specified values.

APPLICATION

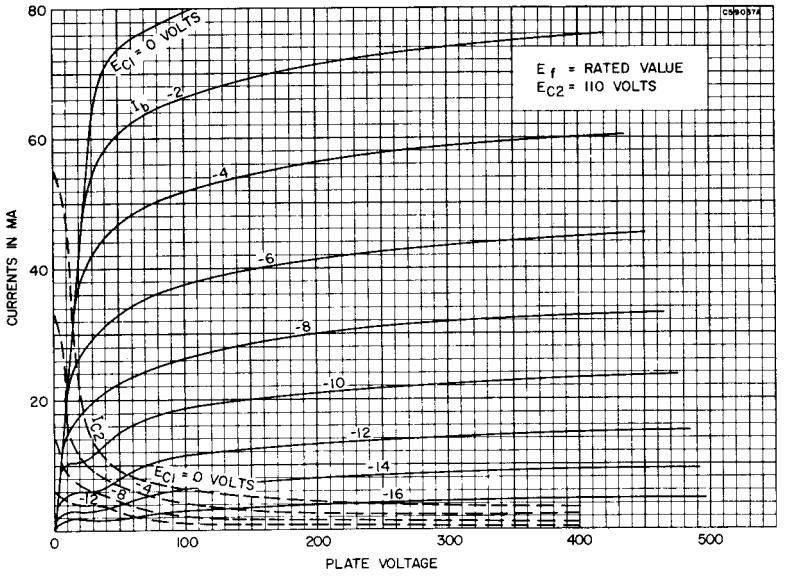
The Sylvania Type 32ET5A is a miniature beam power pentode designed for service as an audio output amplifier. It features high efficiency at relatively low plate and Grid No. 2 voltage.

Type 32ET5A designed for use in AC-DC radio receivers incorporates a 100 Ma heater controlled for heater warm-up time.

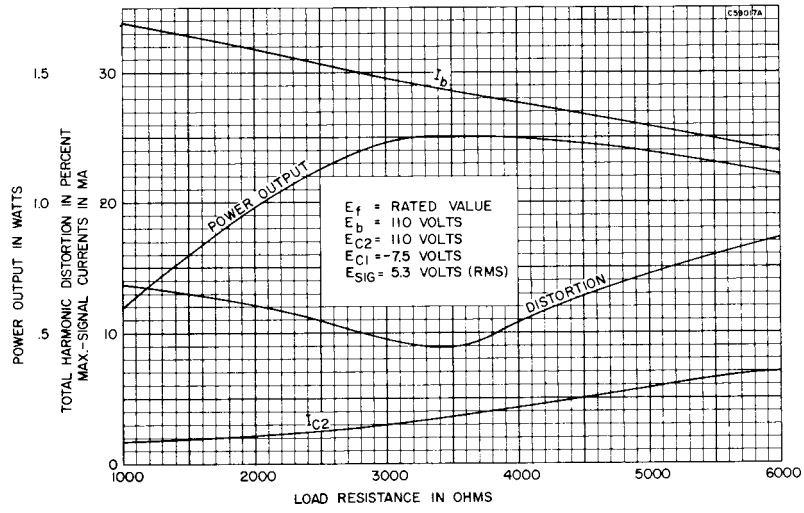
Type 32ET5A replaces obsolete Type 32ET5.

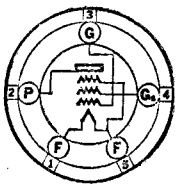
SYLVANIA TYPE 32ET5A (Cont'd)

AVERAGE PLATE CHARACTERISTICS



OPERATIONAL CHARACTERISTICS

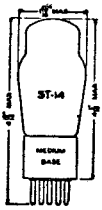




Sylvania

TYPE 33

PENTODE AMPLIFICATEUR DE SORTIE



CARACTERISTIQUES

Tension filament CC	2,0 volts
Courant filament	0,260 ampère
Ampoule	ST-14
Culot	5-K
Position de montage	verticale

Capacités directes interélectrodes :

Grille à plaque	1,0 $\mu\mu$f
Entrée	8,0 $\mu\mu$f
Sortie	12,0 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension filament	2,0	2,0 volts
Tension plaque	135	180 volts max.
Tension grille	—13,5	—18 volts
Tension écran	135	180 volts max.
Courant plaque	14,5	22,0 ma.
Courant écran	3,0	5,0 ma.
Résistance interne	50,000	55,000 ohms
Conductance mutuelle	1,450	1,700 μmhos
Coefficient d'amplification	70	90
Impédance de charge	7,000	6,000 ohms
Puissance modulée	7,0	1,4 watts

APPLICATION

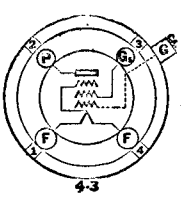
Sylvania 33 est un amplificateur de puissance pentode pour récepteur batteries.

Grâce à son grand coefficient d'amplification, il est possible de supprimer le premier étage basse fréquence et d'attaquer directement le tube 33, économisant ainsi les courants filament et plaque absorbés par l'étage supprimé.

Le tube 33 peut être utilisé seul ou en montage push-pull. Lorsque le tube fonctionne avec polarisation automatique, la résistance de polarisation doit être de 770 ohms environ pour un seul tube et 385 ohms pour le push-pull.

Lorsque le couplage par résistance est utilisé, la valeur maximum de la résistance de grille est 1 mégohm pour le fonctionnement avec polarisation automatique; avec la polarisation fixe, cette valeur est 0,5 mégohm.

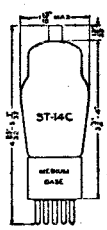
La grille de suppression est connectée à l'intérieur de l'ampoule, à l'extrémité du filament, dont la broche est voisine de la broche de grille écran.



Sylvania

TYPE 34

AMPLIFICATEUR H. F.
PENTODE
A PENTE VARIABLE



CARACTERISTIQUES

Tension filament	2,0 volts
Courant filament	0,060 ampère
Ampoule	ST-14C
Culot — Moyen 4 broches	4-M
Position de montage	verticale

Capacités directes interélectrodes :

Grille à plaque (avec blindage)	0,015 $\mu\mu f$
Entrée	6,0 $\mu\mu f$
Sortie	11,5 $\mu\mu f$

Conditions de fonctionnement et caractéristiques :

Tension filament	2,0	2,0	2,0 volts
Tension plaque	67,5	135	180 volts max.
Tension grille	—3	—3	—3 volts min.
Tension écran	67,5	67,5	67,5 volts max.
Courant plaque	2,7	2,8	2,8 ma.
Courant écran	1,1	1,0	1,0 ma.
Résistance interne	0,4	0,6	1,0 mégohm
Conductance mutuelle	560	600	620 μmhos
Conductance mutuelle*	15	15	15 μmhos
Coefficient d'amplification	224	360	620

* A —22,5 volts de polarisation.

APPLICATION

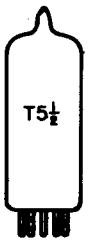
Sylvania 34 est un amplificateur H.F. pentode à pente variable.

Le tube 34 permet d'obtenir de très bons résultats sur batteries, résultats comparables à ceux obtenus avec récepteurs sur secteur alternatif. Il est très efficace pour réduire la distorsion de modulation et la transmodulation.

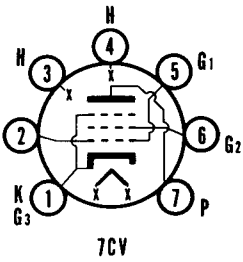
Le fonctionnement stable et avec grand gain d'amplification du tube dans un circuit haute fréquence, exige la séparation des éléments d'entrée et de sortie. Un blindage complet de chaque étage et un filtrage adéquat sont requis.

La tension grille écran peut être obtenue d'une prise sur la batterie haute tension ou d'un diviseur de tension.

L'usage d'une résistance série n'est pas recommandée pour alimenter la grille écran, à moins que le tube fonctionne avec polarisation automatique. Dans chaque cas, l'écran doit être convenablement by-passé aussi près que possible de la broche n° 3.



SYLVANIA TYPE 34GD5A



MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-3
Basing	7CV
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Average Characteristics	Series Operation
Heater Voltage	34 Volts
Heater Current	100 Ma
Heater Warm-up Time	20 Seconds
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts
Heater Positive with Respect to Cathode	
D C	100 Volts
Total D C and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.6 μμf
Input: g1 to (h+k+g2+g3)	12 μμf
Output: p to (h+k+g2+g3)	9.0 μμf

RATINGS (Design Maximum System)

Plate Voltage	150 Volts Max.
Grid No. 2 Voltage	130 Volts Max.
Plate Dissipation	5.0 Watts Max.
Grid No. 2 Dissipation	1.1 Watts Max.
Grid No. 1 Circuit Resistance	
Fixed Bias	0.1 Megohm Max.
Cathode Bias	0.5 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

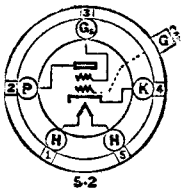
Class A1 Amplifier

Plate Voltage	110 Volts
Grid No. 2 Voltage	110 Volts
Grid No. 1 Voltage	−7.5 Volts
Peak AF Grid No. 1 Voltage	7.5 Volts
Zero-Signal Plate Current	35 Ma
Zero-Signal Grid No. 2 Current	3.0 Ma
Transconductance	5700 μmhos
Plate Resistance (approx.)	13,000 Ohms
Load Resistance	2500 Ohms
Maximum-Signal Power Output	1.4 Watts
Total Harmonic Distortion (approx.)	10 Percent

APPLICATION

The Sylvania Type 34GD5A is a miniature beam power pentode designed for service as an audio output amplifier. It features high efficiency at relatively low plate and Grid No. 2 voltages.

Type 34GD5A, designed for use in AC/DC radio receivers, incorporates a 100 Ma heater controlled for heater warm-up time. Type 34GD5A replaces obsolete Type 34GD5.

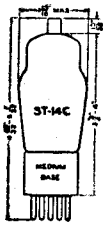


5-2

Sylvania

TYPE 35/51

TETRODE
A PENTE VARIABLE



CARACTERISTIQUES

Tension de chauffage CA ou CC	2,5 volts
Courant de chauffage	1,75 ampère
Ampoule	ST-14C
Culot : moyen 5 broches	5-E
Position de montage	Toutes

Capacités directes interélectrodes :

Grille à plaque (avec blindage)	0,007 $\mu\mu f$
Entrée	5,3 $\mu\mu f$
Sortie	10,5 $\mu\mu f$

Conditions de fonctionnement et caractéristiques :

Tension de chauffage	2,5	2,5 volts
Tension plaque	180	250 volts
Tension grille	—3,0	—3,0 volts min.
Tension écran	90	90 volts max.
Courant plaque	6,3	6,5 ma.
Courant écran	2,5	2,5 ma.
Résistance interne	0,3	0,4 mégohm
Conductance mutuelle	1,020	1,050 μmhos
Cœfficient d'amplification	305	420
Conductance mutuelle à —40 volts polarisation	15	15 μmhos

APPLICATION

Sylvania 35/51 est un amplificateur à grille écran à pente variable et à chauffage indirect sous 2,5 volts. Il est utilisé comme amplificateur de haute fréquence, de moyenne fréquence, de basse fréquence ou comme premier détecteur. Il n'est plus utilisé que comme remplacement dans les vieux appareils.

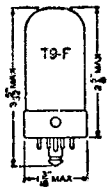


6-AA

Sylvania

TYPE 35A5

AMPLIFICATEUR DE PUISSANCE A FAISCEAUX D'ELECTRONS DIRIGES



CARACTERISTIQUES

Tension chauffage (nominale) CA ou CC	35,0 volts
Courant chauffage (nominal)	0,160 ampère
Ampoule	T9-F
Culot : loktal 8 broches	6-AA
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

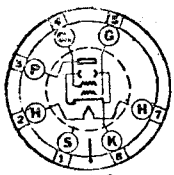
Tension chauffage	32,0 volts
Courant chauffage	0,150 ampère
Tension plaque	110 volts max.
Tension écran	110 volts max.
Tension grille	—7,5 volts min.
Courant plaque	35 ma.
Courant écran	2,8 ma.
Résistance interne	25.000 ohms
Conductance mutuelle	5.500 μmhos
Impédance de charge	2.500 ohms
Résistance de polarisation automatique	200 ohms
Puissance modulée	1,4 watt
Distorsion harmonique totale	10 pour cent

(Voir page 9 pour interprétation conditions limites de fonctionnement.)

APPLICATION

Sylvania type 35A5 est un amplificateur de puissance à faisceaux d'électrons dirigés de construction loktal, destiné spécialement à l'étage de sortie des récepteurs CC et universels. Le filament est du type 150 millis et conçu pour être monté en série. La structure de construction des électrodes est similaire à celle du type 6L6G et autres tubes utilisant les faisceaux d'électrons dirigés. Une forte puissance modulée est obtenue avec une grande sensibilité et un excellent rendement.

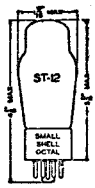
Les systèmes de couplage par transformateur ou par impédance peuvent servir pour le circuit d'entrée. Si on utilise la polarisation automatique, la résistance du circuit de grille ne peut pas dépasser 0,5 mégohm; pour la polarisation fixe on ne dépassera pas 0,1 mégohm.



Sylvania

TYPE 35L6G

AMPLIFICATEUR DE PUISSANCE A FAISCEAUX D'ELECTRONS DIRIGES



CARACTERISTIQUES

Tension de chauffage CA ou CC	35,0 volts
Courant chauffage	0,150 ampère
Ampoule	ST-12
Culot : Moyen octal 7 broches	7-AC
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A :

Tension chauffage	35,0 volts
Tension plaque	110 volts max.
Tension écran	110 volts max.
Tension grille	—7,5 volts
Courant plaque	40 ma.
Courant écran	3 ma.
Résistance interne	13.800 ohms
Conductance mutuelle	5.800 µmhos
Impédance de charge	2.500 ohms
Puissance modulée	1,5 watt
Distorsion harmonique totale...	10 pour cent

APPLICATION

Sylvania type 35L6G est un amplificateur de puissance à faisceaux d'électrons dirigés conçu pour utilisation dans l'étage de sortie des récepteurs CC et universels. Ce type est quelque peu similaire au 25L6G et on put se référer aux notes et applications de ce type pour plus amples informations.

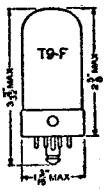


4-Z

Sylvania

TYPE 35Z3

REDRESSEUR DEMI-ONDE



CARACTERISTIQUES

Tension chauffage (nominale) CA ou CC	35,0 volts
Courant chauffage (nominal)	0,160 ampère
Ampoule	T9-F
Culot : loktal 8 broches	4-Z
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

Tension de chauffage*	32,0 volts
Courant de chauffage	0,150 ampère
Tension efficace CA par plaque	250 volts max.
Courant redressé	100 ma. max.
Tension inverse max. de pointe disponible ...	700 volts
Courant plaque de pointe max. disponible	600 volts
Chute de tension à 200 milis	22 volts

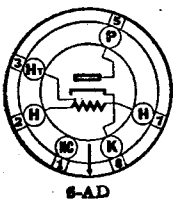
* Différence potentiel CC entre filament et cathode maximum : 300 volts.

(Pour interprétation conditions limites fonctionnement, voir page 9.)

APPLICATION

Sylvania type 35Z3 est un redresseur demi-onde à vide poussé de construction loktal pour utilisation dans les récepteurs compact, et spécialement ceux utilisant le 35A5. Les caractéristiques de chauffage sont communes aux deux tubes, permettant ainsi le fonctionnement en série. La tension élevée et le faible courant du circuit chauffage rendent possible une construction compacte avec le minimum de dissipation de chaleur.

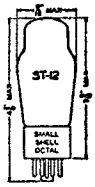
Les circuits classiques redresseurs demi-onde sont applicables à ce tube. Des surtensions au delà de 125 volts CA rendent nécessaire d'intercaler une résistance de 100 ohms en série avec la plaque.



Sylvania

TYPE 35Z5G

REDRESSEUR DEMI-ONDE



CARACTERISTIQUES

Tension chauffage (broches 2 et 7) totale	35,0 volts
Courant chauffage (total)	0,150 ampère
Section ampoule de tableau (broches 2 et 3) ...	7,5 volts
Ampoule	ST-12
Culot : petit octal 6 broches	6-AD
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

ENTREE CONDENSATEUR :

Tension chauffage	35,0 volts
Tension efficace CA plaque	125 volts max.
Courant redressé*	50 ma. max.
Courant redressé**	100 ma. max.
Tension inverse max. de pointe disponible	700 volts
Courant plaque de pointe max. disponible	600 ma.
Résistance en série avec plaque	25 ohms min.
Chute de tension à 200 millis	21 volts

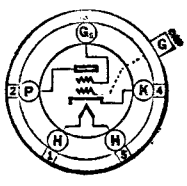
* Avec courant plaque redressé à travers la section ampoule de tableau du filament shunté par une ampoule 6,3 volts 0,15 ampère (Sylvania type S40 ou 47).

** Ampoule de tableau non connectée.

APPLICATION

Sylvania type 35Z5G est un redresseur demi-onde à vide poussé, destiné aux récepteurs CC ou universels. Sur le filament de 35 volts on prend la tension nécessaire pour le fonctionnement d'une ampoule de tableau par les broches 2 et 3. Les circuits classiques redresseurs demi-ondes sont d'application.

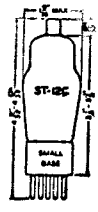
Une résistance limiteuse de pointe d'au moins 25 ohms doit être mise en série avec la plaque et une resistance limiteuse de surtension devrait être placée en série avc les filaments des autres tubes dans le circuit chauffage.



Sylvania

TYPE 36

AMPLIFICATEUR H. F. A GRILLE ECRAN



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12C
Culot : petit modèle 5 broches	5-E
Position de montage	Toutes

Capacités directes interélectrodes :

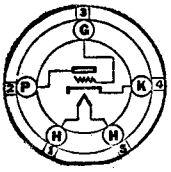
Grille à plaque (avec blindage)	0,007 $\mu\mu f$
Entrée	3,7 $\mu\mu f$
Sortie	9,2 $\mu\mu f$

Conditions de fonctionnement et caractéristiques :

Tension de chauffage	6,3	6,3	6,3	6,3 volts
Tension plaque	100	135	180	250 volts
Tension grille	—1,5	—1,5	—3.0	—3,0 volts
Tension écran	55	67,5	90	90 volts
Courant plaque	1,8	2,8	3,1	3,2 ma.
Courant écran	Pas plus du 1/3 du courant plaque.			
Résistance interne	0,55	0.475	0,50	0,55 mégohm
Conductance mutuelle	850	1,000	1,050	1,080 μmhos
Cœfficient d'amplification ...	470	475	525	595

APPLICATION

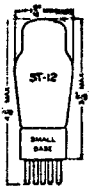
Sylvania 36 est un tube à quatre électrodes à chauffage indirect, sous 6,3 volts et peut être utilisé en amplificateur de haute fréquence ou en détecteur dans des circuits spécialement conçus pour lui. Il est nécessaire de blinder convenablement les conducteurs, pour obtenir un fonctionnement stable en haute fréquence.



Sylvania

TYPE 37

AMPLIFICATEUR D'USAGE GENERAL



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12
Culot	5-A
Position de montage	Toutes

Capacités directes interélectrodes :

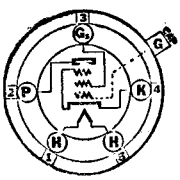
Grille à plaque	2,0 $\mu\mu f$
Entrée	3,5 $\mu\mu f$
Sortie	2,9 $\mu\mu f$

Conditions de fonctionnement et caractéristiques :

Tension de chauffage ...	6,3	6,3	6,3	6,3 volts
Tension plaque	90	135	180	250 volts max.
Tension grille	—6	—9	—13,5	—18 volts
Courant plaque	2,5	4,1	4,3	7,5 ma.
Résistance interne ...	11,500	10,000	10,200	8,400 ohms
Conductance mutuelle	800	925	900	1,100 μmhos
Coefficient d'amplification	9,2	9,2	9,2	9,2

APPLICATION

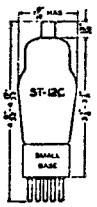
Sylvania 37 est un tube triode à chauffage indirect. sous 6,3 volts, pour usage général. Il peut être utilisé comme amplificateur, détecteur, oscillateur, ou tube d'A.V.C.



Sylvania

TYPE 38

AMPLIFICATEUR DE PUISSANCE PENTODE



CARACTERISTIQUES

Tension de chauffage	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12C
Culot	5-F
Position de montage	Toutes

Capacités directes interélectrodes :

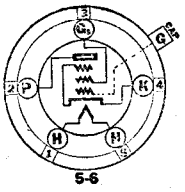
Grille à plaque	0,3 $\mu\mu$f
Entrée	3,5 $\mu\mu$f
Sortie	7,5 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension de chauffage ...	6,3	6,3	6,3	6,3 volts
Tension plaque	100	135	180	250 volts max.
Tension grille	—9,0	—13.5	—18,0	—25 volts
Tension écran	100	135	180	250 volts
Courant plaque	7,0	9,0	14,0	22,0 ma.
Courant écran	1,2	1,5	2,4	3,8 ma
Résistance interne	0,14	0,13	0,11	0,10 mégohm
Conductance mutuelle ...	875	925	1,050	1,200 μmhos
Coefficient d'amplification	120	120	120	120
Impédance de charge ...	15,000	13,500	11,600	10,000 ohms
Puissance de sortie ...	0,27	0,55	1,0	2,5 watts

APPLICATION

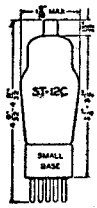
Sylvania 38 est un tube de sortie pentode donnant une puissance modulée considérable pour un signal de faible amplitude appliqué à la grille. Le tube 38 peut être utilisé avec une tension de plaque et d'écran aussi élevée que 250 volts, la puissance fournie pour cette valeur maximum étant de 2,5 watts.



Sylvania

TYPE 39/44

AMPLIFICATEUR H. F. PENTODE A PENTE VARIABLE



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12C
Culot	5-F
Position de montage	Toutes

Capacités directes interélectrodes :

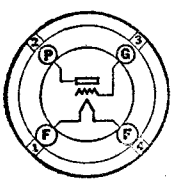
Grille à plaque	0,007 $\mu\mu$f
Entrée	3,5 $\mu\mu$f
Sortie	10,0 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension de chauffage	6,3	6,3	6,3 volts
Tension plaque	90	180	250 volts max.
Tension grille	—3,0	—3,0	—3,0 volts min.
Tension écran	90	90	90 volts max.
Courant plaque	5,6	5,8	5,8 ma.
Courant écran	1,6	1,4	1,4 ma.
Résistance interne	0,375	0,750	1,0 mégohm
Conductance mutuelle	960	1,000	1,050 μmhos
Cœfficient d'amplification	360	750	1,050
Conductance mutuelle à —42,5 volts grille	2	2	2 μmhos

APPLICATION

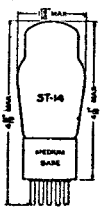
Sylvania 39/44 est un tube pentode à pente variable, destiné aux étages amplificateurs de haute fréquence et de moyenne fréquence, dans les récepteurs pour secteur alternatif automobile ou dans tout récepteur sur secteur 110 volts. Actuellement, il ne sert qu'au remplacement dans les vieux récepteurs.



Sylvania

TYPE 40

AMPLIFICATEUR DE TENSION



CARACTERISTIQUES

Tension filament CC	5,0 volts
Courant filament	0,25 ampère
Ampoule	ST-14
Culot : moyen 4 broches	4-D
Position de montage	Verticale

Capacités directes interélectrodes :

Grille à plaque	8,0 $\mu\mu$f
Entrée	2,8 $\mu\mu$f
Sortie	2,2 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension filament	5,0	5,0 volts
Tension plaque	135	180 volts max.
Tension grille	—1,5	—3,0 volts
Courant plaque	0,2	0,2 ma.
Résistance interne	0,15	0,15 mégohm
Conductance mutuelle	200	200 μmhos
Facteur d'amplification	30	30
Impédance de charge	0,25	0,25 mégohm

APPLICATION

Sylvania type 40 est un triode à mu élevé d'utilisation dans les amplificateurs couplés par résistance ou par impédance ou comme détecteur. La tension efficace de plaque égale celle de la source de tension moins la chute de tension dans une impédance de charge de 0,25 mégohm : la tension efficace de plaque ne devrait jamais dépasser 180 volts. Ce tube sert actuellement au remplacement dans les vieux récepteurs.

SYLVANIA

engineering data service

SYLVANIA

40A1

MECHANICAL DATA

Bulb	T-9
Base	Intermediate Shell Octal 5-Pin
Basing	8ES
Filament	Iron
Type of Cooling	Radiation
Ambient Temperature (Maximum)	65° C
Net Weight	1 Ounce
Mounting Position	Vertical, Base Down

ELECTRICAL DATA

RATINGS (Absolute Values)

Current	
Maximum	95 Ma
Minimum	70 Ma
Voltage	
Maximum	60 Volts
Minimum	20 Volts

CHARACTERISTICS

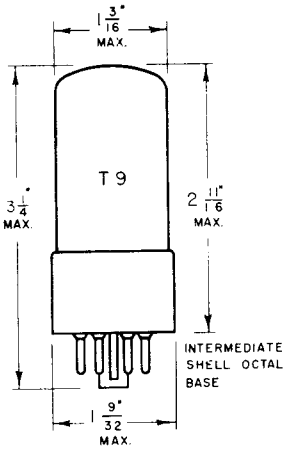
Averaging Operating Current	
20 Volts	74 Ma
40 Volts	84 Ma
60 Volts	90 Ma

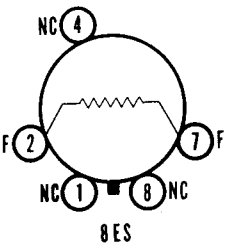
APPLICATION

The type 40A1 is used as the cathode resistor of the horizontal output tube in receivers specifically designed for its use. Because of the non-linear resistance characteristic, variations in anode voltage, picture width, output tube cathode current, and damper diode current with line voltage are considerably below that which result from using a fixed cathode resistor. Therefore, it becomes possible to operate the horizontal output tube near full scan capabilities at low line voltage without subjecting it to operating conditions which exceed the maximum ratings at high line voltage.

QUICK REFERENCE DATA

Gas filled ballast tube designed to maintain relatively constant current over a specified operating voltage range. It is designed for application as a horizontal deflection stabilizer in television receivers.





SYLVANIA ELECTRIC PRODUCTS INC.

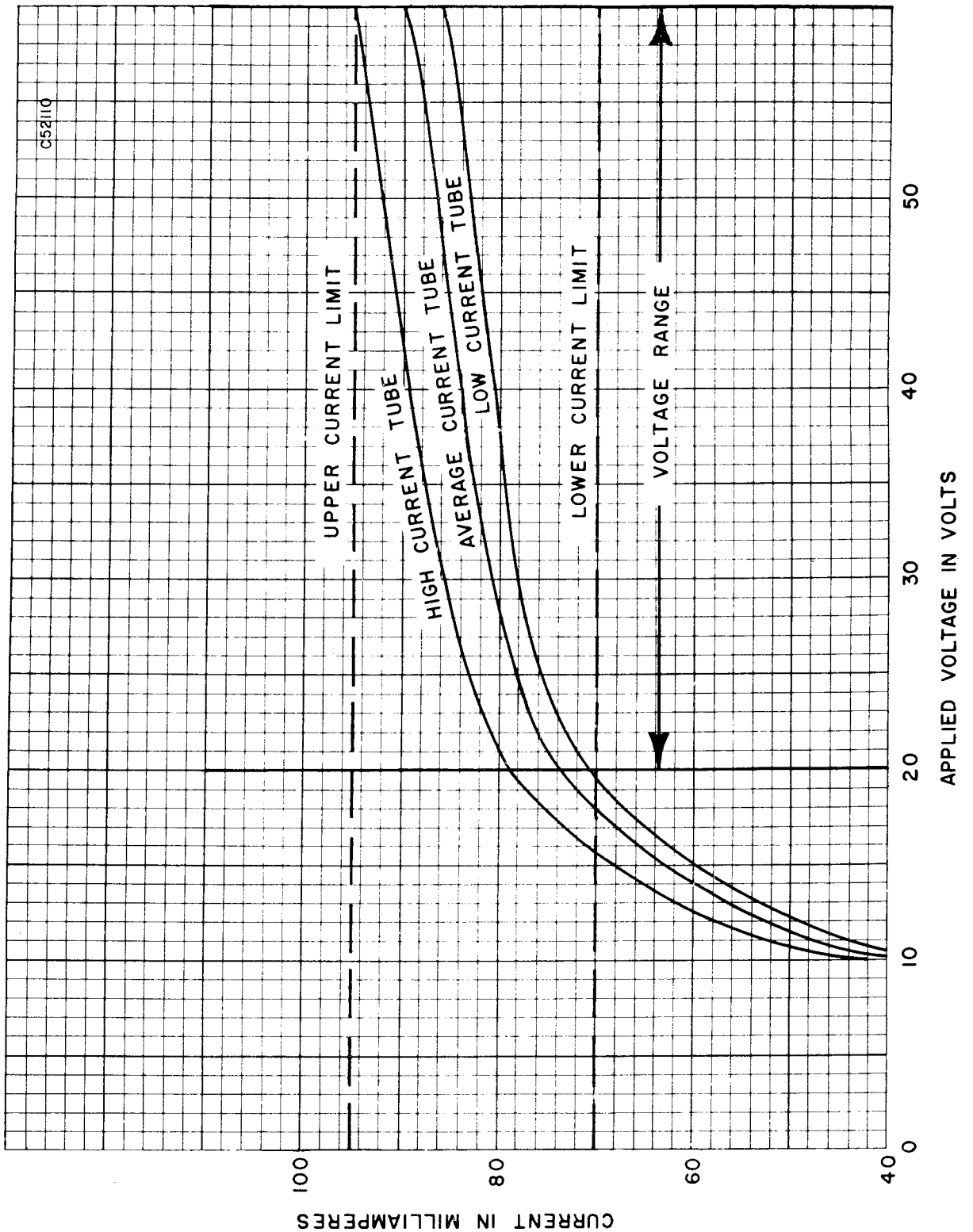
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

APRIL 1953

SYLVANIA

40A1

AVERAGE CHARACTERISTICS



SYLVANIA

JETEC Registration Data

TYPE 40B2

BALLAST TUBE

The Type 40B2 is a gas-filled ballast tube designed to maintain a relatively constant current over a specified operating voltage range.

MECHANICAL DATA

Style	GT
Bulb	T-9
Base	B5-10, Intermediate Shell Octal 5-Pin
Outline	9-9
Maximum Overall Length	3 1/4 inches
Maximum Seated Height	2 11/16 inches
Maximum Diameter	1 9/32 inches
Mounting Position	vertical, base down
Type of Cooling	radiation
Maximum Ambient Temperature	65 °C
Net Weight, maximum	1 ounce

Basing 8ES

Connections:
- Pin 1 - no connection
- Pin 2 - filament
- Pin 4 - no connection
- Pin 7 - filament
- Pin 8 - no connection

ELECTRICAL DATA

RATINGS - Absolute Values

Current:	
Maximum	160 ma
Minimum	135 ma
Voltage:	
Maximum	60 volts
Minimum	20 volts

CHARACTERISTICS

Average Operating Current:	
At 20 Volts	140 ma
At 40 Volts	150 ma
At 60 Volts	155 ma

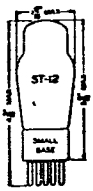
from RTMA release #1177, April 10, 1953



Sylvania

TYPE 41

PENTODE DE PUISSANCE INTERMEDIAIRE



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,4 ampère
Ampoule	ST-12
Culot	6-B
Position de montage	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,4 ampère
Tension plaque	315 volts max.
Tension écran	285 volts max
Dissipation plaque	8,5 watts max.
Dissipation écran	2,8 watts max.

Conditions de fonctionnement et caractéristiques :

Tension de chauffage	6,3	6,3	6,3 volts
Tension plaque	100	250	315 volts
Tension grille	—7	—18	—21 volts
Tension écran	100	250	250 volts
Courant plaque (signal zéro) ...	9,0	32,0	25,5 ma.
Courant plaque (signal max.) ...	9,5	33,0	28,0 ma.
Courant écran (signal zéro) ...	1,6	5,5	4,0 ma.
Courant écran (signal max.) ...	3,0	10,0	9,0 ma.
Résistance interne	104,000	68,000	75,000 ohms
Conductance mutuelle	1,500	2,300	2,100 μmhos
Tension signal HF de pointe ...	7	18	21 volts
Impédance de charge	12,000	7,600	9,000 ohms
Puissance modulée	0,35	3,4	4,5 watts
Distorsion harmonique totale ...	11	11	15 pour cent

APPLICATION

Sylvania 41 est un amplificateur efficient pentode de puissance, à chauffage indirect. La tension de chauffage est de 6,3 volts. Il est utilisable sur postes CA, CC, universels ou pour automobile. Ce tube fut désigné spécialement pour les récepteurs automobiles.

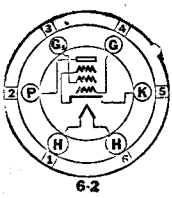
Le filament peut fonctionner directement sur une batterie de 6 volts, les variations de tension pendant les périodes de charge et de décharge n'affectant pas le fonctionnement du tube. Le type 41 fournit une grande puissance modulée avec faible distorsion pour un signal d'entrée relativement faible. Le tube 41 peut supporter normalement une tension plaque de 250 volts, ce qui le rend spécialement adaptable aux récepteurs prévus pour fonctionner avec cette tension.

Le tube 41 peut être utilisé soit simple soit en montage push-pull. Si un seul tube est utilisé dans l'étage de sortie, en polarisation automatique, la résistance de cathode doit être shuntée par un filtre convenable. Pour le montage push-pull, la valeur de résistance est la moitié de celle requise pour un seul tube.

Les dispositifs de couplage par transformateur ou par impédance sont recommandés. Lorsque l'on utilise le couplage par résistance, la résistance de grille (en polarisation automatique) doit être limitée à 1 mégohm, pourvu que la tension de chauffage n'excède jamais 7 volts. Avec polarisation fixe, la valeur maximum de la résistance de grille sera 0,1 mégohm.

Lorsque l'impédance de charge utilisée est celle renseignée au tableau ci-dessus, le second harmonique a son amplitude minimum. Si, cependant, deux tubes sont montés en push-pull classe A, on peut réduire quelque peu l'amplitude du troisième harmonique en utilisant une impédance plus faible que la normale, le second harmonique étant annulé grâce à la symétrie du montage.

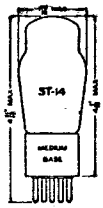
Le type « G » équivalent est le Sylvania type 6K6G.



Sylvania

TYPE 42

AMPFIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,70 ampère
Ampoule	ST-14
Culot	6-B
Position de montage	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

	Pentode	Triode*
Tension de chauffage CA ou CC	6,3	6,3 volts
Courant de chauffage	0,7	0,7 ampère
Tension plaque	375	350 volts max.
Tension écran	285	— volts max.
Dissipation plaque	11	10 watts max.
Dissipation écran	3,75	— watts max.

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR DE PUISSANCE CLASSE A1 (Un seul tube)

	Pentode		Triode*
Tension de chauffage	6,3	6.3	6,3 volts
Tension plaque	250	285	285 volts
Tension écran	250	285	— volts
Tension grille	—16,5	—20	—20 volts
Courant plaque	34	38	31 ma.
Courant écran	6.5	7.0	— ma.
Résistance interne (approx.)	80 000	78,000	2,600 ohms
Conductance mutuelle	2,500	2,550	2,600 µmhos
Cœfficient d'amplification ...	—	—	6,8
Résistance interne	7,000	7,000	4,000 ohms
Puissance modulée	3,2	4,8	0,85 watts
Distorsion harmonique totale	8	9	6,5 pour cent

* Grille écran reliée à la plaque.

AMPLIFICATEUR PUSH-PULL

	Classe A1	Classe AB2	
	Pentode	Pentode	Triode*
Tension de chauffage	6,3	6,3	6,3 volts
Tension plaque	315	375	350 volts
Tension écran	285	250	— volts
Tension grille	—24	—26	—38 volts
Pointe BF grille à tension grille	48	82	123 volts
Courant plaque (signal zéro)	62	34	48 ma.
Courant plaque (signal max.)	80	82	92 ma.
Courant écran (signal zéro)	12	5	— ma.
Courant écran (signal max.)	19,5	19,5	— ma.
Impédance de charge (P. à P.)	10,000	10,000	6,000 ohms
Puissance modulée	11	18,5	13 watts
Distorsion harmonique totale	4	3,5	2 pour cent

* Avec grille écran reliée à la plaque.

APPLICATION

Sylvania type 42 est un tube pentode de puissance, à chauffage indirect sous 6,3 volts. Ce tube ne peut pas remplacer le type 47 dans des récepteurs existants, car il nécessite une tension de chauffage de 6,3 volts et un socket pour six broches. Ses caractéristiques sont semblables à celles du tube 47, à part que la puissance de sortie est considérablement accrue.

L'utilisation du tube 42 dans l'étage de sortie réduit grandement le bruit de fond généralement présent dans les récepteurs utilisant des pentodes à chauffage direct.

Avec l'impédance de charge optimum, une tension plaque de 250 volts, une polarisation de grille de —16,5 volts et une tension de pointe du signal appliqué égale à la polarisation de grille, le tube 42 peut fournir plus de 3 watts modulés avec le minimum de second harmonique.

Le tube 42 peut être utilisé dans l'étage de sortie avec couplage par résistance au tube détecteur ou au premier étage

basse fréquence, si la détection se fait par diode. Dans le cas de couplage par résistance, la résistance de grille ne peut pas être supérieure à 500.000 ohms, si la polarisation est automatique. Si la polarisation est fixe, ou partiellement fixe, le maximum pour la résistance de grille est 250.000 ohms.

En vue de réduire l'amplitude du second harmonique au minimum, une impédance de sortie, de valeur indiquée au tableau ci-dessus, doit être employée. Si, cependant, deux tubes 42 sont utilisés en montage push-pull classe A, une amplitude quelque peu plus faible du troisième harmonique peut être obtenue par l'emploi d'une impédance de charge plus faible que la normale, le second harmonique étant nul à cause de la symétrie du montage.

Une application importante du tube 42, qui a été développée intensivement, est son utilisation comme triode. Les caractéristiques indiquent que la conductance mutuelle, la résistance interne et le coefficient d'amplification du tube 42 en connexion triode (grille écran reliée à la plaque) sont idéales pour le fonctionnement en classe AB, un tube 42 attaquant deux tubes 42 en push-pull. En plus des caractéristiques satisfaisantes, ce tube a encore l'avantage d'être à chauffage indirect, ce qui permet l'emploi d'un circuit compensé spécial de polarisation, sans devoir recourir à des connexions supplémentaires au transformateur d'alimentation.

Une des plus sérieuses difficultés rencontrées dans l'amplification classe AB est de maintenir une tension de polarisation suffisamment constante pour obtenir le maximum de puissance modulée avec une faible distorsion. Cette difficulté est due au fait que les tubes sont surpolarisés et que, si la polarisation est automatique, celle-ci s'accroît, pendant le fonctionnement, à cause de l'augmentation du courant plaque. Cette variation de polarisation peut être, en grande partie, compensée en sous-polarisant l'étage pilote, tandis que les tubes de sortie sont normalement surpolarisés, les cathodes des trois tubes ayant une résistance de polarisation commune. La polarisation du tube d'attaque est prise sur une portion de cette résistance, de telle sorte que toute variation du courant total de plaque des trois tubes produise une variation correspondante dans la tension de polarisation. Lorsqu'un signal est appliqué, le courant dans les tubes de sortie augmente, ce qui accroît la chute de tension dans la résistance de cathode; la polarisation de l'étage pilote comme celle des tubes de sortie est ainsi augmentée, ce qui a pour conséquence une diminution du courant cathodique du tube pilote, compensant en partie l'accroissement du courant des tubes de sortie. Ainsi, la variation de polarisation des tubes de sortie est loin d'être aussi grande que celle qu'on aurait dans un amplificateur classe AB ne comportant pas ce montage de compensation.

En vue d'avoir le minimum de distorsion aux puissances élevées de sortie, il est essentiel d'utiliser la polarisation optimum. Un tel montage a l'avantage de fonctionner comme un amplificateur classe A pour les faibles puissances de sortie, donc avec une distorsion presque négligeable au-dessous de 10 watts; il peut fournir jusqu'à 15 watts sans que la distorsion totale dépasse 5 %.

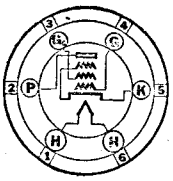
Dans l'amplificateur push-pull classe AB, utilisant le tube 42 en triode ou en pentode et fonctionnant avec la tension maximum, des dispositifs de couplage par transformateur ou impédance peuvent être utilisés.

L'étage d'attaque sera prévu pour pouvoir fournir le maximum de puissance modulée avec le minimum de distorsion.

Dans chacun des cas renseignés aux tableaux des caractéristiques, le tube d'attaque recommandé est un simple tube 42 en connexion triode, fonctionnant dans les conditions suivantes:

Tension plaque	250 volts
Tension grille	—20 volts
Impédance minimum de plaque	10,000 ohms.

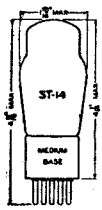
Les sources de tension de plaque, d'écran et de grille devront avoir une résistance négligeable.



Sylvania

TYPE 43

AMPFIFICATEUR DE PUISSANCE PENTODE



CARACTERISTIQUES

Tension de chauffage CA ou CC	25 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-14
Culot	6-B
Position de montage	Toutes

Conditions limites de fonctionnement. (Voir page 9) :

Tension de chauffage CA ou CC	25 volts
Courant de chauffage	0,3 ampère
Tension plaque	160 volts max.
Tension écran	135 volts max.
Dissipation plaque	5,3 watts max.
Dissipation écran	1,9 watt max.

Conditions de fonctionnement et caractéristiques :

Tension de chauffage	25	25	25 volts
Tension plaque	95	135	160 volts
Tension grille	—15	—20	—18 volts
Tension écran	95	135	120 volts
Courant plaque	20	37	33 ma.
Courant écran	4,0	8,0	6,5 ma.
Résistance interne	45,000	35,000	42,000 ohms
Conductance mutuelle	2,000	2,450	2,375 μmhos
Impédance de charge	4,500	4,000	5,000 ohms
Puissance modulée	0,9	2,0	2,2 watts
Distorsion harmonique totale	11	9	10 pour cent

APPLICATION

Sylvania 43 est un tube de puissance pentode, à chauffage indirect, sous 25 volts, conçu pour utilisation dans les récepteurs C.C. et universels.

Ces tubes peuvent être employés soit simple, soit en montage push-pull classe A, auquel cas aucune puissance n'est demandée au tube d'attaque et tout tube fournissant une tension suffisante aux grilles peut être utilisé dans l'étage d'attaque. Comme dans les autres montages push-pull, l'impédance de charge par tube peut être réduite pour réduire l'amplitude du troisième harmonique, le second étant nul à cause de la symétrie du montage.

Pour le fonctionnement avec polarisation automatique, la résistance de cathode doit être de 625 ohms pour 95 volts plaque, 450 ohms pour 135 volts et/ou pour 160 volts plaque. Un filtrage adéquat est essentiel pour prévenir les effets de dégénération aux très basses fréquences.

Lorsque deux 43 sont montés en push-pull avec polarisation automatique, la résistance cathodique sera égale à la moitié de la valeur donnée pour un seul tube. Il peut être nécessaire de shunter cette résistance par un réseau de filtre.

Dans le cas du couplage par résistance, la résistance de grille n'excédera pas 250.000 ohms.

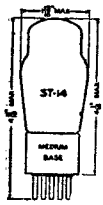
Lorsqu'un tube 43 a son filament en série avec ceux d'autres tubes, une tension élevée peut exister entre filament et cathode pouvant causer des courants de fuite nuisibles dans beaucoup d'applications. La disposition du circuit sera étudiée avec soin, afin de prévenir les difficultés engendrées par ce courant de fuite.



Sylvania

TYPE 45

AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension filament CA ou CC	2,5 volts
Courant filament	1,5 ampère
Ampoule	ST-14
Culot : moyen 4 broches	4-D
Position de montage	Verticale

Capacités directes interélectrodes :

Grille à plaque	7,0 $\mu\mu$f
Entrée	4,0 $\mu\mu$f
Sortie	3,0 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

Tension filament	2,5	2,5	2,5 volts
Tension plaque	180	250	275 volts max.
Tension grille	—31,5	—50	—56 volts
Courant plaque	31	34	36 ma.
Résistance interne	1.650	1.610	1.700 ohms
Conductance mutuelle...	2,125	2,175	2,050 μmhos
Coefficient d'amplification	3,5	3,5	3,5
Impédance de charge	2,700	3,900	4,600 ohms
Puissance modulée	0,83	1,6	2,0 watt

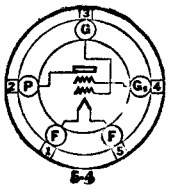
APPLICATION

Sylvania 45 est un tube triode de puissance destiné à fournir une grande puissance modulée sans distorsion. Un signal d'attaque relativement grand est nécessaire. Le filament est chauffé sous une tension de 2,5 volts et peut fonctionner en parallèle avec les autres tubes, dans les récepteurs pour secteur alternatif. Tout le câblage dans le circuit filament sera prévu pour laisser passer le courant de chauffage nécessaire sans une chute de tension excessive.

Pour éviter la distorsion et la surcharge, une polarisation négative de grille, comme indiquée au tableau des caractéristiques, sera utilisée. Cette polarisation est obtenue de la meilleure façon par une résistance dans le retour de plaque (entre filament et masse). La valeur qui convient pour une alimentation plaque de 275 vols est 1.550 ohms, pour 250 volts, 1.470 ohms et, pour 180 volts, 1.300 ohms. Cette méthode d'obtention de la polarisation est dénommée polarisation automatique et doit être utilisée dans des circuits à couplage par résistance.

Dans un circuit de ce genre, si un tube a un courant de plaque anormalement élevé, la polarisation de grille augmente et provoque la diminution du courant plaque, de telle sorte que ce courant prendra sa valeur presque normale.

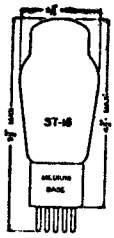
Si l'on désire une plus grande puissance de sortie, deux tubes 45 peuvent être employés en parallèle ou en push-pull. Le montage en parallèle permet un accroissement de puissance sans accroissement du signal d'entrée, tandis que le montage push-pull exige, pour donner toute sa puissance, que le signal d'entrée soit multiplié par deux. Dans chaque cas, un transformateur de sortie convenant à l'impédance de charge sera utilisé pour obtenir le résultat optimum.



Sylvania

TYPE 46

BIGRILLE AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension filament CA ou CC	2,5 volts
Courant filament	1,75 ampère
Ampoule	ST-16
Culot	5-C
Position de montage	Verticale

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A

Tension filament	2,5 volts
Tension plaque	250 volts
Tension grille (grille adjacente à la plaque reliée à la plaque)	—33 volts
Courant plaque	22 ma.
Résistance interne	2.380 ohms
Conductance mutuelle	2.350 μmhos
Coefficient d'amplification	5,6
Impédance de charge**	6.400 ohms
Puissance modulée	1,25 watts

AMPLIFICATEUR CLASSE B

Tension filament	2,5	2,5 volts
Tension plaque	300	400 volts
Tension grille (les deux grilles reliées ensemble)	0	0 volt
Courant plaque (par tube, sans signal)	4	6 ma.
Courant de pointe plaque (par tube)	150	200 ma. max.
Impédance de charge (de plaque à plaque)	5.200	5.800 ohms
Puissance moyenne d'entrée (appliquée entre grilles)	950	650 milliwatts
Puissance de sortie (2 tubes)*	16	20 watts
Dissipation max. plaque (moyenne par tube)	10	10 watts

* Puissance mesurée dans la résistance de valeur indiquée dans la plaque de chaque tube avec un signal appliqué à travers une résistance de 250 ohms dans le circuit de grille.

** Approximativement le double de cette valeur est recommandée pour l'impédance de charge du tube d'attaque d'un étage classe B.

APPLICATION

Sylvania 46 est un amplificateur de puissance à chauffage direct, fonctionnant en classe A ou en classe B; sa structure est semblable à celle du type 47, à part la grille de suppression qui n'existe pas dans le tube 46. Les deux grilles ont des sorties séparées.

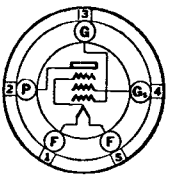
Pour le fonctionnement en classe B, les deux grilles sont reliées ensemble. Dans ce cas, le coefficient d'amplification du tube est si élevé qu'une polarisation négative n'est plus nécessaire. Une paire de tels tubes en montage push-pull classe B est capable de fournir une puissance modulée de 20 watts sans distorsion.

Un tel étage de sortie doit être précédé d'un étage amplificateur de puissance (étage pilote). Un simple tube 46 fonctionnant en classe A peut fournir assez de puissance pour attaquer les étages de sortie classe B. En classe A, la grille externe est reliée à la plaque. Le tube triode ainsi constitué a un faible coefficient d'amplification et une polarisation con-

venable est requise pour un fonctionnement correct. La distorsion introduite par l'étage pilote se retrouve à la sortie. Pour assurer une faible distorsion, il est essentiel que le tube d'attaque fonctionne en-dessous de sa puissance maximum en classe A.

Le transformateur de liaison entre l'étage pilote et l'étage de sortie est du type abaisseur de tension, le rapport de transformation dépendant du type de lampe employé, de la charge sur les tubes de sortie, de la distorsion tolérée et du rendement du transformateur.

La source de tension doit avoir une bonne régulation pour maintenir la tension de fonctionnement recommandée en dépit des variations de charge, car le montage en classe B absorbe un courant très variable durant le fonctionnement.

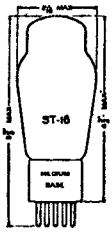


5-B

Sylvania

TYPE 47

AMPLIFICATEUR DE PUISSANCE PENTODE



CARACTERISTIQUES

Tension filament CA	2,5 volts
Courant filament	1,75 ampère
Ampoule	ST-16
Culot — Moyen 5 broches	5-B
Position de montage	Verticale

Capacités directes interélectrodes :

Grille à plaque	1,2 $\mu\mu f$
Sortie	13,0 $\mu\mu f$
Entrée	8,6 $\mu\mu f$

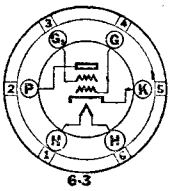
Conditions de fonctionnement et caractéristiques :

Tension filament	2,5 volts
Tension plaque	250 volts max.
Tension grille	—16,5 volts
Tension écran	250 volts max.
Courant plaque	31,0 ma.
Courant écran	6,0 ma.
Résistance interne	60.000 ohms
Conductance mutuelle	2.500 μmhos
Impédance de charge	7.000 ohms
Puissance modulée	2,7 watts
Distorsion harmonique totale	6 pour cent

APPLICATION

Le tube 47 fournit une grande puissance modulée pour une tension d'attaque relativement faible ; une tension de sortie du détecteur de 11 volts efficaces est généralement suffisante pour exciter le tube 47 et lui faire donner sa puissance maximum sans distorsion.

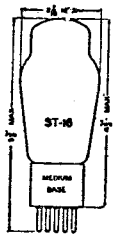
Si le couplage par résistance est utilisé, le tube 47 devra être polarisé automatiquement. Pour un seul tube, la valeur de la résistance de polarisation sera de 450 ohms. Elle devra être shuntée par un condensateur de grande capacité, pour empêcher la dégénération en très basse fréquence. Dans le montage en push-pull de deux 47, la résistance de polarisation sera réduite à 225 ohms et le condensateur shunt n'est pas nécessaire.



Sylvania

TYPE 48

AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension de chauffage CC	30,0 volts
Courant de chauffage	0,4 ampère
Ampoule	ST-16
Culot — Moyen 6 broches...	6-A
Position de montage	verticale

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A (Un seul tube)

	Tétrode		Triode**		
Tension de chauf.	30,0	30,0	30,0	30,0	volts
Tension plaque ...	95	125*	92,5	125*	volts
Tension grille ...	—20	—22,5*	—22,5	—45	volts
Tension écran ...	95	100	...	...	volts
Courant plaque ...	52	52	50	26	ma.
Courant écran ...	12	12	...	...	ma.
Résistante interne	4.000***	11.000***	600	1.000	ohms
Conductance mut.	3,900	3,900	3,850	2,100	μmhos
Coefficient d'amp.	15,6***	43**	2,3	2,1	
Impédance charge	1.500	1.500	2.000	2.000	ohms
Puissance mod. .	2,0****	3,0****	0,400	1,0	watts

**Grille écran connectée à la plaque.

*Conditions recommandées de fonctionnement avec batterie de polarisation, ce qui permet d'utiliser la tension entière du secteur (110-125 v.) pour l'alimentation plaque.

*** Valeurs approximatives.

**** 9 p. c. distorsion totale harmonique.

AMPLIFICATEUR CLASSE A (Push-Pull)

	Tétrode		Triode		
Impéd. de charge (P. à P.)	2.500	3.000	1.250	1.250	ohms
Puissance modulée	4,0	6,0	1,0	2,5	watts

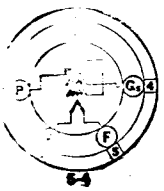
NOTE : Conditions de tensions similaires à celles données plus haut.

APPLICATION

Sylvania 48 est un tube tétrode amplificateur de puissance, à chauffage indirect, spécialement destiné à être utilisé dans l'étage de sortie de récepteurs pour secteur continu. Il convient parfaitement à ce service, à cause de son aptitude à fournir une grande puissance modulée avec une faible tension plaque.

Avec un seul tube polarisé automatiquement, la puissance obtenue est de 2 watts modulés. La résistance de polarisation automatique est de 350 ohms shuntée par une capacité suffisante pour éviter la dégénération aux très basses fréquences. La résistance totale introduite dans le circuit grille par le dispositif de couplage et le filtre doit être maintenue en-dessous de 10.000 ohms. Pour un montage push-pull de deux 48, il peut être possible de supprimer le filtre réseau. La résistance de polarisation automatique, dans ce cas, vaut la moitié de celle utilisée pour un seul tube.

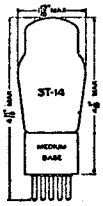
Ce tube n'est pas adaptable aux récepteurs universels classiques, à cause de son courant de chauffage de 0,4 ampère, différent de celui des autres tubes utilisés sur ces récepteurs (0,3 amp.). Pour un tel service, le type 43 convient mieux.



Sylvania

TYPE 49

BIGRILLE AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension filament CC	2,0 volts
Courant filament	0,12 ampère
Ampoule	ST-14
Culot — Moyen 5 broches	5-C
Position de montage	verticale

Conditions limites de fonctionnement. (Voir page 9) :

	Classe A.	Classe B. (2 tubes)
Tension filament	2,0	2,0 volts
Courant filament	0,12	0,12 ampère
Tension plaque	135	180 volts max.
Courant pointe de plaque par tube		50 ma. max.

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A

Tension filament	2,0 volts
Tension plaque	135 volts max.
Tension grille	—20 volts
Courant plaque	6,0 ma.
Résistance interne	4,175 ohms
Conductance mutuelle	1,125 μmhos
Coefficient d'amplification	4,7
Impédance de charge...	11,000* ohms
Puissance modulée	170 Mw.

AMPLIFICATEUR DE PUISSANCE CLASSE B
(Deux tubes)

Tension filament	2,0	2,0 volts
Tension plaque	135	180 volts
Tension grille (Grilles G et Gs rel. ens.)	0	0 volt
Courant plaque par tube (signe Zéro) ...	1,3	2,0 ma.
Tension signal pointe BF par tube** ...	35	35 volts
Impédance de charge (P à P)...	8,000	12,000 ohms
Puissance modulé (approx.)	2,3	3,5 watts

* Approximativement le double de cette valeur est recommandée pour la charge du tube fonctionnant en étage d'attaque.

** Pour la puissance modulée indiquée.

APPLICATION

Sylvania 49 est un tube amplificateur de puissance à deux grilles, destiné aux récepteurs sur batteries. La construction à double grille, chacune des grilles ayant une sortie séparée, permet l'adaptation de ce type à l'amplification classe A ou classe B.

En connectant les deux grilles ensemble, le type 49 constitue un tube triode à grand coefficient d'amplification. Deux tubes ainsi connectés forment un amplificateur classe B à bon rendement, pouvant fournir 3,5 watts modulés dans les conditions optima de fonctionnement. Le courant plaque en l'absence de signal, est 2 ma. par tube.

Si la grille adjacente à la plaque est connectée à la plaque, le tube devient un amplificateur à faible coefficient d'amplification et, comme tel, convient bien pour attaquer une paire de tubes 49 ou un tube 19. Lorsqu'il fonctionne dans les conditions spécifiées au tableau ci-dessus, il débite une puissance modulée maximum de 170 milliwatts. Utilisé comme tube pilote d'un étage classe B, une impédance de charge approximativement double de celle indiquée est recommandée. Une puissance de 120 milliwatts peut être appliquée au circuit d'entrée du étage classe B. La puissance modulée que l'on peut obtenir dépend des caractéristiques et du rendement du transformateur étage ainsi que de la valeur de la tension appliquée aux de l'étage classe B.

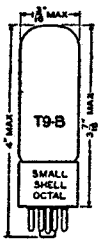


7-AR

Sylvania

TYPE 117Z6G

REDRESSEUR
DEUX ALTERNANCES



CARACTERISTIQUES

Tension chauffage		58,5	117 volts
Courant chauffage		0,150	0,075 ampère
Ampoule			T9-B
Culot — Petit octal 7 broches			7-AR
Position de montage			Toutes

Conditions limites de fonctionnement (Voir page 9.) :

Tension chauffage	58,5	117 volts
Courant chauffage	0,150	0,075 ampère
Potentiel CC entre filament et cathode ...	350	350 volts
Tension inverse de pointe	700	700 volts
Chute tension dans tube (120 ma. par plaque)	15,5	15,5 volts

Conditions de fonctionnement et caractéristiques :

Doubleur de tension :

Tension chauffage	117 volts
Tension efficace CA par plaque	117 volts max.
Courant redressé	60 ma. max.
Courant plaque de pointe	350 ma. max.
Source impédance de plaque, par plaque (min.) ...	*

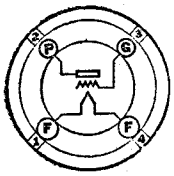
Redresseur demi-onde :

Tension chauffage	117	117	117 volts
Tension efficace CA par plaque	117	150	235 volts max.
Courant redressé, par plaque	60	60	60 ma. max.
Source impédance plaque, par plaque ...	0	40	100 ohms min.

* Impédance suffisante pour limiter courant plaque stable à la valeur indiquée.

APPLICATION

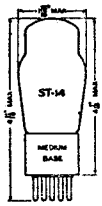
Sylvania type 117Z6G est un redresseur deux alternances à chauffage indirect, conçu pour fonctionner directement sur réseau alternatif jusqu'à 117 volts. Le point milieu du filament est ramené à la broche No 1, de telle sorte qu'il est possible d'utiliser les filaments en parallèle sur 58,5 volts. Avec cette connexion, le courant de chauffage est de 150 millis. Les circuits classiques de redressement peuvent être utilisés en prenant soin de ne pas dépasser les taux maxima de tension et de courant indiqués.



Sylvania

TYPE 182B/482B
TYPE 183/483

AMPLIFICATEURS DE PUISSANCE



CARACTERISTIQUES

Tension filament CA ou CC	5,0 volts
Courant filament	1,25 ampère
Ampoule	ST-14
Culot — Moyen — 4 broches	4-D
Position de montage	Verticale

Conditions de fonctionnement et caractéristiques :

Type	182B/482B	183/483
Tension filament	5,0	5,0 volts
Tension plaque	250	250 volts
Tension grille	—35	—60 volts
Courant plaque	20	30 ma.
Résistance interne	2.500	1.750 ohms
Conductance mutuelle	2.000	1,700 μmhos
Coefficient d'amplification	5	3
Impédance de charge	4.500	5.000 ohms
Puissance modulée	1,35	1,8 watts

APPLICATION

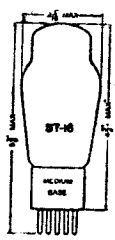
Sylvania types 182B-482B et 183-483 sont des amplificateurs de puissance à faible impédance de charge. Ils ne servent plus qu'au remplacement pour anciens récepteurs SPARTON.



Sylvania

TYPE 210T

AMPLIFICATEUR DE PUISSANCE AVEC CULOT EN ISOLANTITE



CARACTERISTIQUES

Tension filament	7,5 volts
Courant filament	1,25 ampère
Ampoule	ST-16
Culot : Moyen 4 broches	4-D
Position de montage	verticale

APPLICATION

Sylvania type 210-T est similaire au type 10, excepté le culot qui est en isolantite. Grâce à cela, les pertes H.F. sont fortement réduites. Afin de tirer le maximum d'avantages en résultant, il est recommandé d'utiliser également un socket en isolantite avec ce tube, présentant lui-même les mêmes faibles pertes H.F. Pour autres applications et caractéristiques, se référer au type 10.

SYLVANIA

engineering data service 407A

MECHANICAL DATA

Bulb	T-6 ½
Base	E9-1, Miniature Button 9-Pin
Basing	See Diagram
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage Series/Parallel	40.0/20.0 Volts
Heater Current Series/Parallel	50.0/100.0 Ma

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	1.1 $\mu\mu$f	
Input	2.2 $\mu\mu$f	
Output	1.0 $\mu\mu$f	
Plate to Plate	0.1 $\mu\mu$f	Max.

RATINGS (Absolute Maximum Values) Each Section

Plate Voltage	330 Volts
Plate Dissipation	1.65 Watts
Cathode Current	18 Ma
Heater-Cathode Voltage	±100 Volts

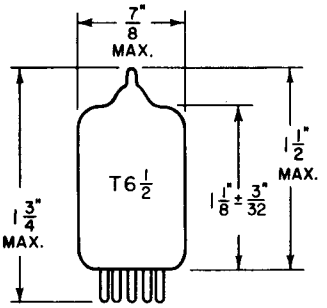
TYPICAL OPERATION

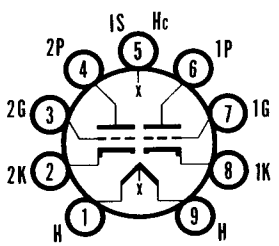
Class A_1 Amplifier — Each Section

Plate Voltage	150 Volts	
Grid Voltage	0 Volts	
Cathode Bias Resistor	240 Ohms	
Plate Current	8.2 Ma	
Transconductance	5500 μmhos	
Amplification Factor	35	
Cutoff		
Plate Current at E_{c1} = −10 Volts	45 μa	Max.

QUICK REFERENCE DATA

The Sylvania Type 407A is a miniature, high frequency medium mu double triode having separate cathode connections and is designed for reliable service under conditions encountered in communications applications.





407A

SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
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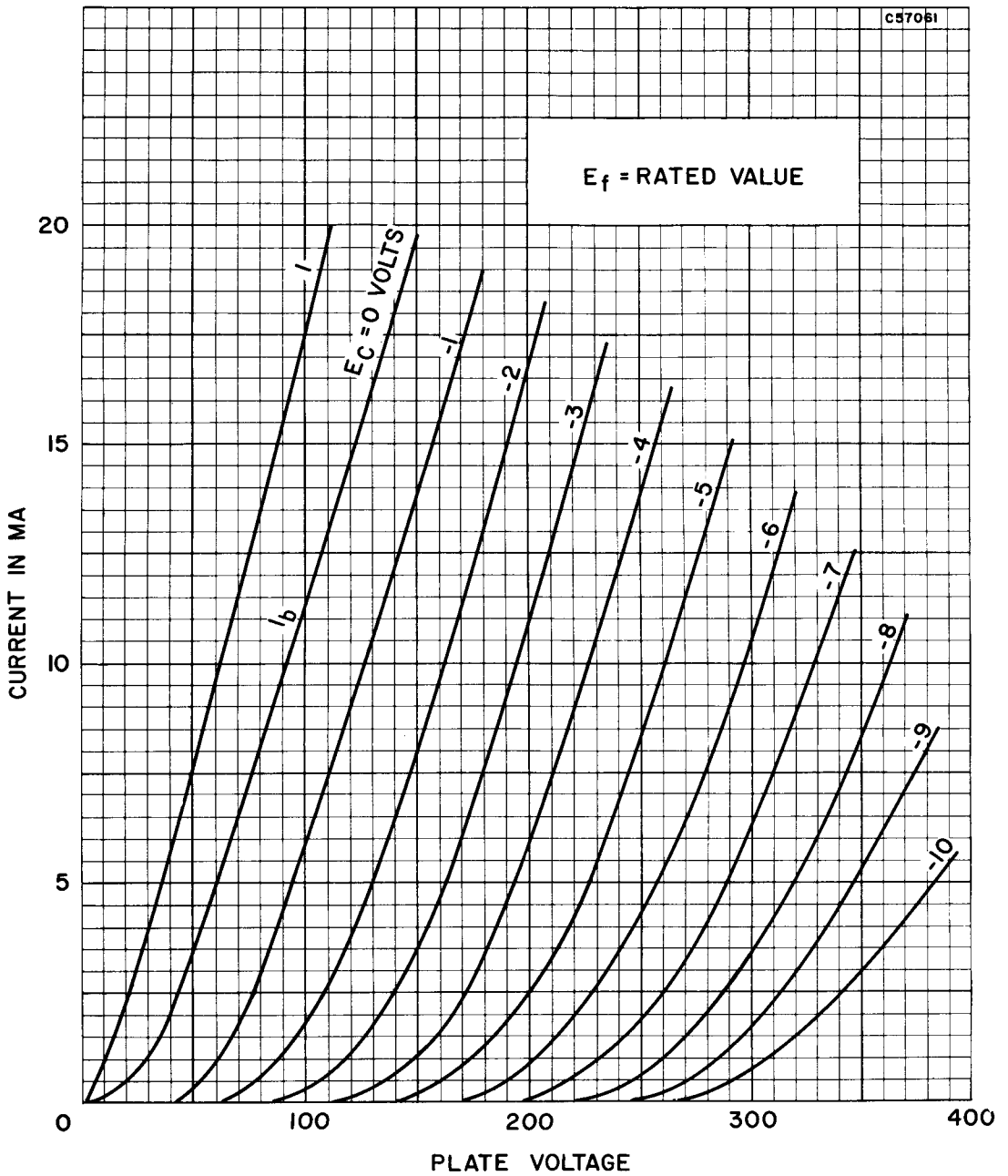
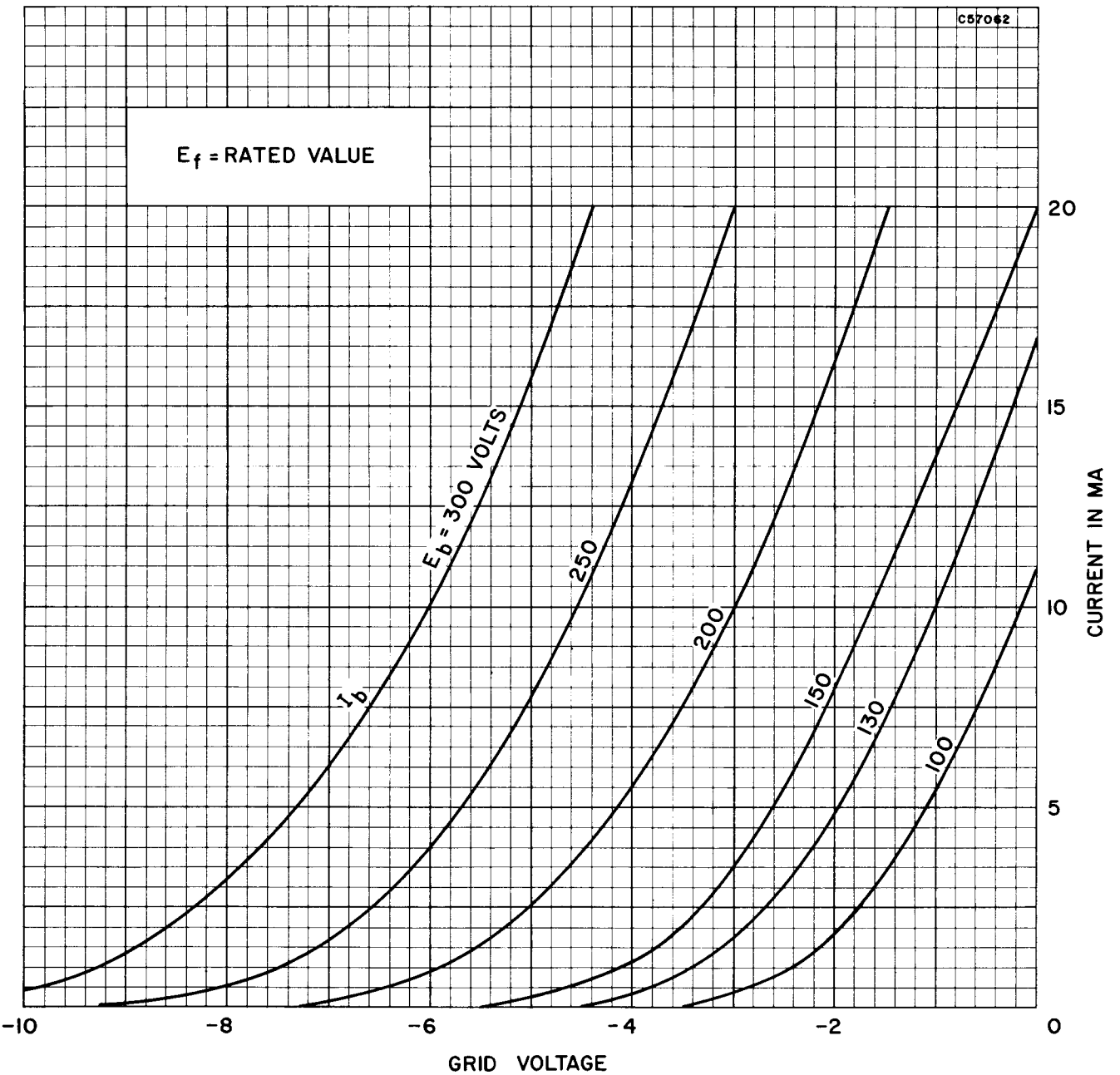
EMPORIUM, PENNSYLVANIA
JULY, 1957

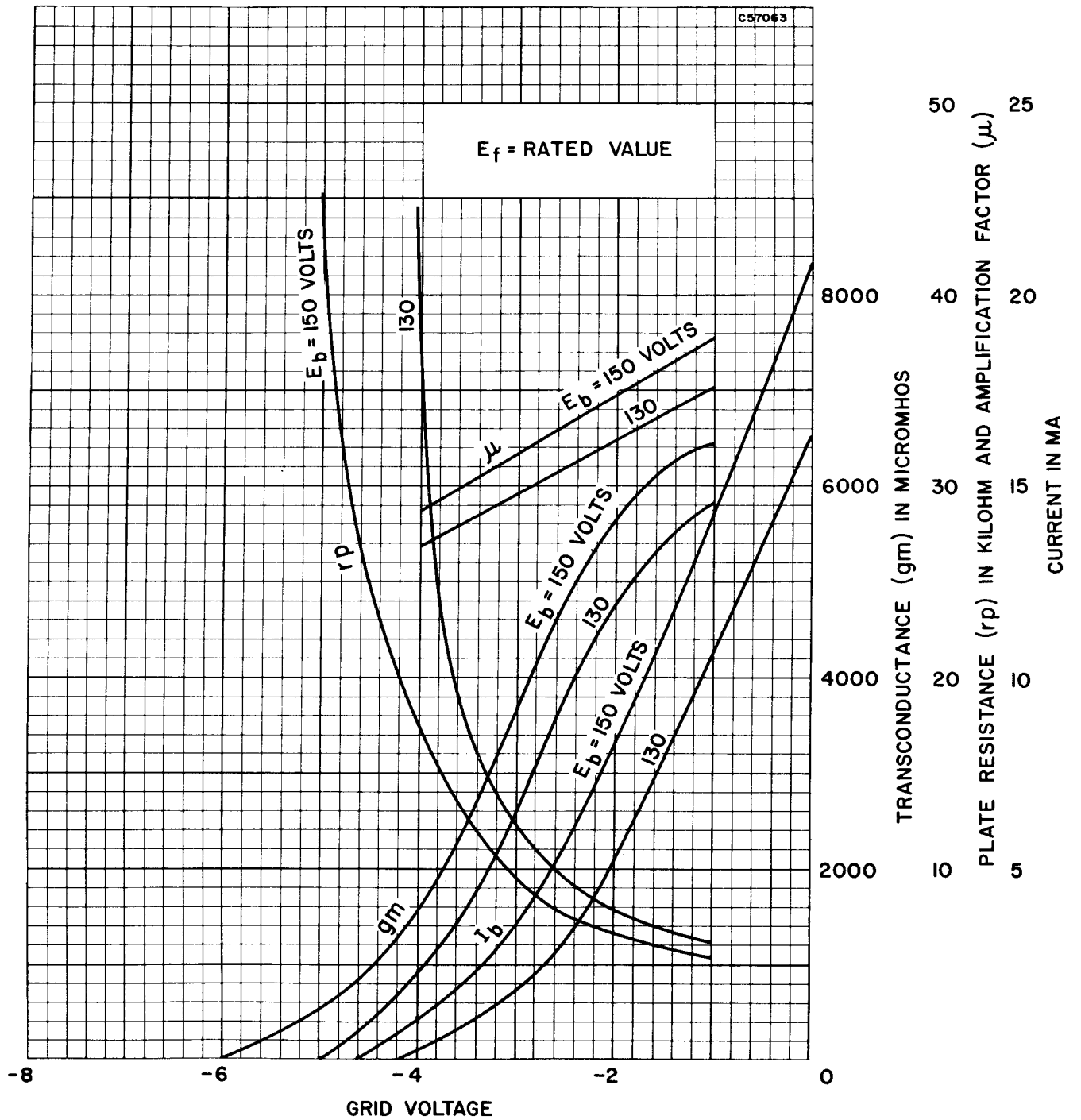
AVERAGE PLATE CHARACTERISTICS
(EACH SECTION)



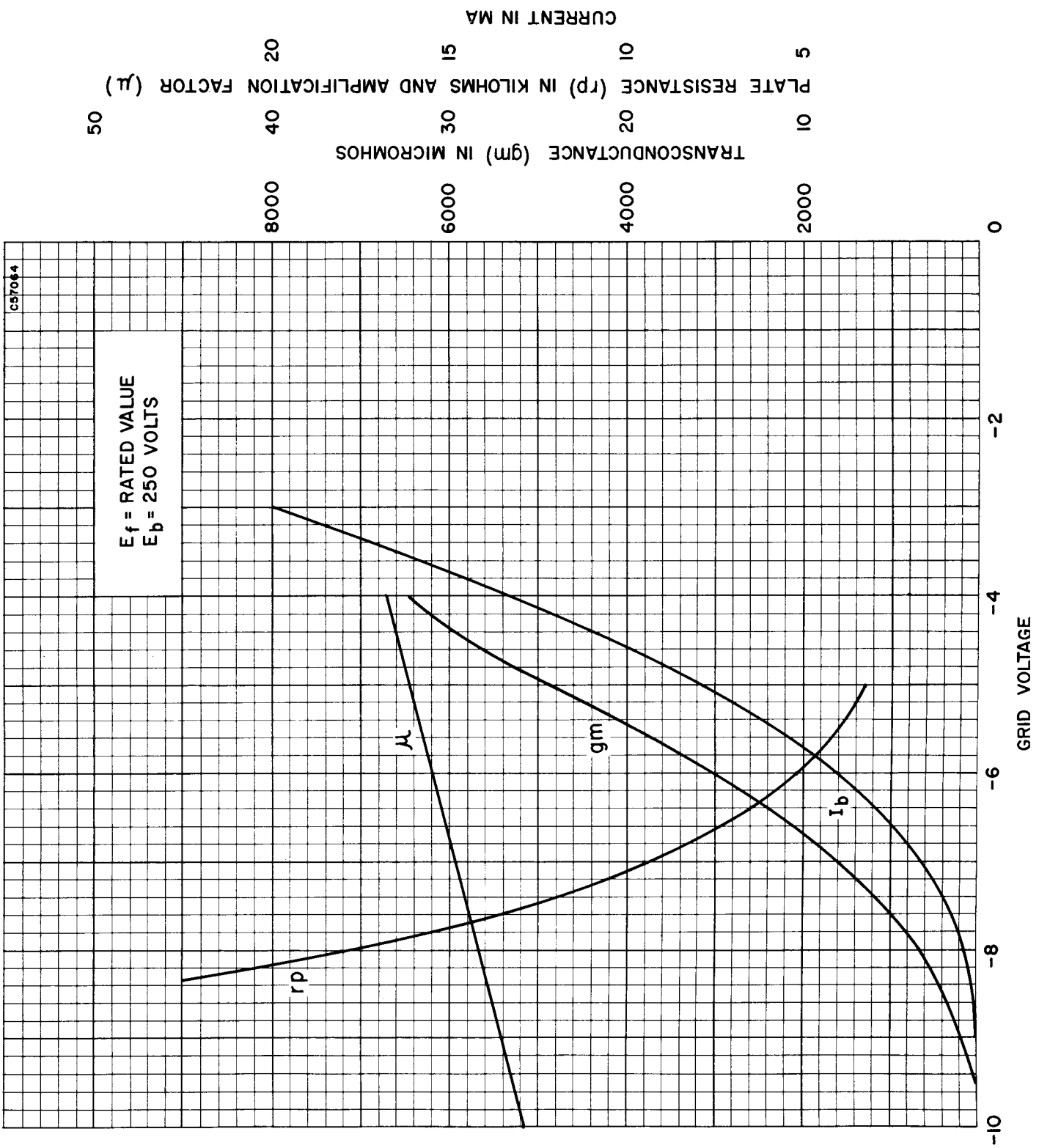
AVERAGE TRANSFER CHARACTERISTICS
(EACH SECTION)



AVERAGE TRANSFER CHARACTERISTICS
(EACH SECTION)



AVERAGE TRANSFER CHARACTERISTICS
(EACH SECTION)



SYLVANIA

engineering data service 408A

MECHANICAL DATA

Bulb	T-5 ½
Base	E7-1, Miniature Button 7-Pin
Basing	7BD
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	20.0 Volts
Heater Current	50.0 Ma

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[1]

Grid to Plate	0.01 μμf
Input	3.9 μμf
Output	2.85 μμf

RATINGS (Absolute Maximum Values)

Plate Voltage	180 Volts
Plate Dissipation	1.7 Watts
Grid No. 2 Supply Voltage	180 Volts
Grid No. 2 Voltage	See Rating Chart
Grid No. 2 Dissipation	0.5 Watt
Positive DC Grid No. 1 Voltage	0 Volt
Heater-Cathode Voltage	75 Volts
Cathode Current	18 Ma

TYPICAL OPERATION

Class A_1 Amplifier

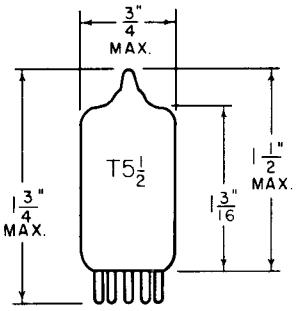
Plate Voltage	120 Volts
Grid No. 2 Voltage	120 Volts
Cathode Bias Resistor[2]	200 Ohms
Plate Current	7.0 Ma
Grid No. 2 Current	2.2 Ma
Transconductance	5000 μmhos
Plate Resistance (approx.)	0.34 Megohm
Grid No. 1 Voltage for Ib = 200 μa Max.	−10.0 Volts

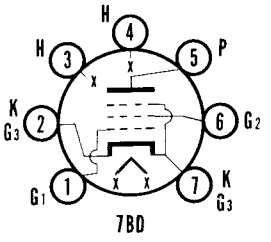
NOTES:

1. *Shield No. 316 connected to cathode.*
2. *Fixed bias operation is not recommended.*

QUICK REFERENCE DATA

The Sylvania Type 408A is a miniature, sharp-cutoff rf pentode, designed for reliable service under conditions encountered in communication applications.





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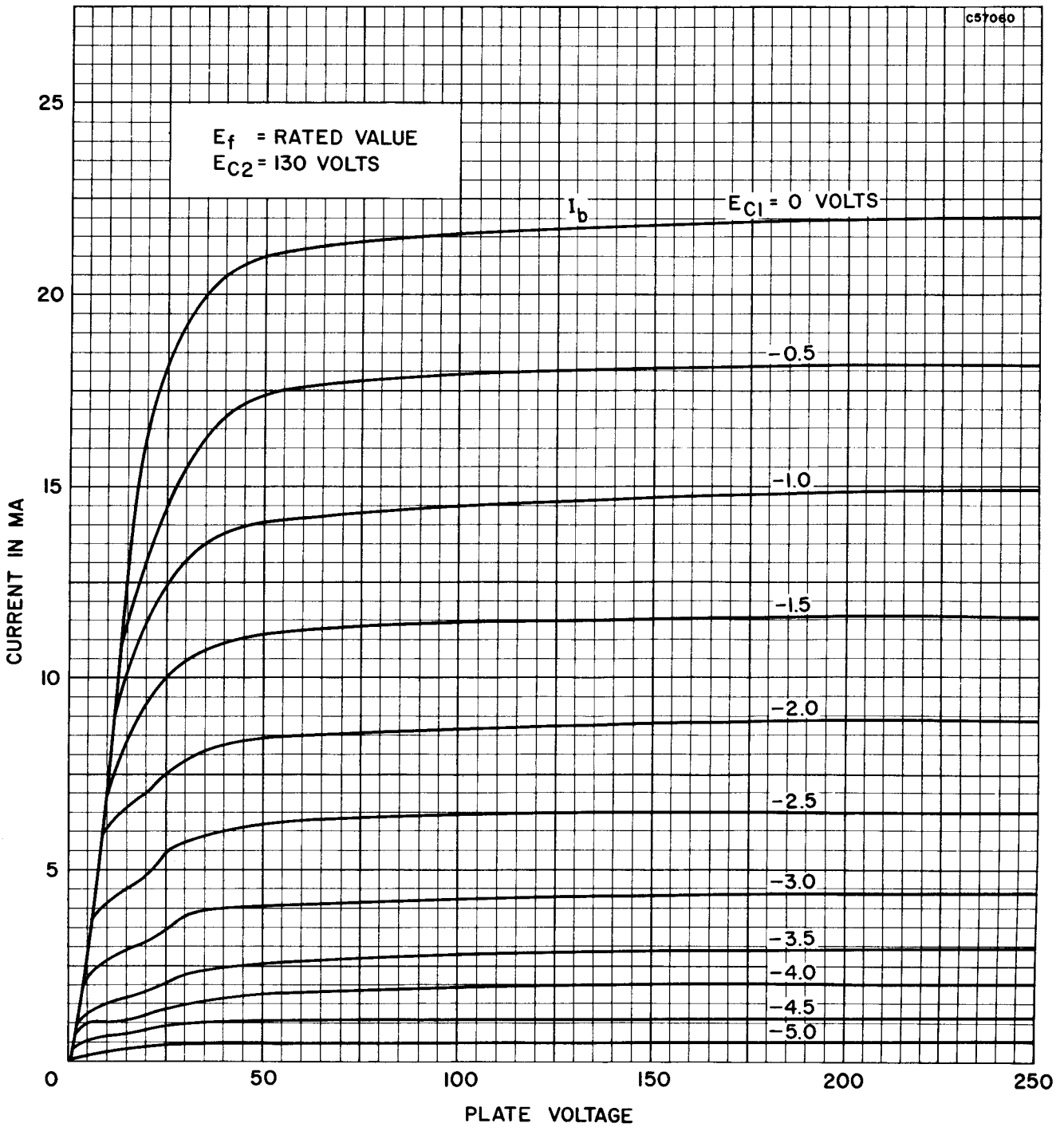
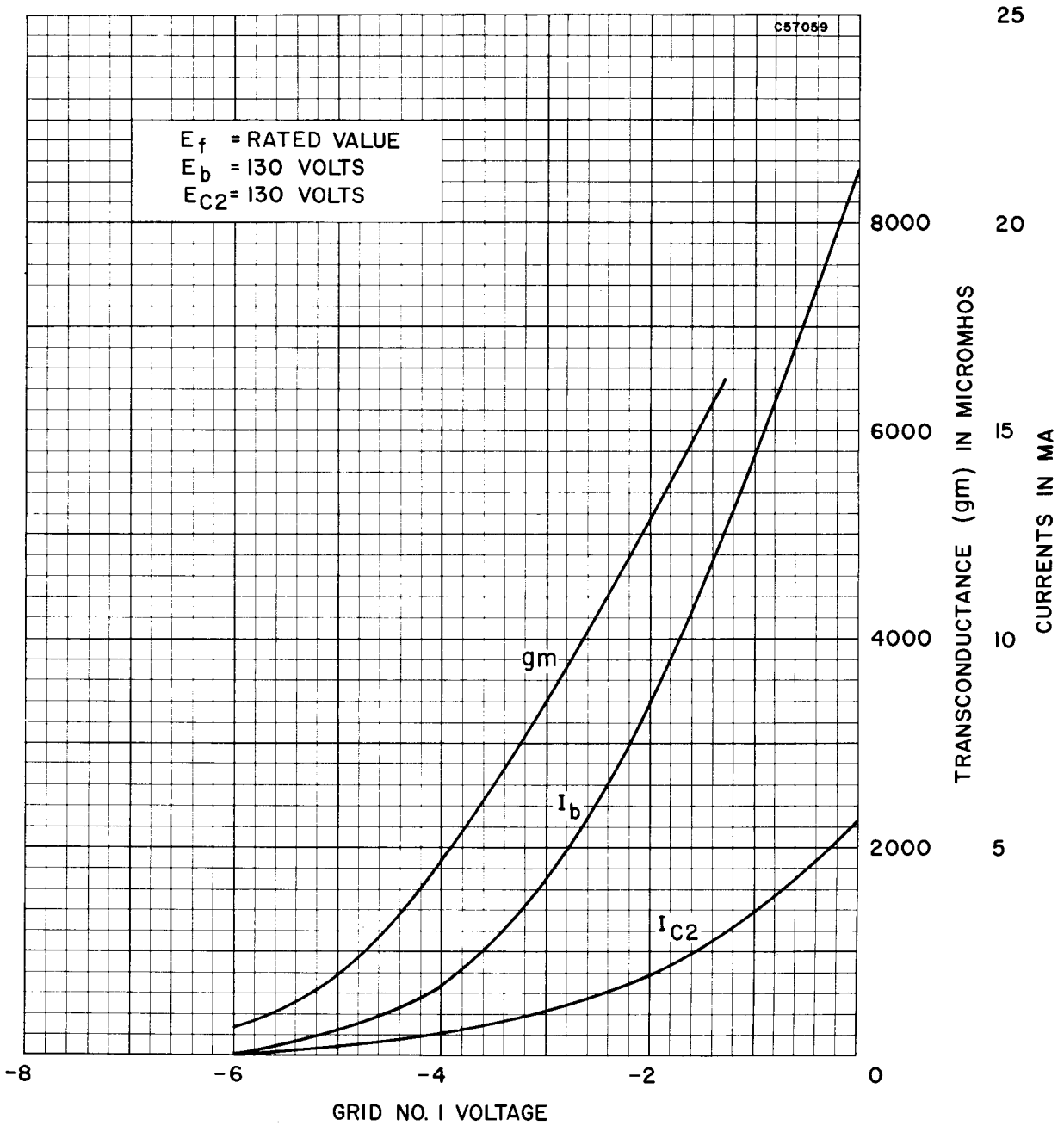
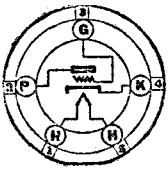
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS

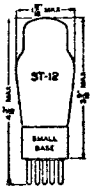




Sylvania

TYPE 485

DETECTEUR AMPLIFICATEUR



CARACTERISTIQUES

Tension filament CA ou CC	3,0 volts
Courant filament	1,25 ampère
Ampoule	ST-12
Culot — Petit modèle 5 broches	5-A
Position de montage	Toutes

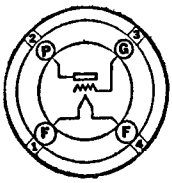
Conditions de fonctionnement et caractéristiques :

Tension filament	3,0 volts
Tension plaque	180 volts
Tension grille	—9 volts
Courant plaque	5,8 ma.
Résistance interne	8.900 ohms
Conductance mutuelle	1.400 μmhos
Coefficient d'amplification	12,5

APPLICATION

Le type 485 est un tube amplificateur et détecteur à chauffage indirect rapide.

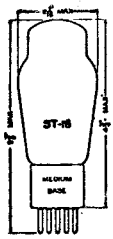
Des précautions spéciales ont été prises pour rendre ce tube exempt de troubles dus à la présence de gaz. Il ne sert plus actuellement, qu'au remplacement sur anciens récepteurs.



Sylvania

TYPE 50

AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension filament CA ou CC	7,5 volts
Courant filament	1,25 ampère
Ampoule	ST-16
Culot — Moyen 4 broches	4-D
Position de montage	Verticale

Capacités directes interélectrodes :

Grille à plaque	8,4 $\mu\mu f$
Entrée	4,2 $\mu\mu f$
Sortie	3,4 $\mu\mu f$

Conditions de fonctionnement et caractéristiques :

Tension filament	7,5	7,5	7,5	7,5 volts
Tension plaque	300	350	400	450 volts max.
Tension grille*	—54	—63	—70	—84 volts
Courant plaque	35	45	55	55 ma.
Résistance interne	2.000	1.900	1.800	1.800 ohms
Conductance mutuelle ...	1.900	2.000	2.100	2.100 μmhos
Coefficient d'amplification	3,8	3,8	3,8	3,8
Impédance de charge	4.600	4.100	3.670	4.350 ohms
Puissance modulée	1,6	2,4	3,4	4,6 watts

* Tension grille mesurée à partir du point milieu du filament

APPLICATION

Sylvania 50 est un tube triode de sortie, destiné à fournir une bonne puissance modulée sans distorsion. Le couplage par transformateur doit être employé avec ce tube.

Le filament oxydé du tube 50 est prévu pour fonctionner sur secteur alternatif, par l'intermédiaire d'un transformateur abaisseur. La tension filament doit être maintenue très voisine de 7,5 volts. Les conducteurs dans le circuit filament devront être de section suffisante pour laisser passer le courant relativement élevé absorbé par le filament.

Pour prévenir la distorsion et la surcharge, une polarisation négative de grille convenable doit être utilisée avec le tube 50. Cette polarisation est obtenue de la meilleure façon, par une résistance insérée dans le retour de plaque. Les valeurs des résistances de polarisation pour un seul tube ou pour deux tubes en parallèle ou en push-pull sont indiquées dans le tableau suivant :

Tens. plaque	Tens. polarisation	Cour. plaque	Résistance 1 tube	Résistance 2 tubes
Volts	Volts	Milliampère	Ohms	Ohms
250	—45	28	1.600	800
300	—54	35	1.550	775
350	—63	45	1.400	700
400	—70	55	1.275	640
450	—84	55	1.520	760

Si une puissance supérieure est désirée, deux tubes 50 peuvent être utilisés en parallèle ou en push-pull.

SYLVANIA

JETEC Registration Data

TYPE 50A1

BALLAST TUBE

The Type 50A1 is a gas-filled ballast tube designed to maintain a relatively constant current over a specified operating voltage range.

MECHANICAL DATA

Bulb	T-6 1/2
Base	Miniature Button 9-Pin
Outline	6-3
Maximum Overall Length	2 5/8 inches
Maximum Seated Height	2 3/8 inches
Maximum Diameter	7/8 inch
Mounting Position	vertical, base down
Type of Cooling	radiation
Maximum Ambient Temperature	65 °C
Net Weight, maximum	1 ounce

Basing 9CM

Connections:

Pin 1 - internal connection*
Pin 2 - filament
Pin 3 - no connection
Pin 4 - internal connection*
Pin 5 - no connection
Pin 6 - no connection
Pin 7 - filament
Pin 8 - no connection
Pin 9 - internal connection*

*Do not use.

ELECTRICAL DATA

RATINGS - Absolute Values

Current:	
Maximum	58 ma
Minimum	50 ma
Voltage:	
Maximum	65 volts
Minimum	30 volts

CHARACTERISTICS

Average Operating Current:	
At 30 Volts	52 ma
At 50 Volts	54 ma
At 65 Volts	56 ma

from RTMA release #1183, May 1, 1953

SYLVANIA

engineering data service

SYLVANIA

50B5

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-3
Basing	7BZ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	50 Volts
Heater Current	150 Ma

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	0.64 $\mu\mu$f
Input	13 $\mu\mu$f
Output	6.5 $\mu\mu$f

RATINGS (Design Center Values)

Plate Voltage	135 Volts	Max.
Grid No. 2 Voltage	117 Volts	Max.
Plate Dissipation	5.5 Watts	Max.
Grid No. 2 Dissipation	1.25 Watts	Max.
Heater-Cathode Voltage	180 Volts	Max.
Control Grid Circuit Resistance		
Fixed Bias	0.1 Megohm	Max.
Cathode Bias	0.5 Megohm	Max.

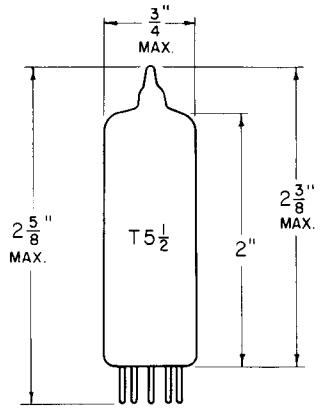
CHARACTERISTICS AND TYPICAL OPERATION (Single Tube)

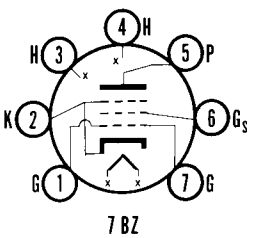
Class A_1 Amplifier

Plate Voltage	110 Volts
Grid No. 2 Voltage	110 Volts
Grid No. 1 Voltage	−7.5 Volts
Peak A F Grid No. 1 Voltage	7.5 Volts
Zero-Signal Plate Current	49 Ma
Maximum-Signal Plate Current	50 Ma
Zero-Signal Grid No. 2 Current	4.0 Ma
Maximum-Signal Grid No. 2 Current	8.5 Ma
Plate Resistance (approx.)	10,000 Ohms
Transconductance	7,500 μmhos
Load Resistance	2,500 Ohms
Maximum-Signal Power Output	1.9 Watts
Total Harmonic Distortion (approx.)	9.0 Percent

QUICK REFERENCE DATA

The Sylvania Type 50B5 is a miniature, beam power amplifier designed for service as the audio power output stage of AC/DC receivers. The Type 50B5 features relatively high power output at low B supply voltages.





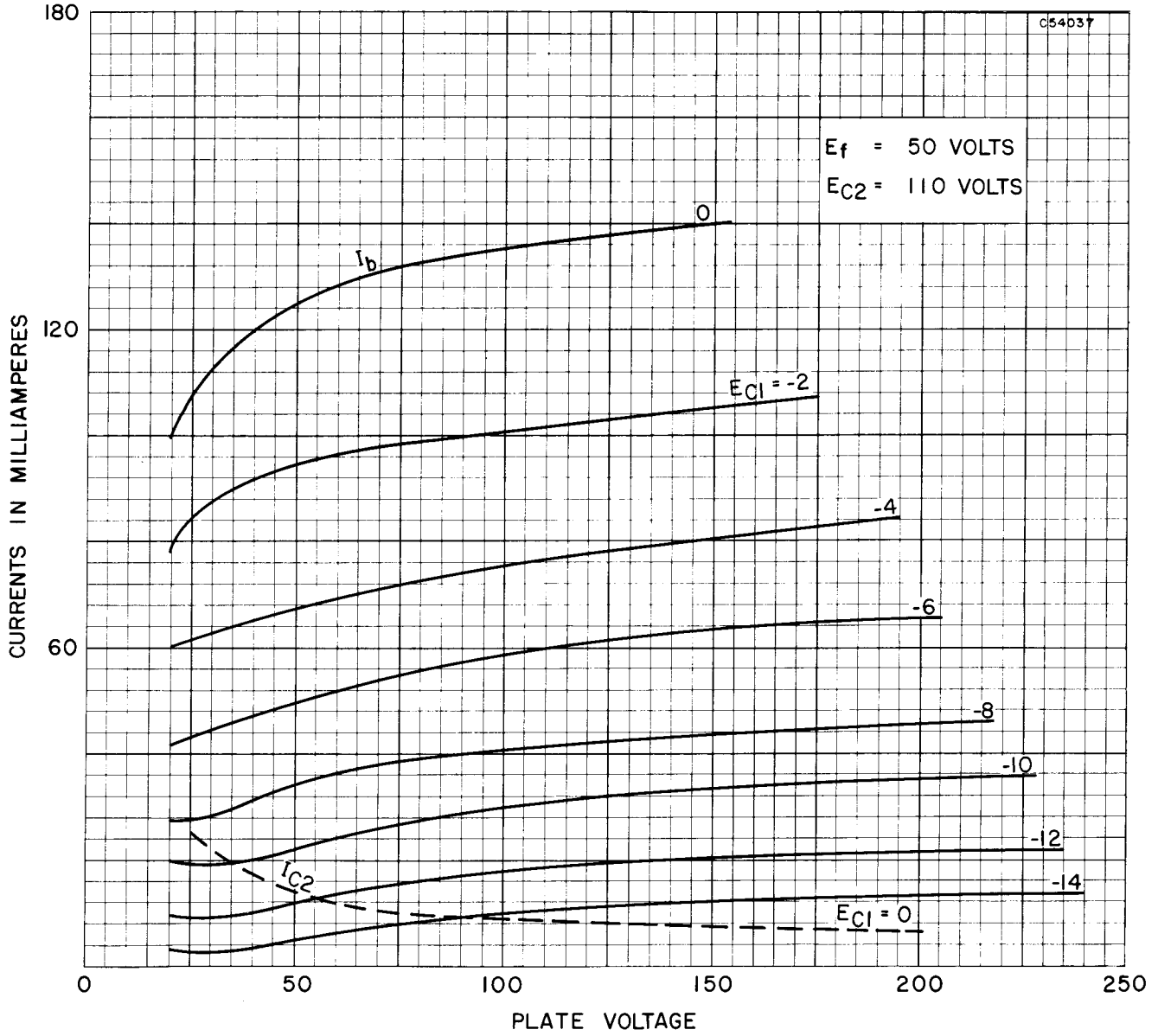
7BZ

SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION

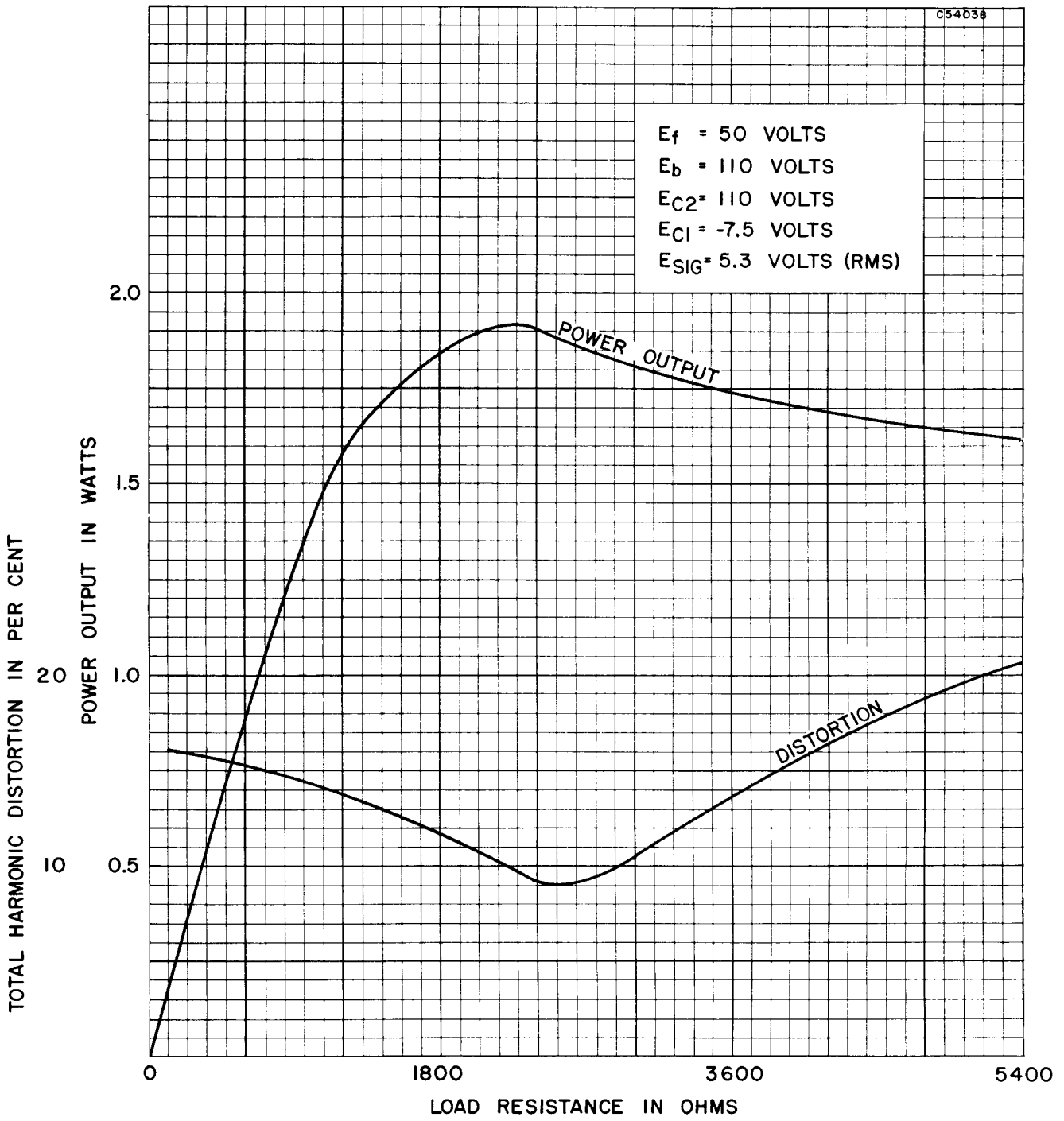
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

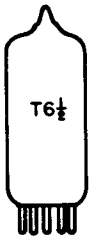
AUGUST, 1954

AVERAGE PLATE CHARACTERISTICS

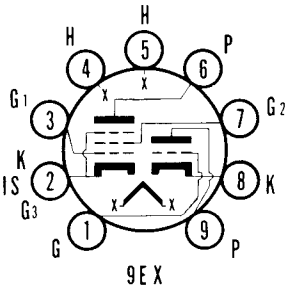


AVERAGE OPERATION CHARACTERISTICS





TYPE 50FY8



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-4
Basing	9EX
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	50 Volts
Heater Current	150 Ma
Heater-Cathode Voltage (Design Maximum Values)	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
D C	100 Volts Max.
Total D C and Peak	200 Volts Max.

RATINGS (Design Maximum Values)

	Triode Section	Pentode Section
Plate Voltage	150	150 Volts Max.
Grid No. 2 Voltage		150 Volts Max.
Plate Dissipation	1.0	10 Watts Max.
Grid No. 2 Dissipation		3 Watts Max.
Grid No. 1 Circuit Resistance		
Fixed Bias	1.0	0.5 Megohm Max.
Cathode Bias	3.0	1.0 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier	Triode Section	Pentode Section
Plate Voltage	125	125 Volts
Grid No. 2 Voltage	...	125 Volts
Grid No. 1 Voltage	−1.5	... Volts
Cathode Bias Resistor		120 Ohms
Zero Signal Plate Current	2.5	70 Ma
Max. Signal Plate Current		66 Ma
Zero Signal Grid No. 2 Current		10 Ma
Max. Signal Grid No. 2 Current		19 Ma
Transconductance	2700	7500 μmhos
Amplification Factor	46	....
Plate Resistance	17,000	5000 Ohms
Load Resistance		2000 Ohms
Power Output		3 Watts
Total Harmonic Distortion		10 Percent

APPLICATION

Type 50FY8 contains a high mu triode and Beam Power amplifier in a T-6½ envelope. The Beam Pentode is capable of furnishing 3 watts of output at a B+ voltage of 125 volts.

RMA Release # 231 Feb. 2, 1940

HYGRADE SYLVANIA CORPORATION

TECHNICAL DATA

SYLVANIA TYPE 50Y6G

High-Vacuum Rectifier-Doubler

Physical Specifications

Coated Unipotential Cathode	
Base	Small Shell Octal 7-Pin
Bulb	ST-12
Maximum Diameter	1 9/16"
Maximum Overall Length	4 1/8"
Maximum Seated Height	3 9/16"
Pin Connections	Basing No. 7Q

Pin 1 - No Connection
Pin 2 - Heater
Pin 3 - Plate #2
Pin 4 - Cathode #2
Pin 5 - Plate #1
Pin 7 - Heater
Pin 8 - Cathode #1

Mounting Position — Any

Ratings

Heater Voltage (ac or dc)	50	volts
Heater Current	0.15	amp
Maximum AC Voltage per plate (RMS)	235	volts
Maximum DC Heater to Cathode Potential	350	volts
Maximum Peak Inverse Voltage	700	volts
Maximum Steady-State Peak Plate Current per Plate	450	ma
DC Voltage Drop per plate at 150 ma	22	volts

Typical Operating Conditions

Voltage Doubler

	Half-Wave	Full-Wave	
Heater Voltage	50	50	volts
AC Voltage per Plate (RMS)	117 Max	117 Max	volts
DC Output Current per Plate	75 Max	75 Max	ma
Minimum Total Effective Plate Supply Impedance per Plate #	30	15	ohms

Half-Wave Rectifier

Heater Voltage	50	50	50	volts
AC Voltage per Plate (RMS)	117	150	235 Max	volts
DC Output Current per Plate	75 Max	75 Max	75 Max	ma
Minimum Total Effective Plate Supply Impedance per Plate #	15	40	100	ohms

#When filter condensers larger than 40 mfds are used, it may be necessary to add additional plate supply impedance.

1-29-40

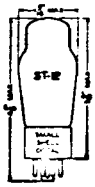


8-AN

Sylvania

TYPE 50Z7G

REDRESSEUR ET DOUBLEUR DE TENSION A VIDE POUSSE



CARACTERISTIQUES

Tension chauffage (broche 2 et 7, au total)	50,0 volts
Courant chauffage (total)	0,150 ampère
Section ampoule panneau (broches 6 et 7)	2,0 volts
Tension efficace ampoule panneau	2,5 volts
Ampoule	ST-12
Culot — Petit octal 8 broches	8-AN
Position de montage	Toutes
Chute tension dans tube (130 ma. par plaque)**	21 volts

** Ampoule tableau non connectée.

Conditions de fonctionnement et caractéristiques :

DOUBLEUR DE TENSION

Tension chauffage (totale)	50.0 volts
Tension efficace CA par plaque	117 volts max.
Courant redressé*	65 ma. max.
Courant de pointe de plaque	400 ma. max.
Source impédance de charge par plaque***	25 ohms min.

*** Suffisant pour limiter le courant maximum de pointe de plaque à la valeur indiquée. On pourait demander plus d'impédance lorqu'un filtre de plus de 40 mid est utilisé.

REDRESSEUR DEMI-ONDE
(Entrée condensateur)

Tension chauffage	50,0 volts
Tension plaque CA	117 volts max.
Courant redressé, par plaque	65 ma. max.
Courant de pointe de plaque, par plaque	400 ma. max.
Impédance, par plaque	25 ohms min.

* Avec un courant plaque redressé à travers la section ampoule de cadran du filament shunté par une ampoule de cadran de 2,9 volts — 0,170 ampère (Sylvania type S292 au S292A).

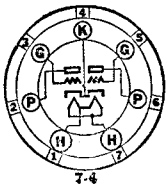
APPLICATION

Sylvania type 50Z7G est un redresseur à vide poussé, conçu pour fonctionner comme doubleur de tension ou redresseur demi-onde convenant pour récepteurs C.C. ou universels. Le filament de 50 volts a une prise intermédiaire pour fournir la tension convenable entre broches 6 et 7 à une ampoule de cadran 2,9 volts 0,170 ampère. Le filament consomme au total 150 millis.

En fonctions de redresseur demi-onde, les deux plaques seront connectées ensemble ainsi que les deux cathodes. Des résistances d'au moins 25 ohms doivent être mises en série avec chaque plaque. Alternativement, on peut n'utiliser qu'une résistance de 25 ohms commune aux deux plaques, résultant par une tension de sortie légèrement inférieure.

Lorsque 50Z7G est utilisé en doubleur de tension, il est essentiel de placer en série dans chaque plaque une résistance limiteuse de pointe, d'au moins 25 ohms. S'il s'agit d'un circuit doubleur en série, alors une résistance de secteur de 30 ohms peut suffire, au lieu de l'arrangement précédent.

Il est recommandé également de placer en série dans le circuit chauffage des autres tubes une résistance limiteuse de surtension.

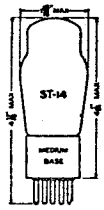


Sylvania

TYPE 53

AMPLIFICATEUR

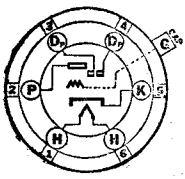
CLASSE B



CARACTERISTIQUES

Tension de chauffage CA ou CC ... ... 2,5 volts
Courant de chauffage ... ... 2,0 ampères

Pour les autres caractéristiques et les applications, voir type 6A6 (excepté tension chauffage).

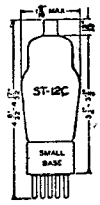


Sylvania

TYPE 55

DOUBLE DIODE

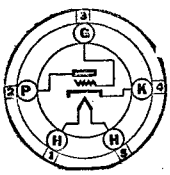
TRIODE



CARACTERISTIQUES

Tension de chauffage CA ou CC ... ... 2,5 volts
Courant de chauffage ... ... 1,0 ampère

Pour les autres caractéristiques et les applications, voir type 85 (excepté tension chauffage).

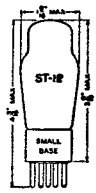


Sylvania

TYPE 56

DETECTEUR

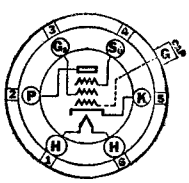
AMPLIFICATEUR



CARACTERISTIQUES

Tension de chauffage CA ou CC	2,5 volts
Courant de chauffage	1,0 ampère

Pour les autres caractéristiques et les applications, voir type 76 (excepté tension chauffage).

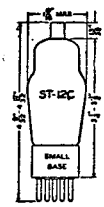


Sylvania

TYPE 57

TRIGRILLE

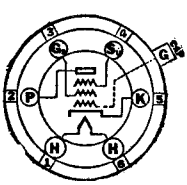
AMPLIFICATEUR



CARACTERISTIQUES

Tension de chauffage CA ou CC ... ... 2,5 volts
Courant de chauffage ... ... 1,0 ampère

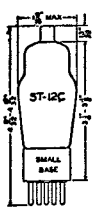
Pour les autres caractéristiques et les applications, voir type 76 (excepté tension chauffage).



Sylvania

TYPE 58

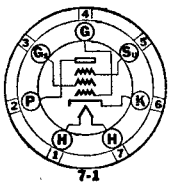
PENTODE H. F.



CARACTERISTIQUES

Tension de chauffage CA ou CC ... ... 2,5 volts
Courant de chauffage ... ... 1,0 ampère

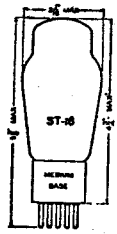
Pour les autres caractéristiques et les applications, voir type 6D6 (excepté tension chauffage).



Sylvania

TYPE 59

TRIGRILLE AMPLIFICATEUR DE PUISSANCE



CARACTERISTIQUES

Tension de chauffage CA ou CC	2,5 volts
Courant de chauffage	2,0 ampères
Ampoule	ST-16
Culot — Moyen 7 broches	7-A
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR DE PUISSANCE CLASSE B
(Connexion triode)

(Grille Su reliée à la plaque; grilles G et Gs connectées ensemble)

Tension de chauffage	2,5 volts
Tension plaque	400 volts max.
Courant dynamique plaque de pointe	200 ma. max.
Dissipation moyenne de plaque	10 watts max.
Dissipation moyenne de grille	1,5 watts max.

Fonctionnement-type (deux tubes) :

Tension plaque	300	400 volts max.
Tension grille	0	0 volt
Courant statique de plaque (par plaque)	10	13 ma.
Impédance de charge (plaque à plaque)	4.600	6.000 ohms
Puissance modulée (2 tubes)	15	20 watts

AMPLIFICATEUR DE PUISSANCE CLASSE A

	Triode (T)	Pentode (P)
Tension de chauffage	2,5	2,5 volts
Tension plaque	250	250 volts max.
Tension grille	—28	—18 volts
Tension écran	...	250 volts max.
Courant plaque	26	35 ma.
Courant écran	...	9 ma.
Résistance interne	2.300	40.000 ohms
Conductance mutuelle	2.600	2.500 µmhos
Coefficient d'amplification	6	100
Impédance de charge	5.000*	6.000 ohms
Puissance modulée (distorsion totale 7 pour cent)	1,25	3,0 watts

T = Grilles Su et Gs reliées à la plaque.
P = Grille Su reliée à la cathode.

* Le double de cette valeur, approximativement, est recommandée pour l'impédance de charge d'un tube 59 attaquant un étage classe B.

APPLICATION

Sylvania 59 est un tube amplificateur trigrille à chauffage indirect. Les trois grilles ont des sorties indépendantes, de telle sorte que des caractéristiques similaires à celles du tube 47 peuvent être obtenues. Le tube 59 peut également fonctionner en classe B comme le tube 46, par une connexion convenable des grilles. Une troisième méthode de connexion des grilles permet un fonctionnement très acceptable en triode.

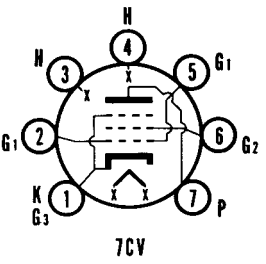
Pour le fonctionnement en amplificateur de puissance classe A, les grilles 2 et 3 sont reliées à la plaque pour ne former qu'une seule électrode; la grille n° 1 sert de grille de contrôle. Pour faire fonctionner le tube 59 en classe B, il suffit de relier les grilles n° 1 et n° 2 qui, ensemble, jouent le rôle de grille de contrôle (donc assurant le grand coefficient d'amplification nécessaire), tandis que la grille n° 3 est connectée à la plaque.

Les résistances employées dans le circuit de grille du tube 59 fonctionnant en classe A (pentode et triode) ne peuvent pas dépasser 0,5 mégohm lorsque le tube est polarisé automatiquement. Sans polarisation automatique, cette valeur maximum est limitée à 0,25 mégohm. Une résistance trop grande dans les circuits de grille peut provoquer une insuffisance de polarisation et, par conséquent, échauffement exagéré et destruction du tube.



SYLVANIA TYPE 60FX5

POWER PENTODE



MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-3
Basing	7CV
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Heater Voltage	60 Volts
Heater Current[1]	100 Ma
Heater-Cathode Voltage (Design Maximum Values)	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
D C	100 Volts Max.
Total D C and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.65 $\mu\mu$f
Input: g1 to (k+g3+g2+h)	17 $\mu\mu$f
Output: p to (k+g3+g2+h)	9 $\mu\mu$f

RATINGS (Design Maximum Values)

Class A1 Amplifier

Plate Voltage	150 Volts Max.
Grid No. 2 Voltage	130 Volts Max.
Plate Dissipation	5.2 Watts Max.
Grid No. 2 Dissipation	2 Watts Max.
Grid No. 1 Circuit Resistance	
Fixed Bias	0.1 Megohm Max.
Cathode Bias	0.5 Megohm Max.
Bulb Temperature (At Hottest Point)	225° Cent. Max.

CHARACTERISTICS AND TYPICAL OPERATION

Plate Voltage	110 Volts
Grid No. 2 Voltage	115 Volts
Cathode Resistor	62 Ohms
Peak AF Grid No. 1 Voltage	3 Volts
Zero-Signal Plate Current	36 Ma
Max.-Signal Plate Current	35 Ma
Zero-Signal Grid No. 2 Current	10 Ma
Max.-Signal Grid No. 2 Current	12 Ma
Load Resistance	3000 Ohms
Max.-Signal Power Output	1.3 Watts
Total Harmonic Distortion	8 Percent

NOTES:

1. For series operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater current.
2. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
3. Heater voltage supply variations shall be restricted to maintain heater current within the specified values.

APPLICATION

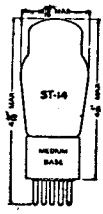
The Sylvania Type 60FX5 is a miniature power pentode designed for service as an audio power amplifier.
It provides low heat dissipation through the use of a 100 ma heater.



Sylvania

TYPE 71A

AMPLIFICATEUR DE PUISSANCE



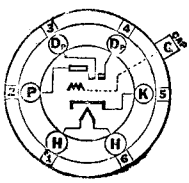
CARACTERISTIQUES

Tension filament CA ou CC	5,0 volts
Courant filament	0,25 ampère
Ampoule	ST-14
Culot — Moyen 4 broches	4-D
Position de montage	Verticale

Capacités directes interélectrodes :

Grille à plaque	7,5 $\mu\mu$f
Entrée	3,2 $\mu\mu$f
Sortie	2,9 $\mu\mu$f

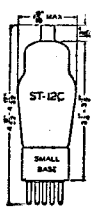
Sylvania 71A est un ancien tube ne servant plus actuellement qu'au remplacement dans les vieux récepteurs.



Sylvania

TYPE 75

DOUBLE DIODE TRIODE A MU ELEVE



CARACTERISTIQUES

Tension de chauffage CA ou CC	**6,3 volts**
Courant de chauffage	0,3 ampère
Ampoule	ST-12C
Culot : petit modèle 6 broches	6-G
Position de montage	Toutes

Capacités directes interélectrodes, section triode (approx.) :

Grille à plaque	1,7 $\mu\mu f$
Entrée	1,7 $\mu\mu f$
Sortie	3,8 $\mu\mu f$

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A (Section triode)

Tension de chauffage	6,3 volts
Tension plaque	250 volts max.
Tension grille	—2 volts
Courant plaque	1,0 ma.
Résistance interne	91,000 ohms
Conductance mutuelle	1,100 μmhos
Coefficient d'amplification	100

APPLICATION

Sylvania 75 est un tube à chauffage indirect comprenant deux diodes et une triode dans la même ampoule. Il ressemble au type 85, mais la section triode possède un coefficient d'amplification de 100 contre 8,3 seulement pour le type 85.

Les sections diodes sont indépendantes les unes des autres, ainsi que de la partie triode. La cathode est commune et possède deux surfaces émettrices : l'une pour les diodes, l'autre pour la triode. Cet arrangement permet l'utilisation de circuits variés; les diodes peuvent par exemple servir à la détection et à l'A.V.C., tandis que la triode fonctionne en amplificateur basse fréquence.

Détecteur :

Les diodes peuvent être montées en redresseur demi-onde ou onde complète. Dans le premier cas, une seule plaque ou toutes deux en parrallèle peuvent être employées.

Pour des valeurs données de modulation et de tension d'alimentation de diodes, l'arrangement demi-onde donnera près de deux fois autant de tension BF et d'A.V.C. que la connexion onde complète. Dans ce dernier cas, seulement la moitié de la tension secondaire est disponible pour chaque diode. Le premier, toutefois, exige un meilleur filtrage M.F.

Contrôle de volume automatique :

La tension d'A.V.C. peut être obtenue d'une plaque de diode seulement. La sensibilité et le retard du contrôle de volume automatique sont fonction de la résistance et de la capacité dont l'ensemble a la constante de temps désirée. La sensibilité de l'A.V.C. peut être réglée par application d'une tension négative à la plaque de la diode d'A.V.C. pour obtenir la réduction désirée.

Des filtres adéquats seront utilisés dans les retours des circuits grille de tous les tubes à sensibilité contrôlée, pour éviter le couplage entre les différents étages et spécialement entre les étages haute et moyenne fréquence, dans les récepteurs superhétérodynes. Dans chaque circuit, une résistance aussi élevée que 0.5 mégohm peut être nécessaire pour éviter une mauvaise qualité aux faibles volumes.

Amplificateur.

La section triode peut être utilisée dans des montages classiques. Cependant, à cause de son coefficient d'amplification élevé, elle ne peut pas être employée en amplificatrice polarisée par les diodes, c'est-à-dire que la polarisation de grille ne peut pas être obtenue par la chute de tension provoquée par le passage du courant redressé dans la résistance de charge du circuit détecteur, car alors le point de fonctionnement peut tomber en-dessous du point d'annulation du courant plaque (cut off.) Il en résulte une mauvaise qualité, spécialement avec les signaux de grande amplitude. La triode doit être couplée par résistance à la diode avec un condensateur ordinaire de couplage et une résistance de fuite de 0,5 mégohm à la masse. Pour produire la polarisation convenable, une résistance dont la valeur dépend de la résistance du circuit plaque et du courant plaque désiré, est insérée dans le retour cathode.

La méthode classique de faire fonctionner la plupart des tubes amplificateurs BF est la polarisation cathodique. Pour un meilleur rendement, la valeur des résistances, convenablement shuntées, est importante si on doit réaliser un gain élevé et une faible distortion. Un autre système de fonctionnement est particulièrement adapté aux tubes triodes à mu élevé, tels que les types 75-6F5G-6Q7G, etc. Cette méthode a été déonmmée « fonctionnement à polarisation nulle », puisque la cathode est connectée directement à la masse, tandis que la résistance de grille est portée d'environ 1 mégohm à 10 mégohm et au delà.

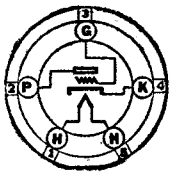
Le fonctionnement des triodes à mu élevé à polarisation nulle est plus économique et on réalise des gains de place au châssis par suite de la suppression de la résistance de cathode et de son condensateur-shunt. Malgré que ceci puisse être réalisé en retournant la fuite de grille au point négatif convenable d'un circuit diviseur de tension, une telle méthode exige une seconde prise sur le diviseur de tension et nécessite habituellement un filtrage « anti-hum » additionnel là où cette tension est appliquée à la grille de contrôle d'un premier tube B.F., constituant une dépense supplémentaire.

Le rendement des triodes à mu-élevé à polarisation nulle s'est révélé satisfaisant si certaines précautions sont prises dans les circuits associés. Les types de tubes convenant spécialement sont ceux ayant de faibles courants plaque. L'impédance de charge (résistance de plaque) ne doit pas être inférieure à 0,1 mégohm, tandis que la résistance de grille devrait être de 10 à 15 mégohms pour assurer le meilleur rendement.

Les avantages principaux résultant de l'usage de 15 mégohms sont (1) gain plus élevé et (2) dissortion plus faible pour des signaux d'entrées faibles.

Le type 75 est un amplificateur de tension et ne peut pas fournir de puissance; en aucune circonstance, il ne sera utilisé comme tube pilote. Couplé par résistance à un tube 41, il peut lui fournir une tension suffisante, même pour un faible pourcentage de modulation, pour en obtenir le maximum de puissance modulée.

De nombreuses illustrations indiquant comment le tube 75 peut être emploié, seront trouvées dans les schémas-types à la fin du volume. Ceux-ci se rapportent à des récepteurs CA, CC, universels ou automobiles.

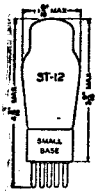


Sylvania

TYPE 76

AMPLIFICATEUR

DETECTEUR



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12
Culot : moyen 5 broches	5-A
Position de montage	Toutes
Capacités directes interélectrodes :	
Grille à plaque	2,8 $\mu\mu f$
Entrée	3,5 $\mu\mu f$
Sortie	2,5 $\mu\mu f$

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A		
Tension de chauffage	6,3	6,3 volts
Tension plaque	100	250 volts
Tension grille	—5	—13,5 volts
Courant plaque	2,5	5 ma.
Résistance interne	12,000	9,500 ohms
Conductance mutuelle	1,150	1,450 μmhos
Cœfficient d'amplification	13,8	13,8

DETECTEUR POLARISE		
Tension de chauffage	6,3	6,3 volts
Tension plaque	100	250 volts max.
Tension grille	—8	—20 volts appr.

Courant plaque ajusté à 0,2 ma. sans signal d'entrée.

DETECTEUR A FUITE DE GRILLE	
Tension de chauffage	6,3 volts
Tension plaque	45 volts
Résistance fuite de grille	1 à 5 mégohms
Capacité de grille	0,00025 μf

APPLICATION

Sylvania 76 est un tube triode d'usage général destiné à accompagner les types 77 et 78. Malgré une puissance de chauffage plus faible, les caractéristiques du tube 76 sont supérieures à celles du type 27.

Les conditions de fonctionnement en amplificateur à couplage par transformateur sont données sous le titre Caractéristiques. Pour les circuits utilisant le couplage par résistance, les conditions-types de fonctionnement sont les suivantes:

Tension d'alimentation plaque ...	250 volts
Tension de grille	—9 volts approx.
Résistance de charge	50,000 à 100,000 ohms
Courant plaque	1 à 2 ma.

Une résistance de grille de valeur supérieure à 1,0 mégohm ne sera pas utilisée.

Ce tube est également utile comme pilote d'un étage amplificateur classe B. Les conditions de fonctionnement recommandées sont:

Tension plaque	250 volts
Tension grille	—13,5 volts

Chargé de plaque : Approximativement 4 fois la résistance interne du tube.

Comme détecteur, le type 76 peut être utilisé en détecteur polarisé ou en détecteur à fuite de grille. En général, la détection par la grille est plus sensible, mais la détection par la plaque permet l'utilisation de signaux plus intenses avec une haute fidélité. Dans cette dernière méthode de détection, la polarisation de grille peut être obtenue de la manière classique par la chute de tension dans une résistance entre cathode et masse. La valeur de cette résistance n'est pas critique : 100,000 à 150,000 ohms convient. La plus grande valeur permet l'application d'un signal d'entrée plus fort.

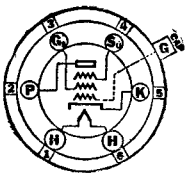
Le tube 76 peut aussi être utilisé en détecteur diode auquel cas il est préférable de connecter la plaque à la cathode pour former une électrode et de prendre la grille comme seconde électrode. Une tension d'entrée atteignant 40 volts efficaces peut être appliquée entre grille et cathode.

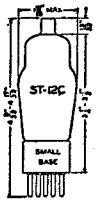
Comme oscillateur, le type 76 peut fonctionner avec une tension plaque de 90 volts et une polarisation nulle. Dans plusieurs applications, une tension plaque plus faible peut être désirable. Le « G » équivalent est le type 6P5G.

Sylvania

TYPE 77

AMPLIFICATEUR DETECTEUR TRIGRILLE





CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12C
Culot : petit modèle 6 broches	6-F
Position de montage	Toutes

Capacités directes intereiectrodes :

Effective grille à plaque (avec blindage)	0,007	$\mu\mu$f max.
Entrée	4,7	$\mu\mu$f
Sortie	11,0	$\mu\mu$f

Conditions limites de fonctionnement. (Voir page 9) :

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,3 ampère
Tension plaque	300 volts max.
Source tension écran	300 volts max.
Tension écran	100 volts max.
Dissipation plaque	0,75 watt
Dissipation écran	0,10 watt
Tension plaque externe	0 volt min.

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A

Tension de chauffage	6,3	6,3 volts
Tension plaque	100	250 volts max.
Tension grille*	—1,5	—3 volts
Tension écran	60	100 volts max.
Grille de suppression	Reliée à la cathode.	
Courant plaque	1,7	2,3 ma.
Courant écran	0,4	0,5 ma.
Résistance interne	0,60	** mégohm appr.
Conductance mutuelle	1,100	1,250 μmhos
Tension grille pour annulation courant cathode	—5,5	—7,5 volts appr.

* La résistance CC dans le circuit grille ne dépassera pas 1 mégh.

** Plus grande que 1 mégohm.

APPLICATION

L'utilisation du type 77 comme amplificateur H.F. doit être limitée aux cas où le signal à amplifier est faible; dans le cas de signaux forts, il se produit de la transmodulation et de la distorsion de modulation. Cette limitation est imposée par la courbure brusque de la caractéristique du tube 77. Le type 78 sera utilisé dans le cas d'amplification de signaux forts. Ce dernier est un tube à pente variable spécialement destiné à un tel service et convenant particulièrement aux postes ayant un contrôle de volume automatique.

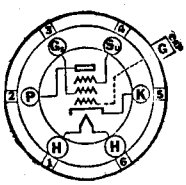
L'impédance de charge utilisée avec le type 77 doit être la plus élevée possible. Dans un amplificateur M.F. à fréquence fixe, une impédance accordée donne entière satisfaction. Un gain de 100 par étage peut être réalisé, pourvu que les transformateurs M.F. utilisés soient de bonne qualité.

Lorsqu'une sensibilité uniforme est nécessaire dans une bande de fréquences étendue, le type de couplage sera choisi en conséquence.

Grâce à son excellente sensibilité, le tube 77, convenablement couplé, est capable de fournir une grande tension basse fréquence avec peu de distorsion pour un faible signal H.F. appliqué à la grille de contrôle. Cette propriété le rend spécialement désirable comme détecteur polarisé.

Les différentes méthodes d'obtention de la tension de polarisation sont adoptables; la polarisation par résistance insérée dans le retour cathode permet une tension de sortie plus élevée dans le cas de faible pourcentage de modulation, car le signal d'entrée peut être accru à peu près en proportion inverse de la profondeur de modulation sans distorsion inacceptable.

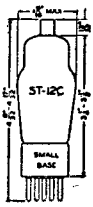
Du point de vue de la fidélité, le fonctionnement le plus satisfaisant est obtenu par le couplage par résistance. Lorsqu'une tension de sortie élevée et une sensibilité accrue sont désirées, une self d'impédance élevée shuntée par une capacité convenable est recommandée.



Sylvania

TYPE 78

TRIGRILLE AMPLIFICATEUR A PENTE VARIABLE



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,3 ampère
Ampoule	ST-12C
Culot — Petit modèle 6 broches	6-F
Position de montage	Toutes

Capacités directes interélectrodes :

Grille à plaque (avec blindage)	0,007 $\mu\mu$f **max.**
Entrée	4,5 $\mu\mu$f
Sortie	11,0 $\mu\mu$f

Conditions limites de fonctionnement. (Voir page 9) :

Tension chauffage	6,3 volts
Courant chauffage	0,3 ampère
Tension plaque	300 volts max.
Source tension écran	300 volts max.
Tension écran	125 volts max.
Dissipation plaque	2,75 watts max.
Dissipation écran	0,35 watt max.
Tension externe de grille	0 volt min.

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR (CLASSE A)

Tension de chauffage ...	6,3	6,3	6,3	6,3 volts
Tension plaque	90	180	250	250 volts
Tension grille	—3	—3	—3	—3 volts
Tension grille-écran ...	90	75	100	125 volts
Courant plaque	5,4	4,0	7,0	10,5 ma.
Courant écran	1,3	1,0	1,7	2,6 ma.
Résistance interne	0,3	1,0	0,8	0,6 mégohm
Conductance mutuelle ...	1,275	1,100	1,450	1,650 μmhos
Tension grille*	—38,5	—32,5	—45,5	—52,5

* Tension grille pour une conductance mutuelle de 2 μmhos
Grille suppression : reliée à la cathode du socket.

MODULATEUR AVEC POLARISATION VARIABLE
(Circuit superhétérodyne)

Tension de chauffage	6,3 volts
Tension plaque	250 volts max.
Tension écran	100 volts
Tension grille**	—10 volts
Grille de suppression	Reliée à la cathode.

** La polarisation indiquée est minimum pour une tension de pointe d'oscillation de 7 volts.

APPLICATION

Sylvania 78 est un tube trigrille à pente variable, conçu pour satisfaire aux multiples exigences imposées pour le service dans les étages de haute fréquence et de moyenne fréquence de récepteurs C.A., C.C. ou automobiles.

Amplificateur de haute fréquence :

C'est dans ce service que le tube 78 est le plus utile et sa caractéristique à pente variable est utilisée le plus avantageusement. Lorsque des tubes amplificateurs H.F. sont soumis à des signaux forts et que le point de fonctionnement est dans une partie non rectiligne de la caractéristique, il se produit de la transmodulation. Ce phénomène peut exister lorsque la polarisation de grille a été accrue en vue de diminuer la sensibilité. Le type 78 est capable de réduire de tels effets, grâce à la forme de sa grille de contrôle, lui permettant de manier des signaux intenses d'une manière satisfaisante.

Pour tirer le maximum d'avantages de la caractéristique à pente variable, la grille écran doit être maintenue à un potentiel constant par rapport à la cathode, tandis qu'une polarisation variable est appliquée à la grille de contrôle, qui peut être obtenue soit par le système d'A.V.C., soit par système manuel.

L'impédance la plus élevée possible sera utilisée dans le circuit plaque du tube 78. Pour des amplificateurs à fréquence fixe, une impédance accordée convient bien et un gain de 100 ou davantage par étage peut être réalisé. Lorsqu'une sensibilité uniforme dans une large bande de fréquences est nécessaire, le type de couplage sera choisi en conséquence.

Si une résistance de couplage de grille est requise, sa valeur ne peut pas dépasser 1,0 mégohm.

Modulateur ou premier détecteur :

L'utilisation du tube 78 comme premier détecteur, dans un circuit superhétérodyne, procure un gain approximativement égal au tiers de celui d'un étage amplificateur M.F., lorsque les conditions convenables de grille et de tension d'oscillation existent.

Le gain peut être contrôlé par la variation de la polarisation de grille, polarisation qui peut être obtenue d'une source séparée ou d'une résistance variable insérée dans le circuit cathode. Ce fait permet, par l'application de la tension d'A.V.C., la réception à un seuil de sensibilité plus bas, sans diminution d'amplification. De plus, il rend possible la réception de signaux forts sans diminution de contrôle.

Un contrôle additionnel est souvent utilisé pour améliorer la régulation de volume, lorsque le nombre de tubes pouvant être soumis à la tension d'A.V.C. est limité.

Lorsque le premier détecteur est polarisé automatiquement, la tension d'oscillation peut atteindre une valeur voisine de la polarisation de grille au maximum de sensibilité, car à ce moment, le signal appliqué est faible. Cependant, afin d'éviter la naissance d'un courant de grille introduisant une perte dans le circuit d'entrée, il est conseillé de limiter la tension de pointe d'oscillation à une valeur inférieure d'un volt à la polarisation de grille.

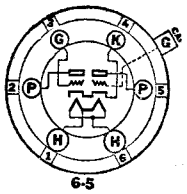
Lorsque la polarisation est fixe, la tension de pointe d'oscillation doit être maintenue à une valeur quelque peu plus faible. Ceci signifie un sacrifice de sensibilité. Sa valeur sera inférieure à la polarisation de grille d'une quantité égale à la tension de pointe du plus fort signal à recevoir, plus la valeur de pointe de toute interférence possible.

Type 78 est utilisé actuellement rarement comme premier détecteur dans les superhétérodynes, depuis que les types tels que 6A8G et 6J8G donnent un meilleur rendement.

Blindage :

Le type 78 comporte un blindage interne en forme de cage, qui a pour but de diminuer fortement la capacité grille-plaque. Cette propriété du tube 78 rend possible la réduction du blindage externe ayant pour but de réduire la capacité grille-plaque. Dans beaucoup de circonstances, ce tube peut fonctionner sans blindage.

Dans les étages à gain élevé, un blindage peut être utilisé avec avantage, pour réduire le couplage entre circuits d'entrée et de sortie. Le style adopté devra être conforme à celui qui donnera les capacittés les mieux adaptées aux exigences des circuits.

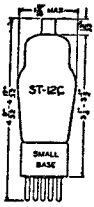


6-5

Sylvania

TYPE 79

AMPLIFICATEUR CLASSE B COMPLET



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,6 ampère
Ampoule	ST-12C
Culot — Petit modèle 6 broches	6-H
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

Tension de chauffage	6,3	6,3 volts
Tension plaque	180	250 volts
Tension grille...	0	0 volt
Courant plaque (sans signal)	7,5	10,5 ma.
Impédance de charge (plaque à plaque)	7,000	14,000 ohms
Puissance modulée*	5,5	8,0 watts

Toutes les caractéristiques se rapportent à deux triodes fonctionnant en classe B.

Tous les courants de plaque sont la somme des courants dans chaque circuit plaque.

*Puissance moyenne d'entrée —380 Mw. grille à grille.

APPLICATION

Sylvania type 79 est un tube amplificateur de puissance classe B complet, spécialement adapté aux exigences du service sur récepteur pour automobiles. Ses avantages importants sont : faible dimension de l'ampoule et puissance modulée élevée avec le minimum de courant batterie. Le gain de puissance est accru en comparaison avec d'autres tubes amplificateurs classe B à chauffage indirect, comme on peut s'en apercevoir en se référant au tableau.

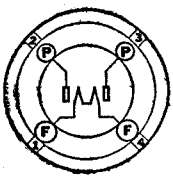
Comme tube classe B, le type 79 peut fonctionner avec 180 volts plaque et une polarisation nulle. Le courant plaque absorbé est 7,5 ma. (3,7 ma. par plaque) sans signal. Lorsqu'un signal est appliqué, le courant dépend de l'amplitude de ce signal. Le tube peut fonctionner avec un courant continu de plaque de 42 ma. et peut subir des pointes de courant d'amplitude considérablement plus grandes, pourvu que ces pointes ne soient pas continues.

Le type 37 peut être utilisé comme tube pilote, lorsqu'une puissance modulée de 2 à 4 Watts est désirée. La puissance de sortie utilisable dépend du rendement du transformateur interétage et de la valeur exacte de la tension plaque utile. La puissance de sortie croît rapidement lorsque la tension plaque augmente, le fonctionnement de l'étage pilote, ainsi que de l'étage classe B étant amélioré. Pour des puissances modulées plus élevées, un type 89 ou deux types 37 en push-pull peuvent être utilisés dans l'étage pilote. Le tube pentode 41 est aussi utilisable pour fournir la puissance maximum d'entrée figurant au tableau. L'expérience indique qu'il est possible d'obtenir avec ce tube un fonctionnement satisfaisant, si le transformateur interétage est pourvu d'une résistance en parallèle pour éviter que le second harmonique causé par la variation d'impédance de charge du tube d'attaque n'atteigne une valeur trop élevée.

Le type 79 peut encore être employé comme amplificateur et inverseur de phase combinés, un système permettant le couplage par résistance à un étage push-pull de sortie (par ex. deux 41) et procurant un gain égal à un bon étage triode-transformateur. Ce système procure une réduction d'encombrement et de prix. Il n'est applicable qu'à la classe A. Le gain moyen de tension obtenu avec un tube 79 monté en inverseur de phase, est approximativement 35 pour une tension de plaque de 250 volts.

Lorsqu'il est utilisé comme amplificateur en cascade, chaque section fonctionne comme une triode séparée. A cause de leur grand coefficient d'amplification et de leur résistance interne élevée, les sections conviennent bien au couplage par résistance. Un gain total de tension de 1000 peut être facilement obtenu. Avec un gain aussi élevé, un grand soin est nécessaire dans le choix des constantes de circuit, en vue de réduire le bourdonnement.

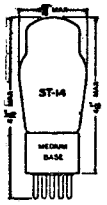
Le type « G » équivalent est le tube 6Y7G.



Sylvania

TYPE 80

REDRESSEUR DEUX ALTERNANCES



CARACTERISTIQUES

Tension filament CA	5,0 volts
Courant filament	2,0 ampères
Ampoule	ST-14
Culot — Moyen 4 broches	4-C
Position de montage	verticale

Conditions limites de fonctionnement. (Voir page 9) :

Tension filament CA	5,0 volts
Courant chauffage	2,0 ampères
Tension inverse de pointe	1,400 volts max.
Chute tension dans tube (125 ma. par plaque) ...	60 volts

Conditions de fonctionnement et caractéristiques :

CONDENSATEUR D'ENTREE A FILTRE :

Tension CA efficace par plaque	350 volts max.
Courant redressé	125 ma. max.
Source Impédance de plaque, par plaque	10 ohms min.

SELF D'ENTREE A FILTRE :

Tension CA efficace par plaque	500 volts max.
Courant redressé	125 ma. max.
Valeur Self entrée	5 henrys min.

(Pour les courbes de redressement, voir fin du volume.)

APPLICATION

Sylvania 80 est un redresseur à vide fournissant du courant continu par redressement des deux alternances du **courant** alternatif.

Le filament est oxydé et est alimenté sous 5 volts par un enroulement du transformateur d'alimentation. La tension filament doit être maintenue près de sa valeur normale. Le courant filament étant de 2 ampères, il est nécessaire d'utiliser du fil de diamètre suffisant. Dans la plupart des cas, une prise médiane à l'enroulement de chauffage n'est pas nécessaire.

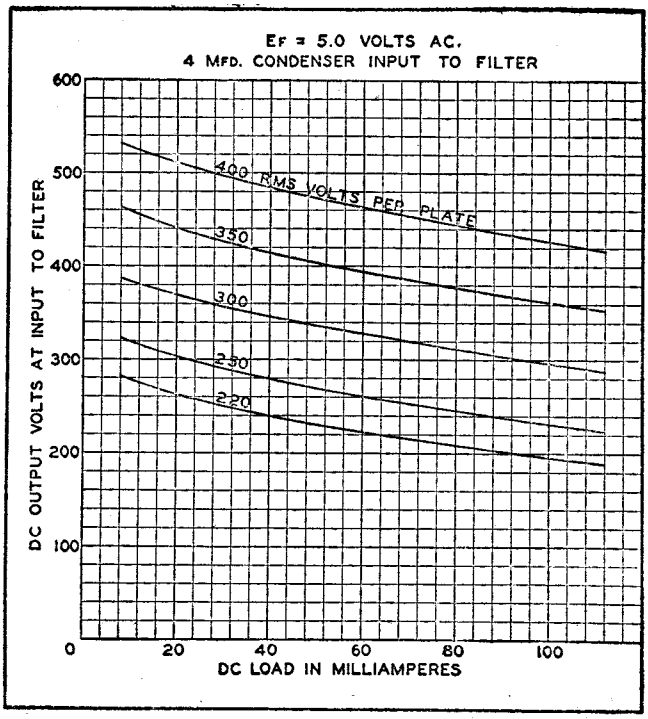
Le transformateur d'alimentation du tube 80 doit posséder deux enroulements: un enroulement de chauffage, comme il vient d'être dit, et un enroulement haute tension avec point milieu.

La tension alternative appliquée est limitée à 350 volts efficaces par plaque, lorsque le tube débite le courant redressé maximum de 125 ma. dans un filtre à capacité d'entrée.

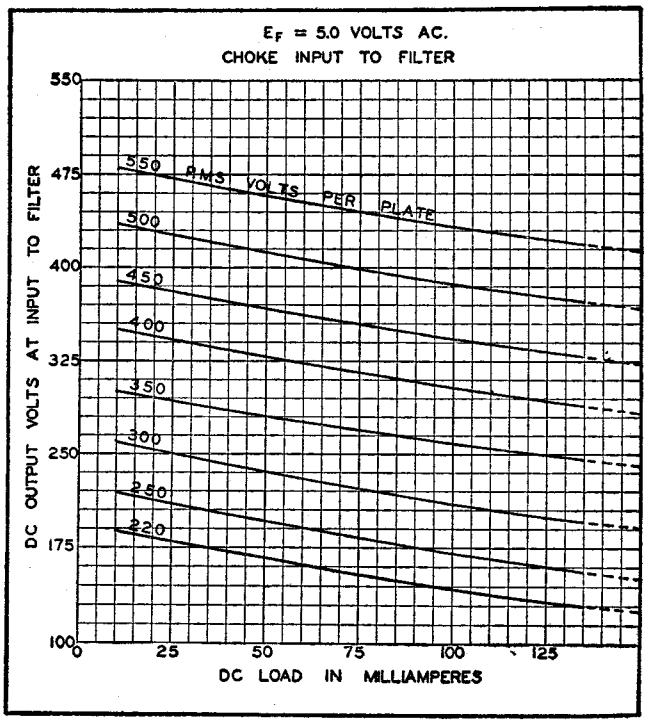
Il est possible d'augmenter la tension appliquée jusqu'à 500 volts efficaces par plaque si un circuit filtre utilisant une self d'entrée d'au moins 5 henrys est employé. La source d'impédance de plaque doit être d'au moins 10 ohms.

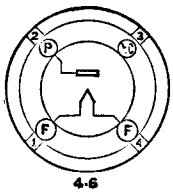
Les « G » équivalents sont les types 5Y3G et 5Y4G.

TYPE 80, 5Y3G, 5Y4G



TYPE 80, 5Y3G, 5Y4G

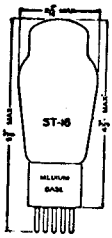




Sylvania

TYPE 81

REDRESSEUR
UNE ALTERNANCE



CARACTERISTIQUES

Tension filament CA	7,5 volts
Courant filament	1,25 ampère
Ampoule	ST-16
Culot — Moyen 4 broches	4-B
Position de montage	verticale

Conditions limites de fonctionnement. (Voir page 9) :

Tension filament CA	7,5 volts
Courant filament	1,25 ampère
Tension inverse de pointe	2,000 volts max.
Chute tension dans tube (170 ma. par tube) ...	91 volts

Conditions de fonctionnement et caractéristiques :

REDRESSEMENT D'UNE ALTERNANCE (Un tube)

Tension filament	7,5 volts
Tension alternative plaque	700 volts efficaces max.
Courant redressé	85 ma. max.

REDRESSEMENT DES DEUX ALTERNANCES (Deux tubes)

Tension filament	7,5 volts
Tension alternative plaque	700 volts efficaces max.
Courant redressé	170 ma. max.

NOTE : Pour la courbe de redressement, voir fin de volume.

APPLICATION

Sylvania 81 est un tube redresseur à vide, fournissant du courant continu par redressement d'une alternance.

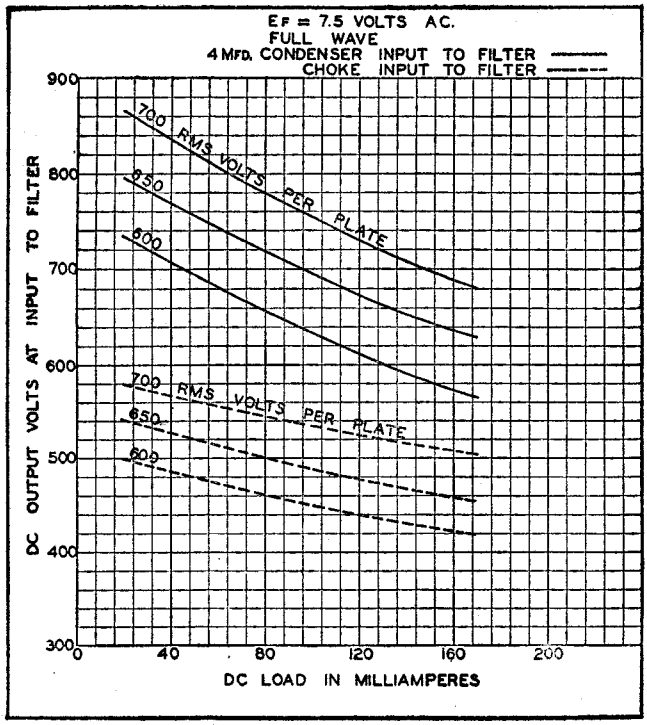
Le filament est un ruban recouvert d'oxyde, destiné à fonctionner sur une tension alternative de 7,5 volts obtenue par un enroulement sur le transformateur d'alimentation. La tension filament doit être maintenue aussi près que possible de sa valeur normale. Le fil utilisé doit être de section suffisante pour laisser passer le courant de chauffage de 1,25 ampère. Il n'est généralement pas nécessaire d'avoir une prise médiane sur l'enroulement de chauffage.

Le tube 81 peut être utilisé dans un circuit redressant une alternance ou dans un circuit en redressant deux.

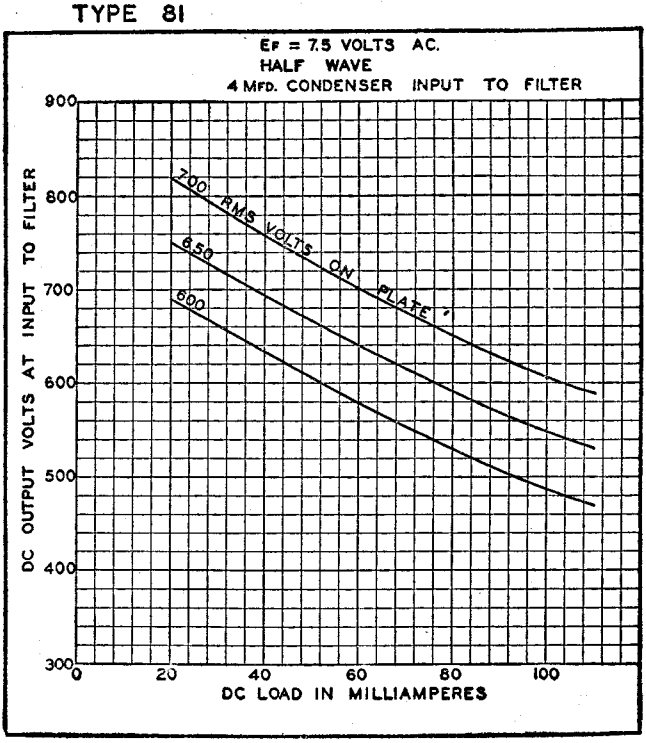
Dans le premier cas, l'enroulement de haute tension du transformateur d'alimentation est prévu pour fournir une tension de plaque généralement comprise entre 600 et 700 volts efficaces dépendant de la tension et du courant redressés qu'on veut obtenir ainsi que des constantes de l'équipement associé.

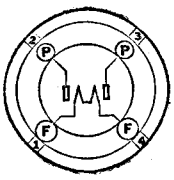
Dans le second cas (redressement des deux alternances), chaque moitié de l'enroulement haute tension du transformateur d'alimentation est prévu pour fournir une tension généralement comprise entre 600 et 700 volts dépendant du débit demandé. Il y a donc une tension alternative de 1.200 à 1.400 volts efficaces entre les extrémités de l'enroulement total haute tension. En redresseur d'une alternance, le filtre sera du type à condensateur d'entrée. Les condensateurs seront prévus pour pouvoir supporter les hautes tensions utilisées. En redresseur deux alternances, le filtre peut être du type à condensateur d'entrée ou du type à self d'entrée.

TYPE 81



TYPE 81

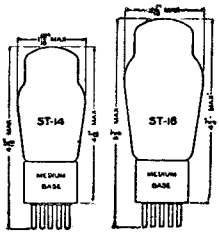




Sylvania

TYPES 82. 83

REDRESSEUR DEUX ALTERNANCES A VAPEUR DE MERCURE



CARACTERISTIQUES

	82	83
Tension filament CA	2,5	5,0 volts
Courant filament	3,0	3,0 ampères
Ampoule	ST-14	ST-16
Culot — Moyen 4 broches	4-C	4-C
Position de montage	verticale cul. au dessous.	verticale

Conditions limites de fonctionnement. (Voir page 9) :

Tension filament CA	2,5	5,0 volts
Courant filament	3,0	3,0 ampères
Tension de pointe inverse	1550	1550 volts max.
Chute de tension dans tube (approx.) ...	15	15 volts

Conditions de fonctionnement et caractéristiques :

CONDENSATEUR D'ENTREE A FILTRE:

Tension efficace CA, par plaque ...	450	450 volts max.
Courant redressé	115	225 ma. max.
Courant plaque de pointe	0,5	1,0 ampere max.
Source Impédance de plaque, par plaque	50	50 ohms min.
Température du mercure condensé durant le fonctionnement	24° à 60°	20° à 60° centigrades

SELF D'ENTREE A FILTRE :

Tension efficace CA, par plaque ...	500	500-volts max.
Courant redressé	115	225 ma. max.
Courant plaque de pointe	0,5	1,0 ampère max.
Valeur self entrée (min.)	6	3 henrys
Température du mercure condensé durant le fonctionnement	24° à 60°	20° à 60° centigrades

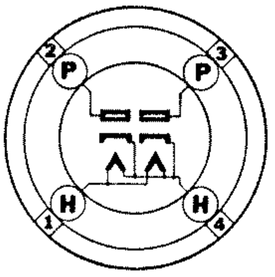
APPLICATION

Les types Sylvania 82 et 83 sont des redresseurs destinés au même genre de service que le tube 80 et ayant sur celui-ci certains avantages, mais présentant par contre certaines limitations qui doivent être prises en considération dans la conception des circuits utilisant ces tubes. Ils ne peuvent pas remplacer le tube 80 sur un récepteur existant.

Dans les redresseurs à vide parfait, la chute de tension dans le tube dépend de l'intensité du courant, augmentant graduellement avec l'accroissement du débit. Il en résulte une mauvaise regulation et une dissipation de puissance importante dans le tube. L'introduction de vapeur de mercure dans les types 82 et 83 modifie grandement les caractéristiques de fonctionnement. La vapeur de mercure ionisée neutralise la charge spatiale, de telle sorte que la chute de tension demeure pratiquement constante, en dépit de variations de courant; la régulation est ainsi fortement améliorée et la puissance perdue dans le tube est réduite. La chute de tension est approximativement de 15 volts. Une telle caractéristique présente une importance particulière lorsque le circuit alimenté est tel qu'il cause des variations considérables dans l'intensité du courant débité par le redresseur. Ce cas se présente dans un récepteur utilisant un étage de sortie classe B.

Le même type de filament robuste que celui du tube 80 est utilisé dans les types 82 et 83 et le temps de chauffage est approximativement le même. En fonctionnement, une luminescence bleuâtre apparaît entre plaque et filament, causée par la présence de vapeur de mercure.

Pour tirer le maximum d'avantages des caractéristiques de bonne régulation des tubes 82 et 83, il faut que la résistance de l'enroulement du transformateur et celle du choke soient les plus faibles possibles. Si cela ne peut être réalisé, une amélioration de la régulation peut être obtenue en connectant une résistance en parallèle dans le circuit filtre.



4AD-0-0



Sylvania Type 83V

FULL-WAVE HIGH-VACUUM RECTIFIER

PHYSICAL SPECIFICATIONS

Base	Medium 4 Pin
Bulb	ST14
Maximum Overall Length	$4\frac{11}{16}$"
Maximum Seated Height	$4\frac{1}{16}$"
Mounting Position	Any

RATINGS

Heater Voltage AC	5.0 Volts
Heater Current	2.0 Amperes
Peak Inverse Voltage	1400. Volts
Tube Voltage Drop (175 Ma. per Plate)	25 Volts

TYPICAL OPERATION

CONDENSER INPUT TO FILTER

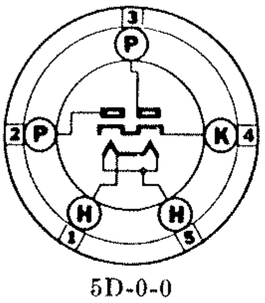
AC Voltage per Plate (RMS)	375 Volts Max.
DC Output Current	175 Ma. Max.
Plate Supply Impedance per Plate	100 Ohms Min.

CHOKE INPUT TO FILTER

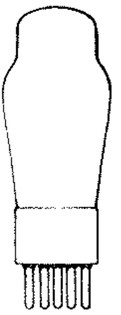
AC Voltage per Plate	500 Volts Max.
DC Output Current	175 Ma. Max.
Input Choke Value (Minimum)	4.0 Henrys

APPLICATION

Sylvania Type 83V is a heater-cathode type of high-vacuum rectifier. The heater-cathode type of construction allows much closer spacing of electrodes than with the filament type of construction. This close spacing reduces the inherent tube drop and improves the voltage regulation. High-vacuum type rectifiers are usually preferred in receivers because of the radio frequency hash noises usually generated by mercury vapor tubes. The use of shielding and filters to suppress this noise is unnecessary with high-vacuum rectifiers. Curves for type 83V will be found under equivalent type 5V4G.



5D-0-0



Sylvania Type 84/6Z4

FULL-WAVE RECTIFIER

PHYSICAL SPECIFICATIONS

Base	Small 5 Pin
Bulb	ST12
Maximum Overall Length	$4\frac{3}{16}$"
Maximum Seated Height	$3\frac{9}{16}$"
Mounting Position	Any

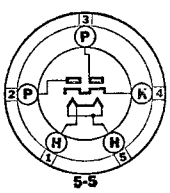
TYPICAL OPERATION

	Note 1	Note 2
Heater Voltage AC or DC	6.3	6.3 Volts
Heater Current	0.50	0.50 Ampere
Maximum RMS Plate Supply Voltage (Per Plate)	325	450 Volts
Maximum DC Output Current	60	60 Ma.
Minimum Plate Supply Impedance (Per Plate)	150	.... Ohms
Minimum Input Choke		10 Henrys

Note 1: Condenser input filter. Note 2: Choke Input filter.

APPLICATION

Sylvania Type 84/6Z4 is a cathode type full-wave rectifier designed primarily for auto radio service. It is similar in application to type 7Y4.

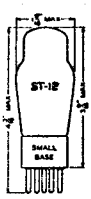


5-5

Sylvania

TYPE 84/6Z4

REDRESSEUR DEUX ALTERNANCES A VIDE PARFAIT



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chauffage	0,5 ampère
Ampoule	ST 12
Culot — Petit modèle 5 broches	5-D
Position de montage	Toutes

...ions limites de fonctionnement. (Voir page 9) :

Tension chauffage CA ou CC	6,3 volts
Courant chauffage	0,5 ampère
Tension inverse de pointe	1.250 volts max.
Potentiel CC entre filament et cathode	450 volts max.
Chute tension dans tube (60 ma. par plaque) ...	20 volts

Conditions de fonctionnement et caractéristiques :

Entrée condensateur à filtre :

Tension efficace CA par plaque	325 volts max.
Courant redressé	60 ma. max.
Source impédance plaque, par plaque	65 ohms min.

Entrée self à filtre :

Tension CA, par plaque	450 volts max.
Courant redressé	60 ma. max.
Valeur self entrée	10 henrys min.

(Voir courbes redressement en fin de volume.)

APPLICATION

L'utilisation du tube Sylvania 84/6Z4 pour l'alimentation anodique dans un récepteur automobile est hautement recommandée. Construit pour permettre une différence de potentiel de 400 volts C.C. entre filament en cathode, ce redresseur peut être alimenté par la même batterie que les autres tubes du poste.

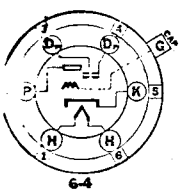
En vue d'obtenir une tension redressée convenable et une régulation satisfaisante, il faudra étudier avec soin le circuit filtre. Des filtres des types à condensateur d'entrée ou à choke d'entrée sont applicables.

Le courant redressé sera considérablement plus intense avec le filtre avec condensateur d'entrée, mais, dans ce cas, le courant de pointe est plus élevé. Pour cette raison, le condensateur d'entrée n'aura pas une capacité trop élevée. Il n'est pas probable que la tension alternative d'entrée soit une sinusoïde pure, de sorte que la tension de pointe peut être considérablement plus grande que 1,4 fois la tension efficace. Les condensateurs doivent être capables de supporter la tension de pointe maximum rencontrée.

Pour adapter le tube 84/6Z4 à un circuit redressant une alternance, il suffit de relier ensemble les deux plaques, pour en former un seul élément.

Il peut également être employé dans des récepteurs C.A. compacts, équipés de tubes de 6 volts, pour fournir la tension ...ue. L'application du tube 84/6Z4 à ce circuit demande ... secondaires au transformateur d'alimentation: un secon... de tension avec prise médiane et un enroulement ... pour le chauffage. Le tube 84/6Z4 étant à chauffage ... pointe de tension à l'allumage du récepteur sera ...e qu'avec un redresseur à filament car, au moment ... commence à redresser, les autres tubes sont suffisamment chauds pour absorber du courant.

Le tube « G » équivalent est le tube 6X5G.

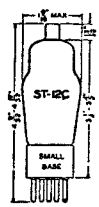


6-4

Sylvania

TYPE 85

DOUBLE DIODE TRIODE



CARACTERISTIQUES

Tension de chauffage CA ou CC	6,3 volts
Courant de chaufage	0,30 ampère
Ampoule	ST-12C
Culot — Petit 6 broches	6-G
Position de montage	Toutes

Capacités directes interélectrodes (section triode) :

Grille à plaque	1,5 $\mu\mu f$
Entrée	1,5 $\mu\mu f$
Sortie	4,3 $\mu\mu f$

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR CLASSE A (Section triode)

Tension de chauffage	6,3	6,3	6,3 volts
Tension plaque	135	180	250 volts
Tension grille	—10,5	—13,5	—20,0 volts
Courant plaque	3,7	6,0	8,0 ma.
Résistance interne	11.000	8.500	7.500 ohms
Conductance mutuelle	750	975	1.100 μmhos
Coefficient d'amplification ...	8,3	8,3	8,3
Impédance de charge	25.000	20.000	20.000 ohms
Puissance modulée	75	160	350 milliwatts

APPLICATION

Sylvania 85 est un tube à chauffage indirect pour secteur CA, CC ou batterie. Il comporte deux diodes et une triode enfermées dans la même ampoule et peut être utilisé en détecteur-amplificateur combinés, fournissant en même temps la tension pour le contrôle automatique de volume.

L'indépendance de fonctionnement des deux diodes et de la section triode permet une grande souplesse dans la conception du circuit associé. Par exemple, les diodes de ce tube peuvent assurer en même temps les fonctions de détecteur et de contrôle de sensibilité à action différée, la section triode fonctionnant en amplificateur dans les conditions optima propres.

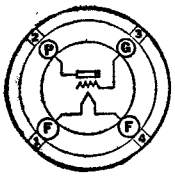
Deux diodes peuvent être montées en redresseur de deux alternances ou leurs plaques connectées en parallèle pour le redressement d'une seule alternance. Dans le cas du redressement de deux alternances, le circuit d'entrée peut être équilibré, de telle sorte qu'aucune tension de fréquence porteuse n'est appliqué à la grille de l'amplificateur suivant et que, théoriquement, un filtre n'est pas nécessaire. Le redressement d'une alternance fournit une tension double de celle obtenue en redressant les deux alternances, mais exige un filtre de fréquence porteuse.

Pour le contrôle automatique de volume, la tension de polarisation peut être obtenue par l'une des deux méthodes générales. Dans un cas, cette tension est obtenue du circuit détecteur par l'utilisation de la chute de tension provoquée dans la résistance de détection, par le passage du courant redressé. Dans l'autre cas, la tension de régulation est obtenue d'une des diodes spécialement réservées pour ce service.

Cette dernière méthode est particulièrement intéressante, en ce qu'elle rend la sensibilité et le retard fonctions seulement des constantes du circuit d'A.V.C. L'action retardée est naturellement déterminée par la combinaison d'une résistance et d'une capacité ayant la constante de temps désirée. L'action du contrôle de sensibilité est déterminée par l'application d'une tension négative à la plaque de diode d'A.V.C. de valeur telle que la réduction désirée soit obtenue.

Pour l'amplification, la section triode peut être employée en montage classique. La polarisation de grille, dépendant du circuit utilisé, peut être obtenue d'une prise fixe sur la source de courant continu, ou bien par l'utilisation de la chute de tension variable provoquée par le passage du courant redressé dans la résistance du circuit détecteur.

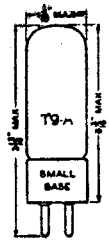
Le type « G » équivalent est le tube 6V7G.



Sylvania

TYPE 864

TRIODE SPECIAL NON MICROPHONIQUE POUR USAGE GENERAL



CARACTERISTIQUES

Tension filament CC	1,1 volt
Courant filament	0,25 ampère
Ampoule	T9-A
Culot : petit 4 broches	4-D
Position de montage	verticale
Capacités directes interélectrodes :	
Grille à plaque	5,3 $\mu\mu$f
Entrée	3,3 $\mu\mu$f
Sortie	2,1 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :		
Tension filament CC	1,1	1,1 volt
Tension plaque	90	135 volts max.
Tension grille	—4,5	—9 volts
Courant plaque	2,9	3,5 ma.
Résistance interne	13,500	12,700 ohms
Conductance mutuelle	610	645 μmhos
Facteur d'amplification	8,2	8,2

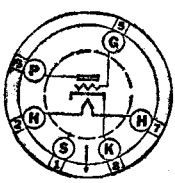
APPLICATION

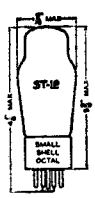
Type Sylvania 864 est un tube triode à vide parfait pour usage général, construit spécialement pour être utilisé dans les cas où un tube exempt de troubles microphoniques est nécessaire. Il peut servir comme détecteur, amplificateur ou oscillateur, pour alimentation sur batteries; l'appareil peut supporter des chocs ou des vibrations continues.

Le filament, oxydé, doit fonctionner sous sa tension normale de 1,1 volt mesurée au socket pendant le fonctionnement. La grille du type 864 doit être polarisée négativement suffisamment, dans toute application, pour limiter le courant plaque à 4,0 ma.

Lorsque type 864 est utilisé dans un amplificateur à gain élevé à couplage par résistance, une grande latitude est permise dans le choix de la tension d'alimentation plaque, pourvu que les résistances de couplage et la polarisation grille soient telles que la tension moyenne plaque soit limitée à 135 volts. La tension moyenne est celle qui existe lorsqu'aucun signal n'est appliqué. Une résistance de grille supérieure à 2,0 mégohms n'est pas recommandée.

Type 864 peut être utilisé comme oscillateur avec une tension plaque aussi élevée que 90 volts, pourvu que le courant plaque soit limité à 4,0 ma.

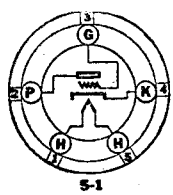


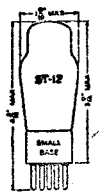


Sylvania

TYPE 884
TYPE 885

TRIODES A GAZ





CARACTERISTIQUES

	884	885
Tension chauffage	6,3	2,5 volts
Courant chauffage	0,6	1,4 ampère
Ampoule	ST-12	ST-12
Culot	6-Q	5-A
Position de montage	Toutes	Toutes

Capacités directes interélectrodes :

Grille à anode	3,5	3,5 $\mu\mu f$
Grille à cathode	3,5	3,5 $\mu\mu f$
Anode à cathode	2,5	2,5 $\mu\mu f$

Conditions de fonctionnement et caractéristiques :

Tension anode (instantanée)	300	300 volts max.
Tension pointe (entre n'importe quelles deux électrodes)	350	350 volts max.
Courant anodique de pointe	300	300 ma. max.
Courant anodique moyen :		
pour fréquences au dessous de 200 p/s. ...	3	3 ma. max.
pour fréquences au dessus de 200 p/s ...	2	2 ma. max.
Résistance de grille	**	**

Fonctionnement comme redresseur contrôlé par la grille* :

Tension pointe entre n'importe quelles deux électrodes	350	350 volts max.
Courant anodique de pointe	300	300 ma. max.
Courant anodique moyen (au delà période de 30 secondes)	75	75 ma. max.
Résistance de grille	**	**
Chute tension dans tube	16	16 volts appr.

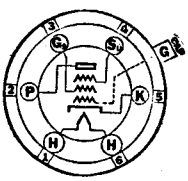
* Chauffage du filament sera appliqué durant 30 secondes avant lancer courant anodique de charge.

** La résistance de grille devra être de 1,000 ohms minimum par volt maximum instantané appliqué à la grille. Des valeurs de résistance supérieure à 500,000 ohms pourraient causer des instabilités dans le circuit.

APPLICATION

Sylvania types 884 et 885 sont des triodes à gaz à chauffage indirect conçues pour utilisation comme oscillateurs de circuits balayeurs ou comme redresseurs à contrôle de grille. Type 884 est chauffé sous 6,3 volts et a le culot octal. Type 885 est chauffée sous 2,5 volts et a un culot standard 5 broches.

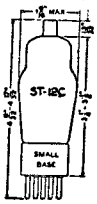
Lorsque c'est possible, la cathode sera connectée au point milieu du filament. Dans les cas où cette connexion n'est pas possible, le filament pourrait être rendu négatif par rapport à la cathode, pourvu que la tension entre filament et cathode ne dépasse pas 100 volts et que la tension pointe entre le filament et n'importe quel autre élément ne dépasse pas 350 volts.



Sylvania

TYPE 89

AMPLIFICATEUR DE PUISSANCE TRIGRILLE



CARACTERISTIQUES

Tension de chaufage CA ou CC	6,3 volts
Courant de chauffage	0,4 ampère
Ampoule	ST-12C
Culot — Petit 6 broches	6-F
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

AMPLIFICATEUR DE PUISSANCE CLASSE A
FONCTIONNEMENT TRIODE
(Grilles Gs et Su reliées à la plaque)

Tension de chauffage	6,3	6,3	6,3 volts
Tension plaque	160	180	250 volts max.
Tension grille	—20	—22,5	—31 volts
Courant plaque	17	20	32 ma.
Résistance interne...	3,300	3,000	2,600 ohms
Conductance mutuelle	1.425	1.550	1.800 μmhos
Coefficient d'amplification	4,7	4,7	4,7
Impédance de charge*	7.000	6.500	5.500 ohms
Puissance modulée	0,3	0,4	0,9 watt

AMPLIFICATEUR DE PUISSANCE CLASSE B
FONCTIONNEMENT TRIODE
(Grille Su reliée à la plaque; grilles Gs et G connectées ensemble.)

Tension de chauffage	6,3 volts
Tension plaque	250 volts max.
Courant dynamique de pointe plaque	90 ma. max.
Dissipation moyenne de grille (Grille G et Gs ensemble)	0,35 watt max.

Fonctionnement-type (deux tubes) :

Tension plaque	180 volts
Tension grille	0 volt
Courant statique de plaque (par tube)	3 ma.
Impédance de charge (de plaque à plaque) ...	9.400 ohms
Puissance modulée (deux tubes)	3,5 watts

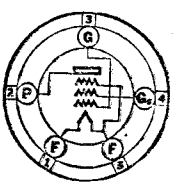
AMPLIFICATEUR DE PUISSANCE CLASSE A
FONCTIONNEMENT PENTODE
(Grille Su reliée à la cathode)

Tension de chauffage	6,3	6,3	6,3 volts
Tension de plaque	135	180	250 volts max.
Tension grille	—13,5	—18	—25 volts
Tension grille-écran	135	180	250 volts max.
Courant plaque	14	20	32 ma.
Courant grille écran	2,2	3,0	5,5 ma.
Résistance interne	92.500	80.000	70.000 ohms
Conductance mutuelle	1.350	1.550	1.800 μmhos
Coefficient d'amplification ...	125	125	125
Impédance de charge	9.200	8.000	6.750 ohms
Puissance modulée	0,75	1,5	3,4 watts

* Pour le tube pilote d'un étage classe B, le double de cette valeur est recommandée.

APPLICATION

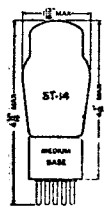
Le type 89 est un amplificateur de puissance pentode à chauffage indirect spécialement destiné aux récepteurs pour postes automobiles ou similaires. Ses caractéristiques sont assez semblables à celles du type 41. Le nombre des applications du tube est accru par le fait que la grille de suppression est connectée à une broche séparée et par la conception spéciale de chacune des trois grilles qui sont nécessaires pour assurer les caractéristiques pentode. Cette construction rend possible l'usage du tube non seulement en pentode, mais encore en triode classe A ou classe B.



Sylvania

TYPE 95O

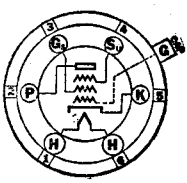
PENTODE DE PUISSANCE

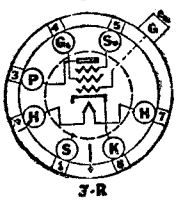


CARACTERISTIQUES

Tension filament CC	2,0 volts
Courant filament	0,120 ampère
Ampoule	ST-14
Culot : moyen 5 broches	5-K
Postion de montage	Verticale

Pour conditions de fonctionnement et caractéristiques, ainsi que les applications, voir type IJ5G, qui est son équivalent.



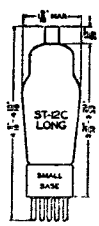


3-R

Sylvania

TYPE 1221
TYPE 1223

PENTODES SPECIALES NON MICROPHONIQUES



CARACTERISTIQUES

	1221	1223
Tension chauffage	6,3	6,3 volts
Courant chauffage	0,3	0,3 ampère
Ampoule	ST-12C Long	ST-12C Long
Culot : petit 6 broches	6-F	- -
Culot : petit octal 7 broches ..	—	7-R
Position de montage	Toutes	Toutes

Conditions de fonctionnement et caractéristiques :

Voir 6C6: elles sont identiques.

APPLICATION

Sylvania types 1221 et 1223 sont des pentodes à pente fixe, identiques au type 6C6. Elles sont toutefois de construction spéciale non-microphonique pour utiliser dans les amplificateurs où un tube non-microphonique est nécessaire.

Type 1221 possède le culot standard 6 broches, tandis que type 1223 est équipé avec le petit culot octal 7 broches.

MECHANICAL DATA

Bulb	ST-12
Base	Small 4-Pin, Phenolic
Outline	12-6
Top Cap	C1-1
Basing	4K

ELECTRICAL DATA

FILAMENT CHARACTERISTICS

Filament Voltage DC	0.90 Volts
Filament Current	35 Ma

TYPICAL OPERATION

DC Voltage Amplifier[1]

Plate Supply Voltage (DC)	45 Volts
Grid No. 2 Voltage (DC)	16.5 Volts
Grid No. 1 Voltage	−1.6 Volts
Plate Load Resistor	100 Megohms
Plate Current (DC)	0.33 μa
Grid No. 2 Current (DC)	0.3 μa
DC Voltage Gain[2]	125

CHARACTERISTICS

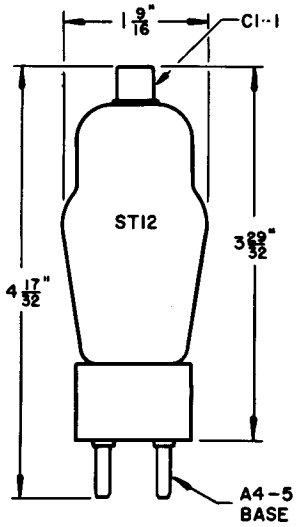
Grid No. 1 Current[3]	±1.0 μμa	Max.
Linearity[4]	10 Percent	Max.

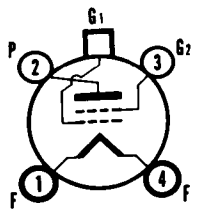
NOTES:

1. *Tube shielded from all light and external electrical influences.*
2. *The ratio ΔEb/ΔEc2 is calculated from the change in Grid No. 1 voltage required to give 2.0 volts increase in Eb.*
3. *Ef = .8 to 1.0 volts, Ebb = 45 volts, Eb = 12 volts, Ec1 Adj., Ec2 = 16.5 volts, Ib = .33μa, Rg1 = 10,000 megohms.*
4. *The departure of the Ec1 vs Eb curve from a straight line between the point Eb = 12 Volts, and Eb = 14 Volts, measured on the Eb axis and expressed as a percentage of 2 volts under Typical Operating Conditions.*

QUICK REFERENCE DATA

The Sylvania Type 1229 is a filamentary tetrode electrometer tube contained in a ST-12 envelope. The 1229 features exceptionally low grid current characteristics, electrostatic shielding and light shielding.





4K

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
EMPORIUM, PA.

A Technical Publication

JULY, 1965

PAGE 1 OF 1

File Under

RECEIVING TUBES

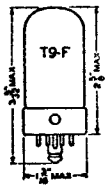


8-B

Sylvania

TYPE 1231

AMPLIFICATEUR TRIGRILLE



CARACTERISTIQUES

Tension chauffage (nominale) CA ou CC	7,0 volts
Courant de chauffage	0.48 ampère
Ampoule...	T9-F
Culot — Loktal 8 broches	8-V
Position de montage	toutes

Capacités directes interélectrodes (en pentode) :

Grille à plaque	0,015 $\mu\mu$f
Grille à tous les autres éléments	8,5 $\mu\mu$f
Plaque à tous les autres éléments	6,5 $\mu\mu$f

Conditions de fonctionnement et caractéristiques :

	Pentode	Tetrode	Triode
Tension de chauffage	6,3	6,3	6,3 volts
Courant de chauffage	0,45	0,45	0,45 ampère
Tension plaque	300	300	250 volts
Tension grille écran ...	150	150	à la plaque volts
Résistance de polarisation cathodique	200	200	400 ohms
Grille de suppression.	à la cathode	à la grille-écran	à la plaque
Courant plaque	10,0	12,0	13,0 ma.
Courant grille écran ...	2,5	0,5	— ma.
Résistance interne	700,000	540,000	5,200 ohms Approx.
Conductance mutuelle.	5,500	6,500	6,300 micromhos
Coefficient d'amplificat.	3,850	3,500	33

APPLICATION

Le type Sylvania 1231 est un amplificateur trigrille LOKTAL ayant une conductance mutuelle très élevée et qui, de plus, est caractérisé par un certain nombre d'innovations de construction. Il est introduit principalement pour l'usage dans les amplificateurs de télévision et dans d'autres applications similaires. Il doit fonctionner avec polarisation automatique.

Les dimensions du tube 1231 sont considérablement plus réduites que celles des tubes « Verre » standard. La nouvelle construction permet des conducteurs très courts aux électrodes, de faibles capacités interélectrodes et de faibles pertes diélectriques.

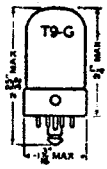
La grille est connectée à une broche, ce qui permet une connexion de grille plus courte. Cela élimine les gênantes connexions flexibles et les clips nécessaires avec les grilles reliées au sommet de l'ampoule. Un bon blindage est réalisé pour la connexion de grille à l'intérieur du tube et la broche-guide métallique sert d'écran entre les conducteurs extérieurs de grille et de plaque.



Sylvania

TYPE 1232

AMPLIFICATEUR TRIGRILLE



CARACTERISTIQUES

Tension chauffage (nominale) CA ou CC	7,0 volts
Courant chauffage (nominal)	0,48 ampère
Ampoule	T9-G
Culot — Loktal 8 broches	8-V
Position de montage	Toutes
Capacités directes interélectrodes* :	
Grille à plaque	0,007 $\mu\mu$f max.
Entrée : G à (F+K+Gs+Su+blindage)	9,0 $\mu\mu$f
Sortie : P à (idem)	7,0 $\mu\mu$f

* Avec blindage standard du tube.

Conditions de fonctionnement et caractéristiques :	
Tension chauffage	6,3 volts
Courant chauffage	0,45 ampère
Tension plaque	250 volts
Tension grille suppression	reliée à cathode
Tension écran	100 volts
Tension grille	—2 volts
Courant plaque	6,0 ma.
Courant écran	2,0 ma.
Dissipation plaque	1,5 watt. max.
Dissipation écran	0,2 watt. max.
Résistance interne (approx.)	800,000 ohms
Conductance mutuelle	4,500 μmhos
Tension grille pour annulation courant cathode	—6 volts (appr.)

APPLICATION

Sylvania type 1232 est un tube loktal amplificateur trigrille, quelque peu similaire au type 1231. Toutefois, type 1232 possède un blindage additionnel, la construction du tube et ses caractéristiques étant convenablement ajustées pour accommoder l'incorporation du blindage.

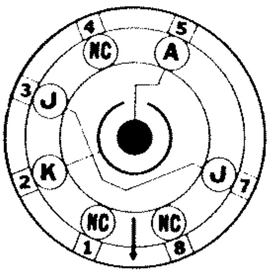
Type 1232 peut être utilisé dans les amplificateurs de télévision et autres applications où un tube à haute conductance mutuelle est nécessaire. En égard à la grande conductance mutuelle par milliampère, ce tube est bien adapté aux circuits de récepteurs ayant une grande gamme d'amplification H.F. et où le système d'antenne est conçu de telle sorte qu'il évite l'application de tensions H.F. excessives sur la grille No 1.

La construction Loktal assure compacité, blindage parfait et le verrouillage du tube. En service sur C.A., la tension nominale de 7,0 volts correspond à un secteur de 130 volts.

1266 Sylvania Type

VOLTAGE REGULATOR





4AJ-0-0
Jumper not used.

PHYSICAL SPECIFICATIONS

Base	Intermediate Octal 6 Pin
Bulb	T-9
Maximum Overall Length	$3\frac{5}{16}$"
Maximum Seated Height	$2\frac{3}{4}$"
Mounting Position	Any

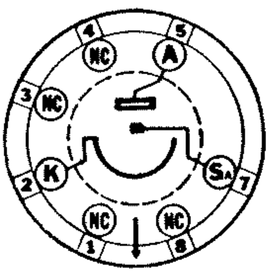
APPLICATION

Sylvania Type 1266 is a cold-cathode voltage regulator tube. It is very similar to type 0B3/VR90 and regulates at 70 volts.

1267 Sylvania Type

COLD-CATHODE CONTROL TUBE





4V-0-0

PHYSICAL SPECIFICATIONS

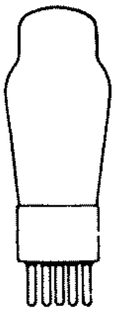
Base	Intermediate Octal 7 Pin
Bulb	T-9
Maximum Overall Length	$3\frac{5}{16}$"
Maximum Seated Height	$2\frac{3}{4}$"
Mounting Position	Any

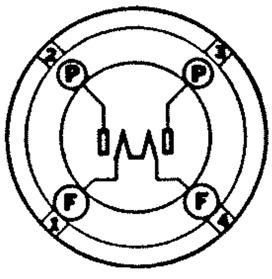
APPLICATION

Sylvania Type 1267 is a cold-cathode gas triode similar to type 0A4G. It is used as a control tube for relay operation.

1275 Sylvania Type

FULL-WAVE RECTIFIER





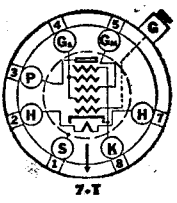
4C-0-0

PHYSICAL SPECIFICATIONS

Base	Medium 4 Pin
Bulb	ST16
Maximum Overall Length	$5\frac{3}{8}$"
Maximum Seated Height	$4\frac{3}{4}$"
Mounting Position	Vertical

APPLICATION

Sylvania Type 1275 is a full-wave high-vacuum rectifier. It is similar to type 5Z3 except for lower filament current rating, which is 2.0 amperes.

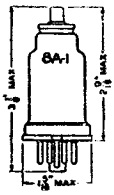


7-T

Sylvania

TYPE 1612

AMPLIFICATEUR MODULATEUR PENTAGRILLE



CARACTERISTIQUES

Tension chauffage CA ou CC	6,3 volts
Courant chauffage	0,3 ampère
Ampoule	8A-1
Capuchon	miniature
Culot : petit octal 7 broches	7-T
Position de montage	Toutes

APPLICATION

Sylvania type 1612 est un amplificateur modulateur pentagrille de construction « métal » et faiblement microphonique. Il est identique en caractéristiques avec le tube métal Sylvania 6L7 et le culot est le même.

Une construction spéciale et des essais spéciaux de ce tube pour mocrophonisme le recommandent dans les applications où il faut un tube non-microphonique.

Pour caractéristiques et applications autres que celles ci-dessus, voir type 6L7.

MECHANICAL DATA

Bulb[1]	T-40
Top Cap	See Outline
Mounting Position[2]	Vertical
Ambient Temperature Range	-55 to 75°C

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (±7.5%)	6.3 Volts
Heater Current	25-33 Amperes

RATINGS (Absolute Values)

Peak Anode Voltage[3], epy	25.0 Kv	Max.
Peak Inverse Anode Voltage[4], epx	25.0 Kv	Max.
	5% epy	Min.
Cathode Current Rate of Rise	5000 A/μsec.	Max.
Peak Anode Current, I_b	1000 A	Max.
Peak Inverse Grid Voltage, egx	450 Volts	Max.

CHARACTERISTICS AND TYPICAL OPERATION

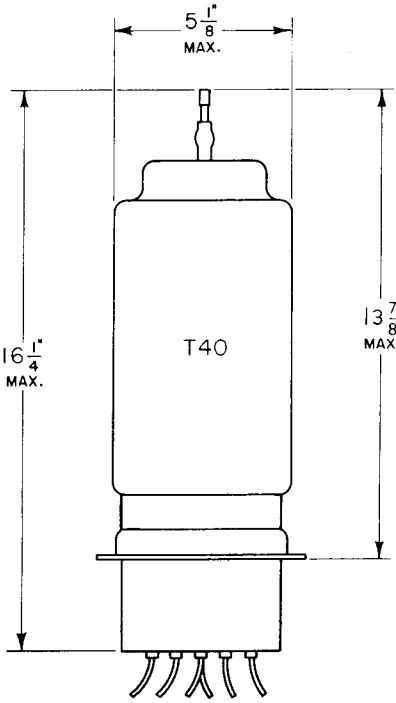
Reservoir Voltage[5]	2.5-5.5 Volts
Reservoir Current at 4.5 Volts	3-6 Amperes
Cathode Heating Time	15 Minutes
Starting Anode Voltage	4 Kv dc Max.
Average Anode Current	1.0 Amperes dc
Dissipation Factor[6]	9.0×10^9 Max.
Duty Cycle[6]	.001
Grid Drive[7]	
A. Peak Grid Voltage, egy	
Minimum	700 Volts
Maximum	1000 Volts
B. Rate of Rise	.35 μsec. Max.
C. Grid Pulse Duration	2.0 μsec. Min.
D. Drive Impedance	50-200 Ohms
Peak Inverse Grid Voltage, egx	450 Volts
Operation (1)	(Note 8)

NOTES:

1. *No cooling stream of air should be directly applied to the tube envelope.*
2. *Tube should be kept away from strong fields which could ionize the gas in the tube. Clamping is permissible by the base only.*
3. *Instantaneous starting is not recommended. However, when it is absolutely necessary, the maximum permissible epy is 18.0 Kv and should be attained in no less than .04 μsec.*
4. *The peak inverse voltage should not exceed 5 Kv during the first 25 μsec. following the anode pulse.*
5. *The optimum reservoir voltage for operation (1) conditions is printed on the base of the tube and must be held to within ±5%. Applications involving other operating conditions will necessitate redetermination of the optimum reservoir setting.*
6. *The maximum dissipation factor will depend upon the peak forward anode voltage, peak anode current, and pulse repetition according to the formula — epy x I_b x prr = 9. x 10^9 max. This formula is applicable for pulse repetition rates up to 1500 pps. Special caution should be exercised in applying rates in excess of this value. The duty cycle will depend upon the pulse repetition rate and anode pulse width (tp in μsec.) according to formula prr x tp = .001.*

QUICK REFERENCE DATA

The Sylvania Type 1754 is a heavy duty hot cathode, grid controlled, gas rectifier featuring a hydrogen reservoir. The 1754 is designed for pulsing service at high repetition rates, high current and high voltages.



SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

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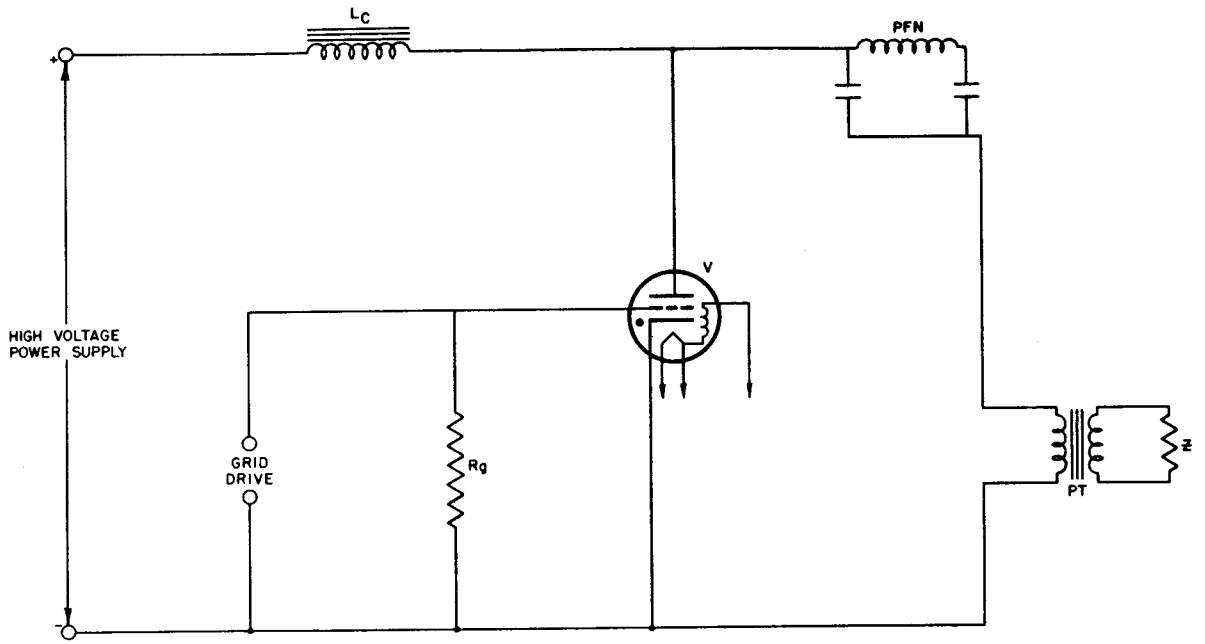
4-54-68

NOTES (Continued)

7. *Measurements are made at the tube socket with the thyratron grid disconnected.*
8. *Circuit constants for operation (1) should be so chosen that the peak anode voltage (epy) is 25 Kv under resonant charging conditions; rate of rise of cathode current is 5000 A/μsec.; peak anode current is 1000 A; anode pulse duration is 2.5 μsec.; and pulse repetition rate is 360.*

APPLICATION DATA

The outstanding feature of the Type 1754 is the built-in hydrogen reservoir. A change in the low voltage impressed across this reservoir will change the gas pressure in the tube; an increase will cause the capsule to emit hydrogen, a decrease will cause hydrogen to be absorbed from the tube. By adjusting this reservoir voltage, the equipment designer can effectively use the 1754 over a wider range of parameters than would otherwise be possible. For each specific application, optimum pressure settings provide minimum deionization time, minimum arc-back, and minimum anode heating, with consequent improvement in life potential. The high repetition rates permitted with the 1754 are due to the short deionization time — the time required to convert gaseous ions to neutral molecules when the anode voltage is removed.



L_c: Charging Choke
PFN: Pulse Forming Network
PT: Pulse Transformer
Z: Load
V: Thyratron

FIG. 1 — CIRCUIT EMPLOYING THE TYPE 1754 THYRATRON

APPLICATION DATA (Continued)

The circuit for which this tube was especially developed is shown in Figure 1. The output, in this case, consists of periodic rectangular pulses developed when the thyratron fires and releases electrical charges stored in the capacitance of the pulse forming network (PFN). This network determines the duration and shape of the pulses. Between pulses, when the thyratron is not conducting, the PFN capacitance charges up through the charging choke L_c in a transient which swings the instantaneous plate voltage of the 1754 above the power supply voltage. The value reached is about double the power supply voltage and must be taken into consideration when applying the peak anode voltage rating of the tube. The peak voltage of the pulse supplied to the pulse transformer is about equal to that of the power supply. By means of the pulse transformer, the output to the load may be stepped up to a higher level. This results in a saving in the size and cost of the supply by permitting the use of components with lower voltage ratings. The Sylvania 1754 is well adapted to such voltage step-up by virtue of the very high peak currents it can furnish. Many varieties of short duration pulses may be produced by different PFN designs.

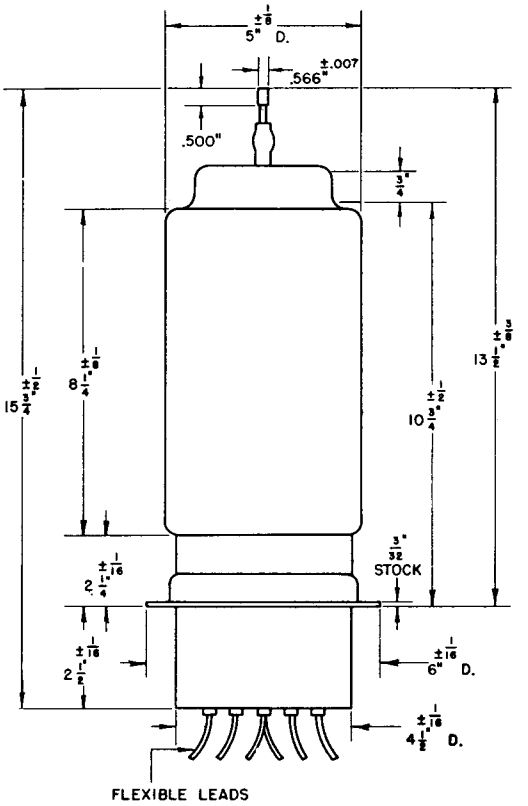
The Type 1754 thyratron may be used in a wide variety of applications which take advantage of such features as:

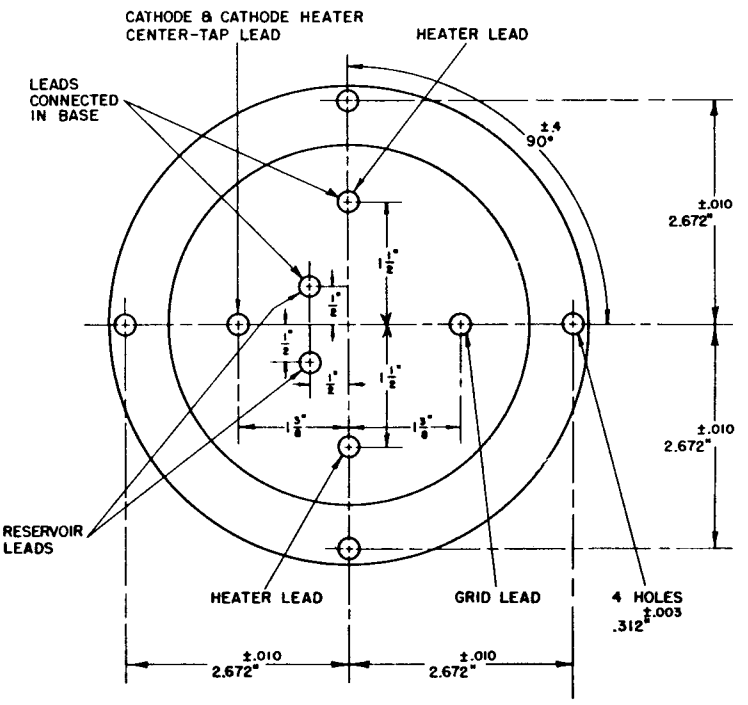
1. Low deionization time, hence, rapid switching rates
2. High peak currents
3. High plate voltages (but may be used at lower voltages)
4. Moderate trigger requirements
5. Ability to operate at zero bias
6. Operation over a wide ambient temperature range without appreciable effect on the electrical characteristics
7. High efficiency because of low tube voltage drop
8. Reliability and general flexibility of operation

Several specific applications are listed below:

1. Switching in radar modulators
2. As a clipper in radar modulators
3. Switching in welding circuits
4. High power pulse generators
5. Magnetron aging

OUTLINE DRAWING





MECHANICAL DATA

Bulb[1]	T-26
Cap	Special — See Outline
Base	Super Jumbo 5 Pin
Mounting Position[2]	Vertical or Horizontal
Ambient Temperature Range	-55 to 75°C

ELECTRICAL DATA

RATINGS (Absolute Values)

Heater Voltage (±5%)	6.3 Volts	
Peak Anode Voltage (epy)[3]	25.0 Kv	Max.
Peak Inverse Anode Voltage (epx)[4]	25.0 Kv	Max.
	5% epy	Min.
Rate of Rise of Cathode Current	2500 A/μsec.	Max.
Peak Anode Current (I_b)	500 Amperes	Max.
Peak Inverse Grid Voltage (egx)	450 Volts	Max.

CHARACTERISTICS AND OPERATING CONDITIONS

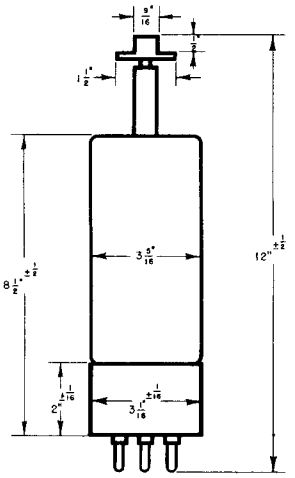
Heater Current at 6.3 Volts	15.0-22.0 A	
Reservoir Voltage[5]	3.0-5.5 Volts	
Reservoir Current at 4.5 Volts	2.0-5.0 Amperes	
Cathode Heating Time	15 Minutes	
Starting Anode Voltage	5 Kv dc	
Average Anode Current (I_b)	.5 A dc	
Dissipation Factor[6]	6.25×10^9	Max.
Duty Cycle[6]	.001	
Grid Drive[7]		
A. Peak Grid Voltage (egy)	550 Volts	Min.
B. Rate of Rise	1800 V/μsec.	Min.
C. Grid Pulse Duration	2.0 μsec.	Min.
D. Driver Impedance	50-200 Ohms	
Peak Inverse Grid Voltage (egx)	450 Volts	
Operation (1)	(Note 8)	

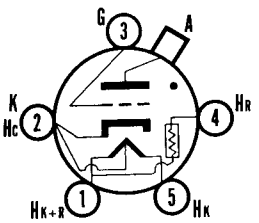
NOTES:

1. *No cooling stream of air should be directly applied to the tube envelope.*
2. *Tube should be kept away from strong fields which could ionize the gas in the tube. Clamping is permissible by the base only.*
3. *Instantaneous starting is not recommended. However, when it is absolutely necessary, the maximum permissible epy is 18.0 Kv and should be attained in no less than .04 μsec.*
4. *The peak inverse voltage should not exceed 5 Kv during the first 25 μsec. following the anode pulse.*
5. *The optimum reservoir voltage for operation (1) conditions is printed on the base of the tube and must be held to within ±5%. Applications involving other operating conditions will necessitate redetermination of the optimum reservoir setting.*
6. *The maximum dissipation factor will depend upon the peak forward anode voltage, peak anode current and pulse repetition according to the formula epy x I_b x prr = 6.25×10^9 max. This formula is applicable for pulse repetition rates up to 1200 pps. Special caution should be exercised in applying rates in excess of this value. The duty cycle will depend upon the pulse repetition rate and anode pulse width (tp in μsec.) according to the formula prr x tp = .001.*

QUICK REFERENCE DATA

The Sylvania Type 1907 is a heavy duty thyratron with a hydrogen reservoir. The 1907 hot-cathode, grid controlled, gas rectifier is especially designed for pulsing service at high repetition rates, high currents, and high voltages.





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WOBURN, MASS.

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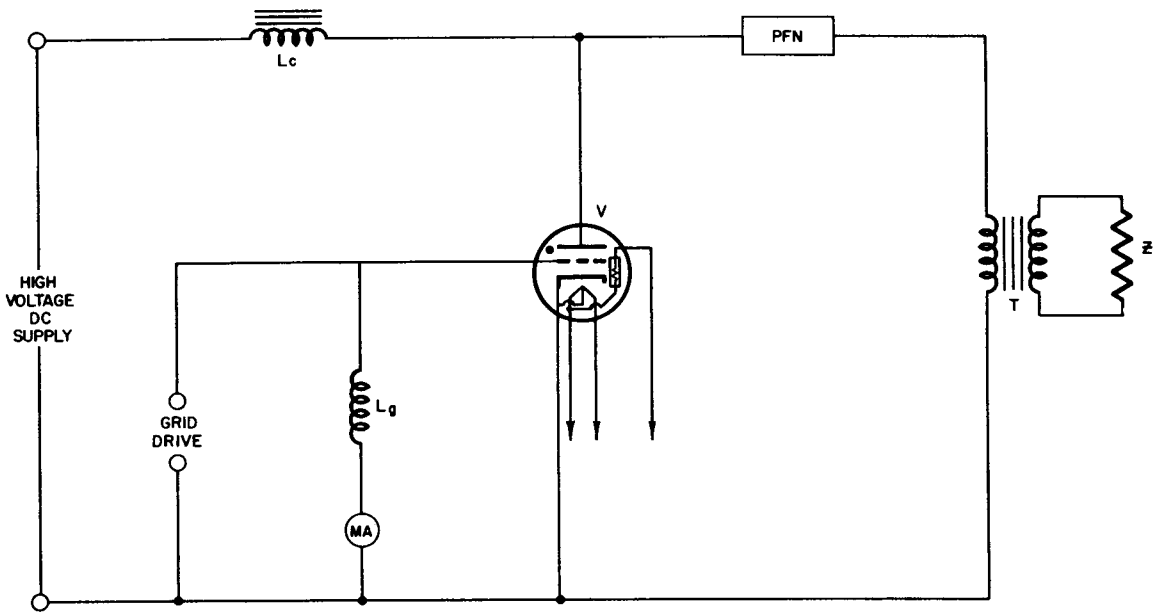
3-54-66

NOTES (Continued)

7. *Measurements are made at the tube socket with the thyratron grid disconnected.*
8. *Circuit constants for operation (1) should be so chosen that the peak anode voltage (epy) is 25 Kv under resonant charging conditions; rate of rise of cathode current is 2500 A/μsec.; peak anode current is 500 A; anode pulse duration is 2 μsec.; and pulse repetition rate is 500.*

APPLICATION DATA

The outstanding feature of the Type 1907 thyratron is the built-in hydrogen reservoir. A change in the low voltage impressed across this reservoir will change the gas pressure in the tube; an increase will cause the capsule to emit hydrogen, a decrease will cause hydrogen to be absorbed from the tube. By adjusting this reservoir voltage, the equipment designer can effectively use the 1907 over a wider range of parameters than would otherwise be possible. For each specific application, optimum pressure settings provide minimum deionization time, minimum arc-back, and minimum anode heating, with consequent improvement in life potential. The high repetition rates permitted with the 1907 are due to the short deionization time — the time required to convert gaseous ions to neutral molecules when the anode voltage is removed.



Lg: Grid Choke
Lc: Charging Choke
PFN: Pulse Forming Network
V: 1907 Thyratron
T: Pulse Transformer
Z: Load

FIG. 1 — CIRCUIT UTILIZING THE 1907 THYRATRON

APPLICATION DATA (Continued)

The circuit for which this tube was especially developed is shown in Figure 1. The output, in this case, consists of periodic rectangular pulses developed when the thyratron fires and releases electrical charges stored in the capacitance of the pulse forming network (PFN). This network determines the duration and shape of the pulses. Between pulses, when the thyratron is not conducting, the PFN capacitance charges up through the charging choke L_c in a transient which swings the instantaneous plate voltage of the 1907 above the power supply voltage. The value reached is about double the power supply voltage and must be taken into consideration when applying the peak anode voltage rating of the tube. The peak voltage of the pulse supplied to the pulse transformer is about equal to that of the power supply. By means of the pulse transformer the output to the load may be stepped up to a higher level. This results in a saving in the size and cost of the supply by permitting the use of components with lower voltage ratings. The Sylvania 1907 is well adapted to such voltage step-up by virtue of the very high peak currents it can furnish. Many varieties of short duration pulses may be produced by different PFN designs.

The Type 1907 thyratron may be used in a wide variety of applications which take advantage of such features as:

1. Low deionization time, hence, rapid switching rates
2. High peak currents
3. High plate voltages (but may be used at lower voltages)
4. Moderate trigger requirements
5. Ability to operate at zero bias
6. Operation over a wide ambient temperature range without appreciable effect on the electrical characteristics
7. High efficiency because of low tube voltage drop
8. Reliability and general flexibility of operation

Several specific applications are listed below:

1. Switching in radar modulators
2. As a clipper in radar modulators
3. Switching in welding circuits
4. High power pulse generators
5. Magnetron aging

TECHNICAL DATA

from RMA release # 639,
Feb. 25, 1948

Sylvania

TYPE 5633

REMOTE CUT-OFF R.F. PENTODE

TENTATIVE RATINGS

Heater Voltage AC or DC ±10%	6.3	Volts
Max. Plate Voltage	150	Volts
Max. Screen Voltage	140	Volts
Max. Plate Dissipation	0.8	Watts
Max. Screen Dissipation	0.3	Watts
Max. Heater Cathode Voltage	90	Volts

Direct Interelectrode Capacitances:

	Shielded*	Unshielded	
Grid to Plate	0.01 Max.	0.015	uuf. Max.
Input	4.00	4.00	uuf.
Output	2.80	2.20	uuf.

*With a 0.405" diameter shield connected to cathode.

PHYSICAL SPECIFICATIONS

Style	Subminiature
Bulb	T3
Base	Flexible Leads
Dimensions	See Outline
Mounting Position	Any

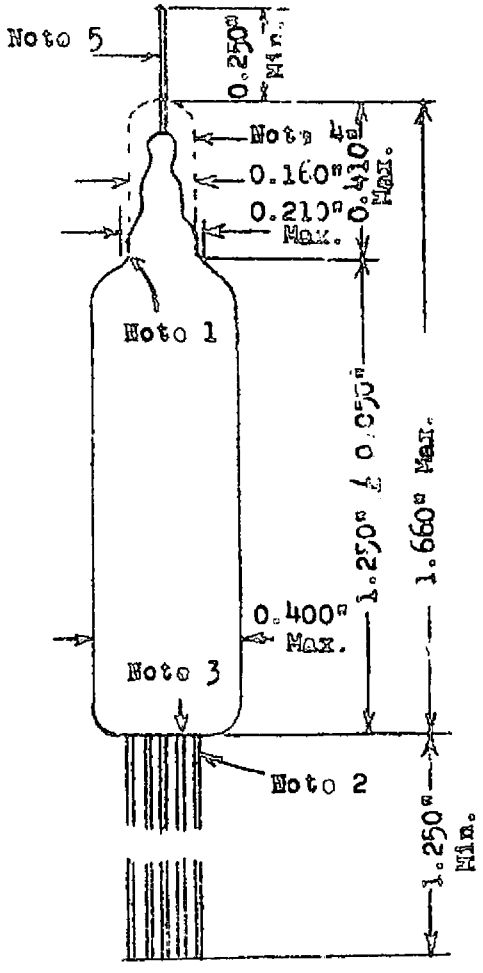
LEAD CONNECTIONS

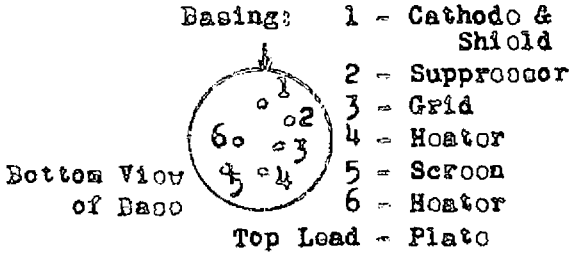
As per outline

TYPICAL OPERATING CONDITIONS

Heater Voltage	6.3	Volts
Heater Current	150	Ma.
Plate Voltage	100	Volts
Screen Voltage	100	Volts
Suppressor Voltage	0	Volt
Cathode Bias Resistor**	150	Ohms
Plate Current	7.0	Ma.
Screen Current	2.8	Ma.
Transconductance	3400	umhos
Plate Resistance	200,000	Ohms
Grid Voltage for 10 ua. Plate Current (approx)	-19	Volts

**Provides an operating bias of approximately 1.45 volts. Maximum grid circuit resistance should not exceed 1 megohm.





CIRCUIT APPLICATION

Sylvania Type 5633 is a double-ended construction remote cut-off RF pentode of the subminiature design. It is suitable for high frequency amplifiers where gain and high input impedance are important factors. The flexible leads permit the tube to be wired directly to circuit components, thereby minimizing high frequency lead and base losses. When circuit requirements make fixed bias necessary the grid resistance should not exceed 1/4 megohm.

Notes:

1. Reference diameter from which tip and bulb lengths are determined.
2. Avoid soldering leads closer than ¼" from glass.
3. Arrow indicates position of cathode lead.
4. All tips lie within dotted outline.
5. On top lead do not solder closer than 1/8" from gl...
6. Avoid bending leads closer than 0.060" from g...

2/10/48

SYLVANIA ELECTRIC PRODUCTS INC.
Emporium, Pennsylvania

from RMA release # 639,
Feb. 25, 1948

Sylvania

TYPE 5634

SHARP CUT-OFF R.F. PENTODE

TENTATIVE RATINGS

Heater Voltage AC or DC ±10%	6.3	Volts
Max. Plate Voltage	150	Volts
Max. Screen Voltage	140	Volts
Max. Plate Dissipation	0.8	Watt
Max. Screen Dissipation	0.3	Watt
Max. Heater Cathode Voltage	90	Volts

Direct Interelectrode Capacitances:

	Shielded*	Unshielded	
Grid to Plate	0.01 Max.	0.015	uuf. Max.
Input	4.4	4.4	uuf.
Output	2.8	2.2	uuf.

*With a 0.405" diameter shield connected to cathode.

TYPICAL OPERATING CONDITIONS

Heater Voltage	6.3	Volts
Heater Current	150	Ma.
Plate Voltage	100	Volts
Screen Voltage	100	Volts
Suppressor Voltage	0	Volt
Cathode Bias Resistor**	150	Ohms
Plate Current	6.5	Ma.
Screen Current	2.5	Ma.
Transconductance	3500	umhos
Plate Resistance (approx)	240,000	Ohms
Grid Volts for 10 ua. Plate Current (approx)	-10	Volts

**Provides an operating bias of approximately 1.35 volts. Maximum grid circuit resistance should not exceed 1.0 megohm.

CIRCUIT APPLICATION

Sylvania Type 5634 is a double-ended construction sharp cut-off RF pentode of the subminiature design. It is suitable for high frequency amplifiers where gain and high input impedance are important factors. The flexible leads permit the tube to be wired directly to circuit components, thereby minimizing high frequency lead and base losses. When circuit requirements make fixed bias necessary the grid resistance should not exceed 1/4 megohm.

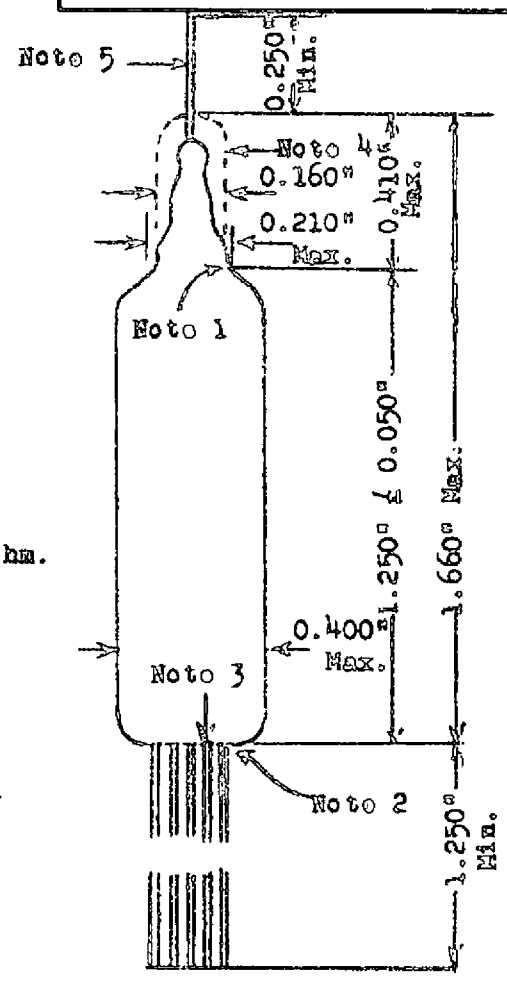
Notes:
1. Reference diameter from which tip and bulb lengths are determined.
2. Avoid soldering leads closer than 1/8" from glass.
3. Arrow indicates position of cathode lead.
4. All tips lie within dotted outline.
5. On top lead do not solder closer than 1/8" from glass.
6. Avoid bending leads closer than 0.060" from glass.

PHYSICAL SPECIFICATIONS

Style	Subminiature
Bulb	T-3
Base	Flexible Leads
Dimensions	See Outline
Mounting Position	Any

LEAD CONNECTIONS

as per outline



Basing: 1 - Cathode & Shield
2 - Suppressor
3 - Grid
4 - Heater
5 - Screen
6 - Heater
Top Load - Plate

Bottom View of Base

2/10/48

SYLVANIA ELECTRIC PRODUCTS INC.
Emporium, Pennsylvania

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DC
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		150	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid No. 1 to Plate	0.015	0.030 μμf Max.
Grid No. 3 to Plate	1.10	1.10 μμf Max.
Grid No. 1 to All Other Electrodes	4.00	4.00 μμf
Grid No. 3 to All Other Electrodes	4.00	3.80 μμf
Plate to All Other Electrodes	3.40	1.90 μμf
Grid No. 1 to Grid No. 3	0.15	0.17 μμf Max.

RATINGS[1 & 5] (Absolute Maximum)

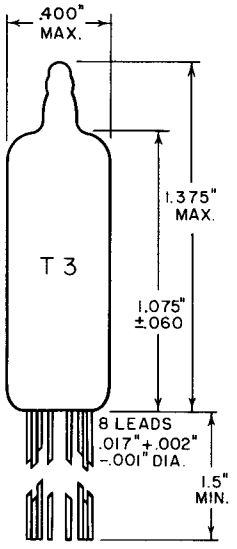
Plate Voltage	165 Vdc
Peak Plate Forward Voltage[6]	330 v
Grid No. 2 Voltage	155 Vdc
DC Grid No. 3 Voltage	
Positive Value	30 Vdc
Negative Value	55 Vdc
DC Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Plate Dissipation	1.1 W
Grid No. 2 Dissipation	0.7 W
Plate Current	11 mAdc
Grid No. 3 Current	2 mAdc
Grid No. 2 Current	7 mAdc
Grid No. 1 Current	2 mAdc
Cathode Current	16 mAdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid No. 1 Circuit Resistance	1.1 Meg

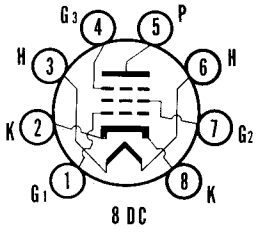
CHARACTERISTICS

	Dual Control Amplifier		Mixer
Plate Voltage	100	100	100 Vdc
Grid No. 2 Voltage	100	100	100 Vdc
Grid No. 3 Voltage	−1	Note 7	0 Vdc
			15 Vac
Cathode Resistor	150	150	150 Ohms
Plate Current	4.0	5.3	3.5 mAdc
Grid No. 2 Current	5.8	3.6	5.7 mAdc
Grid No. 1 Transconductance	1950	3200	— μmhos

QUICK REFERENCE DATA

The Premium Subminiature Type 5636 is a sharp cutoff, dual control pentode intended for use as a gated amplifier. The Type 5636 is designed for operation under conditions of severe shock, vibration, high temperature and high altitude, and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

FEBRUARY 1957

CHARACTERISTICS (Continued)

Grid No. 3 Transconductance	950	500	— μmhos
Plate Resistance	50000	110000	320000 Ohms
Grid No. 1			
Voltage for Ib = 100 μAdc	—	-7.5	— Vdc Max.
Grid No. 3			
Voltage for Ib = 100 μAdc	-8	—	— Vdc Max.
Conversion Transconductance	—	—	1400 μmhos

NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded reduction of instantaneous voltage (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Per MIL-E-1C Par. 6.5 and General Section of this Sylvania Subminiature Tube Manual titled Specifications and Ratings.*
7. *Grid No. 3 connected to cathode.*

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Grid No. 3 Voltage MIL-E-1 Par. 3.2.2.1	0 V
Plate Voltage	100 Vdc	Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1	0 V
Grid No. 1 Voltage	0 V	Cathode Resistor	150 Ohms
Grid No. 2 Voltage	100 Vdc		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7	(Method A)							
4.10.8	Heater Current: ALD = 12	—	—	144	150	156	—	mA
4.10.8	Heater Current:	0.65	140	—	—	—	160	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = -100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid No. 1 Current: Icl Rgl = 1.0 Meg	0.65	0	—	—	—	-0.3	μAdc
4.1.1.7	(Method A)							
4.10.4.1	Plate Current (1): ALD = 2.0	—	—	4.6	5.3	6.0	—	mAdc
4.10.4.1	Plate Current (1):	0.65	3.7	—	—	—	6.9	mAdc
4.1.1.7	(Method A)							
4.10.9	Transconductance (1): ALD = 900 Sm (g1-p)	—	—	2900	3200	3500	—	μmhos
4.10.9	Transconductance (1): Sm (g1-p)	0.65	2700	—	—	—	4000	μmhos
4.10.4.1	Plate Current (2): Ec1 = -7.5 Vdc; Rk = 0 Ohms	0.65	—	—	—	—	100	μAdc
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes:	2.5	—	—	—	—	—	
	g1-all	—	100	—	—	—	—	Meg
	p-all	—	100	—	—	—	—	Meg
4.10.4.3	Screen Grid Current: Ic2	2.5	2.8	—	—	—	5.4	mAdc
4.10.4.1	Plate Current (3): Note 5 Ec3 = −8.0 Vdc	2.5	—	—	—	—	100	μAdc
4.10.9	Transconductance (2): $\triangle$ Sm (g1-p) Ef = 5.7 V $\triangle$ Ef	2.5	—	—	—	—	15	%
4.10.9	Transconductance (3): Note 5 Sm (g3-p) Ec3 = −1.0 Vdc	2.5	500	—	—	—	1800	μmhos
4.10.6.2	Grid No. 1 Emission: Note 4 Ic1 Ef = 7.5 V; Ec1 = −7.5 Vdc; Rg1 = 1.0 Meg; Rk = 0 Ohms	2.5	0	—	—	—	−0.5	μAdc
4.10.3.2	AF Noise: Esig = 70 mVac; Ec2 = 19 Vdc; Rp = 0.2 Meg; Rg1 = 0.1 Meg; Rg2 = 1000 Ohms; Ck = 1000 μf	2.5	—	—	—	—	17	VU
4.10.14	Capacitance:	6.5	—	—	—	—	—	
	0.405 In. Dia. Shield Cg1p	—	—	—	—	—	0.020	μμf
	0.405 In. Dia. Shield Cg3p	—	—	—	—	—	1.10	μμf
	0.405 In. Dia. Shield Cg1-g3	—	—	—	—	—	0.15	μμf
	0.405 In. Dia. Shield Cg1-all	—	3.5	—	—	—	4.5	μμf
	0.405 In. Dia. Shield Cg3-all	—	3.5	—	—	—	4.5	μμf
	0.405 In. Dia. Shield Cp-all	—	2.9	—	—	—	3.9	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 20 ±5 mm Hg.; Voltage = 300 Vac	6.5	—	—	—	—	—	
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
4.9.19.1	Vibration (2): F = 40 cps; G = 15; Rp = 10,000 Ohms; Ck = 1000 μf	2.5	—	—	—	—	60	mVac
4.9.19.1	White Noise: Note 6; Rp = 10,000 Ohms; Ck = 1000 μf;	2.5	—	—	—	—	500	mv pk-pk
	Peak Acceleration = 15 G	2.5	—	—	—	—	75	mVac
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc; Rg1 = 0.1 Meg	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max	6.5	—	—	—	—	—	
	Post Shock and Fatigue Test End Points:							
	Vibration (2)	—	—	—	—	—	200	mVac
	Heater-Cathode Leakage							
	Ehk = +100 Vdc	—	—	—	—	—	20	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	20	μAdc
	Change in Transconductance (1) of Individual Tubes $\triangle_t$ Sm (g1-p)	—	—	—	—	—	20	%
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec1 = Ec2 = Ec3 = Eb = O V	2.5	—	—	—	—	
4.11.3.1	Stability Life Test: (1 Hour) Ehk = +200 Vdc; Rg1 = 1.0 Meg; TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes Δ_t Sm (g1-p)	—	—	—	—	15	%
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	
	Transconductance (1) Sm (g1-p)	1.0	—	—	2350	—	μmhos
4.11.5 4.11.3.1	Intermittent Life Test: Note 3 Stability Life Test Conditions: T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Grid Current Ic1	—	1	3	0	−0.9	μAdc
	Heater Current	—	2	5	138	164	mA
	Change in Transconductance (1) of Individual Tubes Δ_t Sm (g1-p)	—	1	3	—	20	%
	Transconductance (2) Δ_{Ef} Sm (g1-p)	—	2	5	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	10	μAdc
	Ehk = −100 Vdc	—	—	—	—	10	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	g1-all	—	—	—	50	—	Meg
	p-all	—	—	—	50	—	Meg
	Transconductance (1) Average Change Avg Δ_t Sm (g1-p)	—	—	—	—	15	%
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for atributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature lead fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater cycling life test
4.11.5	Intermittent life test

3: Envelope temperature shall be defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

4: Prior to this test tubes shall be preheated five (5) minutes at conditions indicated below. Test within three (3) seconds after preheating. Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission Test.

Ef	Ec1	Ec2	Ec3	Eb	Rk	Rg1
V	Vdc	Vdc	Vdc	Vdc	Ohms	Meg
7.5	0	100	0	100	150	1.0

5: The reference point for grid number 3 potentials on this test shall be the negative side of the cathode resistor.

6: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately

CHARACTERISTICS (Continued)

a "White Noise" spectrum which is free from discontinuities from 100 cps to 5000 cps. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 G's rms acceleration. With this the case, the rms value of acceleration for any bandwidth within the specified spectrum is equal to

$$G\ rms = 2.3\ G \sqrt{3.32 \log_{10} (f2/f1)}$$

f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (0.25 megohm or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 40 db at 13,000 cps. For reading the peak to peak value of output voltage the filter output shall be fed directly to the input of a Ballantine Model 305 peak to peak electronic voltmeter or equal, while the rms value shall be measured with a Hewlett-Packard Model 400C or equal.

APPLICATION DATA

The 5636 is a Premium Subminiature dual control pentode similar to the Type 6AS6. It is designed to provide reliable operation under conditions of severe shock, vibration, high altitude and high temperature.

Both No. 1 and No. 3 grids have sharp cutoff characteristics and are intended for control purposes thus making the 5636 particularly useful in a variety of gated amplifier applications. This type may also be used as a mixer at frequencies up to 400 mc. The oscillator voltage is injected into grid No. 3.

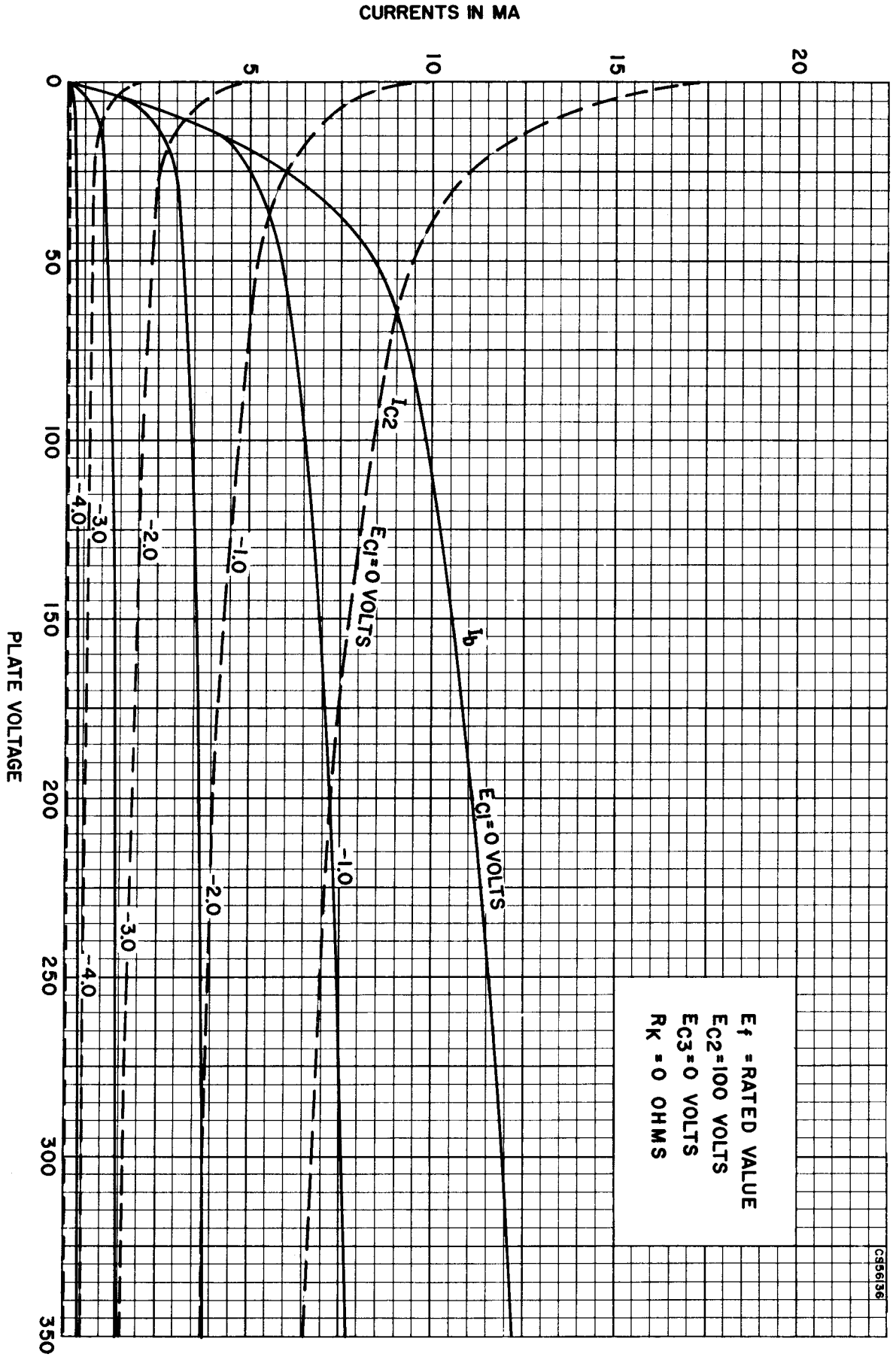
To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

The 5636 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability. Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy (reference should be made to the frontal section of this manual).

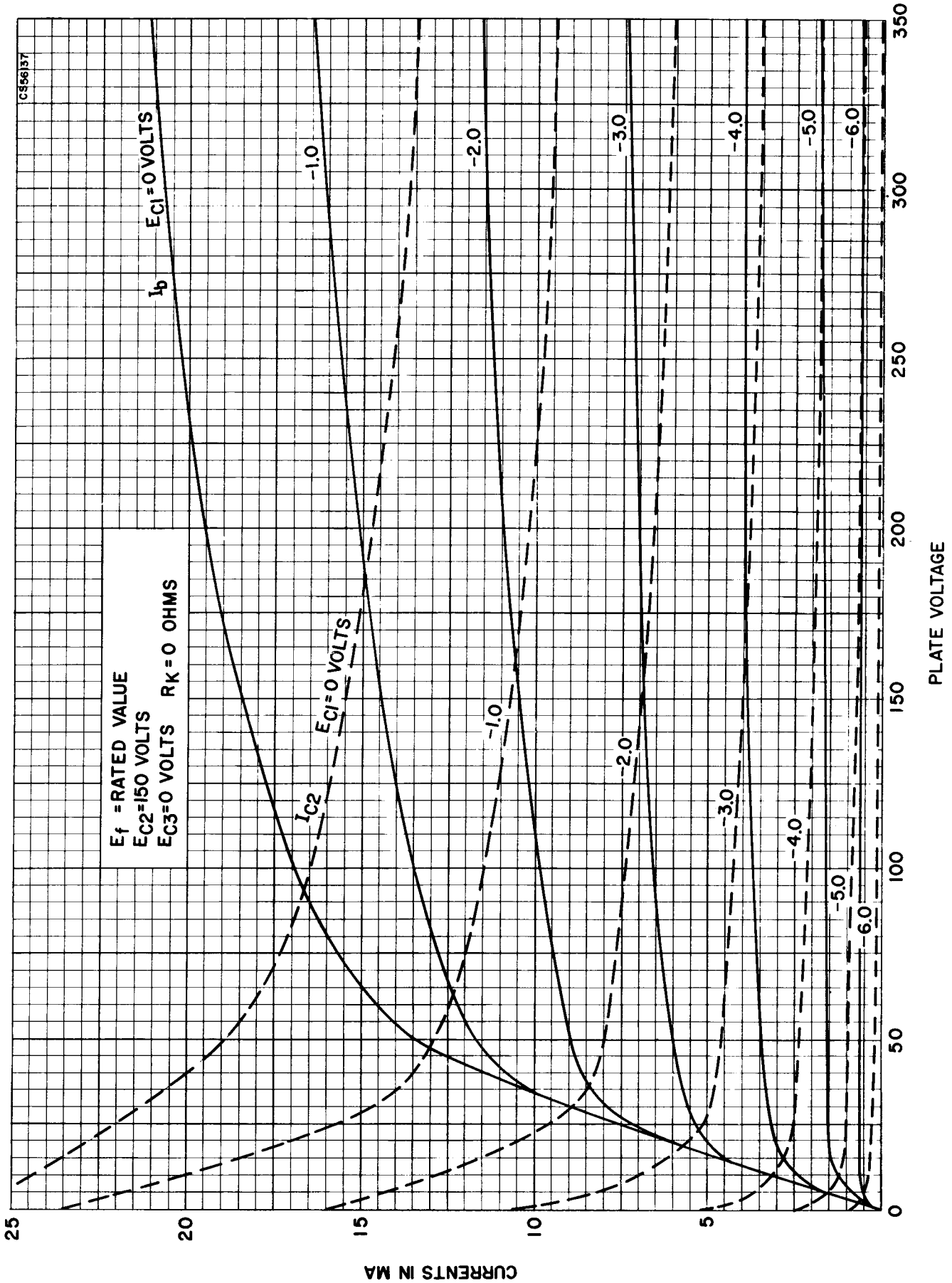
When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



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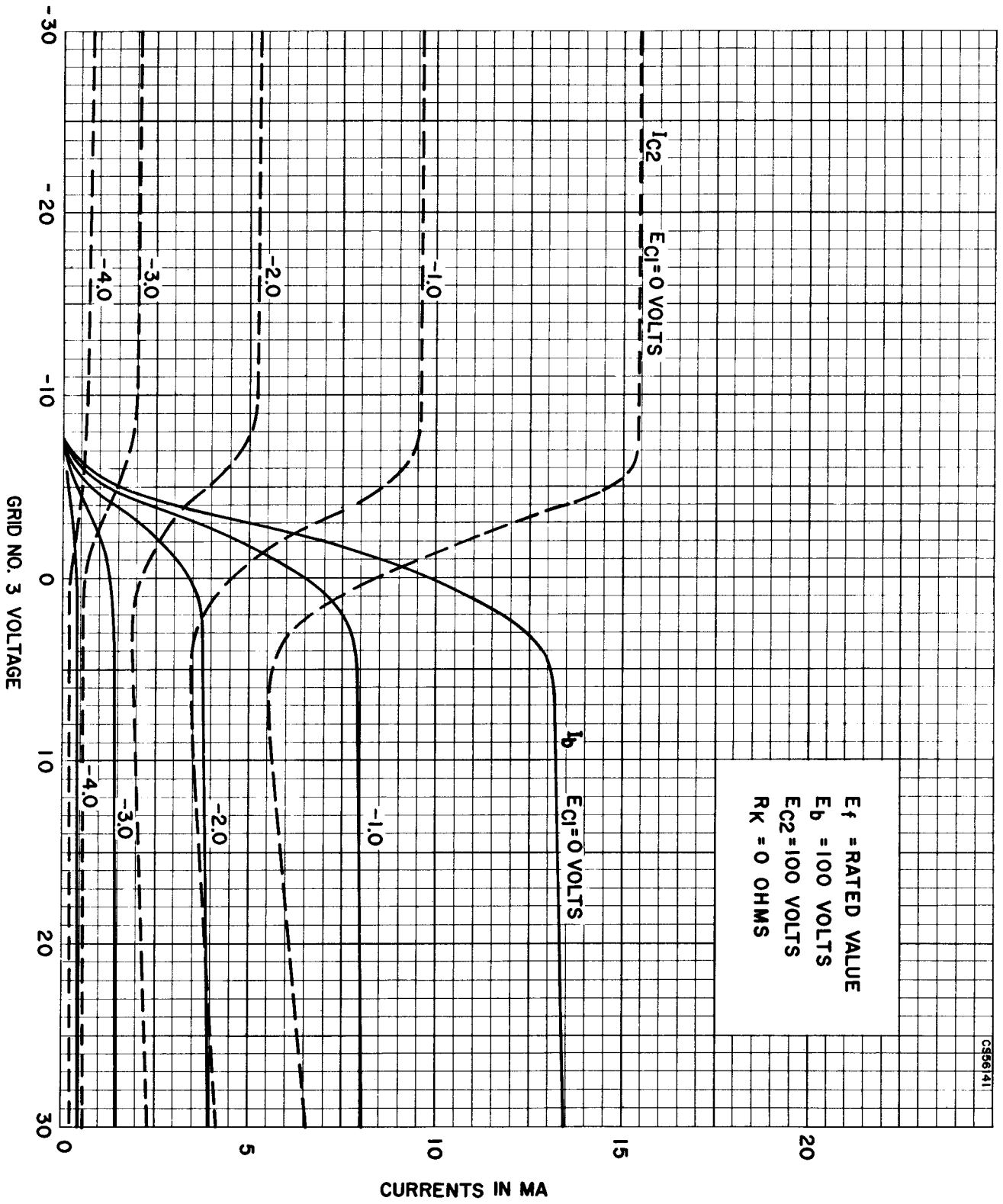
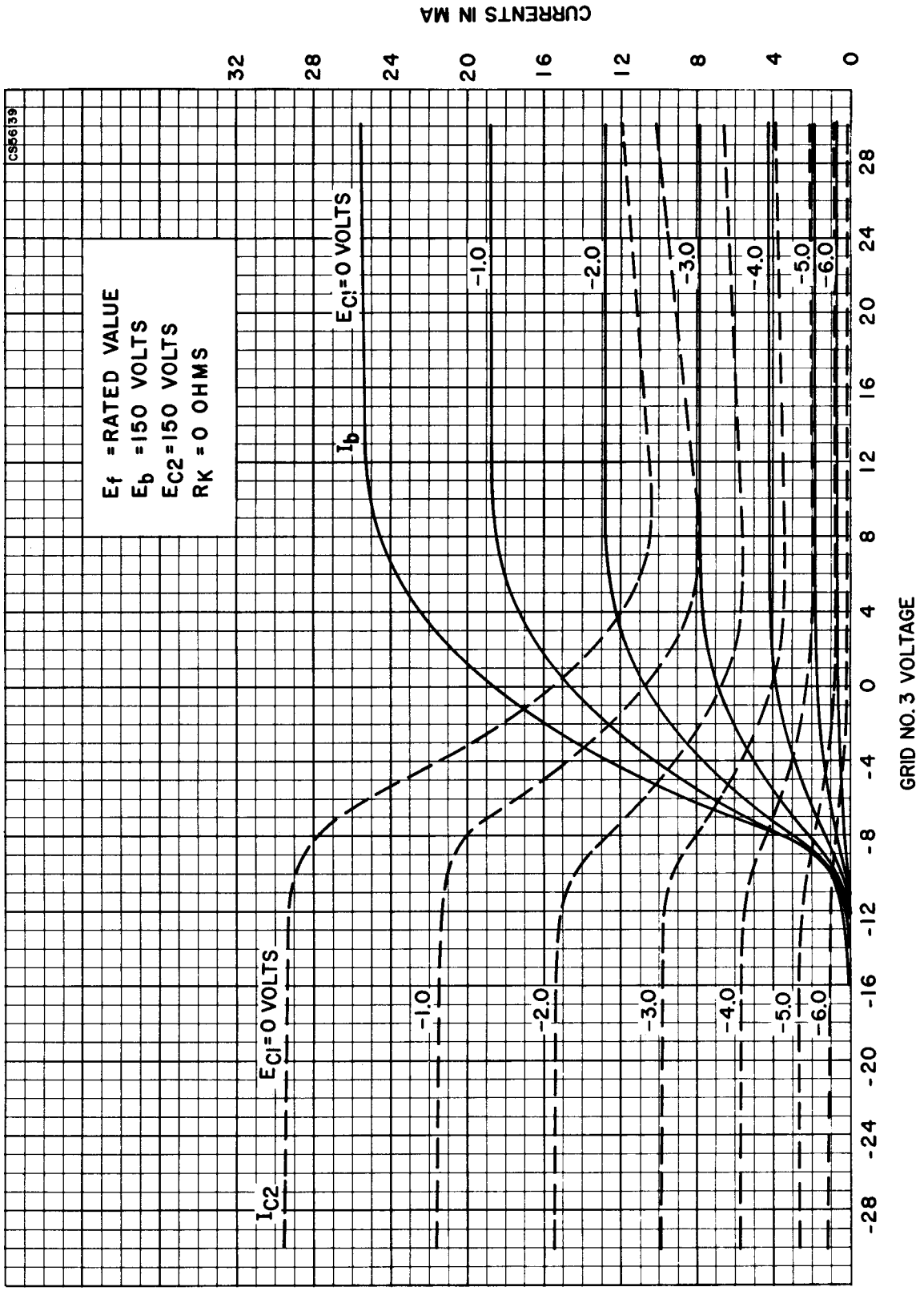


AVERAGE PLATE CHARACTERISTICS



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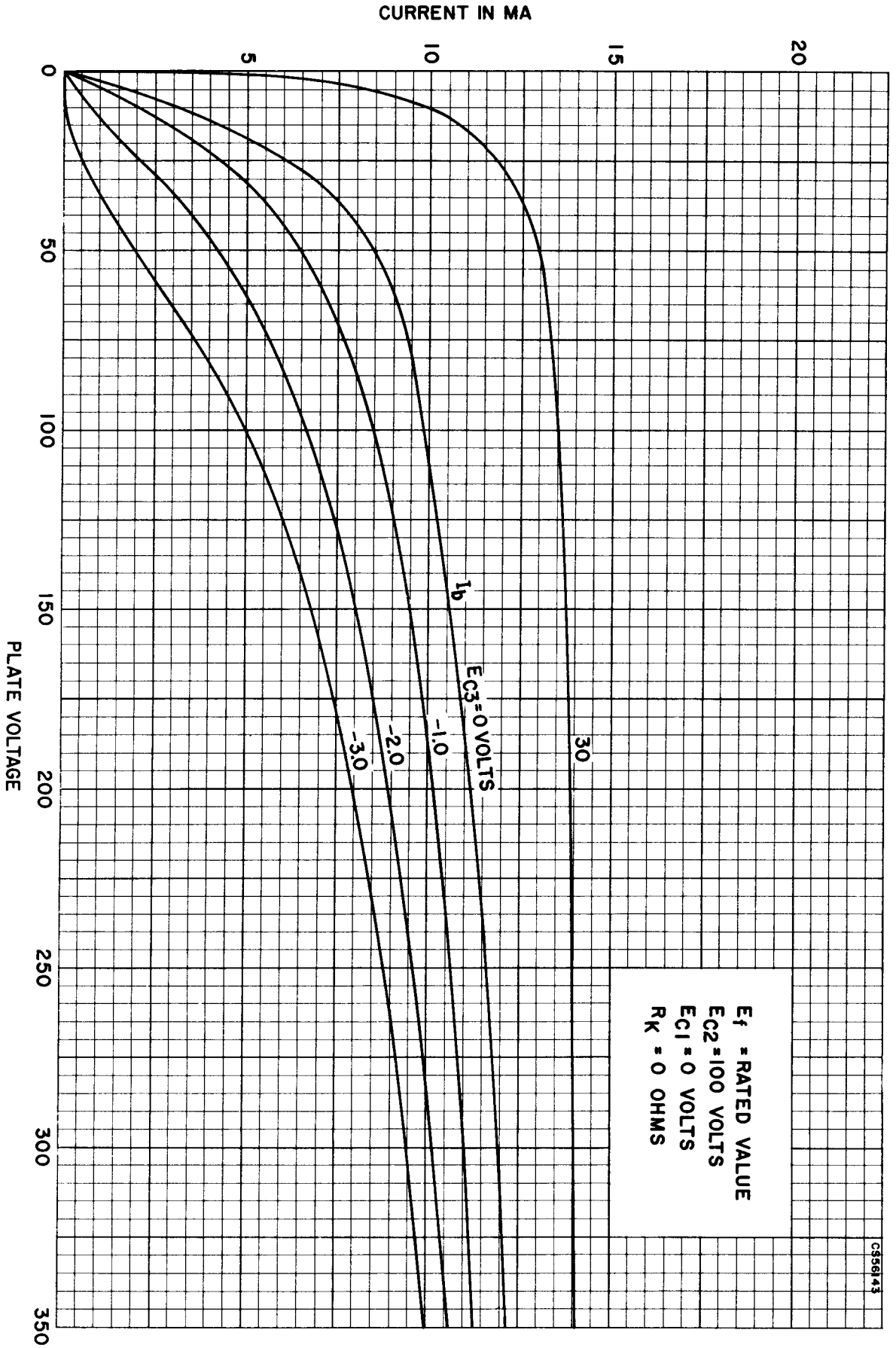

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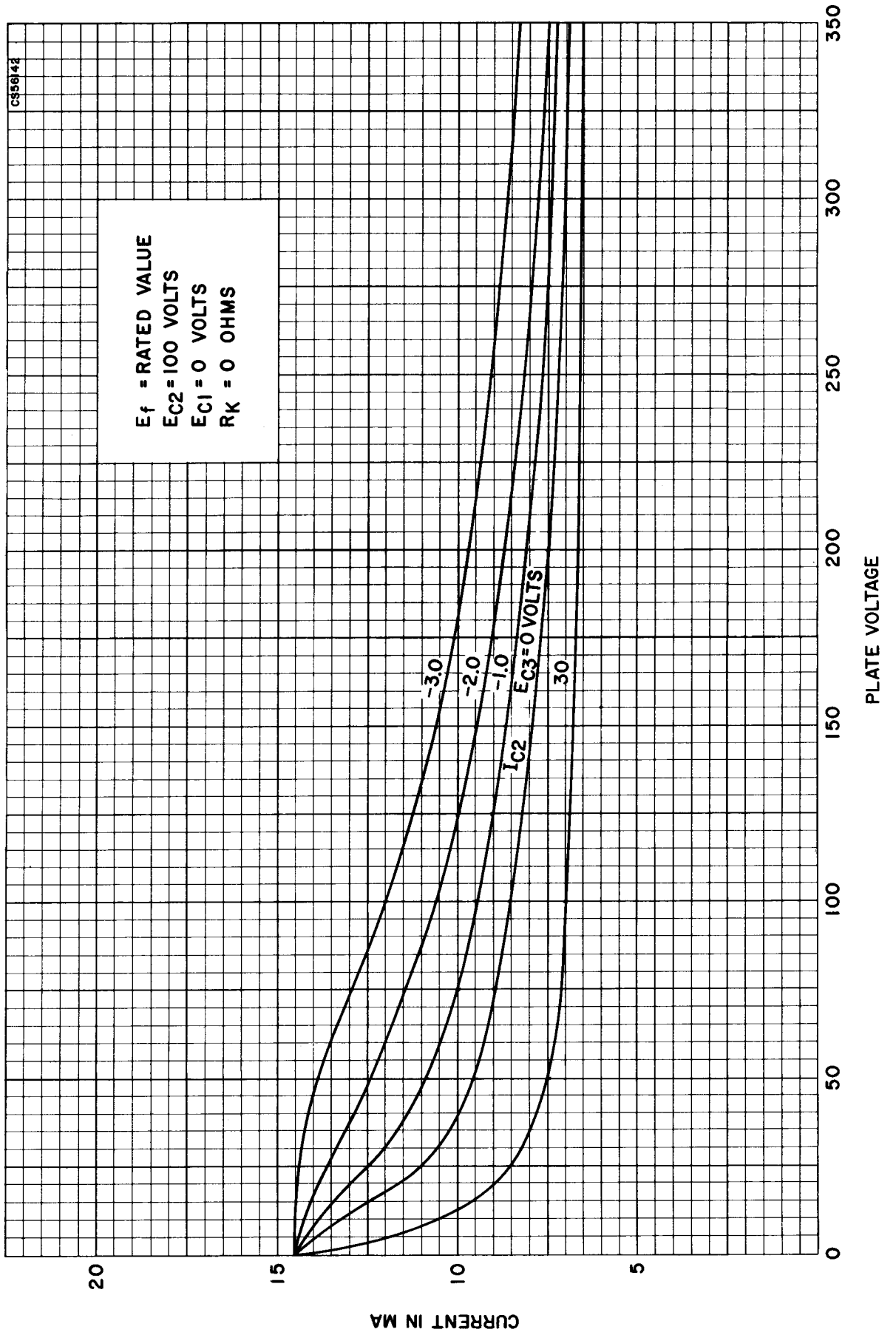

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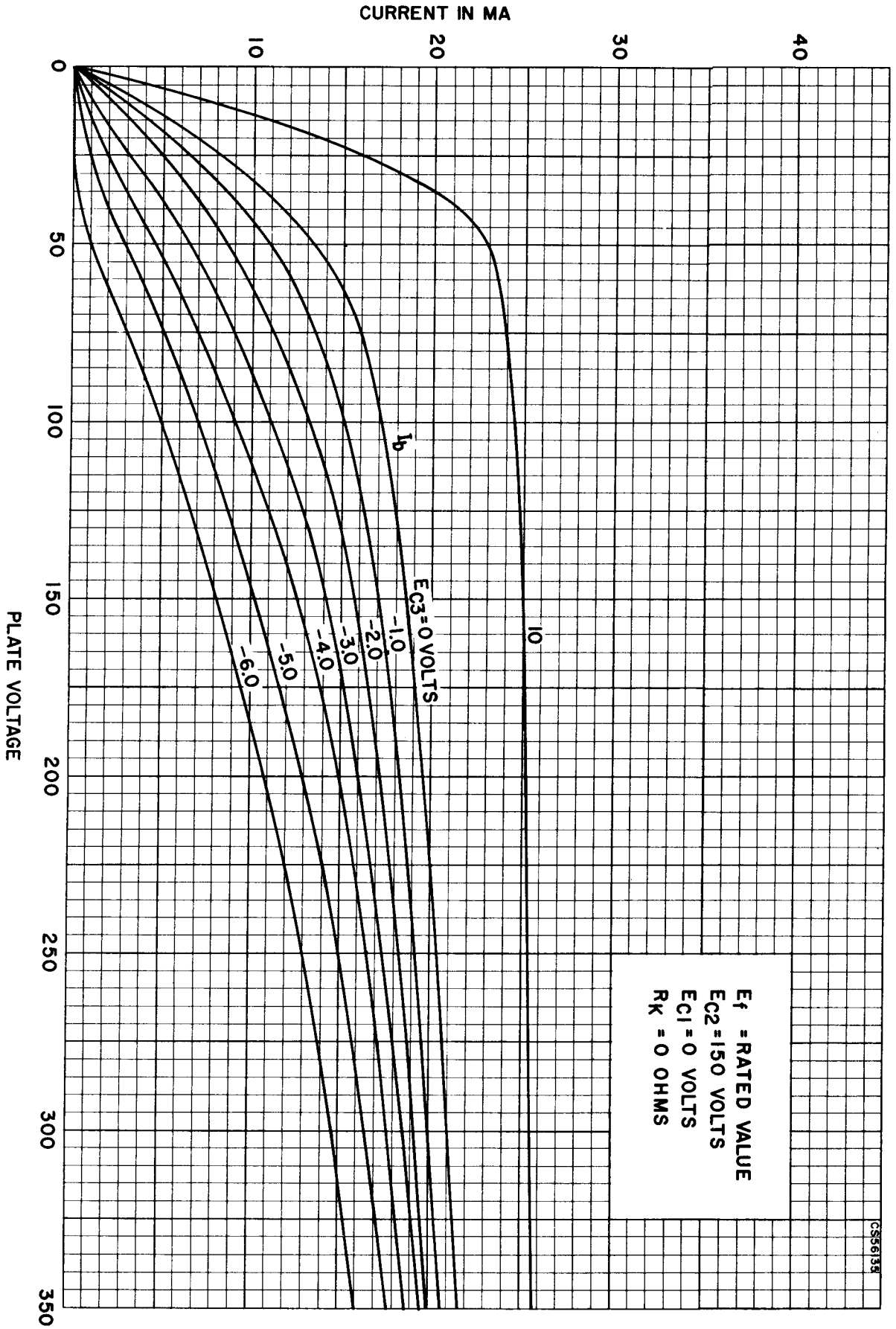

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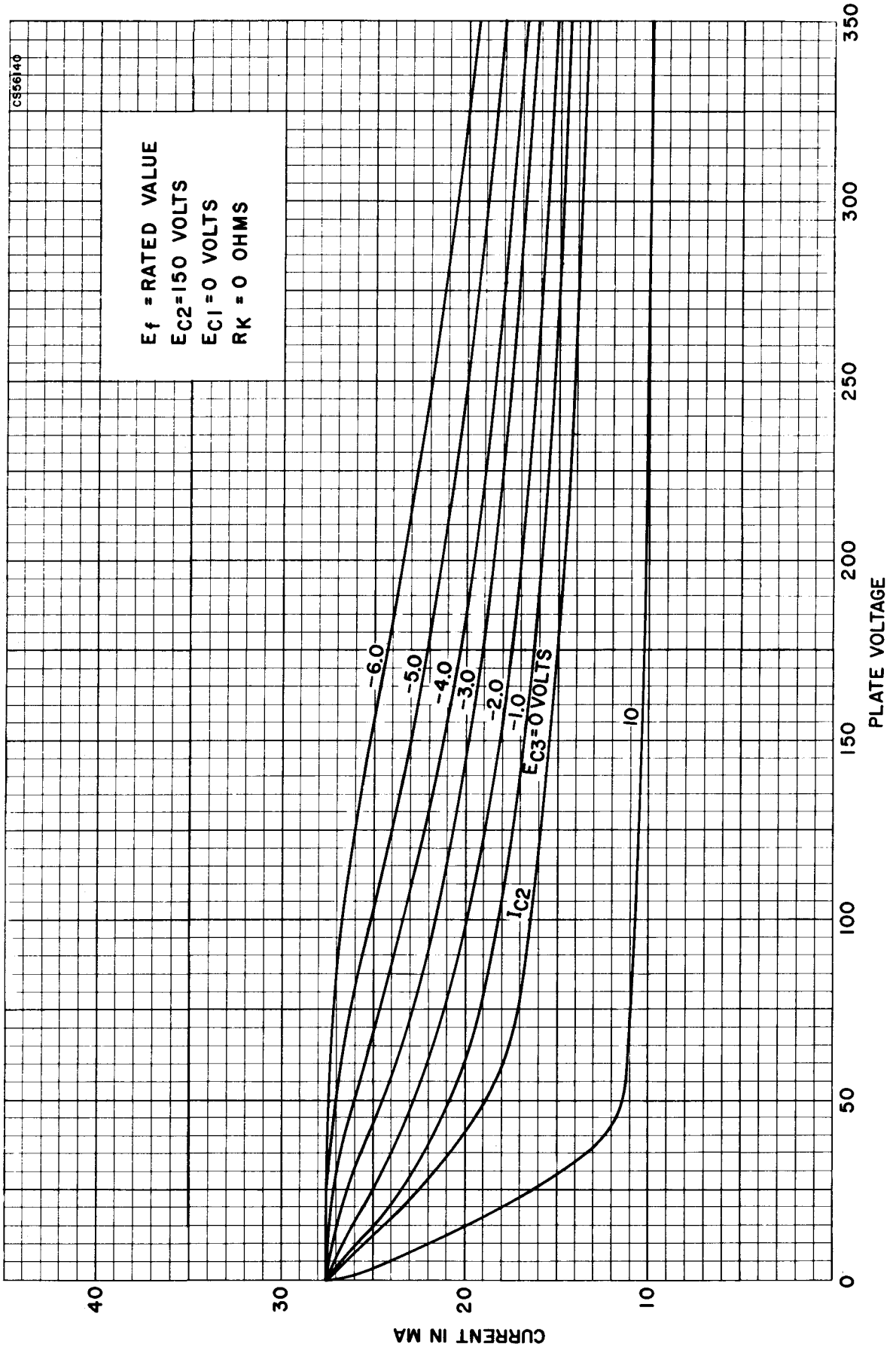
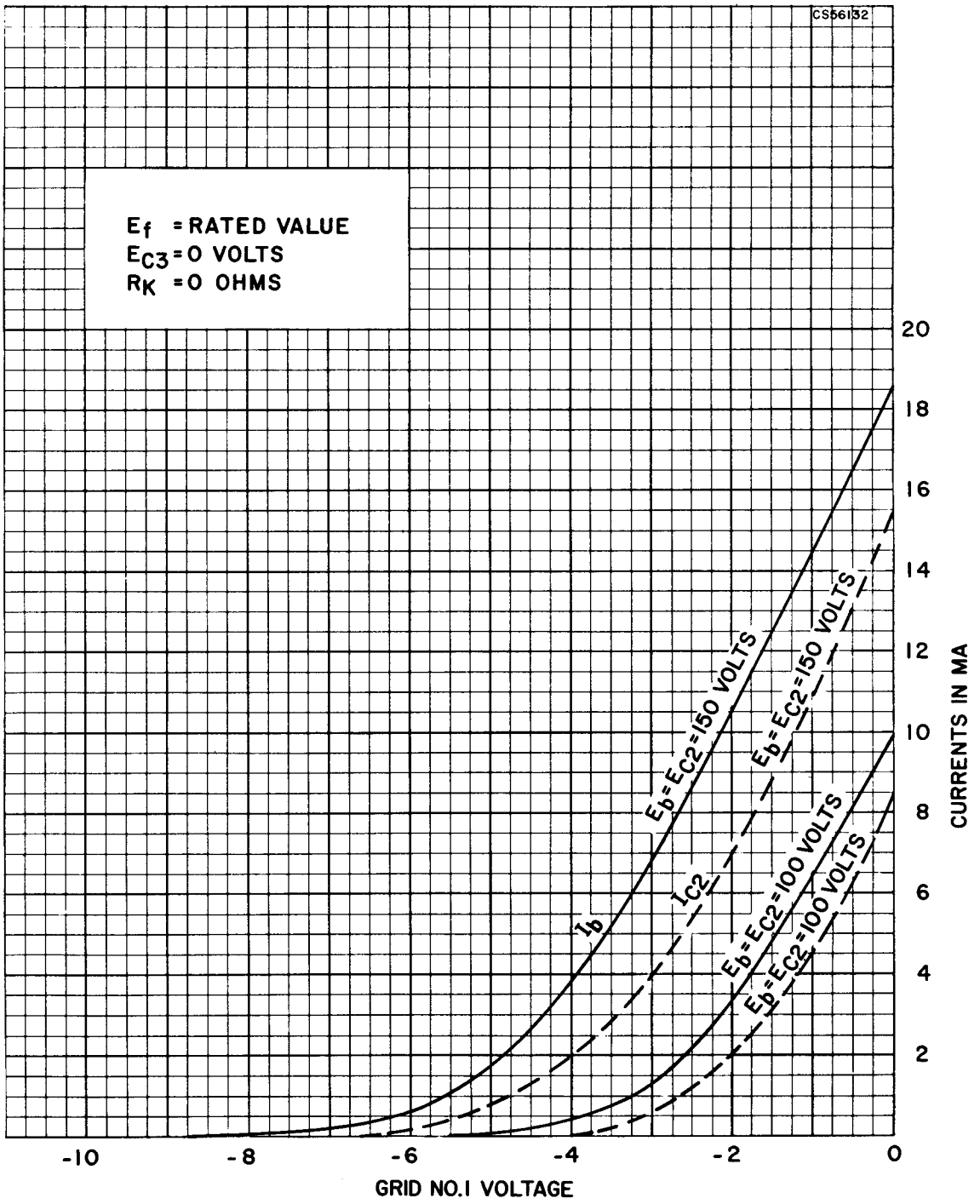


AVERAGE TRANSFER CHARACTERISTICS



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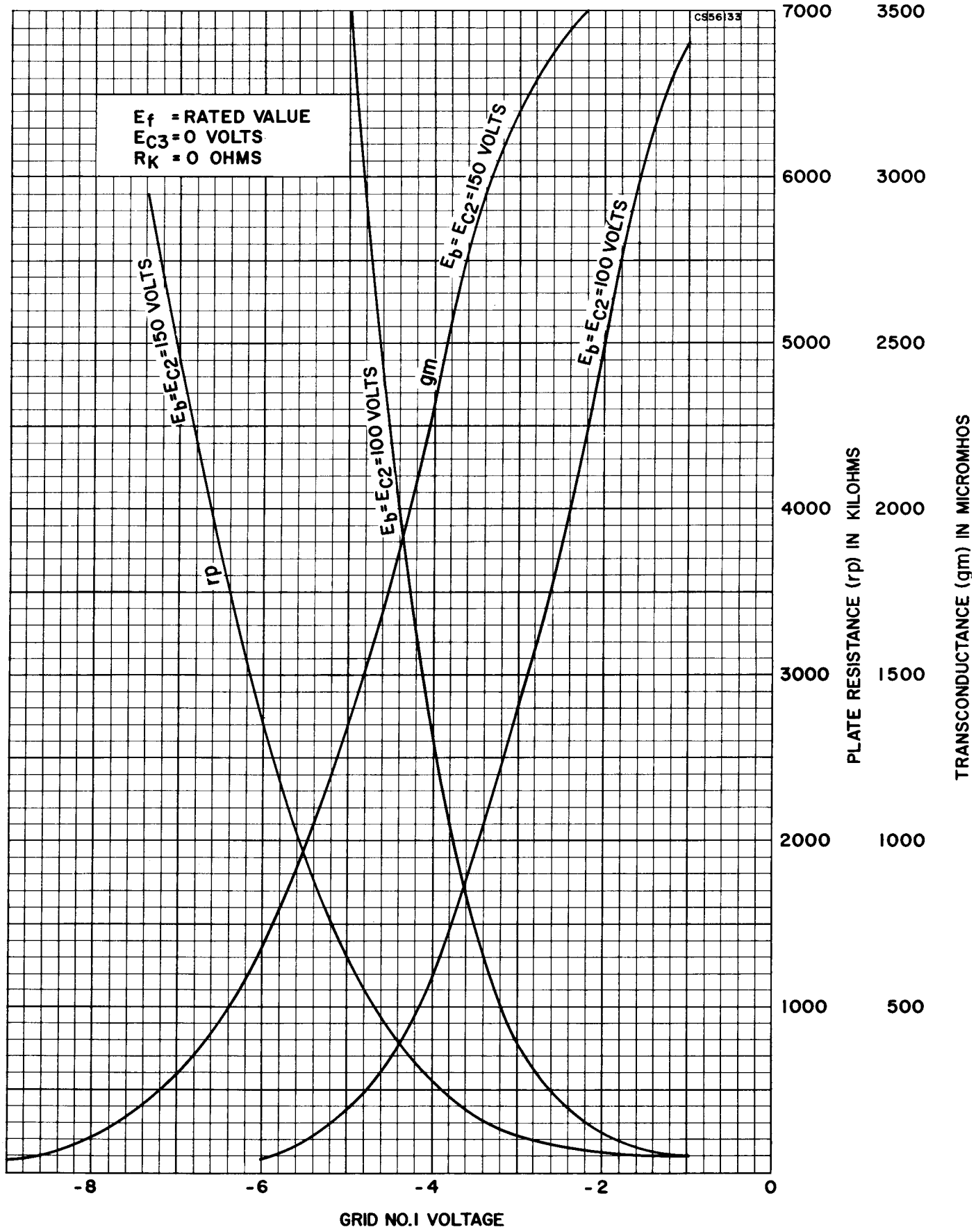

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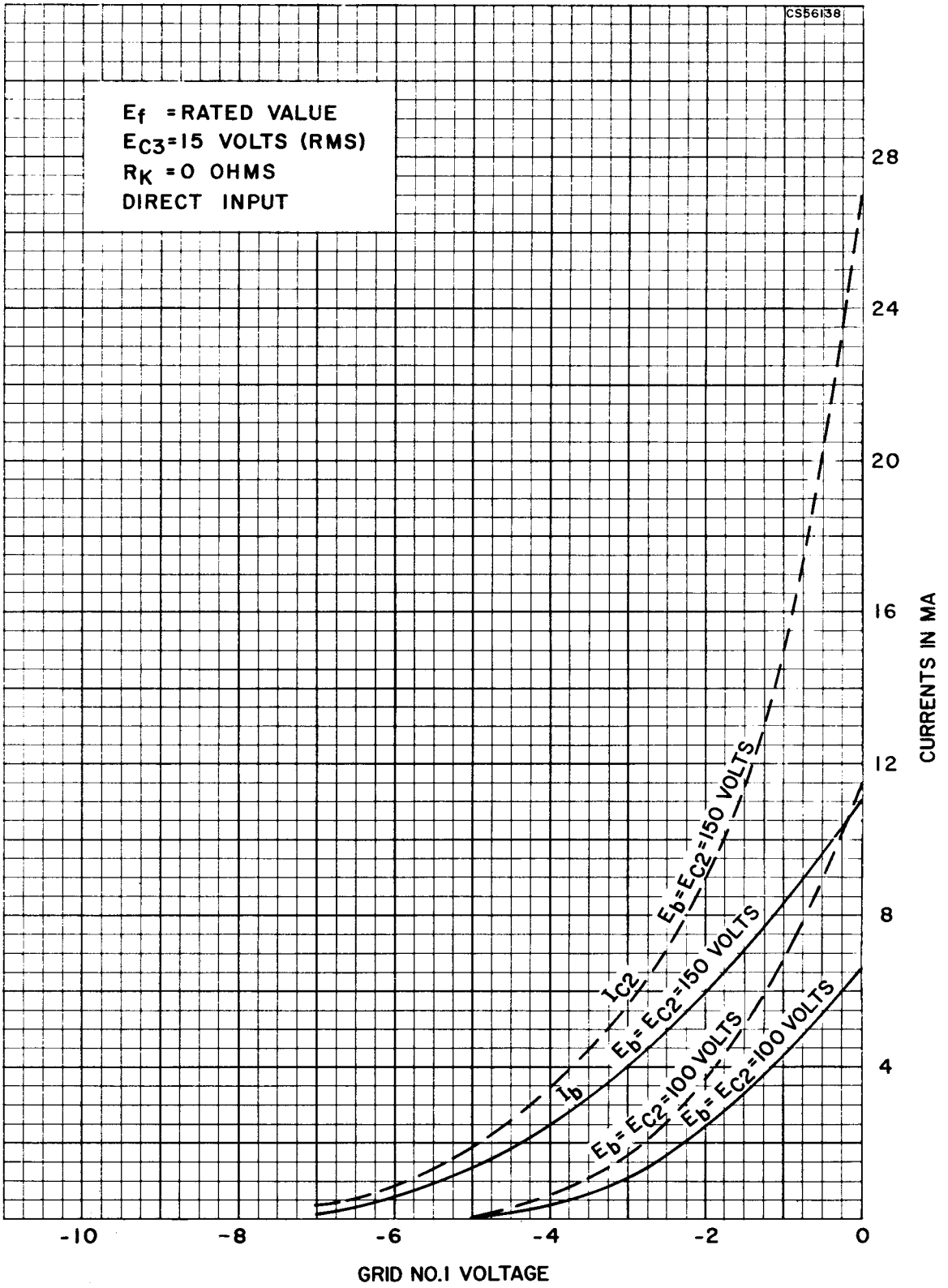

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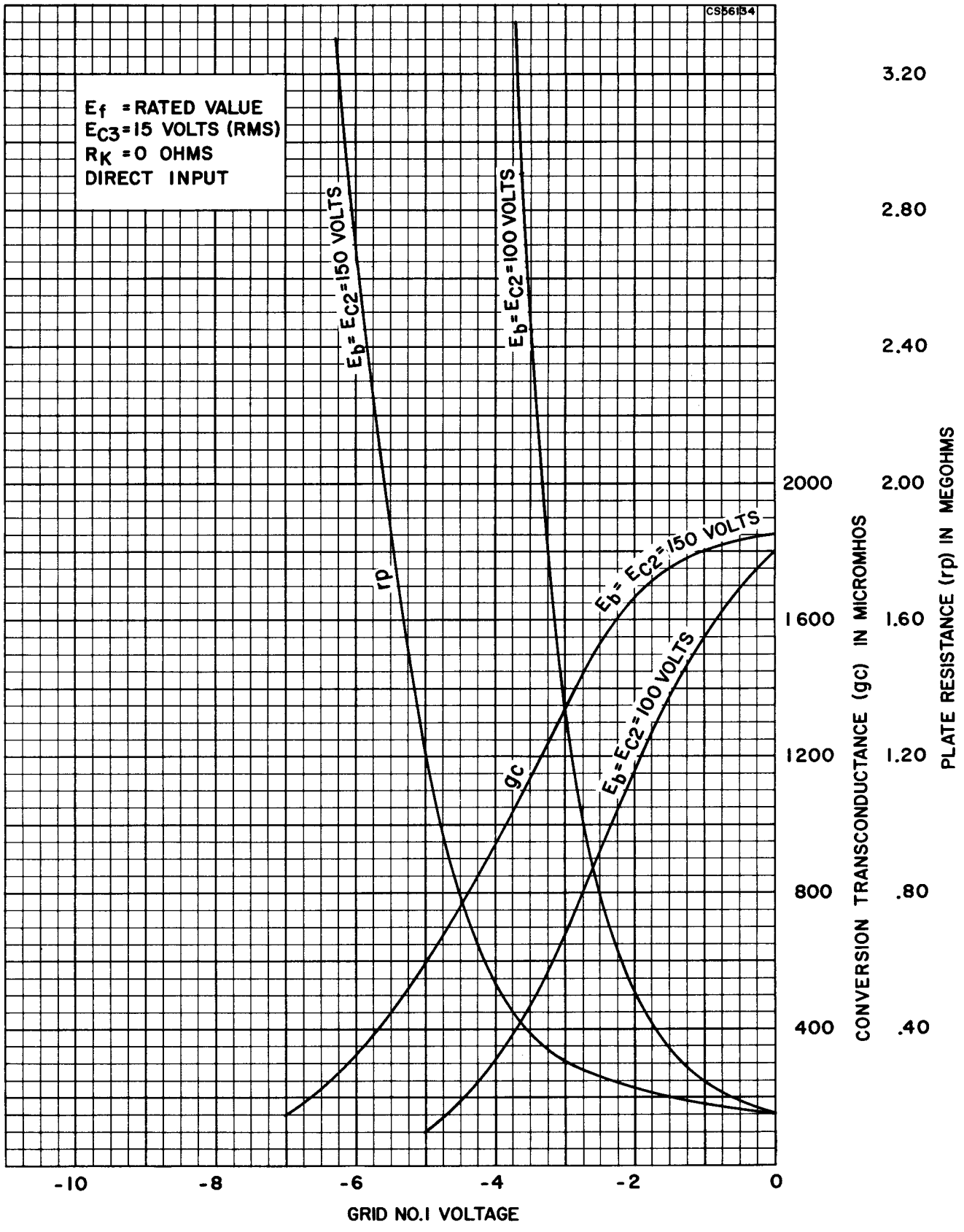

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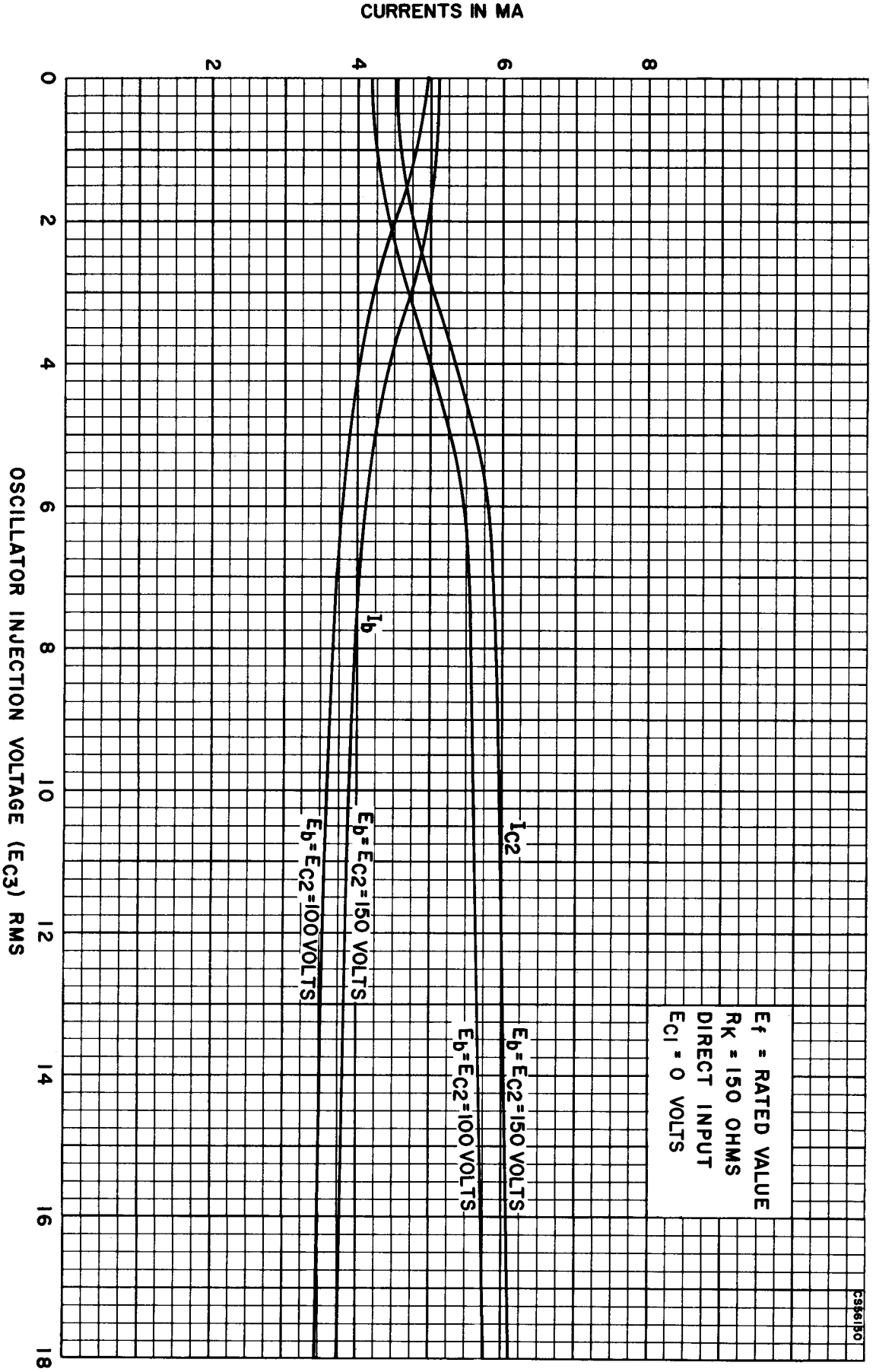

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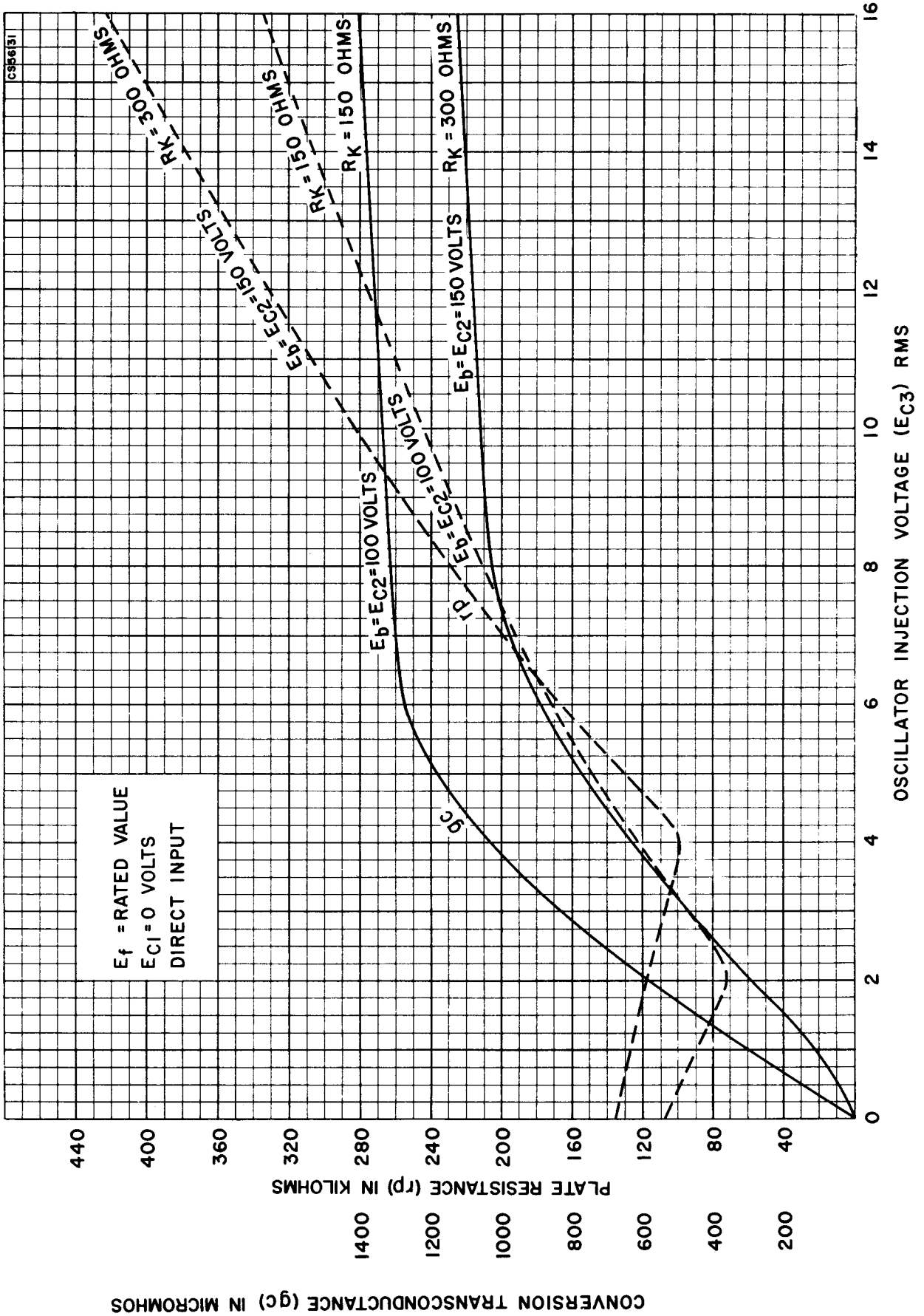


from RMA release # 625A,
May 27, 1949

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 5637

HIGH MU TRIODE

MECHANICAL DATA

Style	subminiature
Cathode	coated, unipotential
Outline	*(see Page 2)*
Maximum Diameter	0.400 inch
Maximum Bulb Length	1.500 inches
Bulb	T-3
Base	subminiature button, flexible leads *(see Page 2)*

Lead Connections:

Lead 1 .. plate	Lead 4 .. heater
Lead 2 .. grid	Lead 5 .. cathode
Lead 3 .. heater	

Mounting Position	any
Maximum Acceleration (1)	1,000 G

ELECTRICAL DATA

GENERAL

Direct Interelectrode Capacitances

	without shield	*with shield* (2)	
Grid to Plate	1.40	1.30	μμf
Input	2.60	2.80	μμf
Output	0.70	3.20	μμf

Heater Voltage	6.3	volts
Heater Current	150	milliamps

RATINGS – – *Design Center Values*

Heater Voltage (ac or dc)	6.3 (±10%)	volts
Maximum Plate Voltage	150	volts
Maximum Plate Dissipation	0.3	watt
Maximum Heater-Cathode Voltage	90	volts
Maximum Cathode Current	2	milliamps
Maximum Grid Circuit Resistance (self bias)	1	megohm

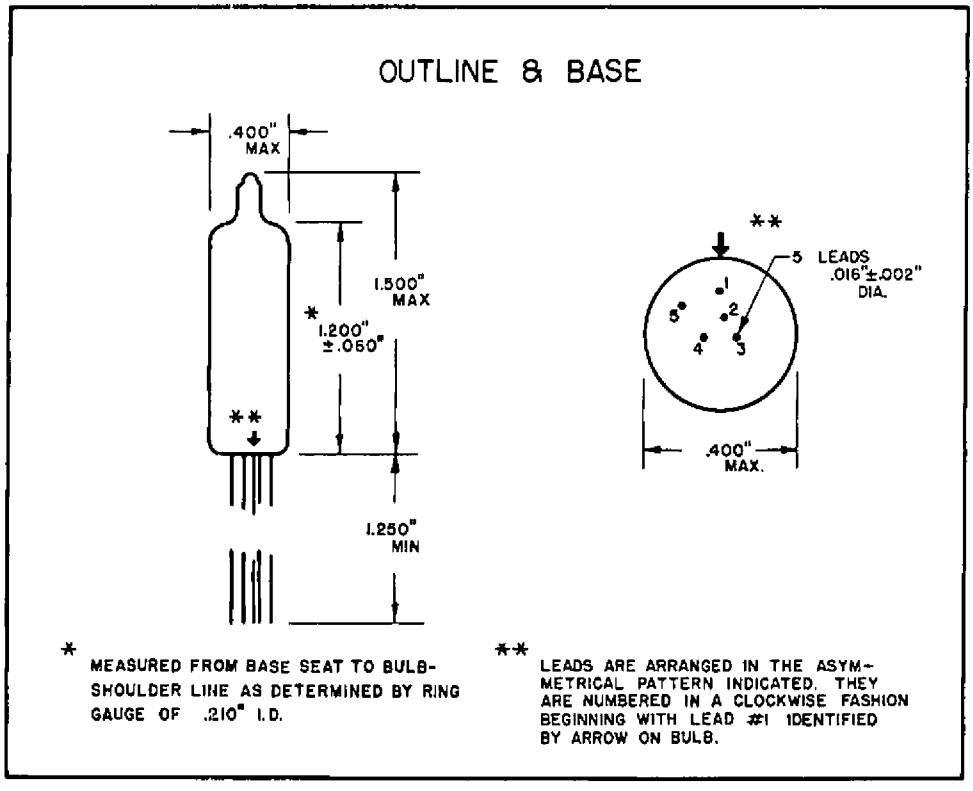
(1) Forces applied gradually, as in centrifuge, in direction of long axis of tube and such that internal structure is in tension.

(2) External shield of 0.405 inch diameter connected to cathode.

TYPE 5637

CHARACTERISTICS

Heater Voltage	6.3	volts
Plate Voltage (dc)	100	volts
Self Bias Resistor	820	ohms
Plate Current	1.4	milliamps
Transconductance	2,700	μmhos
Amplification Factor	70	
Plate Resistance	26,000	ohms
Grid Voltage for 10 μamps Plate Current	-3.6	volts



SYLVANIA ELECTRIC

RMA Registration Data

TYPE 5638

PENTODE VOLTAGE AMPLIFIER

MECHANICAL DATA

Style	subminiature
Cathode	coated, unipotential
Outline	*(see Page 2)*
Maximum Diameter	0.400 inch
Maximum Bulb Length	1.500 inches
Bulb	T-3
Base	subminiature button, flexible leads *(see Page 2)*

Lead Connections:

Lead 1 .. plate	Lead 4 .. heater
Lead 2 .. cathode and grid #3	Lead 5 .. grid #2
Lead 3 .. grid #1	Lead 6 .. heater

Mounting Position	any
Maximum Acceleration(1)	1,000 G

ELECTRICAL DATA

GENERAL

Direct Interelectrode Capacitances

	without shield	*with shield*(2)	
Grid to Plate	0.22	0.19	μμf
Input	4.00	4.00	μμf
Output	3.00	6.50	μμf

Heater Voltage	6.3	volts
Heater Current	150	milliamps

RATINGS - - *Design Center Values*

Heater Voltage (ac or dc)	6.3 (±10%)	volts
Maximum Plate Voltage	150	volts
Maximum Screen Voltage	140	volts
Maximum Plate Dissipation	0.6	watt
Maximum Screen Dissipation	0.2	watt
Maximum Heater to Cathode Voltage	90	volts
Maximum Grid Circuit Resistance (self bias)	1	megohm

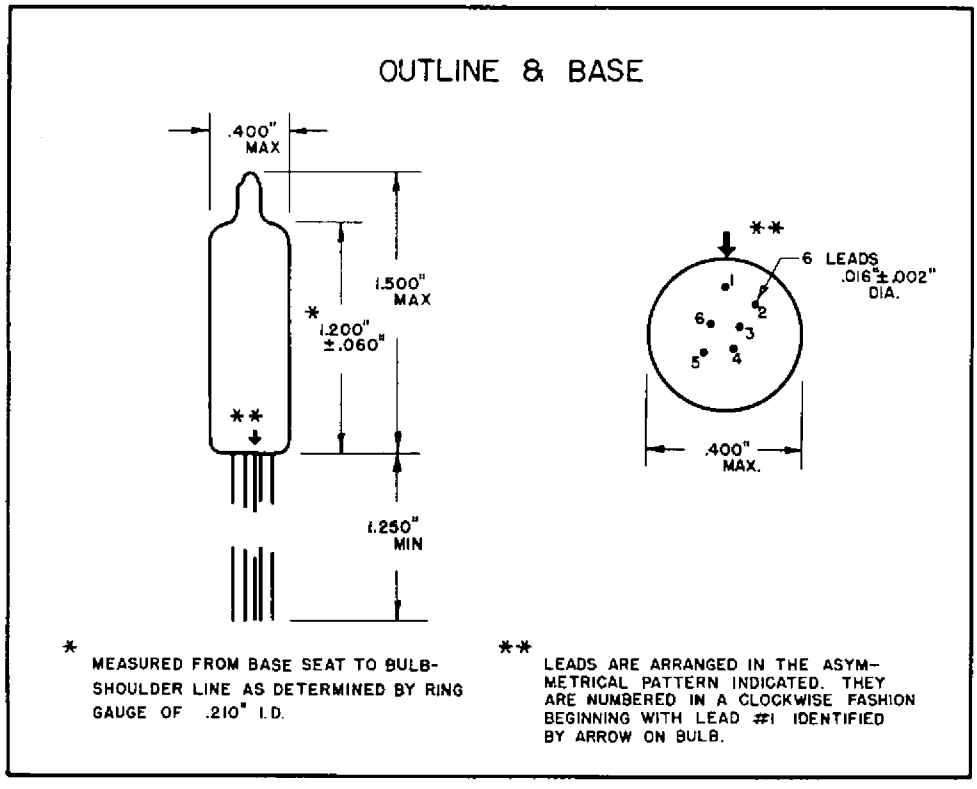
(1) Forces applied gradually, as in centrifuge, in direction of long axis of tube and such that internal structure is in tension.

(2) External shield of 0.405 inch diameter connected to cathode.

TYPE 5638

CHARACTERISTICS

Heater Voltage	6.3	volts
Plate Voltage (dc)	100	volts
Screen Voltage (dc)	100	volts
Self Bias Resistor	270	ohms
Plate Current	4.8	milliamps
Screen Current	1.25	milliamps
Transconductance	3,300	μmhos
Plate Resistance	150,000	ohms
Grid Bias for 10 μamps Plate Current	-9.0	volts



MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-3
Basing	8DL
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		450	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid No. 1 to Plate	0.15	0.18 μμf Max.
Input	9.00	9.00 μμf
Output	8.00	4.60 μμf

RATINGS[1 & 5] (Absolute Maximum)

Plate Voltage	165 Vdc
Peak Plate Forward Voltage[6]	330 v
Grid No. 2 Voltage	155 Vdc
Plate Dissipation	4.0 W
Grid No. 2 Dissipation	1.0 W
Cathode Current	40 mAdc
Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid No. 1 Circuit Resistance	
Self Bias	500000 Ohms
Fixed Bias	100000 Ohms

CHARACTERISTICS

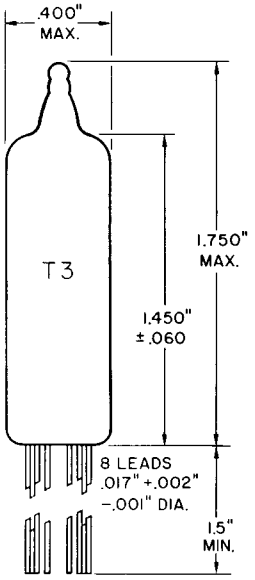
Plate Voltage	150 Vdc
Grid No. 2 Voltage	100 Vdc
Cathode Resistor	100 Ohms
Plate Current	21 mAdc
Grid No. 2 Current	4.0 mAdc
Transconductance	9000 μmhos
Plate Resistance	50000 Ohms
Grid No. 1 Voltage for Ib = 75 μAdc	−14 Vdc Max.

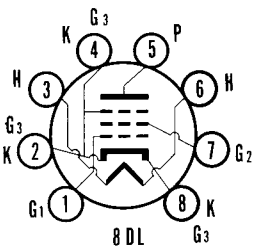
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Per MIL-E-1C Par. 6.5 and General Section of this Manual titled Specifications and Ratings.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5639 is a high gm video pentode intended for operation under conditions of severe shock, vibration, high temperature and high altitude.
The Sylvania Type 5639 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Grid No. 2 Voltage	100 Vdc
Plate Voltage	150 Vdc	Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1	0 V
Grid No. 1 Voltage	0 V	Cathode Resistor (MIL-E-1 Par. 3.2.2.1)	100 Ohms

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7 4.10.8	(Method A) Heater Current: ALD = 36	—	—	432	450	468	—	mA
4.10.8	Heater Current:	0.65	420	—	—	—	480	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	15	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	15	μAdc
4.10.6.1	Grid Current: Ic1 Rg1 = 1.0 Meg	0.65	0	—	—	—	−1.0	μAdc
4.10.4.1	Plate Current (1):	0.65	14.0	—	—	—	28.0	mAdc
4.10.4.1	Plate Current (2): Ec1 = −14.0 Vdc; RK = 0 Ohms	0.65	—	—	—	—	75	μAdc
4.10.9	Transconductance (1): Sm	0.65	7500	—	—	—	10500	μmhos
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-4)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes:	2.5	–	—	—	—	—	
	g1-all	—	100	—	—	—	—	Meg
	p-all	—	100	—	—	—	—	Meg
4.10.16.1	Power Output: Esig = 2.0 Vac; Rp = 9000 Ohms	2.5	0.75	—	—	—	—	W
4.10.4.3	Screen Grid Current: Ic2	2.5	2.0	—	—	—	6.0	mAdc
4.10.9	Transconductance (2): $\triangle$ Sm Ef = 5.7 V $\triangle$ Ef	2.5	—	—	—	—	10	%
4.10.6.2	Grid Emission: Note 4 Ic1 EF = 7.5 V; Ec1 = −14 Vdc; Rg1 = 1.0 Meg; Rk = 0 Ohms	2.5	0	—	—	—	−2.0	μAdc
4.10.3.2	AF Noise: Esig = 200 mVac; Ecc2 = 100 Vdc; Ec1 = −2.5 Vdc; Rg1 = 0.5 Meg; Rg2 = 0.01 Meg; Rp = 2000 Ohms; Rk = 0 Ohms; Cg2 = 4 μf	2.5	—	—	—	—	17	VU
4.10.10	Plate Resistance:	6.5	0.040	—	—	—	—	Meg
4.10.14	Capacitance:	6.5	—	—	—	—	—	
	0.405 In. Dia. Shield Cglp	—	—	—	—	—	0.13	μμf
	0.405 In. Dia. Shield Cin	—	8.0	—	—	—	10.0	μμf
	0.405 In. Dia. Shield Cout	—	7.0	—	—	—	9.0	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 20 ±5 mm Hg.; Voltage = 300 Vac	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 2 (Continued)								
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
4.9.19.1	Vibration (2): Rp = 2000 Ohms; Ck = 1000 μf; G = 15; F = 40 cps	2.5	—	—	—	—	100	mVac
4.9.19.1	White Noise: Rp = 10,000 Ohms; Ck = 1000 μf; Note 5	2.5	—	—	—	—	4500	mv pk-pk
	Peak Acceleration = 15 G	2.5	—	—	—	—	500	mVac
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc; Rg1 = 0.1 Meg	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
	Post Shock and Fatigue Test End Points: Vibration (2)	—	—	—	—	—	350	mVac
	Heater-Cathode Leakage Ehk = +100 Vdc	—	—	—	—	—	40	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	40	μAdc
	Change in Transconductance (1) of Individual Tubes $\Delta \frac{Sm}{t}$	—	—	—	—	—	20	%
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic 1st Sample	Combined Samples	Limits Min.	Max.	Units
Acceptance Life Tests, Note 2							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec1 = Ec2 = Eb = O V	2.5	—	—	—	—	
4.11.3.1	Stability Life Test: (1 Hour) Ehk = +200 Vdc; Rg1 = 0.5 Meg; TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes $\Delta \frac{Sm}{t}$	—	—	—	—	10	%
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	
	Transconductance (1) Sm	1.0	—	—	6750	—	μmhos
4.11.5 4.11.3.1	Intermittent Life Test: Note 3 Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Grid Current	—	1	3	0	−2.0	μAdc
	Heater Current	—	2	5	414	492	mA

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic: 1st Sample	Allowable Defectives per Characteristic: Combined Samples	Limits: Min.	Limits: Max.	Units
Acceptance Life Tests, Note 2 (Continued)							
	Change in Transconductance (1) of Individual Tubes $\frac{\Delta Sm}{t}$	—	1	3	—	20	%
	Transconductance (2) $\frac{\Delta Sm}{Ef}$	—	2	5	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	60	μAdc
	Ehk = —100 Vdc	—	—	—	—	60	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	g1-all	—	—	—	50	—	Meg
	p-all	—	—	—	50	—	Meg
	Transconductance (1) Average Change Avg $\frac{\Delta Sm}{t}$	—	—	—	—	15	%
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3 Subminiature lead fatigue
4.9.20.5 Shock
4.9.20.6 Fatigue
4.11.7 Heater cycling life test
4.11.5 Intermittent life test

3: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

4: Prior to this test, tubes shall be preheated five (5) minutes at conditions indicated below. Test within three (3) seconds after preheating. Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission Test.

Ef V	Ec1 Vdc	Ec2 Vdc	Ec3 Vdc	Eb Vdc	Rk Ohms	Rg1 Meg
7.5	0	100	0	150	100	0.5

5: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "White Noise" spectrum which is free from discontinuities from 100 cps to 5000 cps. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 G's rms acceleration. With this the case, the rms value of acceleration for any bandwidth within the specified spectrum is equal to

$$G\ rms = 2.3\ G \sqrt{3.32 \log_{10} (f2/f1)}$$

f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's. The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (0.25 megohm or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 40 db at 13,000 cps. For reading the peak to peak value of output voltage the filter output shall be fed directly to the input of a Ballantine Model 305 peak to peak electronic voltmeter or equal, while the rms value shall be measured with a Hewlett-Packard Model 400C or equal.

APPLICATION DATA

The 5639 is a Premium Subminiature beam power pentode characterized by long life and stable operation under conditions of severe shock, vibration, high altitude and high temperature.

The tube features a high gm and is intended primarily for service as a video amplifier. The high power sensitivity and high gm combined with efficient operation at low supply voltages lends this type to many applications.

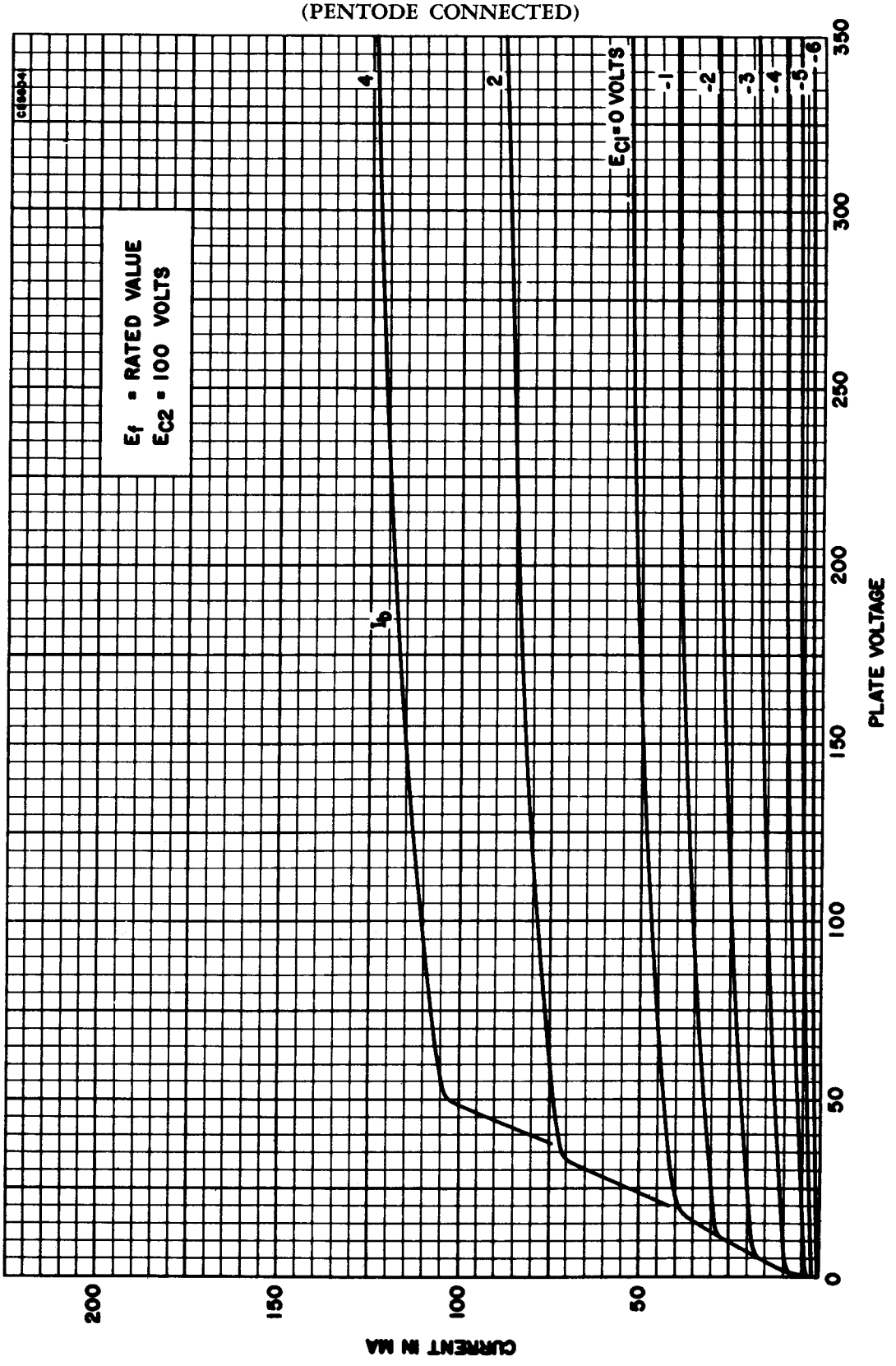
To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at an rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

The 5639 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability. Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

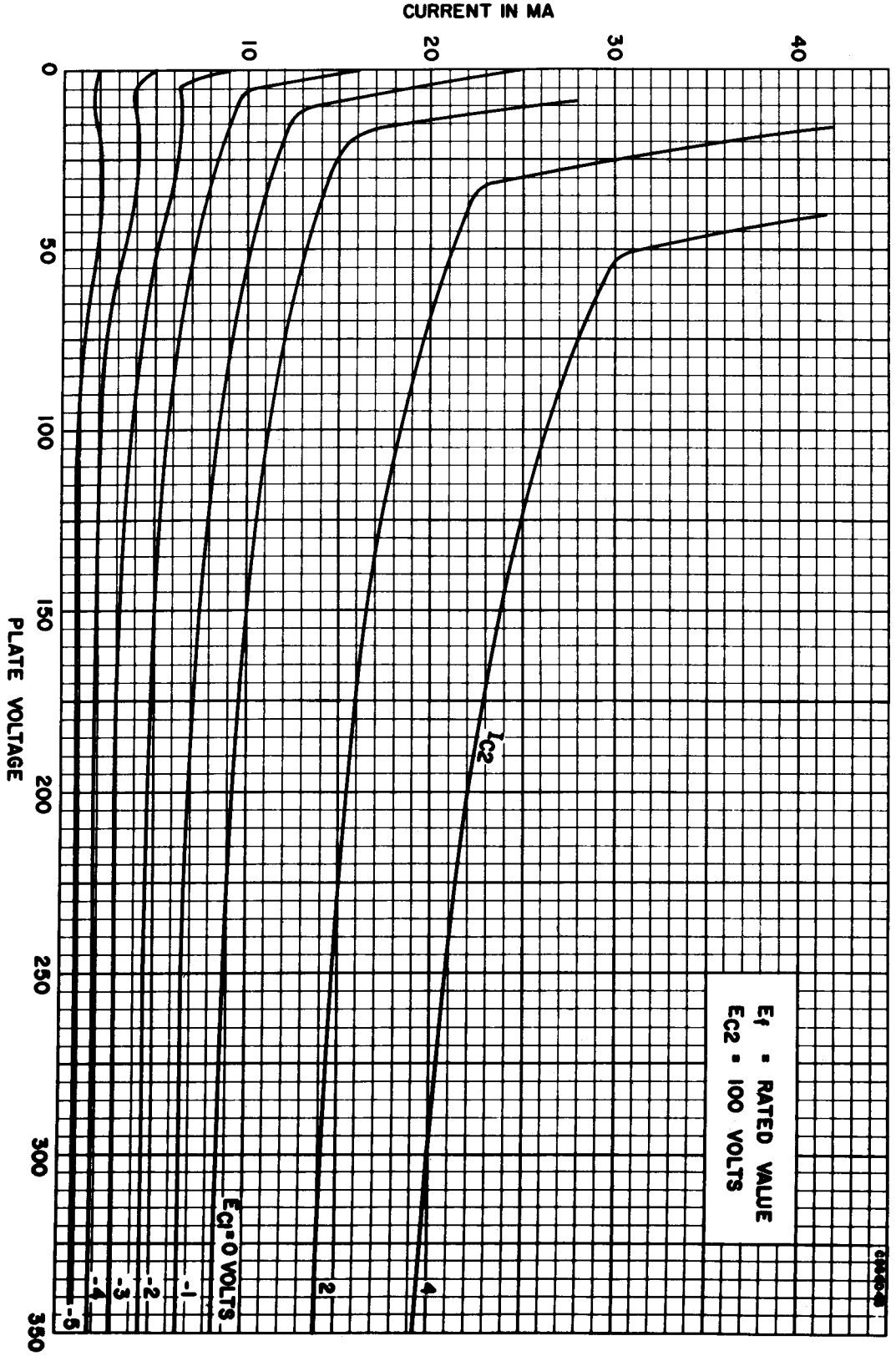
When operated under conditions common to on-off control applications, the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

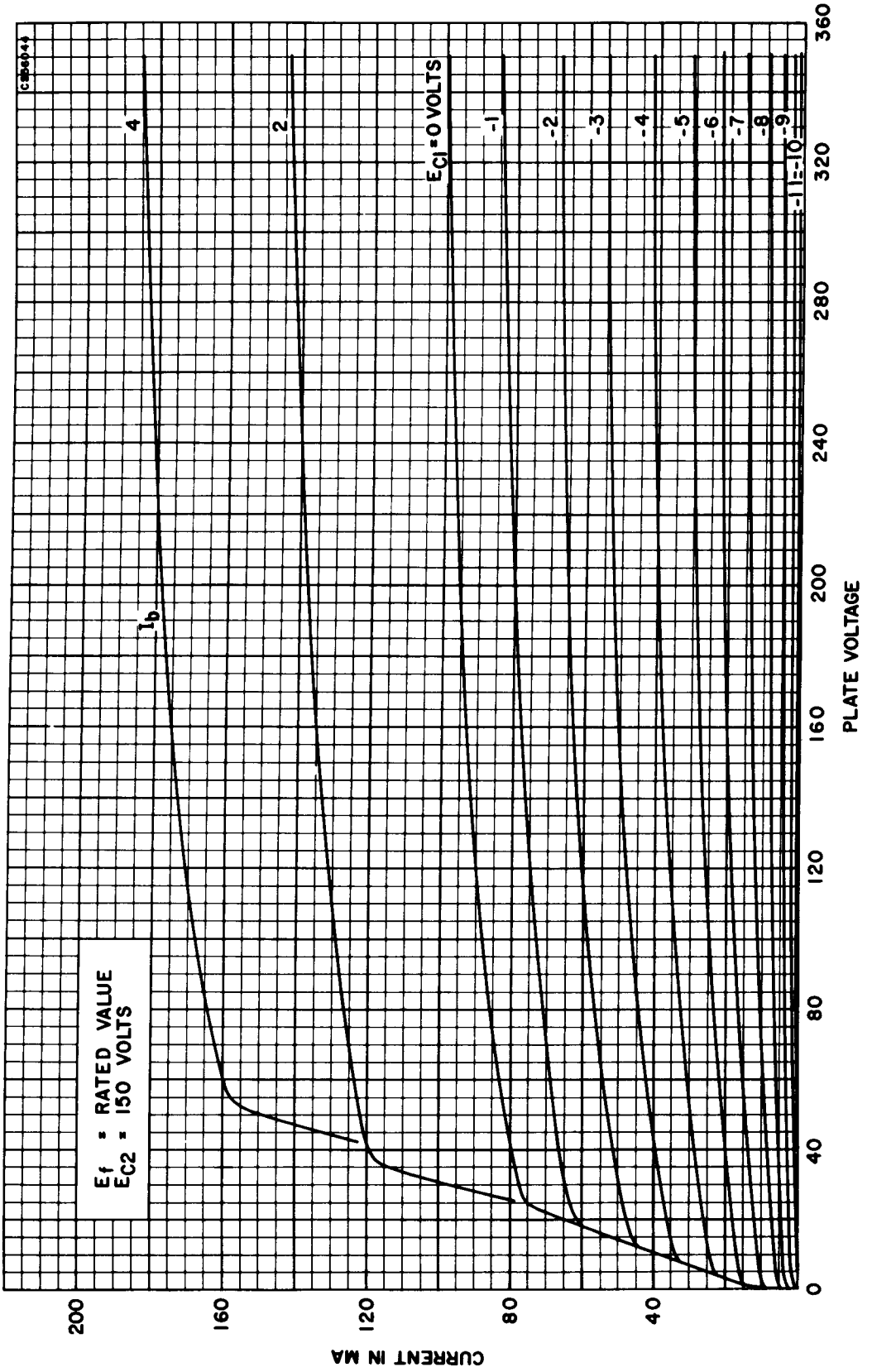
AVERAGE PLATE CHARACTERISTICS
(PENTODE CONNECTED)



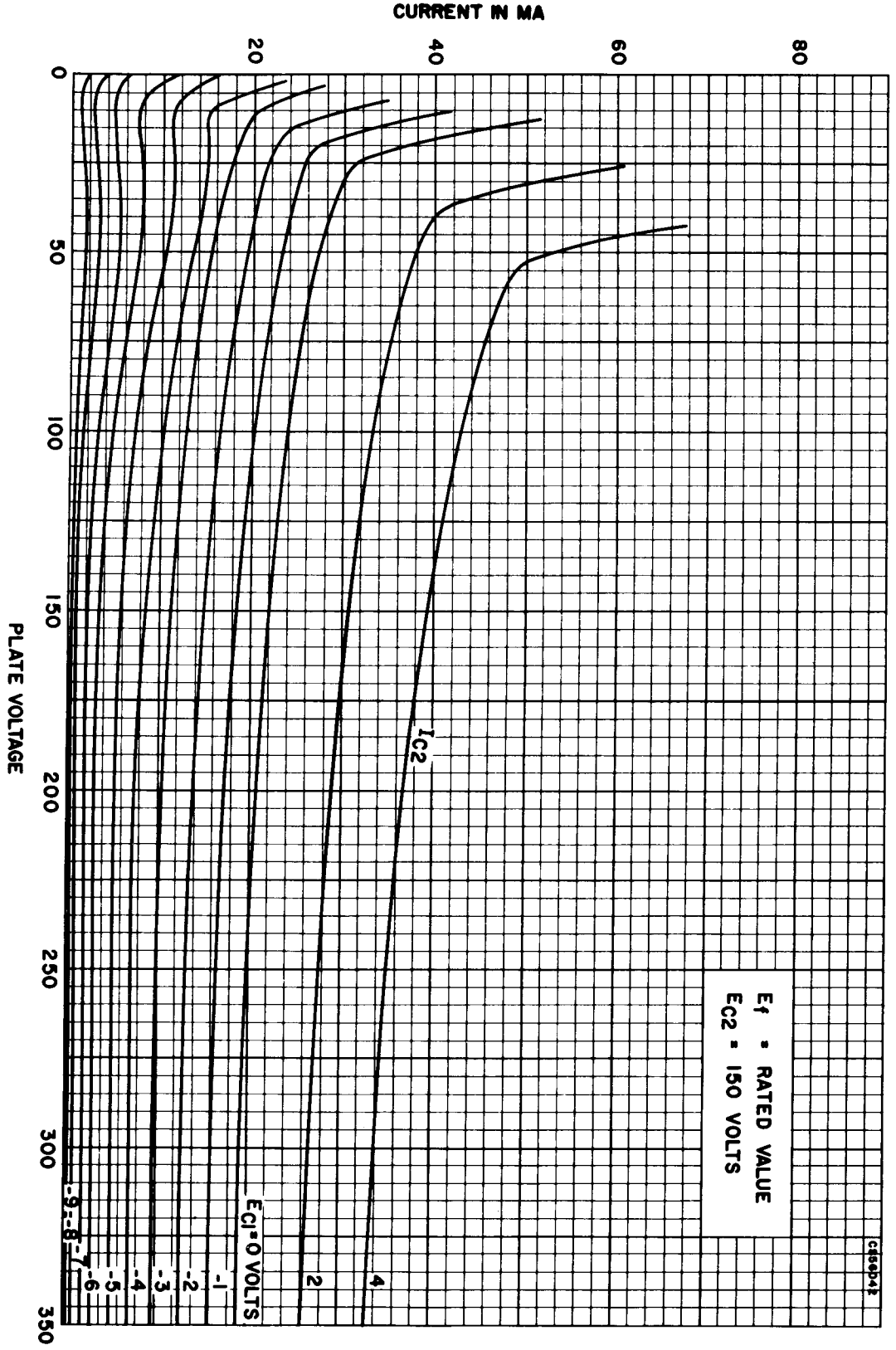
AVERAGE GRID No. 2 CHARACTERISTICS
(PENTODE CONNECTED)



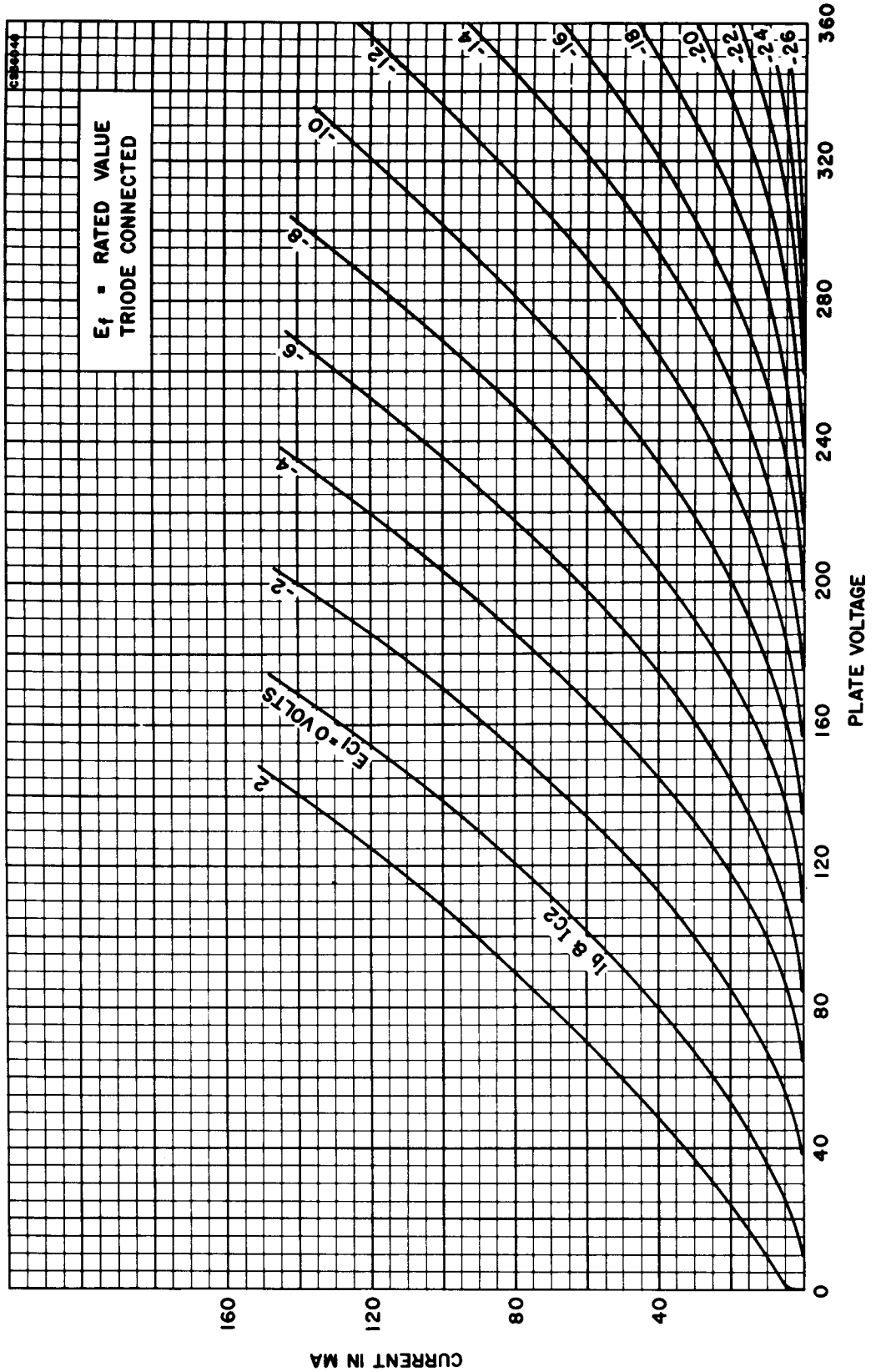
AVERAGE PLATE CHARACTERISTICS
(PENTODE CONNECTED)



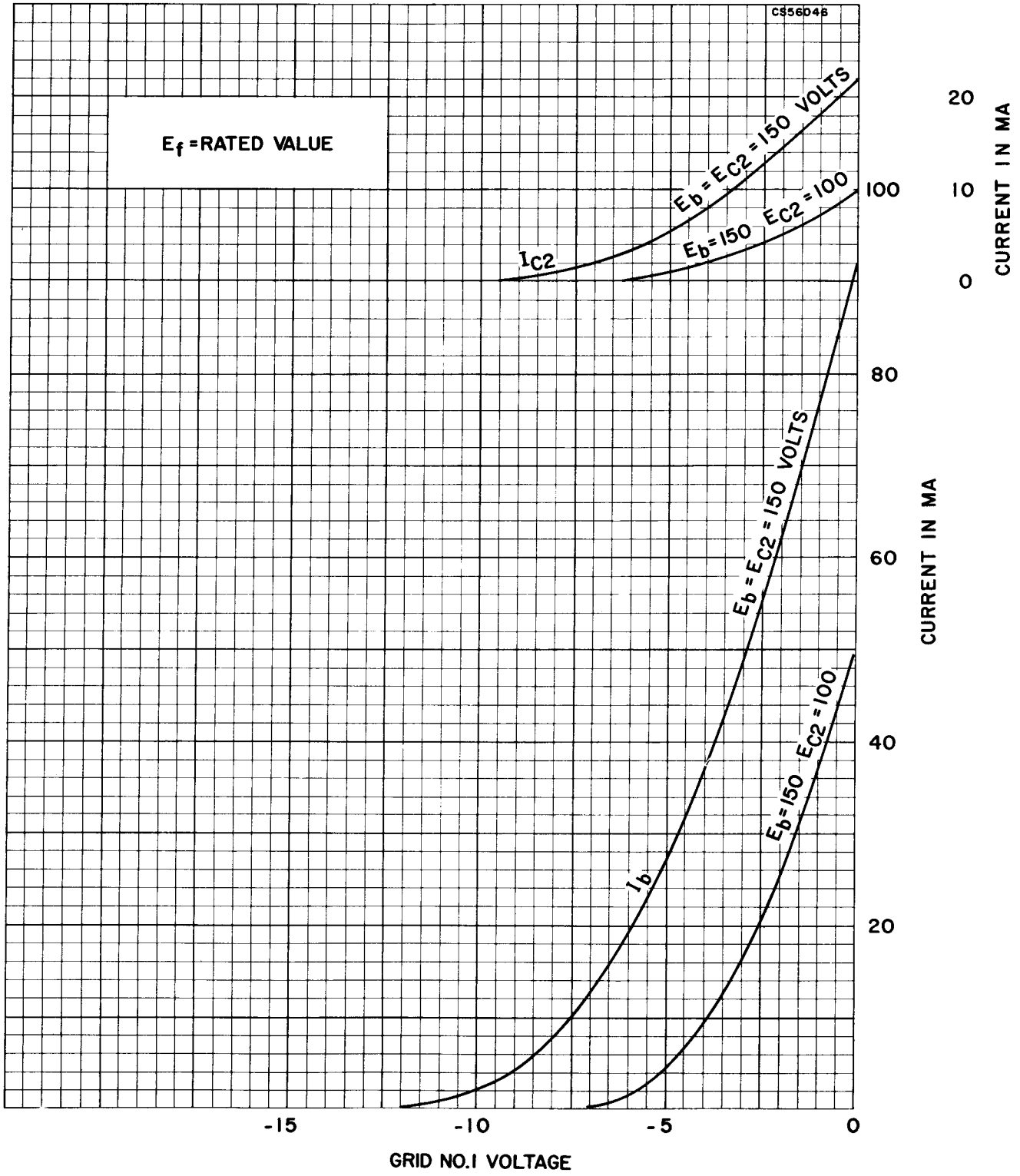
AVERAGE GRID No. 2 CHARACTERISTICS
(PENTODE CONNECTED)



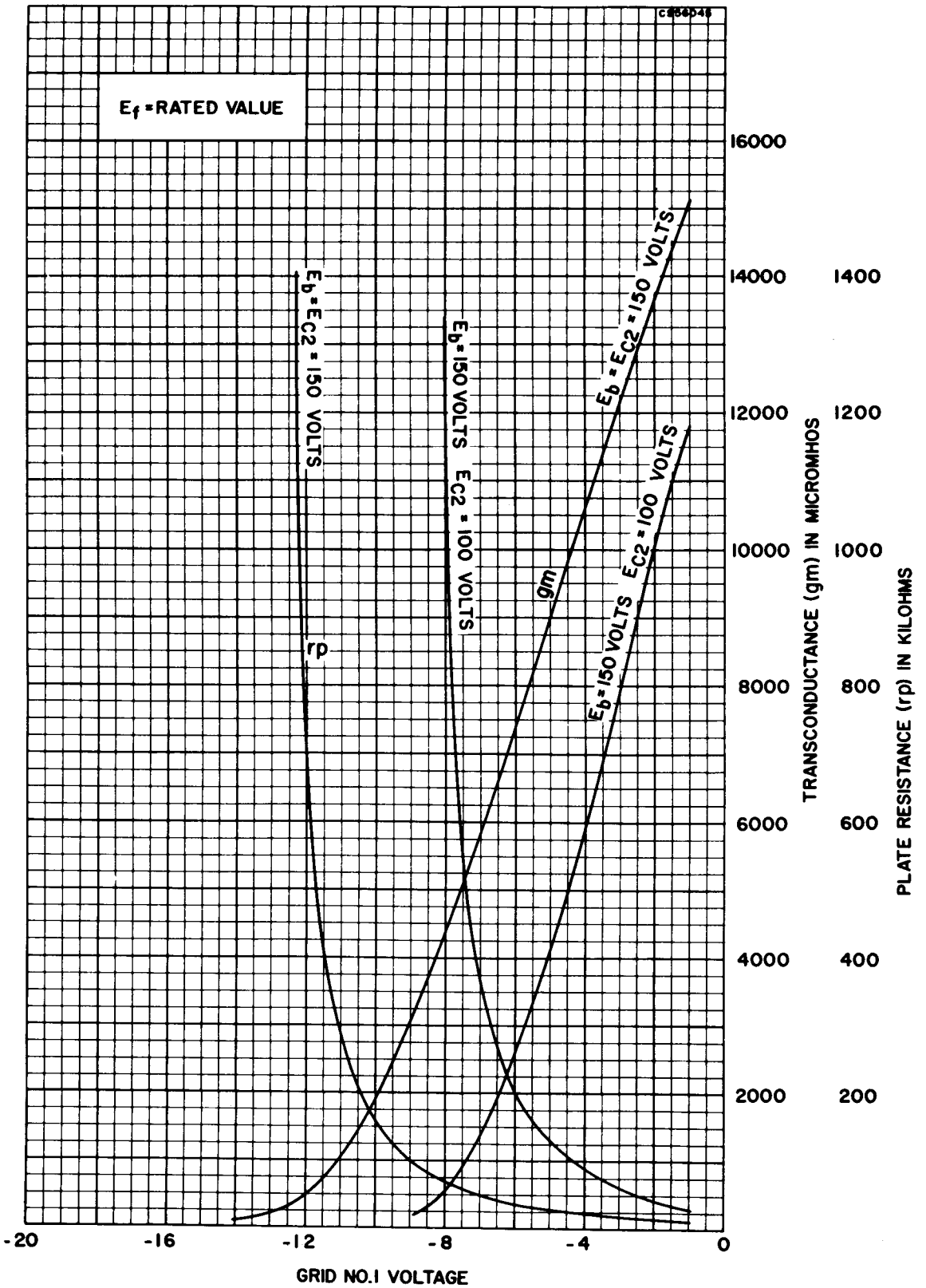
AVERAGE PLATE CHARACTERISTICS
(TRIODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE CONNECTED)



TECHNICAL DATA

5640

Sylvania

TYPE 5640

BEAM POWER AMPLIFIER

TENTATIVE RATINGS

Heater Voltage AC or DC ±10%	6.3	Volts
Max. Plate Voltage	150	Volts
Max. Screen Voltage	140	Volts
Max. Plate Dissipation	3.5	Watts
Max. Screen Dissipation	1.0	Watts
Max. Heater-Cathode Voltage	90	Volts

Direct Interelectrode Capacitances:

	Shielded*	Unshielded	
Grid to Plate	0.18	0.26	uuf.
Input	9.0	9.0	uuf.
Output	7.0	4.0	uuf.

*With a 0.405" diameter shield connected to cathode.

TYPICAL OPERATING CONDITIONS

Heater Voltage	6.3	Volts
Heater Current	0.450	Amperes
Plate Voltage	100	Volts
Screen Voltage	100	Volts
Grid Voltage**	-9.0	Volts
Cathode Bias Resistor	270	Ohms
Plate Current (Zero Signal)	31	Ma.
Plate Current (Max. Signal)	32.0	Ma.
Screen Current (Zero Signal)	2.2	Ma.
Screen Current (Max. Signal)	9.0	Ma.
Transconductance	5000	umhos
Plate Resistance	15,000	Ohms
Load Resistance	3000	Ohms
Power Output (Max. Signal)	1.25	Watts
Distortion	10	%

**Maximum grid circuit resistance should not exceed 0.10 megohm for fixed bias operation and 0.50 megohm for self bias operation.

CIRCUIT APPLICATION

Sylvania Type 5640 is a subminiature beam power output tube designed for use in compact, light-weight equipment.

Notes:

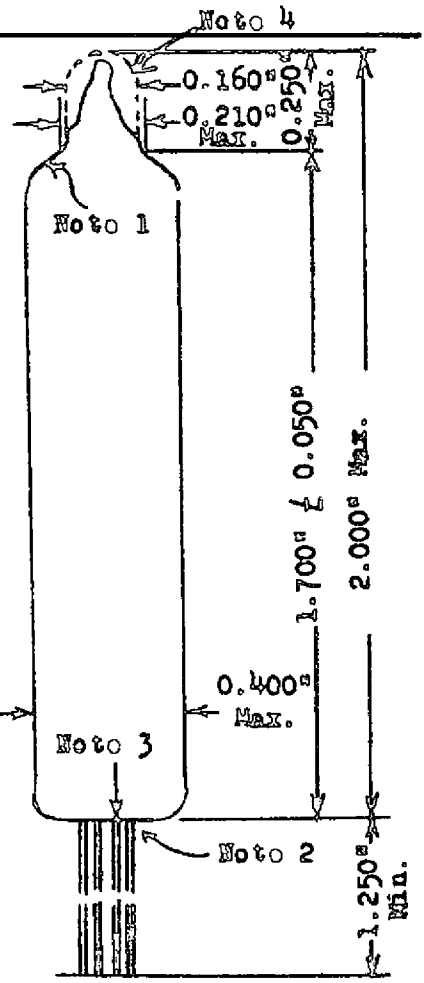
1. Reference diameter from which tip and bulb lengths are determined.
2. Avoid soldering leads closer than ¼" from glass.
3. Arrow indicates position of plate lead.
4. All tips lie within dotted outline.
5. Avoid bending leads closer than 0.060" from glass.

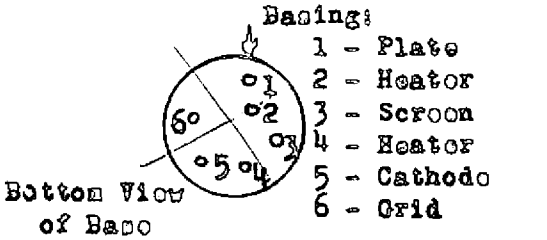
PHYSICAL SPECIFICATIONS

Style	Subminiature
Bulb	T-3
Base	E8-10 Flexible Leads
Dimensions	See outline
Mounting Position	Any

LEAD CONNECTIONS

As per outline





2/10/48

from RMA release # 643, March 20, 1948

SYLVANIA ELECTRIC PRODUCTS INC.
Emporium, Pennsylvania

8DE

SYLVANIA engineering data service 5641

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-3
Basing	6CJ
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	60000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		450	mA

RATINGS[1,4] (Absolute Maximum)

Plate Supply Voltage	330 Vac
Peak Inverse Plate Voltage[5]	930 v
Steady State Peak Plate Current	300 ma
Transient Peak Plate Current	1.1 a
Output Current at 275 Volts Supply	
Choke Input	57 mAdc
Capacitor Input	50 mAdc
Heater-Cathode Voltage[5]	
Heater Positive with Respect to Cathode	465 v
Heater Negative with Respect to Cathode	465 v

CHARACTERISTICS

Tube Voltage Drop for Ib = 90 mAdc	23 Vdc

TYPICAL OPERATION

Half-Wave Rectifier—Capacitor Input to Filter

Plate Supply Voltage	120	235 Vac
Total Plate Supply Impedance	39	270 Ohms
Output Current	48	45 mAdc

Full-Wave Rectifier—Two Tubes

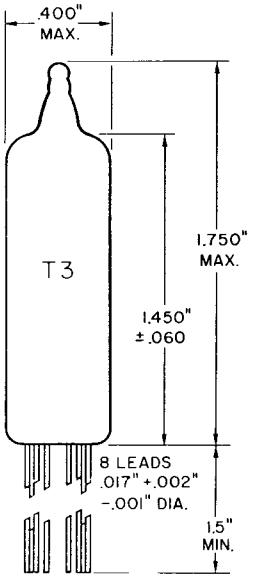
	Capacitor Input	Choke Input
Plate Supply Voltage (Each Plate)	250	300 Vac
Total Plate Supply Impedance (Each Plate)	300	— Ohms
Input Inductance	—	5.0 Henrys
Output Current	90	90 mAdc

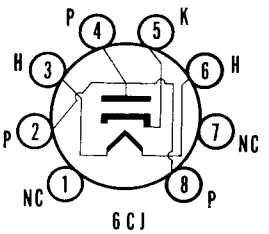
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *Values shown are as registered with RETMA.*
5. *The maximum voltage appearing between any pair of leads shall be no greater than the maximum peak inverse plate voltage.*

QUICK REFERENCE DATA

The 5641 is a Premium Subminiature, high perveance, cathode type, half-wave rectifier designed primarily for use in power supplies.
The 5641 is designed to provide dependable service under conditions of severe shock, vibration, high temperature and high altitude, and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Load Resistance	5000 Ohms
Plate Supply Voltage	275 Vac	Load Capacitance	16 μf
Heater-Cathode Voltage	0 V		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7	(Method A)							
4.10.8	Heater Current: ALD = 36	—	—	432	450	468	—	mA
4.10.8	Heater Current:	0.65	420	—	—	—	480	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +465 Vdc	—	—	—	—	—	50	μAdc
	Ehk = −465 Vdc	—	—	—	—	—	50	μAdc
4.10.13	Operation: Note 4 Io	0.65	47	—	—	—	—	mAdc
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-4)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes: p-all	2.5	10	—	—	—	—	Meg.
4.10.1.1	Emission: Is Eb = 30 Vdc	2.5	100	—	—	—	—	mAdc
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 55 ±5 mm Hg.; Voltage = 550 Vac	6.5	—	—	—	—	—	
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc; Epp = O V	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max	6.5	—	—	—	—	—	
	Post Shock and Fatigue Test End Points: Heater-Cathode Leakage							
	Ehk = +465 Vdc	—	—	—	—	—	100	μAdc
	Ehk = −465 Vdc	—	—	—	—	—	100	μAdc
	Operation Io	—	45	—	—	—	—	mAdc
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2							
4.11.3.1	Survival Rate Life Test: (100 Hours) Note 4 TA = Room	0.65	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives)	—	—	—	—	—	
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Eb = O V	2.5	—	—	—	—	
4.11.5 4.11.3.1	Intermittent Life Test: Notes 3 and 5 Survival Rate Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Operation Io	—	1	3	43	—	mAdc
	Heater Current	—	2	5	414	492	mA
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +465 Vdc	—	—	—	—	100	μAdc
	Ehk = −465 Vdc	—	—	—	—	100	μAdc
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature lead fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater cycling life test
4.11.5	Intermittent life test

3: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the bulb. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

4: In a half-wave circuit, adjust Zp so that a bogey tube gives Io = 50 mAdc. A bogey tube has a tube drop of Etd = 25.0 Vdc at Is = 100 mAdc. Ehk = Eo +117 Vac.

5: In a half-wave life test circuit, the values specified for LR and CL may be considered as approximate and shall be adjusted initially to give not less than Io = 50 mAdc and ib = 250 ma with a bogey tube. Ehk = Eo +117 Vac.

APPLICATION DATA

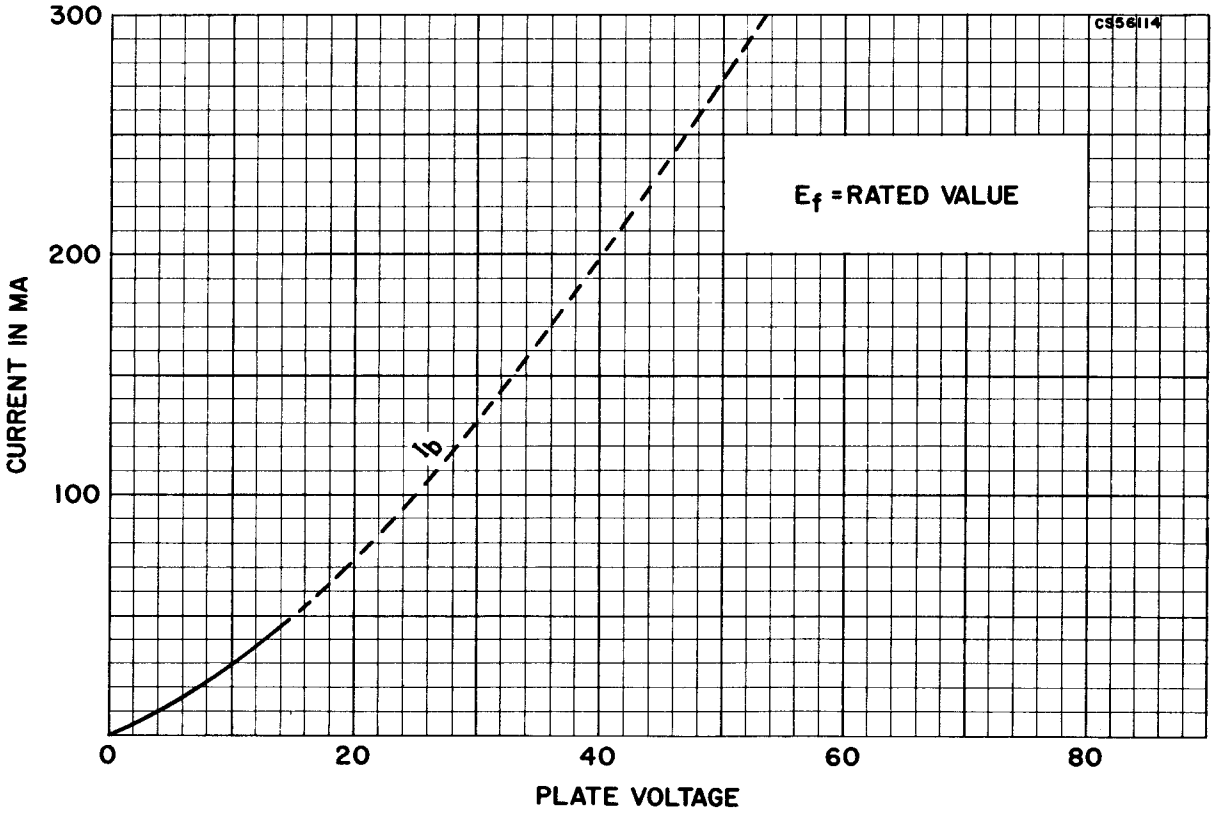
The Sylvania Premium Subminiature Type 5641 is a heater-cathode type diode intended primarily for use as a power supply rectifier where the dc current requirements are not in excess of 45 ma. Where fullwave rectification is desired two 5641's may be used, thus permitting an output current of 90 ma. The 5641 may also be used efficiently in moderate power damping circuits.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicates performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy, reference should be made to the frontal section of this manual.

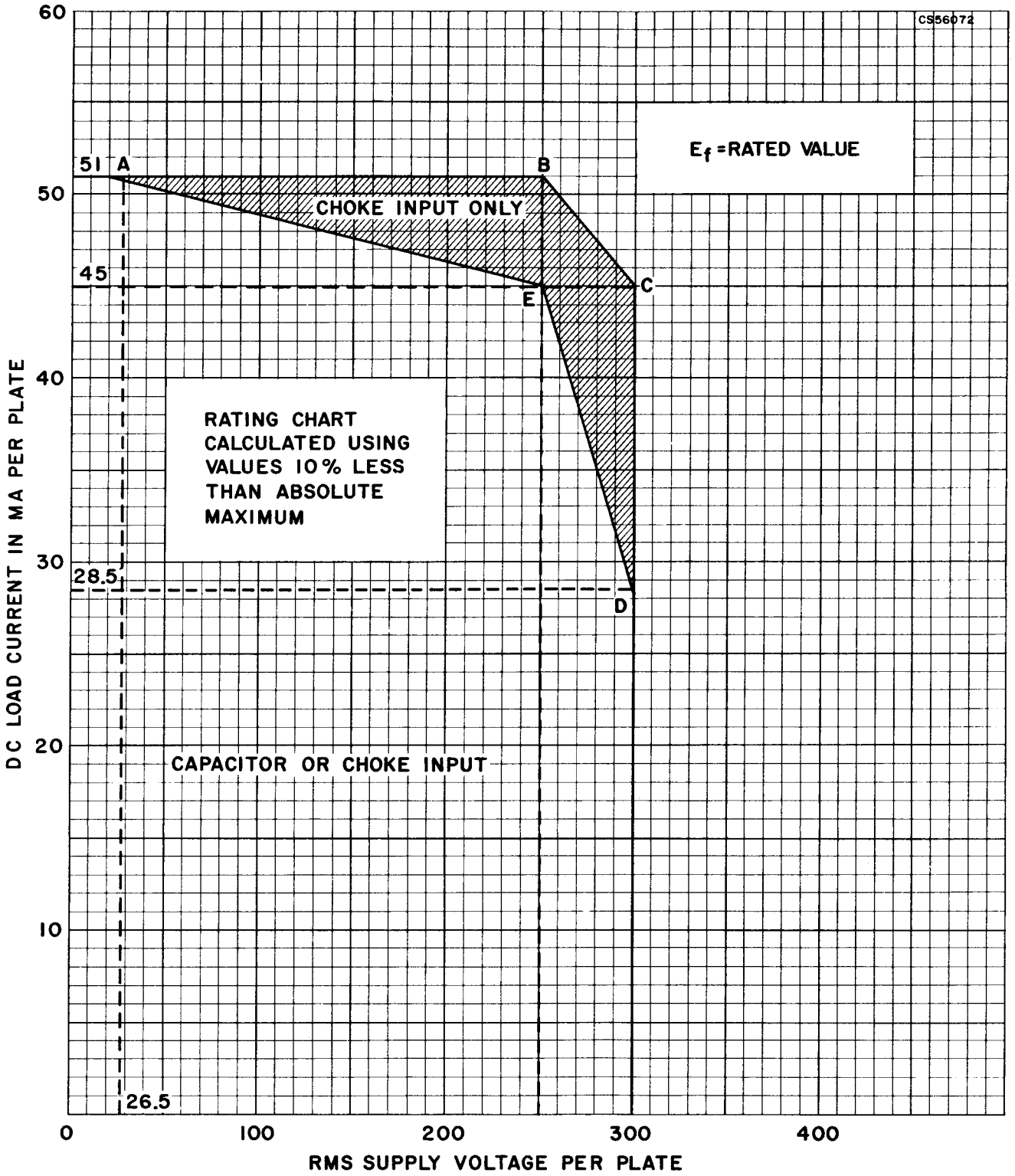
The 5641 is intended for operation under conditions of severe shock, vibration, high temperature, and high altitude and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

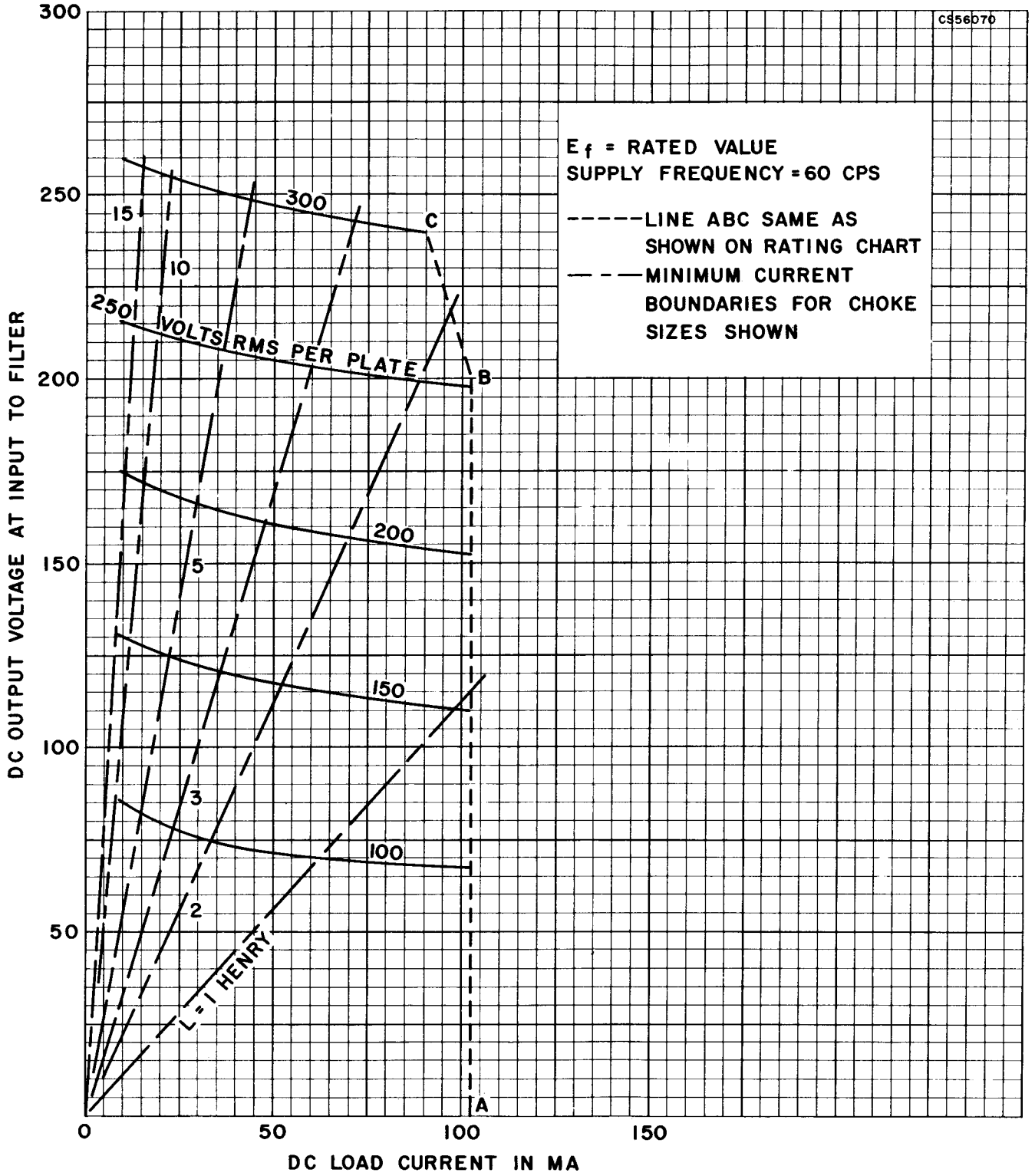
AVERAGE PLATE CHARACTERISTICS



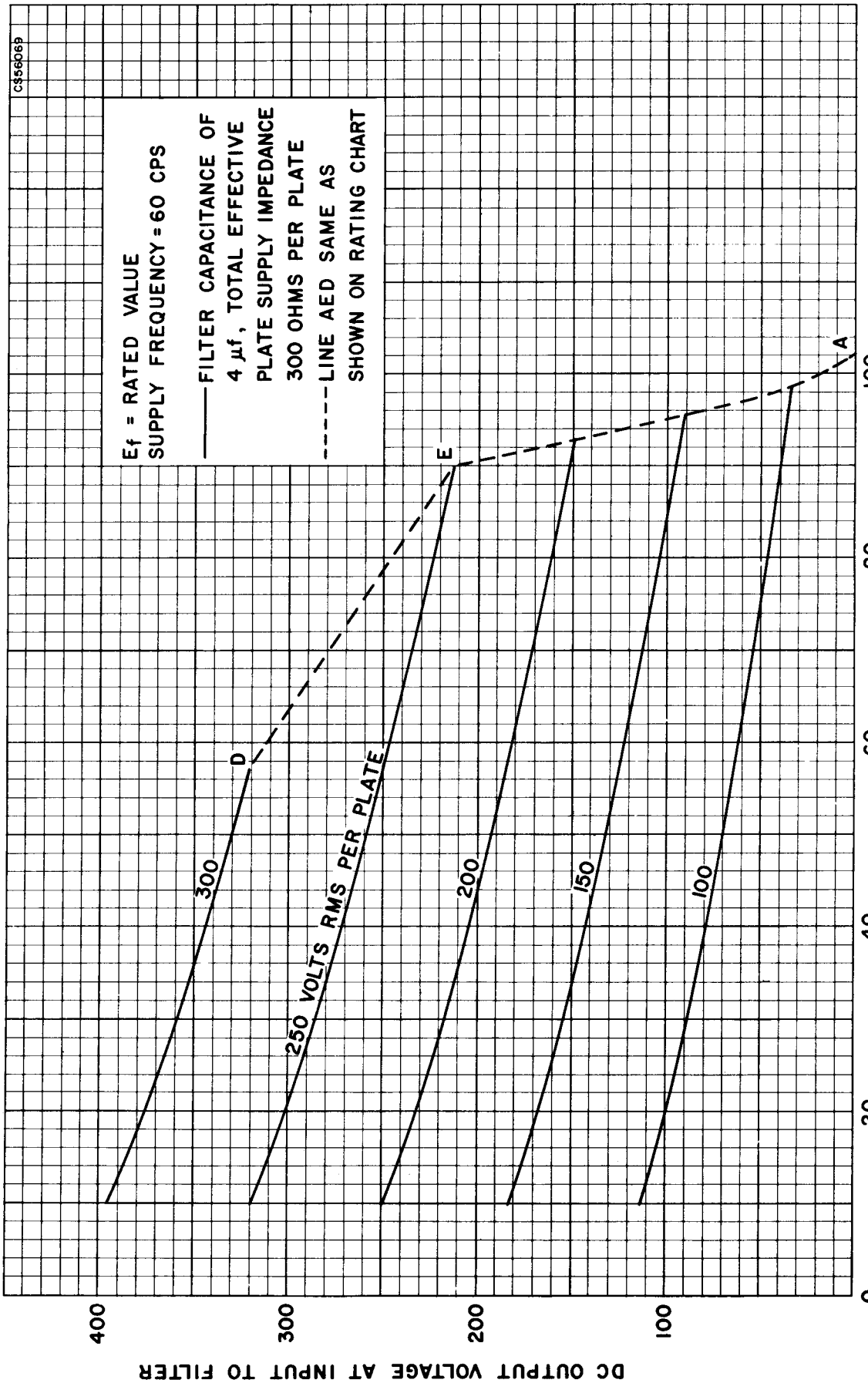
RATING CHART



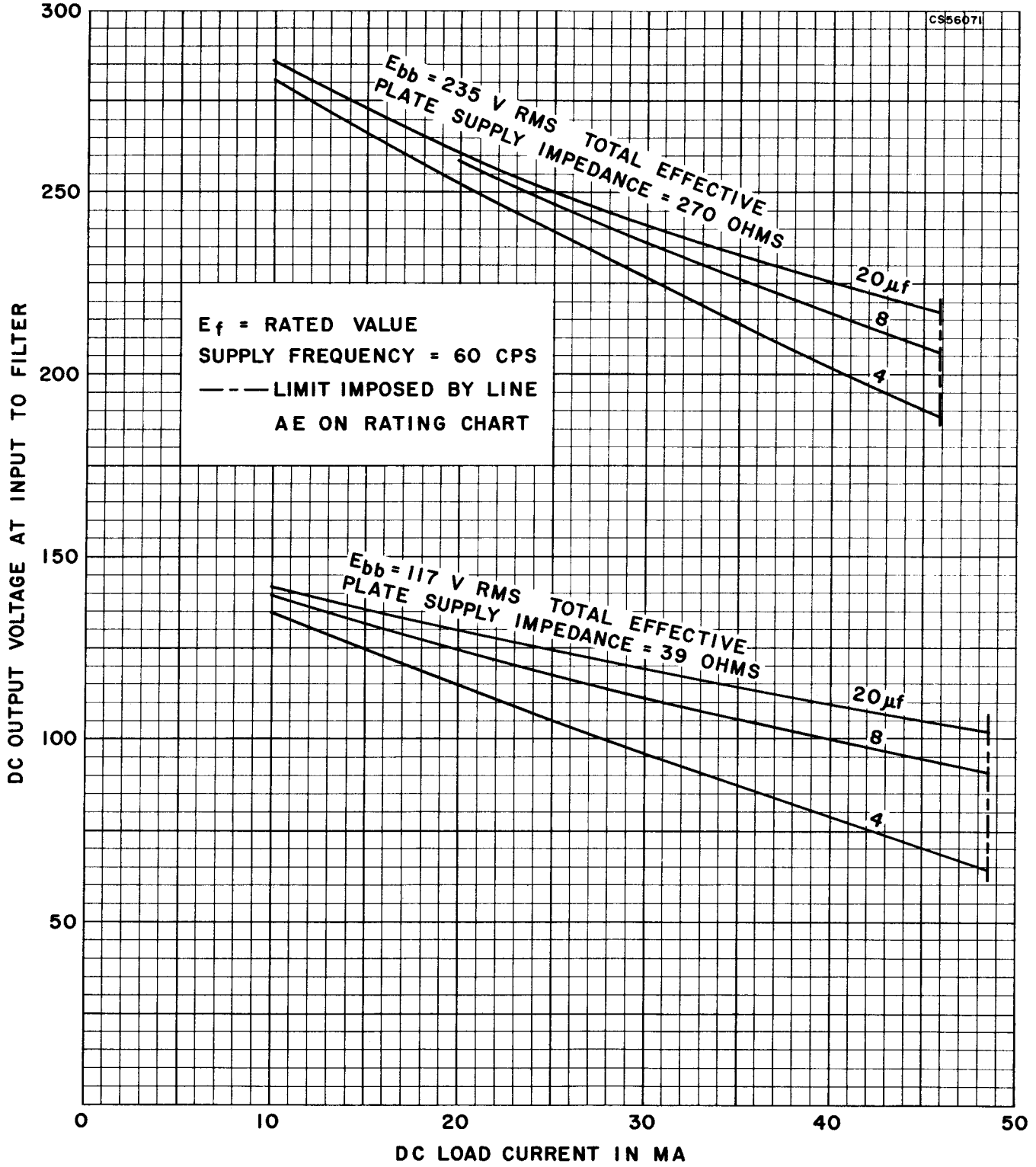
AVERAGE OPERATION CHARACTERISTICS



AVERAGE OPERATION CHARACTERISTICS



AVERAGE OPERATION CHARACTERISTICS



SYLVANIA engineering data service 5643

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DD
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	125° C Max.
	−55° C Min.
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.	
Heater Voltage[3]	6.0	6.3	6.6	V
Heater Current		150		mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid No. 1 to Anode	0.08	0.11 μμf
Grid No. 1 to All Other Electrodes	1.70	1.60 μμf
Anode to All Other Electrodes	1.60	1.50 μμf

RATINGS[1 & 5] (Absolute Maximum — Except as Noted)

Absolute Minimum Cathode Heating Time	10 Seconds
Peak Forward Anode Voltage	500 v
Peak Inverse Anode Voltage	500 v
Negative Grid No. 1 Voltage	
Before Conduction	200 Vdc
During Conduction	10 Vdc
Negative Grid No. 2 Voltage	
Before Conduction	100 Vdc
During Conduction	10 Vdc
Cathode Current	16 mAdc
Peak Plate Current[6]	100 ma
Peak Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	25 v
Heater Negative with Respect to Cathode	100 v
Grid No. 1 Resistor	10 Meg

CHARACTERISTICS

Tube Voltage Drop for Ib = 20 mAdc	10 Vdc

TYPICAL OPERATING CONDITIONS

Anode Voltage	150 Vac
Grid No. 2 Voltage[7]	0 Vac
Grid No. 1 Voltage[8]	5.0 Vac
Peak Grid No. 1 Signal Voltage	5.0 v
Anode Resistor	3750 Ohms
Grid No. 1 Resistor	1.0 Meg

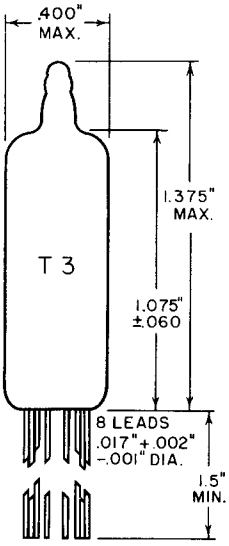
NOTES:

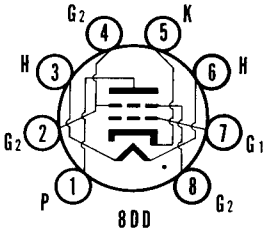
1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Averaged over three seconds maximum.*
7. *The No. 2 grid shall not be used for control purposes.*
8. *Bias voltage, 180° out of phase with anode voltage.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5643 is a tetrode thyratron designed for use in counters, control circuits, as a grid-controlled rectifier and other light duty applications under conditions of severe shock, vibration, high temperature and high altitude.

The Sylvania Type 5643 is manufactured to meet the applicable specification for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

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Prepared and Released By The
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FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage . . . . . 6.3 V
Grid No. 2 Voltage . . . . . 0 V
Heater-Cathode Voltage . . . . . 0 V

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7 4.10.8	(Method A) Heater Current: ALD = 12	—	—	144	150	156	—	mA
4.10.8	Heater Current:	0.65	140	—	—	—	160	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +25 Vdc	—	—	—	—	—	10	μAdc
	Ehk = —100 Vdc	—	—	—	—	—	10	μAdc
4.10.17.1	Grid Voltage (1): Epp = 350 Vac; Rg1 = 0.1 Meg; Rp = 10,000 Ohms	0.65	-2.0	—	—	—	-4.0	Vdc
4.10.17.1	Grid Voltage (2): Epp = 350 Vac; Rg1 = 10 Meg; Rp = 10,000 Ohms	0.65	—	—	—	—	-6.0	Vdc
4.10.17.2	Anode Voltage: Vary Ebb; Ec1 = O V; Rg1 = 0.1 Meg; Rp = 10,000 Ohms	0.65	—	—	—	—	26	Vdc
4.7.5.	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.10.24	Pulse Emission: epy = eg1 = eg2 = 180 ±9 v; tp = 5 ±0.25 μs; tr = 0.5 μs max.; tf = 1.0 μs max.; prr = 120 ±5 pps; tk = 5 sec min.; Ra = 150 Ohms ±5%, noninductive; Rp = 100 Ohms ±5%, noninductive; Dummy = 50 Ohms ±5%, noninductive	2.5	—	—	—	—	76	v
4.9.20.3	Vibration: No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
Degradation Rate Acceptance Tests, Note 3								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°	—	—	—	—	—	—	
4.9.20.6	Fatigue: Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
- - - -	Post Shock and Fatigue Test End Points: Heater-Cathode Leakage							
	Heater Positive	—	—	—	—	—	20	μAdc
	Heater Negative	—	—	—	—	—	20	μAdc
	Anode Voltage	—	—	—	—	—	26	Vdc
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 3							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Eb = Ec1 = Ec2 = O V; Ehk = 18 Vac	2.5	—	—	2500	—	Cycles
4.11.3.1	Survival Rate Life Test: (100 Hours) Notes 2 and 5 Ib = 16 mAdc; ib = 100 ma; Rg1 = 50,000 Ohms min.; Epp = 350 Vac; Ehk = 100/25 Vdc; Rp = 5000 Ohms approx.; TA = Room	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	
4.11.3.1 4.11.5	Intermittent Life Test: Notes 2, 4 and 5 Survival Rate Life Test, tk = 10 sec max.; T Envelope = +125°C min.	—	—	—	—	—	
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Heater Current	—	2	5	138	164	mA
	Grid Voltage (1)	—	1	3	-0.8	-5.0	Vdc
	Anode Voltage	—	1	3	—	70	Vdc
	Pulse Emission	—	2	5	—	100	v
	Heater-Cathode Leakage	—	2	5	—	—	
	Heater Positive	—	—	—	—	20	μAdc
	Heater Negative	—	—	—	—	20	μAdc
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical, shall be one percent. A tube having one or more defects shall be counted as one defective.

2: Phase of grid voltage shall be adjusted to provide start of conduction at the peak of the applied anode voltage.

3: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3 Subminiature lead fatigue
4.9.20.5 Shock
4.9.20.6 Fatigue
4.11.7 Heater cycling life test
4.11.5 Intermittent life test

4: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

5: Cycling shall be 30 seconds positive voltage and 30 seconds negative voltage.

APPLICATION DATA

The 5643 is a Premium Subminiature tetrode thyratron designed for use in counters, grid-controlled rectifiers and other control circuits. This tube has a control characteristic which is virtually independent of ambient temperature over a comparatively wide range.

The No. 1 grid circuit resistance may be as high as 10 megohms, if required to obtain maximum signal from a high impedance source. When this high resistance is used, the tube base must be kept clean and dry to reduce leakage currents to a minimum. If a socket is used, precautions must also be taken to keep socket leakage to a minimum. When a high No. 1 grid resistance is used with a c anode voltage, the grid-anode circuit capacitance should be reduced as much as possible to prevent erratic firing due to line voltage surges. For the usual application, it is recommended that lower values of grid resistance be employed. Values as low as 0.1 megohm are satisfactory for many applications.

As is customary for all gas tubes using oxide-coated cathodes, certain precautions must be observed. To prevent damage to the cathode, the heater voltage must not deviate more than ±5% from the rated value. Low voltage operation reduces cathode temperature and results in cathode sputtering, hot spots and eventual destruction of the cathode. Higher cathode temperatures, due to increased heater voltage, can cause erratic firing voltages.

APPLICATION DATA (Continued)

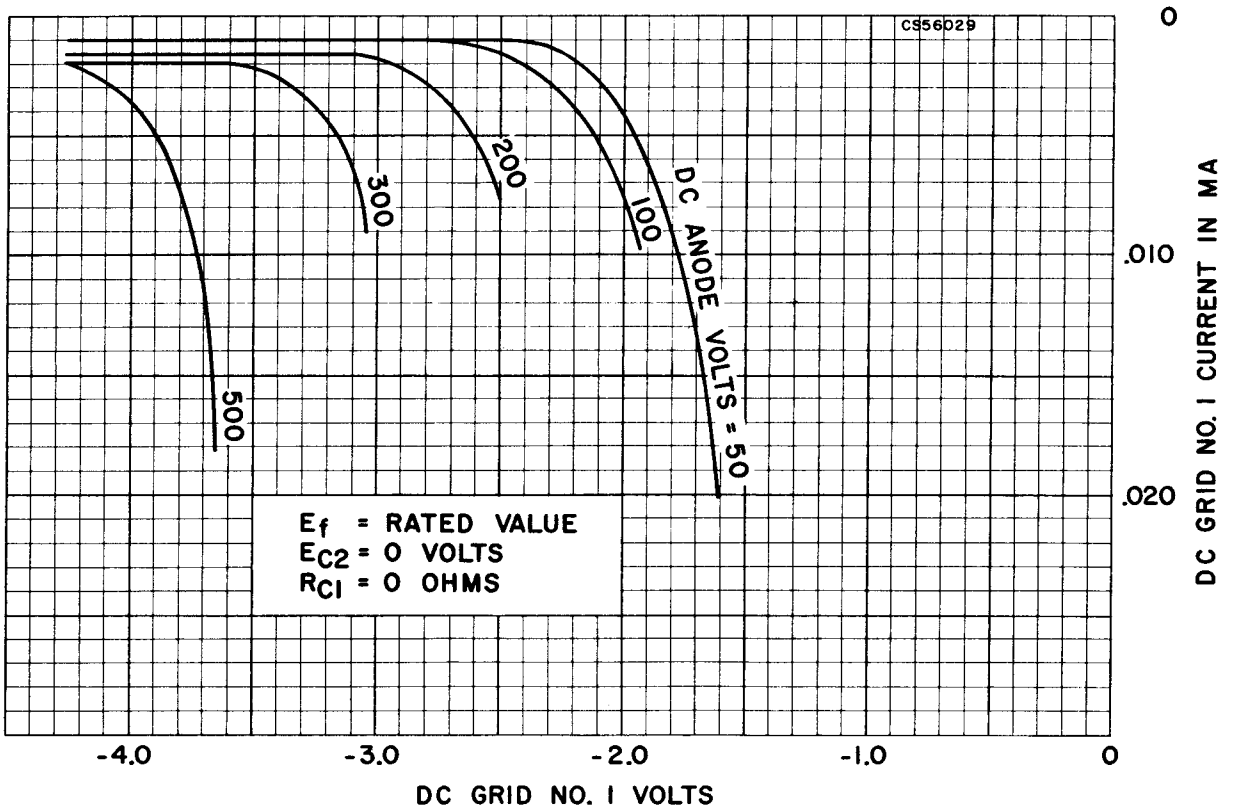
At least 10 seconds should be allowed to permit the cathode to reach normal operating temperature before anode voltage is applied.

Whenever possible, it is recommended that no difference of potential exist between cathode and heater. In circuits where the cathode is not directly connected to the heater, the potential difference between them should not exceed recommended peak values shown in the tabulated data.

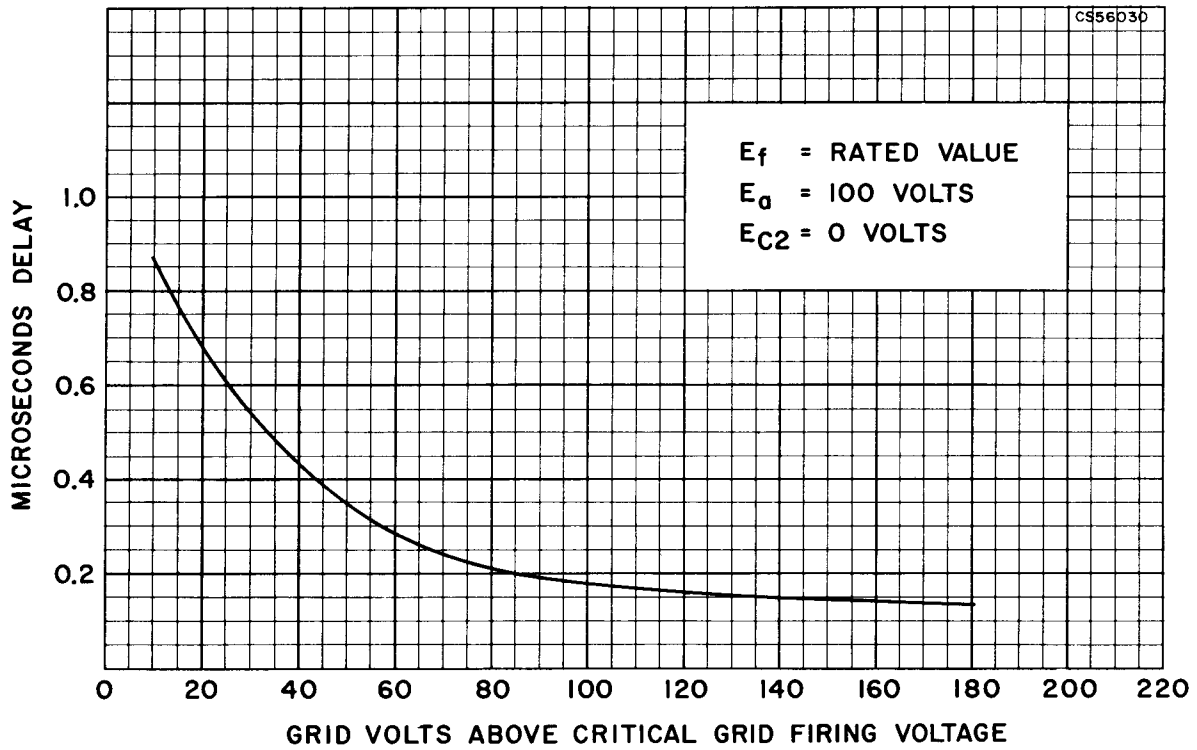
The 5643 is designed to provide long life and stable operation under conditions of severe shock, vibration, high altitude and high temperature. The 5643 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability. Life expectancy is described by the life tests specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

The information presented on this data sheet is furnished without assuming any obligation.

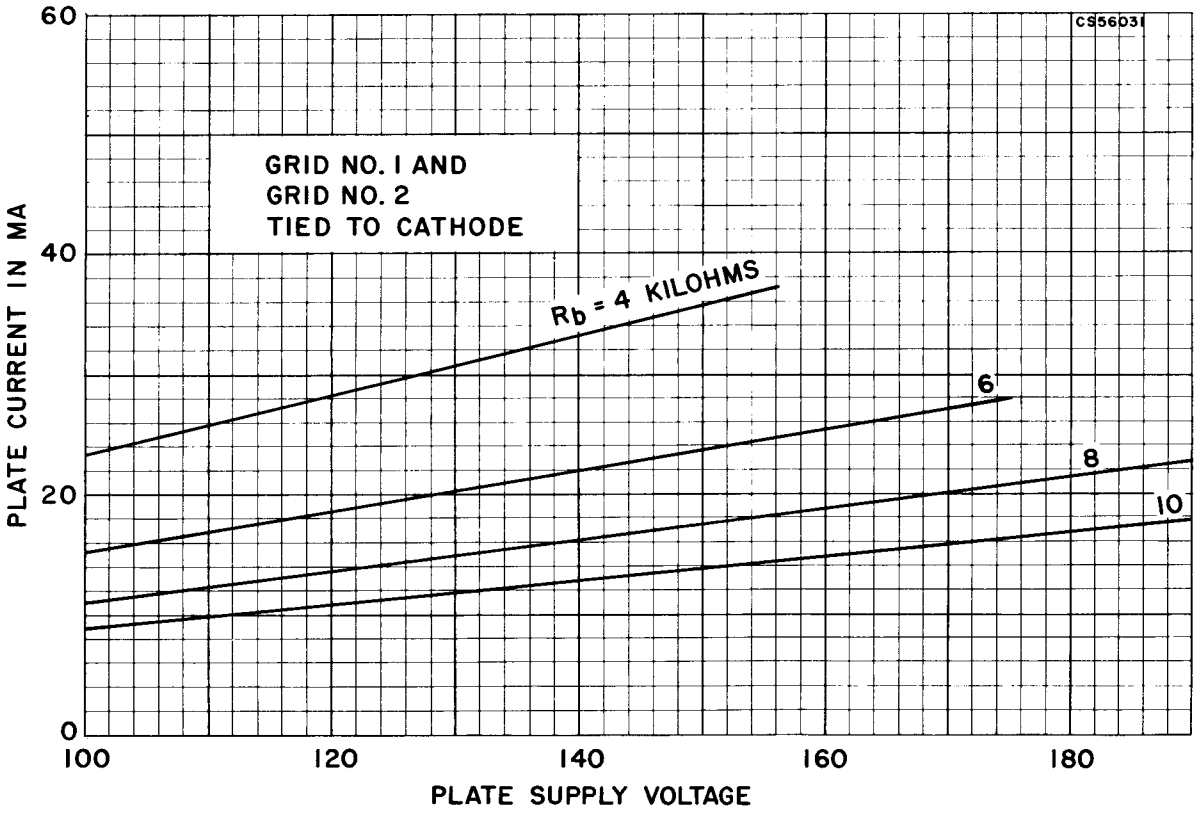
AVERAGE GRID CHARACTERISTICS BEFORE ANODE CONDUCTION



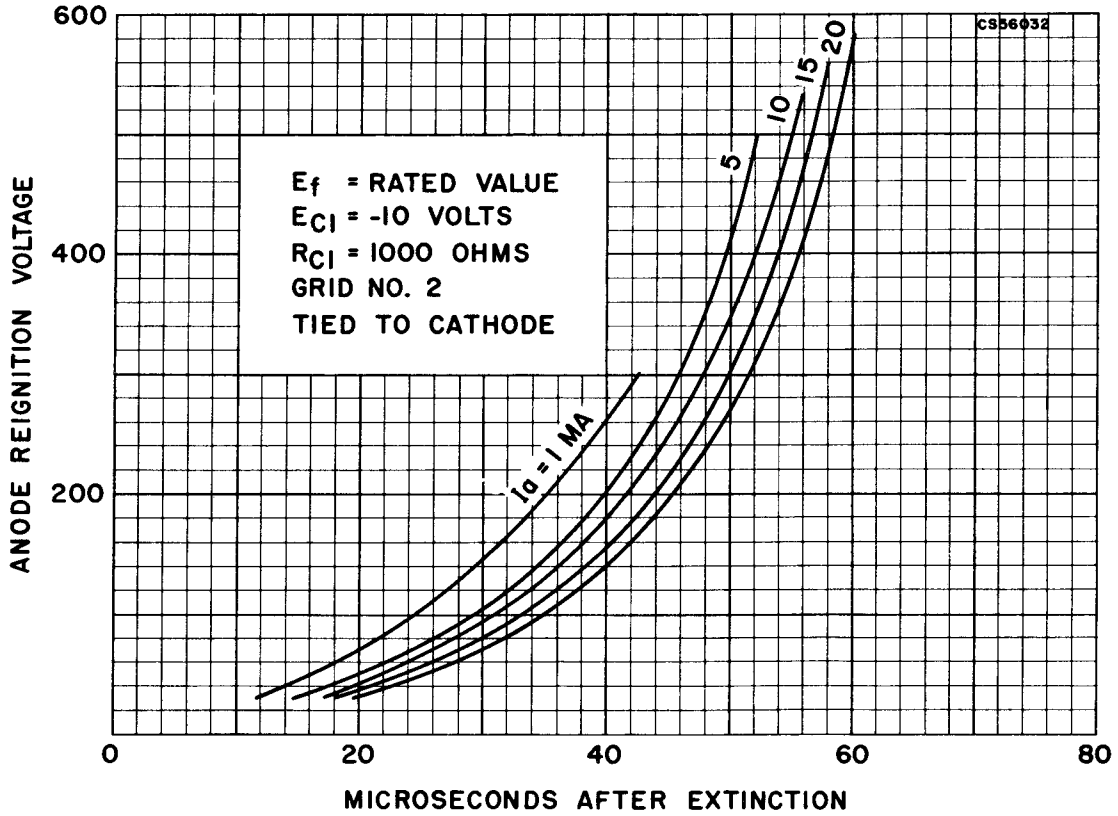
AVERAGE IONIZATION CHARACTERISTICS



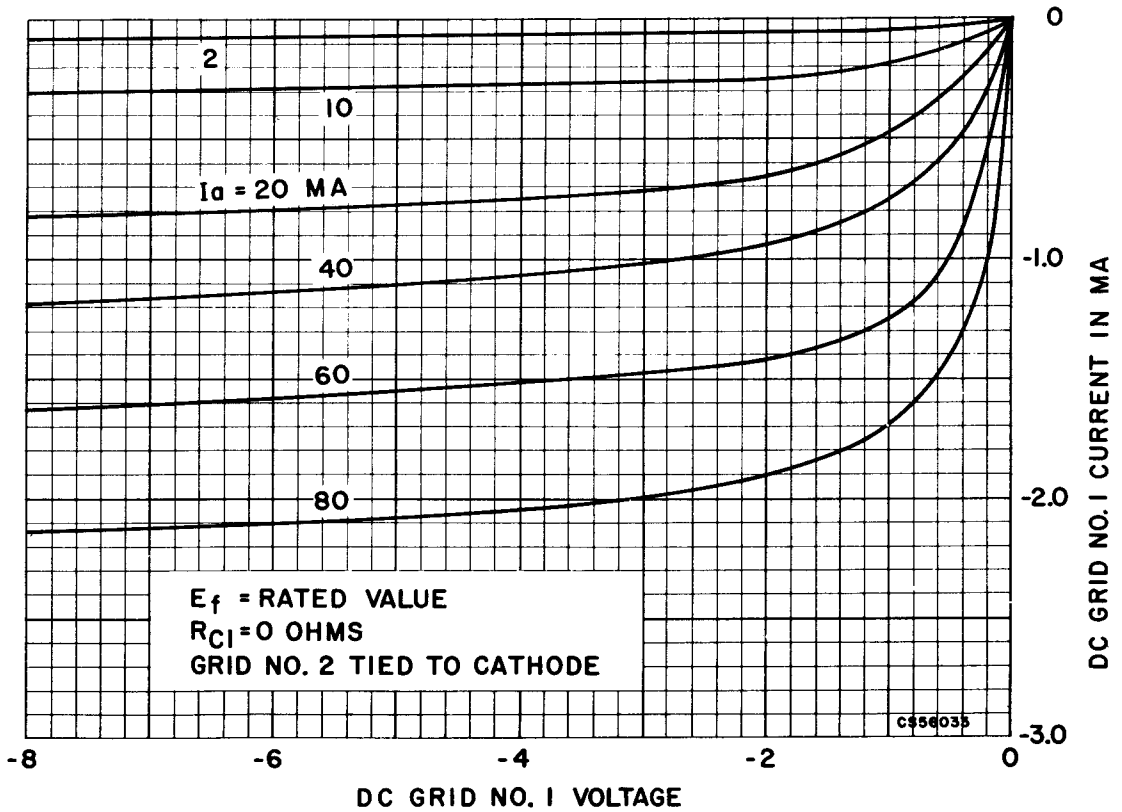
AVERAGE REGULATION CHARACTERISTICS



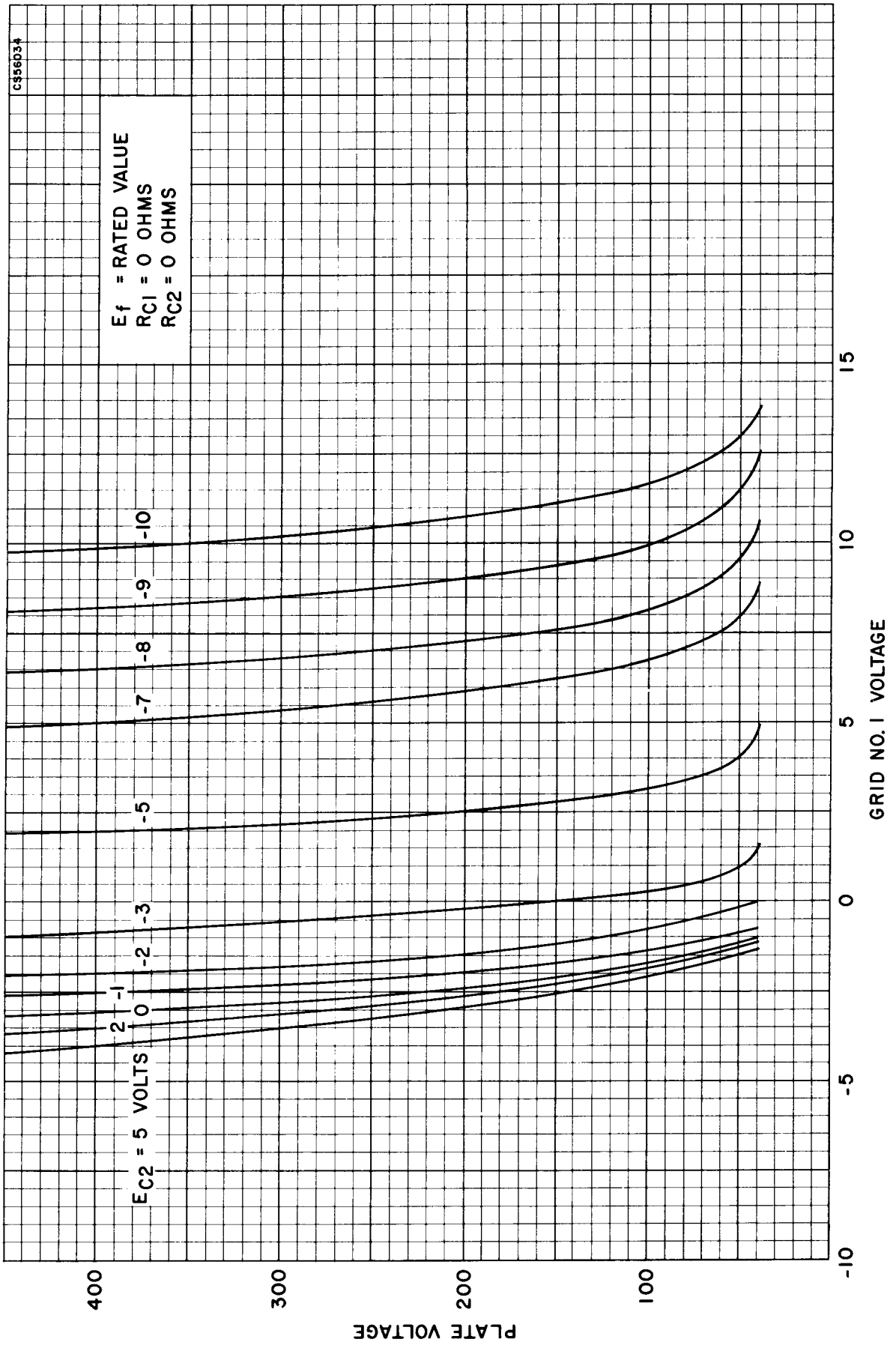
AVERAGE DEIONIZATION CHARACTERISTICS



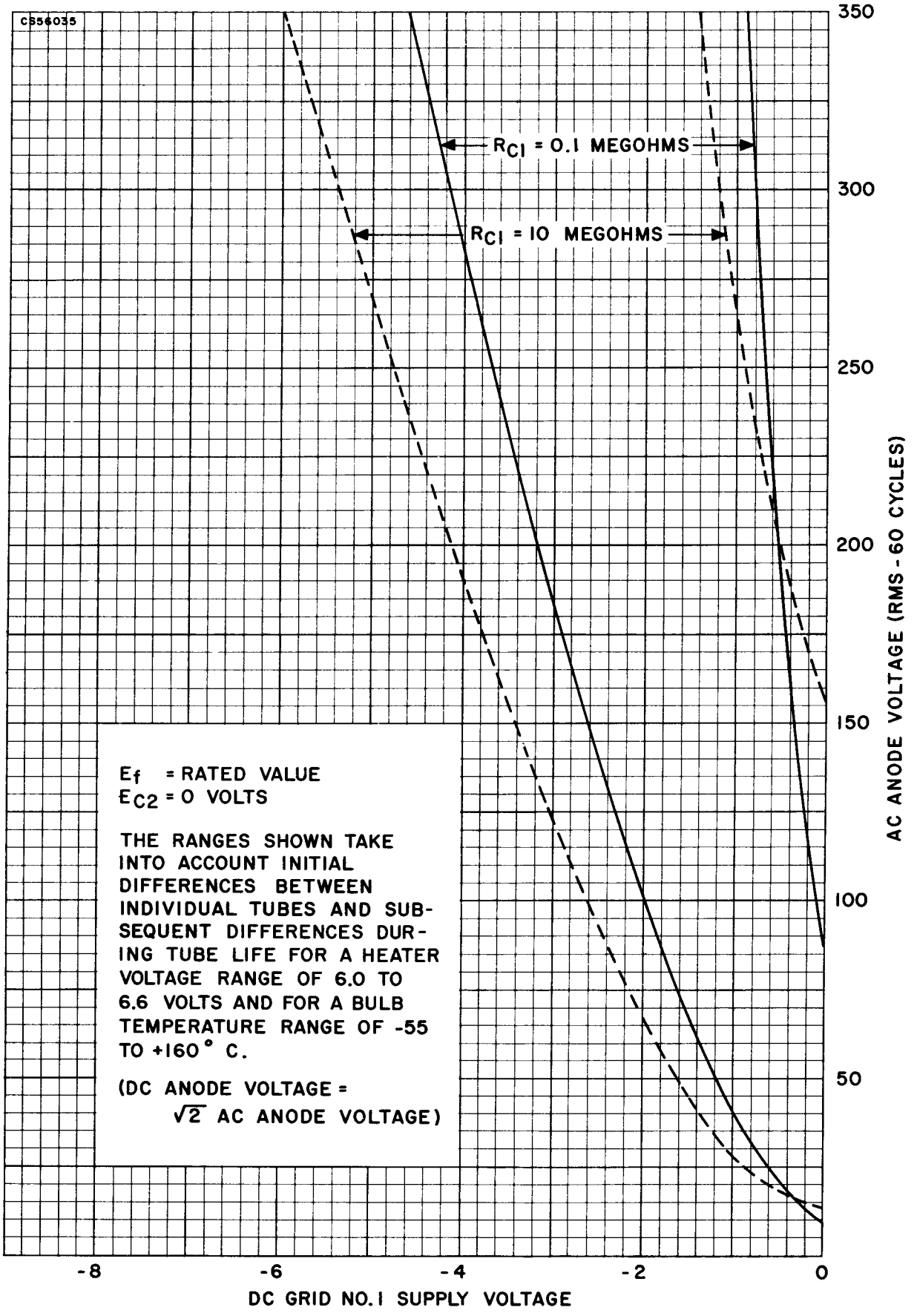
AVERAGE GRID CHARACTERISTICS BEFORE ANODE CONDUCTION



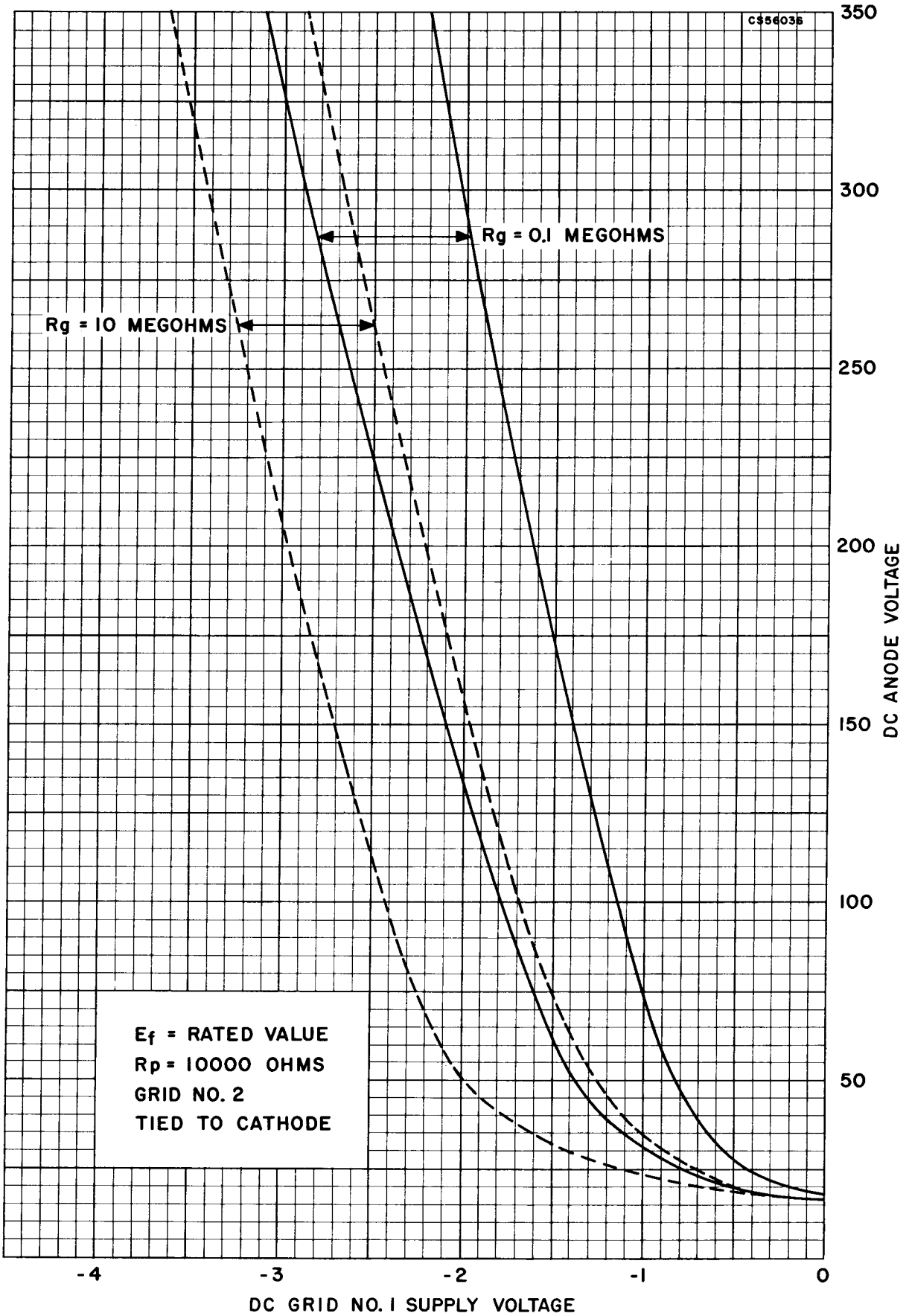
AVERAGE CONTROL CHARACTERISTICS



OPERATIONAL RANGE OF CRITICAL GRID VOLTAGE



INITIAL OPERATING RANGE OF CRITICAL GRID VOLTAGE



SYLVANIA engineering data service 5644

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-4
Basing	4CN
Cathode	Cold
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C Max. −55° C Min.
Altitude	80000 Ft.

ELECTRICAL DATA

RATINGS[1 & 2] (Absolute Values)

Minimum Starting Supply Voltage	130 Vdc
DC Operating Current	25 mAdc Max. 5 mAdc Min.

CHARACTERISTICS

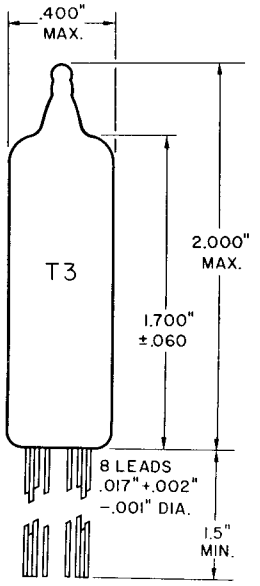
DC Operating Voltage	95 Vdc
Voltage Regulation[3]	5 Vdc Max.

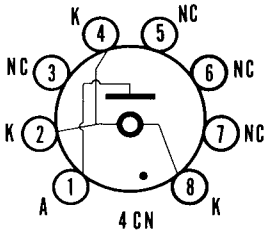
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *Values shown are as registered with RETMA.*
3. *Greatest change in operating voltage as operating current is varied between 5 and 25 milliamps.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5644 is a cold cathode, glow discharge voltage regulator. It has an operating voltage of approximately 95 volts and is designed to provide dependable service under conditions of severe shock, vibration, high temperature and high altitude. The 5644 is manufactured and inspected to meet the applicable specification for reliability.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Plate Supply Voltage Note 1 . . . . . 150 Vdc

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	Symbol	Limits Min.	Limits Max.	Units
Production Tests					
4.13.1	Ionization Voltage (2): Rp/Ib = 25 mAdc; Illumination = 5 to 50 foot candles	(2) Ez	—	120	Vdc
4.13.2	Tube Voltage Drop (1): Rp/Ib = 5 mAdc	(1) Etd	85	—	Vdc
4.13.2	Tube Voltage Drop (2): Rp/Ib = 25 mAdc	(2) Etd	—	105	Vdc
4.13.2.1	Regulation: (2) Etd — (1) Etd	Reg	—	5.0	Vdc
4.13.4.2	Oscillation: RL = 500 Ohms; Eb/Ib = 5 to 25 mAdc	Esig	—	15	mV
Special Design Tests					
4.9.5.3	Subminiature Lead Fatigue:	—	4	—	arcs
4.13.4.3	Noise: Ebb/Ib = 25 mAdc	EB	—	15	mVac
Design Tests					
4.13.3	Leakage: Eb = 50 Vdc	LIB	—	10.0	μAdc
Degradation Tests					
4.9.20.5	Shock: Hammer Angle = 30°	—	—	—	
4.9.20.6	Fatigue: No. Voltages; Notes 2 and 3	—	—	—	
- - - - -	Post Shock and Fatigue Test End Points:				
	Ionization Voltage (2)	(2) Ez	—	130	Vdc
	Regulation	Reg	—	5.0	Vdc
Acceptance Life Tests					
4.11.5	Intermittent Life Test (1): Note 4 Rp/Ib = 25 mAdc; TA = Room	t	500	—	Hours
4.11.4	Intermittent Life Test End Points (1): (500 Hours)				
	Ionization Voltage (2)	(2) Ez	—	125	Vdc
	Tube Voltage Drop (1)	(1) Etd	82	—	Vdc
	Tube Voltage Drop (2)	(2) Etd	—	108	Vdc
	Regulation	Reg	—	5.0	Vdc

ACCEPTANCE CRITERIA NOTES:

1: Fixed resistor may be used and Ebb varied to give desired current.

2: Acceptance sampling procedure shall be in accordance with the shock test sampling procedure of the Inspection Instructions for Electron Tubes.

3: A frequency of 60 cps; G = 2.5 may be used as an alternate test.

4: At the conclusion of the 500 hour life test, the average life of the life test sample shall be not less than 475 hours. Life test sample size shall be 10 tubes. Provision for release of tubes prior to completion of life test on reduced basis as specified in 4.3.1.3 Inspection Instructions for Electron Tubes shall not apply.

APPLICATION DATA

The 5644 is a Premium Subminiature, cold cathode, gas-filled, glow discharge type voltage regulator characterized by long life and stable performance under conditions of severe vibration, shock, high altitude and high temperature.

This tube is constructed with three cathode leads, which provide a rugged mount support and additional external tie points. There are four tube leads with no internal connection. Since these leads extend through the base into the tube, however, they may influence operation of the tube if high voltages are connected to them. For this reason, the use of these leads for circuit tie points is not recommended.

A circuit for use with a 5644 regulator is shown in Figure 1. In this circuit the value of R and the nominal value of supply voltage must be chosen such that the current in the 5644 is maintained within the 5 to 25 milliampere rated limits. Consideration should be given to expected supply voltage variation and to load changes or load removal.

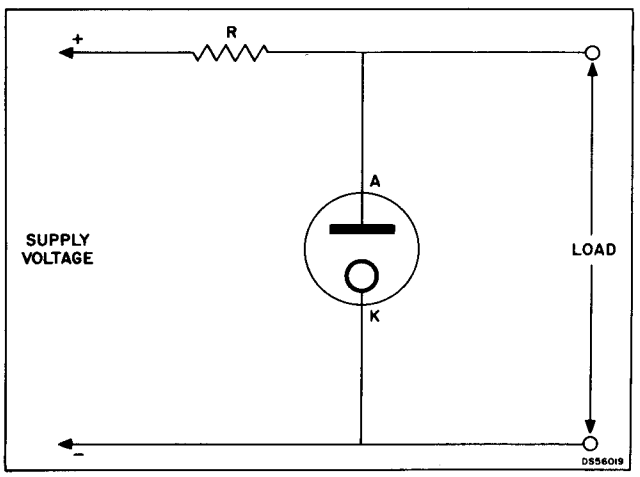


Figure 1—Basic regulator circuit.

When the equipment is first turned on, a starting current in excess of the average operating current is normally encountered. The surge starting current should never be more than double the maximum operating current. When relatively high starting currents are experienced, the tube may take a few minutes to drop to its normal regulating voltage. Similarly, the regulation is affected by changes in the operating current, and by the length of time for which the tube has been conducting this current. If the tube current is suddenly reduced to 5 milliamperes after a long period at 25 milliamperes, the tube will regulate at a slightly different voltage than if it had been conducting 5 milliamperes for the entire period. In like manner, the regulation voltage at a fixed current may vary slightly depending upon the length of periods of idleness. These variations are normal, and typical of all glow-discharge regulator tubes, and need not be considered in any except very precise applications. If the associated circuit has a capacitor shunting the 5644, care must be exercised to prevent peak starting currents from reaching excessively high values.

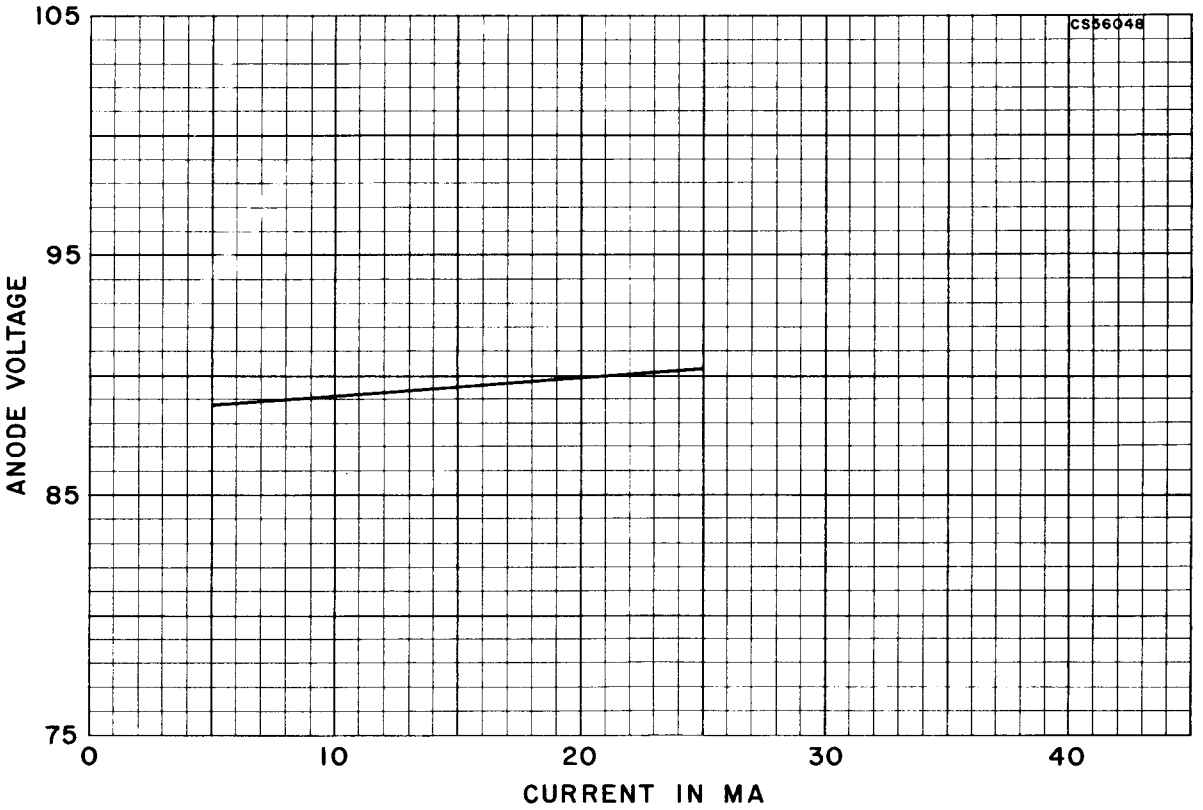
The type 5644 is intended for use as a regulator as shown in Figure 1 and is not well suited for use in voltage reference circuits which provide only a few milliamperes of reference tube current. The 5644 may be operated in series, but parallel operation is not recommended.

The 5644 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability.

Life expectancy is described by the life tests, specified on the attached page and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

The information presented on this data sheet is furnished without assuming any obligation.

AVERAGE REGULATION CHARACTERISTICS



TECHNICAL DATA

5645

Sylvania

TYPE 5645

MEDIUM MU TRIODE

TENTATIVE RATINGS

Heater Voltage AC or DC ±10%	6.3	Volts
Max. Plate Voltage	150	Volts
Max. Plate Dissipation	1.0	Watt
Max. Heater-Cathode Voltage	90	Volts

Direct Interelectrode Capacitances:

	Shielded*	Unshielded	
Grid to Plate	1.70	1.60	mmf.
Input	2.20	2.00	mmf.
Output	3.00	1.00	mmf.

*With a 0.315" diameter shield connected to cathode.

PHYSICAL SPECIFICATIONS

Style	Subminiature
Bulb	T2
Base	Flexible Leads
Dimensions	See outline
Mounting Position	Any

LEAD CONNECTIONS

As per outline

TYPICAL OPERATING CONDITIONS
Class A Amplifier

Heater Voltage	6.3	Volts
Heater Current	150	Ma.
Plate Voltage	100	Volts
Cathode Bias Resistor**	560	Ohms
Plate Current	5.0	Ma.
Transconductance	2700	umhos
Plate Resistance	7400	Ohms
Amplification Factor	20	
Grid Voltage for 10 ua. Plate Current (Approx.)	-20	Volts

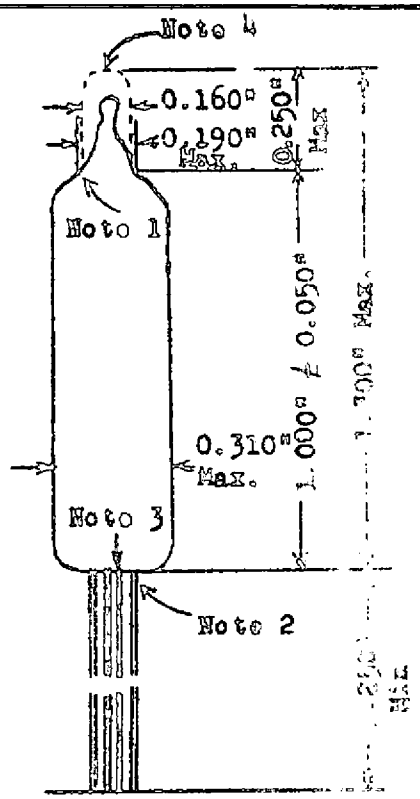
**Provides an operating bias of approximately 2.8 volts.
Maximum grid circuit resistance should not exceed 1.0 megohm.

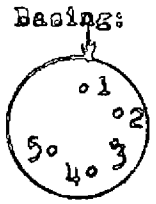
CIRCUIT APPLICATION

Sylvania Type 5645 is a subminiature medium mu triode designed for use in compact, light-weight equipment.

When circuit requirements do not permit the use of self bias, fixed bias may be used but the maximum grid circuit resistance in this case should not exceed 0.25 megohm.

Notes:
1. Reference diameter from which tip and bulb lengths are determined.
2. Avoid soldering leads closer than ⅛" from glass.
3. Arrow indicates position of plate lead.
4. All tips lie within dotted outline.
5. Avoid bending leads closer than 0.060" from glass.





Bottom View of Base

Basing: 1 - Plate
2 - Cathode
3 - Heater
4 - Grid
5 - Heater

2/10/48

SYLVANIA ELECTRIC PRODUCTS INC.
Emporium, Pennsylvania

from RMA release # 643, March 20, 1948

TECHNICAL DATA

5646

Sylvania

TYPE 5646
HIGH MU TRIODE

TENTATIVE RATINGS

Heater Voltage AC or DC ±10%	6.3	Volts
Max. Plate Voltage	150	Volts
Max. Plate Dissipation	0.3	Watt
Max. Heater-Cathode Voltage	90	Volts
Max. Cathode Current	2.0	Ma.

Direct Interelectrode Capacitances:

	Shielded*	Unshielded	
Grid to Plate	1.20	1.30	uuf.
Input	2.40	2.20	uuf.
Output	3.40	1.00	uuf.

*With an 0.315" diameter shield connected to cathode.

TYPICAL OPERATING CONDITIONS
Class A Amplifier

Heater Voltage	6.3	Volts
Heater Current	150	Ma.
Plate Voltage	100	Volts
Cathode Bias Resistor**	820	Ohms
Plate Current	1.4	Ma.
Transconductance	2400	umhos
Plate Resistance	29,000	Ohms
Amplification Factor	70	
Grid Voltage for 10 ua. Plate Current (approx.)	-3.1	Volts

**Provides an operating bias of approximately 1.1 volts.
Maximum grid circuit resistance should not exceed 1.0 megohm.

As a Resistance Coupled Amplifier

Plate Supply Voltage	100	150	Volts
Cathode Bias Resistor	10,000	8200	Ohms
Plate Load Resistor	470,000	470,000	Ohms
Grid Resistor of Following Tube	1.0	1.0	Megohm
Gain (approx.)	40	40	

CIRCUIT APPLICATION

Sylvania Type 5646 is a high mu subminiature triode for use in compact, light-weight equipment. The flexible leads permit the tube to be wired directly to the circuit components thereby minimizing high frequency long lead and base losses. When circuit requirements make fixed bias necessary the grid resistance should not exceed 1/4 megohm.

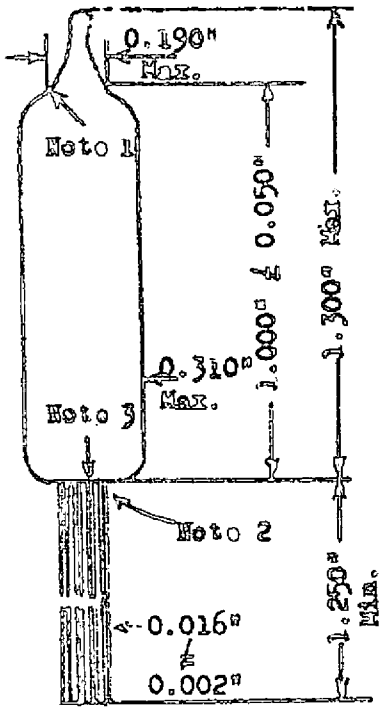
Notes:
1. Reference diameter from which tip and bulb lengths are determined. Measured with Ring Gage 0.190" ∅ 0.000" - 0.001" I.D.
2. Avoid soldering leads closer than 1/4" from glass.
3. Arrow indicates position of plate load.
4. Avoid bending leads closer than 0.060" from glass.

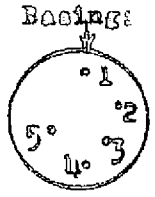
PHYSICAL SPECIFICATIONS

Style	Subminiature
Bulb	T2
Base	Flexible Leads
Dimensions	See Outline
Mounting Position	Any

LEAD CONNECTIONS

As per outline





Bottom View of Base

6/15/48

SYLVANIA ELECTRIC PRODUCTS INC.
Emporium, Pennsylvania

from RMA release # 673, June 29, 1948

SYLVANIA

engineering data service

5647

MECHANICAL DATA

Bulb	T-1
Base	Subminiature Button Flexible Leads
Outline	See Diagram
Basing	See Diagram
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	165° C
Altitude[2]	60000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		150	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Cathode to Plate	2.4	2.6 μμf
Cathode to Heater	4.2	4.0 μμf
Plate to Heater	1.8	0.8 μμf
Plate to Cathode and Heater	4.2	3.4 μμf
Cathode to Plate and Heater	6.0	6.0 μμf

RATINGS[1 & 5] (Absolute Maximum)

Plate Supply Voltage, RMS	165 Vac
Peak Inverse Plate Voltage[6]	460 v
Steady State Peak Plate Current	60 ma
Transient Peak Plate Current	350 ma
Output Current	10 mAdc
Heater-Cathode Voltage[6]	
Heater Positive with Respect to Cathode	360 v
Heater Negative with Respect to Cathode	360 v

CHARACTERISTICS

Tube Voltage Drop for Ib = 18 mAdc	2.8 Vdc

TYPICAL OPERATION

Half-Wave Rectifier—Capacitor Input to Filter		
Plate Supply Voltage	117	150 Vac
Total Plate Supply Impedance	820	1000 Ohms
Output Current	9.0	9.0 mAdc

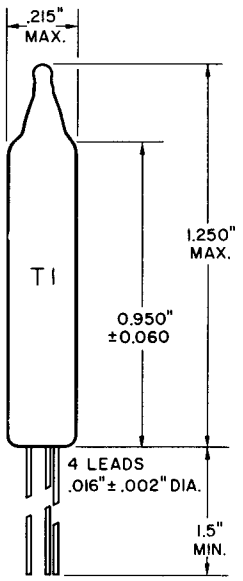
NOTES:

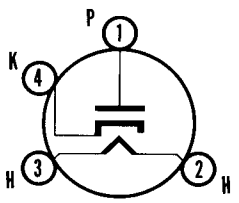
1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.220 inch diameter connected to heater.*
5. *Values shown are as registered with RETMA.*
6. *The maximum voltage appearing between any pair of leads shall be no greater than the maximum peak inverse plate voltage.*
7. *Lead No. 1—Blue, Lead No. 2—Yellow.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5647 is a cathode type diode employing a T-1 envelope. It is useful in uhf detector applications as well as clamping and/or gating circuits.

The 5647 is designed to provide dependable service under severe conditions of vibration, shock, high temperature and high altitude, and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





(Note 7)

SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Load Capacitance	8 μf
Plate Supply Voltage	165 Vac	Load Resistance	15000 Ohms

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7	(Method A)							
4.10.8	Heater Current: ALD = 12	—	—	144	150	156	—	mA
4.10.8	Heater Current:	0.65	140	—	—	—	160	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +360 Vdc	—	—	—	—	—	20	μAdc
	Ehk = −360 Vdc	—	—	—	—	—	20	μAdc
4.10.13	Operation: Note 5 Io	0.65	9.3	—	—	—	—	mAdc
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical:							
	Envelope (As Per Outline)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes:							
	p-all	2.5	20	—	—	—	—	Meg
4.10.4.1	Plate Current:							
	Ebb = O V; Rp = 40,000 Ohms	2.5	5	—	—	—	25	μAdc
4.10.1.1	Emission: Is							
	Eb = 6 Vdc	2.5	25	—	—	—	—	mAdc
4.10.14	Capacitance: Note 2	6.5	—	—	—	—	—	
	0.220 In. Dia. Shield Cpk	—	1.70	—	—	—	3.30	μμf
	0.220 In. Dia. Shield Chk	—	3.4	—	—	—	5.2	μμf
	0.220 In. Dia. Shield Cph	—	1.0	—	—	—	2.6	μμf
4.9.12.1	Low Pressure Voltage Breakdown:							
	Pressure = 55 ±5 mm Hg.; Voltage = 330 Vac	6.5	—	—	—	—	—	
4.9.20.3	Vibration:							
	No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
Degradation Rate Acceptance Tests, Note 3								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock:							
	Hammer Angle = 30°; Ehk = 100 Vdc	20	—	—	—	—	—	
4.9.20.6	Fatigue:							
	G = 2.5; Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
- - - -	Post Shock and Fatigue Test End Points:							
	Heater-Cathode Leakage							
	Ehk = +360 Vdc	—	—	—	—	—	40	μAdc
	Ehk = −360 Vdc	—	—	—	—	—	40	μAdc
	Operation Io	—	9.0	—	—	—	—	mAdc
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 3							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Eb = O V	2.5	—	—	—	—	
4.11.3.1	Stability Life Test: (1 Hour) Note 6 TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Operation of Individual Tubes Δ Io $_t$	—	—	—	—	10	%
4.11.3.1							
4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	
	Operation Io	1.0	—	—	9.0	—	mAdc
4.11.5							
4.11.3.1	Intermittent Life Test: Note 4 Stability Life Test Conditions; T Envelope = +165°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	
4.11.3.1							
4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Heater Current	—	2	5	138	164	mA
	Operation Io	—	1	3	8.5	—	mAdc
	Change in Operation of Individual Tubes From Initial Δ Io $_t$	—	1	3	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +360 Vdc	—	—	—	—	60	μAdc
	Ehk = —360 Vdc	—	—	—	—	60	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	p-all	—	—	—	10	—	Meg
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: This tube incorporates random header leads. With tube properly positioned in adapter face plate, maintain ¼ inch clearance between bottom of tube header and top of face plate.

3: Tubes subjected to the following destructive tests are not to be accepted under this specification.

- 4.9.5.3 Subminiature lead fatigue
- 4.9.20.5 Shock
- 4.9.20.6 Fatigue
- 4.11.7 Heater cycling life test
- 4.11.5 Intermittent life test

4: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

5: In a half-wave circuit adjust Zp so that a bogey tube gives Io = 10 mAdc. A bogey tube has a tube drop of Etd = 6 Vdc at Is = 45 mAdc. Ehk = Eo +117 Vac.

6: In a half-wave life test circuit, the values specified for RL and CL may be considered as approximate and shall be adjusted initially to give not less than Io = 10 mAdc and ib = 50 ma with a bogey tube. Ehk = Eo +117 Vac.

APPLICATION DATA

The 5647 is a Premium Subminiature heater-cathode type diode employing a T-1 envelope. It is particularly useful in a variety of low frequency and uhf detector circuits as well as clamping and/or gating applications. The small size also lends the tube to test equipment probes.

The 5647 is capable of operation to 1000 megacycles in many applications. The self-resonant frequency of the tube structure is approximately 9000 megacycles with a short at the tube base. However, in uhf detector applications, the external tuned circuit may be arranged to reflect the short within the tube envelope, and thus provide operation well beyond the 900-megacycle self-resonant point.

In critical detector applications, a reduction in hum output and contact potential voltage may be realized by lowering the operating heater voltage. Such a reduction will, however, result in a plate characteristic curve which departs from that obtained with rated heater voltage, Figure 1. With practical values of reduced heater voltage, hum output may be lowered by as much as 60% and contact potential by 20 to 30%. Operation under these conditions is satisfactory, providing the current requirements are consistent with values normally encountered in low level detection. An alternative method of lowering hum output and contact potential is to bias the heater with respect to the cathode.

The 5647 is intended for operation under conditions of severe shock, vibration, high altitude and high temperature and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specification. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

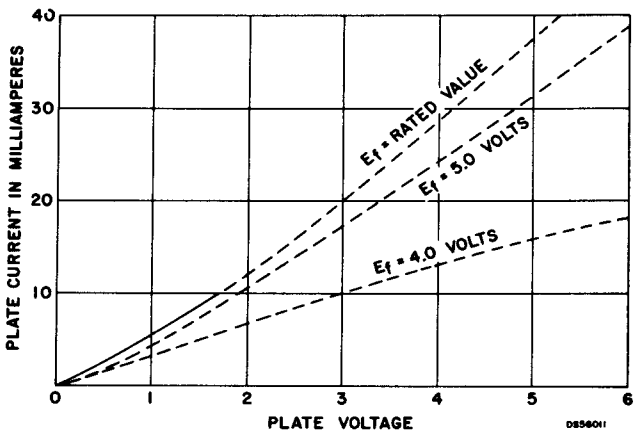
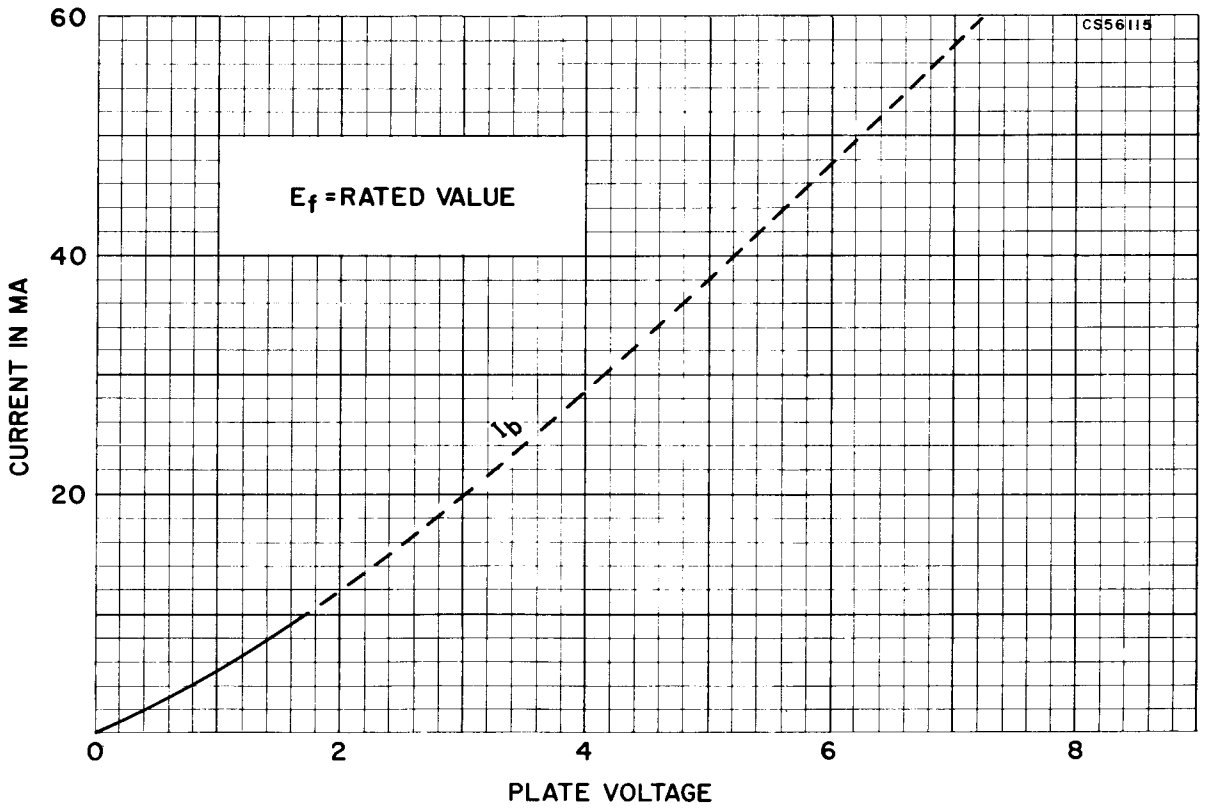


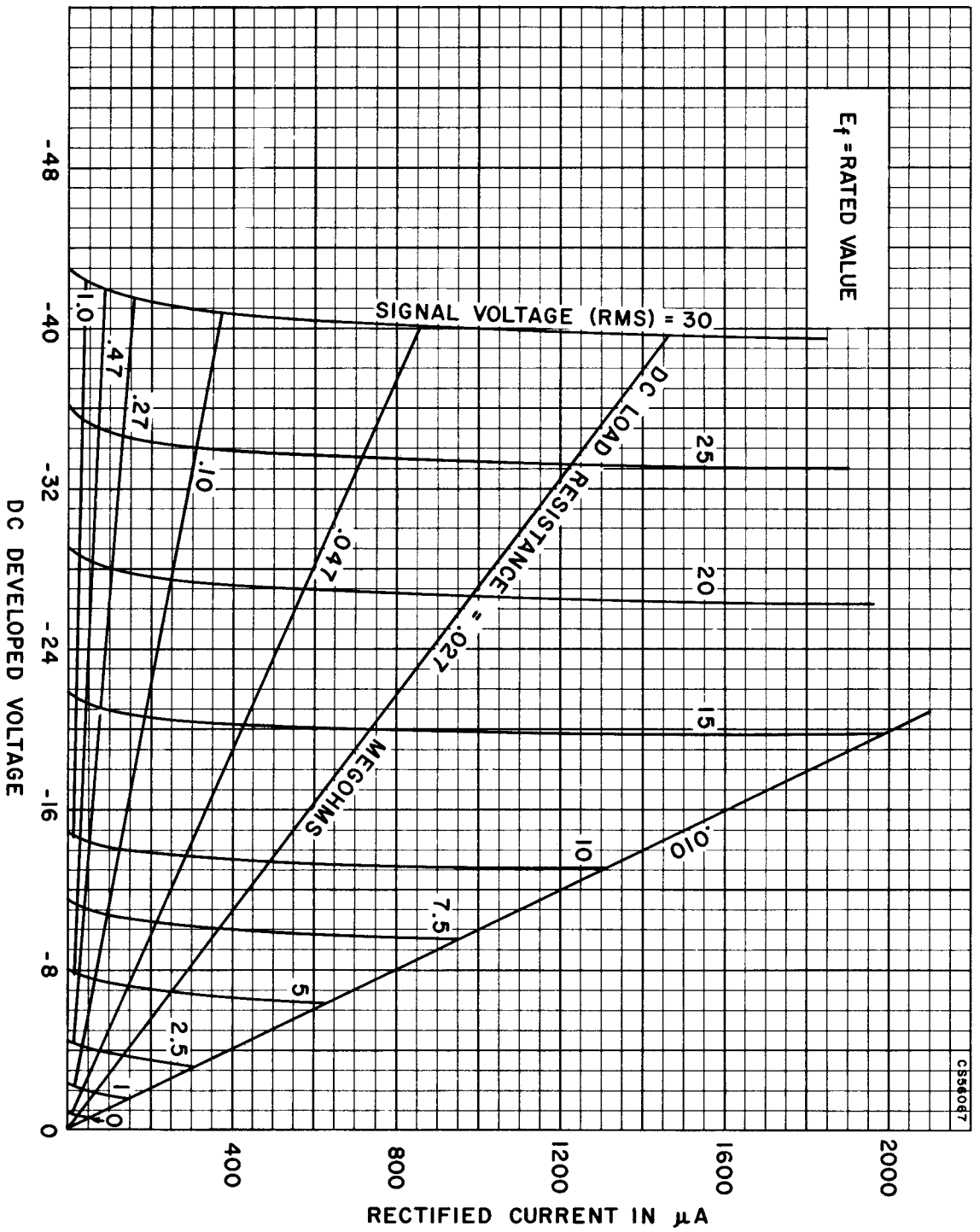
Figure 1—Approximate Plate Characteristics at reduced heater voltage.

The information presented on this data sheet is furnished without assuming any obligation.

AVERAGE PLATE CHARACTERISTICS



AVERAGE CHARACTERISTICS



SYLVANIA

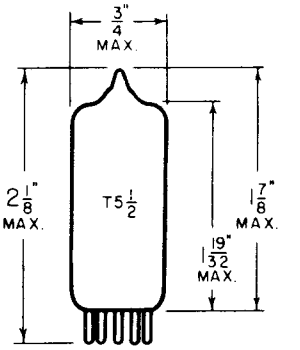
engineering data service

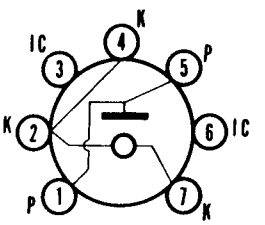
SYLVANIA

5651

QUICK REFERENCE DATA

The Sylvania Type 5651 is a miniature cold cathode, gas filled glow discharge diode intended for use as a voltage reference tube in electronically regulated power supplies.





5B0

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	5BO
Cathode	Cold
Mounting Position	Any

ELECTRICAL DATA

RATINGS (Absolute Values)

DC Operating Current	3.5 Ma Max.
Ambient Temperature Range	−55 to +90°C Max.

CHARACTERISTICS

	Min.	Bogey	Max.	
DC Starting Voltage		107	115[1]	Volts
DC Operating Voltage	82	87	92	Volts
DC Operating Current	1.5		3.5	Ma
Regulation (1.5 Ma to 3.5 Ma)			3	Volts
Stability[2]			0.1	Volt
Shunt Capacitor			0.02	μf

NOTES:

1. *To insure starting throughout tube life, a supply voltage of not less than this value should be provided.*
2. *The maximum sudden voltage change or fluctuation at any current level within the operating current range.*

SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

FEBRUARY, 1955

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5675

MECHANICAL DATA

Maximum Overall Length	2.043 Inches
Maximum Overall Diameter	.814 Inches
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (AC or DC)	6.3 Volts
Heater Current	135 Ma

DIRECT INTERELECTRODE CAPACITANCES

Grid to Plate	1.3 $\mu\mu$f Avg.
Grid to Cathode	2.3 $\mu\mu$f Avg.
Plate to Cathode	.090 $\mu\mu$f Max.

RATINGS (Absolute Values)

Plate Dissipation	5 Watts Max.
Plate Voltage	165 Volts Max.
Plate Current	31 Ma Max.
Seal Temperature	175° C Max.

CHARACTERISTICS

Conditions (E_b=135, R_k=68 ohms)

Transconductance	6400 μmhos
Amplification Factor	20

TYPICAL OPERATING CONDITIONS

UHF Oscillator, CW — 1700 MC

Plate Voltage	120 Volts
Grid Resistor	Adjust for 25 Ma Plate Current
Operating Frequency	1700 Mc
Power Output (minimum)	300 MW

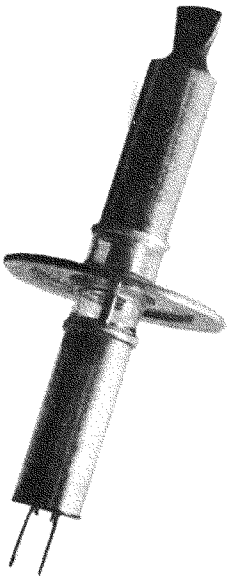
APPLICATION DATA

The double ended construction of the Sylvania Type 5675 makes this tube especially attractive for use in coaxial type cavities at frequencies up to 3000 mc. The mechanical configuration also lends itself readily to lumped-constant and butterfly circuitry. However, coaxial cavities are recommended for operation above 1000 mc.

QUICK REFERENCE DATA

The Sylvania Type 5675 is a medium mu pencil triode designed for service as a cw oscillator, frequency multiplier or grounded grid amplifier at frequencies up to 3000 mc.

The mechanical configuration is particularly adaptable to grounded grid circuitry.



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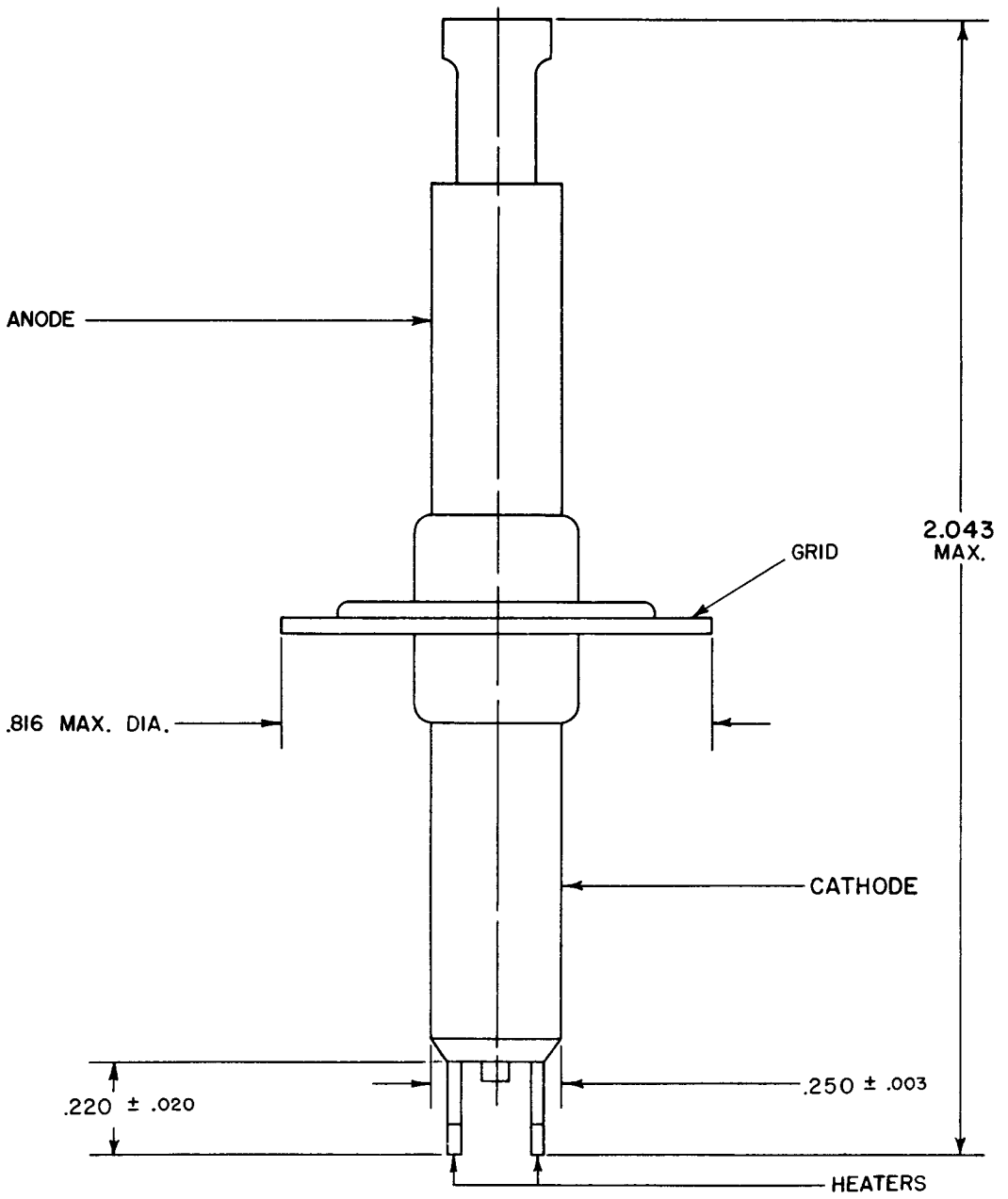
5675

OUTLINE DRAWING



TECHNICAL DATA

5679

Sylvania

TYPE 5679

DUODIODE

RATINGS

Heater Voltage (Nominal)	7.0	Volts
Heater Voltage AC or DC (±10%)	6.3	Volts
Maximum Plate Voltage (RMS)	150	Volts
Maximum Heater-Cathode Voltage	330	Volts
Maximum Peak Current per Plate	45	Ma.
Maximum DC Current per Plate	8	Ma.
Average DC Voltage Drop for 16 Ma. per Plate	11	Volts

Direct Interelectrode Capacitances:*

Plate 1 to Cathode	2.0	μμf.
Plate 1 to Plate 2	0.1	μμf. Max.
Plate 2 to Cathode 2	2.6	μμf.

With 1 5/16" diameter shield (RMA Std. M8-308) connected to cathode.

PHYSICAL SPECIFICATIONS

Style	Lock-In
Base	Lock-In 8-Pin
Bulb	T-9
Diameter	1 3/16" Max.
Seated Height	1 3/4" Max.
Overall Length	2 9/32" Max.
Mounting Position	Any

BASE PIN CONNECTIONS

Pin 1 - Heater
Pin 2 - Cathode Section 2
Pin 3 - Plate Section 2
Pin 4 - Heater Center
Pin 5 - Internal Shield
Pin 6 - Plate Section 1
Pin 7 - Cathode Section 1
Pin 8 - Heater

RMA Basing 7CX-L-5

TYPICAL OPERATING CONDITIONS

Heater Voltage AC or DC	6.3	Volts
Heater Current	.150	Ampere
Plate Voltage	150	Volts
DC Output Current per Plate	8	Ma.

CIRCUIT APPLICATION

Sylvania Type 5679 is a cathode type duodiode in which a heater center tap has been provided to permit balancing of the sections in applications requiring this critical adjustment. In all other respects this type is similar to Sylvania Type 7A6, to which reference should be made for curve data.

Additional series resistance may be required to limit the voltage across either section to the maximum of 3.5 volts under the highest line condition encountered.

from RMA release # 622, Dec. 1, 1947

NOV. 14, 1947 COMMERCIAL ENGINEERING DEPARTMENT
Sylvania Electric Products Inc., Emporium, Pennsylvania
PRINTED IN U.S.A.

SYLVANIA engineering data service 5718

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DK
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	60000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		150	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid to Plate	1.3	1.4 μμf
Input	2.4	2.2 μμf
Output	2.4	0.7 μμf

RATINGS[1 & 5] (Absolute Maximum)

Plate Voltage	165 Vdc
Peak Plate Forward Voltage[6]	330 v
Plate Dissipation	3.3 W
Plate Current	22 mAdc
Grid Current	5.5 mAdc
DC Grid Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid Circuit Resistance	1.2 Meg

CHARACTERISTICS

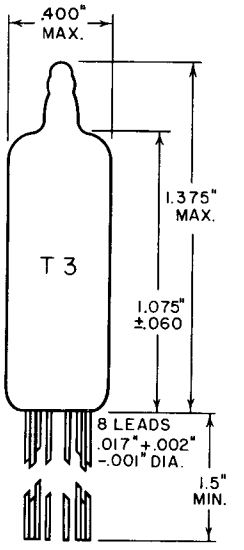
Plate Voltage	100	150 Vdc
Cathode Resistor	150	180 Ohms
Plate Current	8.5	13.0 mAdc
Amplification Factor	27	27
Transconductance	5800	6500 μmhos
Grid Voltage for Ib = 100 μAdc Max.	−7	−11 Vdc

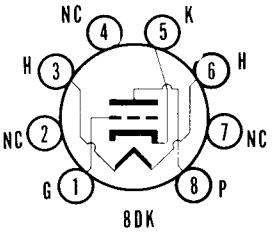
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltage (E_f excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Per MIL-E-1C par. 6.5 and General Section of this Sylvania Subminiature Tube Manual titled Specifications and Ratings.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5718 is a high gm, medium mu triode intended primarily for use as a UHF oscillator. It is also well suited to a variety of low frequency oscillator and amplifier applications. The 5718 is designed for operation under conditions of severe shock, vibration, high temperature and high altitude, and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1	0 V
Plate Voltage	100 Vdc	Cathode Resistor MIL-E-1 Par. 3.2.2.1	150 Ohms
Grid Voltage	0 V		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7	(Method A)							
4.10.8	Heater Current: ALD = 12	—	—	144	150	156	—	mA
4.10.8	Heater Current:	0.65	140	—	—	—	160	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	5	μAdc
4.10.6.1	Grid Current: Eb = 150 Vdc; Rk = 380 Ohms; Rg = 1.0 Meg	0.65	0	—	—	—	−0.4	μAdc
4.1.1.7	(Method A)							
4.10.4.1	Plate Current (1): ALD = 3.0	—	—	7.5	8.5	9.5	—	mAdc
4.10.4.1	Plate Current (1):	0.65	6.0	—	—	—	11.0	mAdc
4.10.4.1	Plate Current (2): Ec = −7.0 Vdc; Rk = 0 Ohms	0.65	—	—	—	—	100	μAdc
4.1.1.7	(Method A)							
4.10.9	Transconductance (1): ALD = 1150 Sm	—	—	5400	5800	6200	—	μmhos
4.10.9	Transconductance (1): Sm	0.65	4800	—	—	—	6800	μmhos
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes:	2.5	—	—	—	—	—	
	g-all	—	100	—	—	—	—	Meg
	p-all	—	100	—	—	—	—	Meg
4.10.4.1	Plate Current (3): Ec = 4.0 Vdc; Rk = 0 Ohms	2.5	20	—	—	—	—	μAdc
4.10.9	Transconductance (2): $\frac{\Delta \text{ Sm}}{\text{Ef}}$ Ef = 5.7 V	2.5	—	—	—	—	10	%
4.10.6.2	Grid Emission: Note 4 Ef = 7.5 V; Ec = −7.0 Vdc; Rg = 1.0 Meg	2.5	0	—	—	—	−0.4	μAdc
4.10.3.2	AF Noise: Esig = 50 mVac; Ec = −4.0 Vdc; Rk = 0 Ohms; Rg = 0.1 Meg; Rp = 0.01 Meg	2.5	—	—	—	—	17	VU
4.10.11.1	Amplification Factor:	6.5	23	—	—	—	31	
- - - -	Pulse Emission: Notes 6 and 7 Ef = 6.0 V; e pulse = 50 v; tp = 25 μsec; prr = 200 pps	6.5	300	—	—	—	—	ma
4.10.14	Capacitance:	6.5	—	—	—	—	—	
	No Shield Cgp	—	1.1	—	—	—	1.8	μμf
	No Shield Cin	—	1.6	—	—	—	2.8	μμf
	No Shield Cout	—	0.5	—	—	—	0.9	μμf

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 2 (Continued)								
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 20 ± mm Hg.; Voltage = 300 Vac	6.5	—	—	—	—	—	
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
4.9.19.1	Vibration (2): Rp = 10,000 Ohms; Ck = 1000 μf; F = 40 cps; G = 15	2.5	—	—	—	—	25	mVac
4.9.19.1	White Noise: Note 5; Rp = 10,000 Ohms; Ck = 1000 μf; Peak Acceleration = 15 G	2.5 2.5	— —	— —	— —	— —	200 30	mv pk-pk mVac
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc; Rg = 0.1 Meg	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
- - - -	Post Shock and Fatigue Test End Points: Vibration (2) Heater-Cathode Leakage Ehk = +100 Vdc Ehk = -100 Vdc Change in Transconductance (1) of Individual Tubes Δ_t Sm	— — — —	— — — —	— — — —	— — — —	— — — —	100 15 15 15	mVac μAdc μAdc %
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic 1st Sample	Combined Samples	Limits Min.	Max.	Units
Acceptance Life Tests, Note 2							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec = Eb = O V	2.5	—	—	—	—	
4.11.3.1	Stability Life Test: (1 Hour) Ehk = +200 Vdc; Rg = 1.0 Meg; TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes Δ_t Sm	—	—	—	—	10	%
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives) Transconductance (1) Sm	0.65 1.0	— —	— —	— 4500	— —	 μmhos
4.11.5 4.11.3.1	Intermittent Life Test: Note 3 Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2 (Continued)							
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Grid Current	—	1	3	0	-0.6	μAdc
	Heater Current	—	2	5	138	164	mA
	Change in Transconductance (1) of						
	Individual Tubes Δ Sm t	—	1	3	—	20	%
	Transconductance (2) Δ Sm Ef	—	2	5	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	10	μAdc
	Ehk = -100 Vdc	—	—	—	—	10	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	g-all	—	—	—	50	—	Meg
	p-all	—	—	—	50	—	Meg
	Transconductance (1) Average Change, Avg Δ Sm t	—	—	—	—	15	%
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature lead fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater cycling life test
4.11.5	Intermittent life test

3: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

4: Prior to this test tubes shall be preheated five (5) minutes at conditions indicated below. Test within three (3) seconds after preheating. Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission Test.

Ef	Ec	Eb	Rk	Rg
V	Vdc	Vdc	Ohms	Meg
7.5	0	100	150	1.0

5: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "White Noise" spectrum which is free from discontinuities from 100 cps to 5000 cps. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 G's rms acceleration. With this the case, the rms value of acceleration for any bandwidth within the specified spectrum is equal to

$$G\ rms = 2.3\ G \sqrt{3.32 \log_{10} (f2/f1)}$$

f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (0.25 megohm or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 40 db at 13,000 cps. For reading the peak to peak value of output voltage the filter output shall be fed directly to the input of a Ballantine Model 305 peak to peak electronic voltmeter or equal, while the rms value shall be measured with a Hewlett-Packard Model 400C or equal.

6: Test each section separately.

7: The pulse is essentially a square wave with 1.0 μsec rise time and 0.8 μsec fall. The pulse shall be applied to plate and grid tied together. Pulse emission shall be measured in terms of voltage developed across a 1.0 ohm resistor in the cathode circuit. Test limit as measured by the leading edge of a calibrated oscilloscope trace, the amplitude of the trailing edge of which shall not vary by more than 20 percent from the value of the leading edge.

APPLICATION DATA

The Premium Subminiature Type 5718 is a high gm, medium mu triode manufactured and inspected to meet the applicable MIL-E-1 specification and provide reliable operation under conditions of severe shock, vibration, high temperature, and high altitude.

The Type 5718 is particularly well suited to application as an uhf oscillator. Approximate oscillator performance is shown in Figure 1, as a function of frequency.

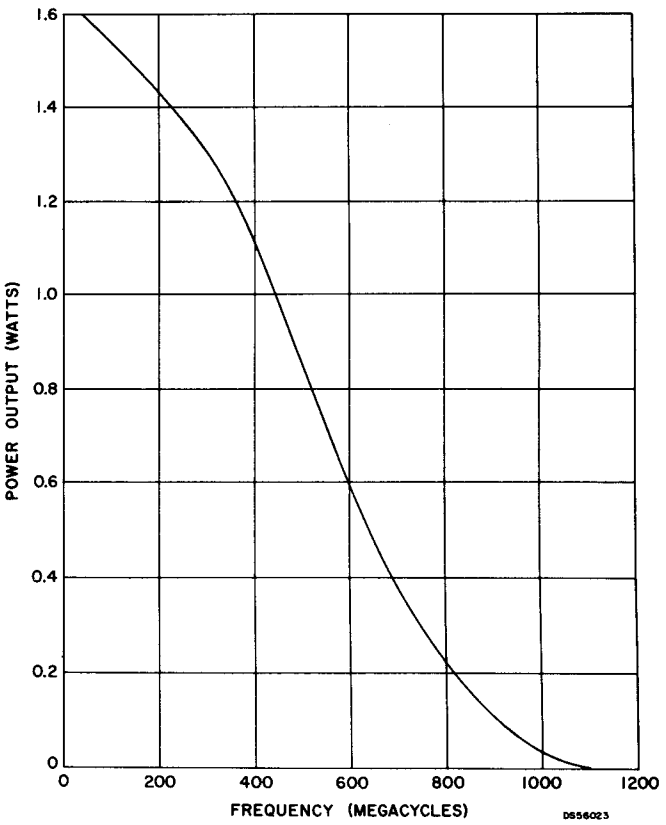


Figure 1—Oscillator performance curve.

The resonant frequency of the grid plate structure is approximately 960 mc with an rf short at the base of the tube. This does not; however, define the upper limit of operation since an open ended line circuit may be connected to reflect an rf short inside the tube.

The 5718 is also suited to Class A amplifier, Class C amplifier or frequency doubler service, as well as, cathode follower, blocking oscillator and multivibrator applications. Figure 2 is a plot of input resistance as a function of frequency. Resistance coupled amplifier data is shown in the accompaning table and circuit.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise

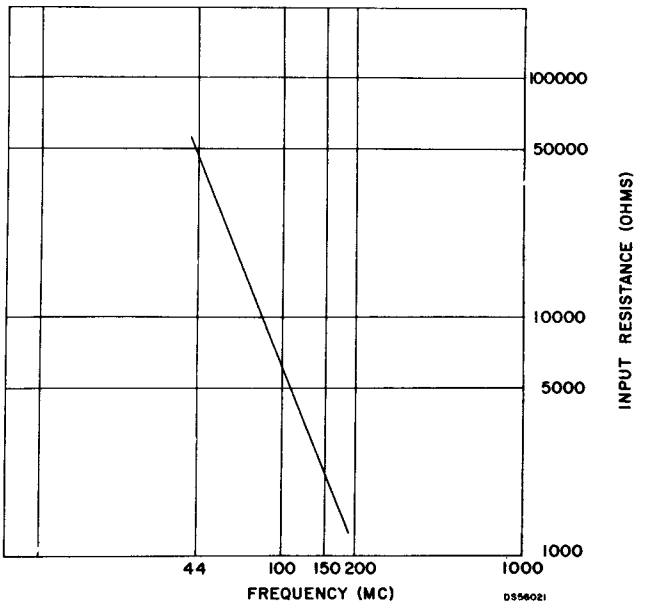


Figure 2—Input resistance vs. frequency

output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poor life expectancy. For further discussion of life expectancy. reference should be made to the frontal section of this manual.

To insure optimum performance in pulse applications the Type 5718, is subjected to a pulse emission test as shown in the accompanying data. The tube must, under the specified pulse operating conditions, deliver a minimum specified current. A further discussion of this test is included in the general section of this manual.

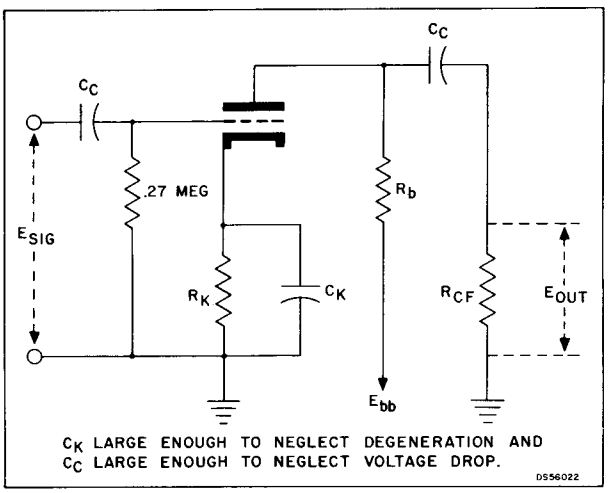
When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

RESISTANCE COUPLED AMPLIFIER DATA

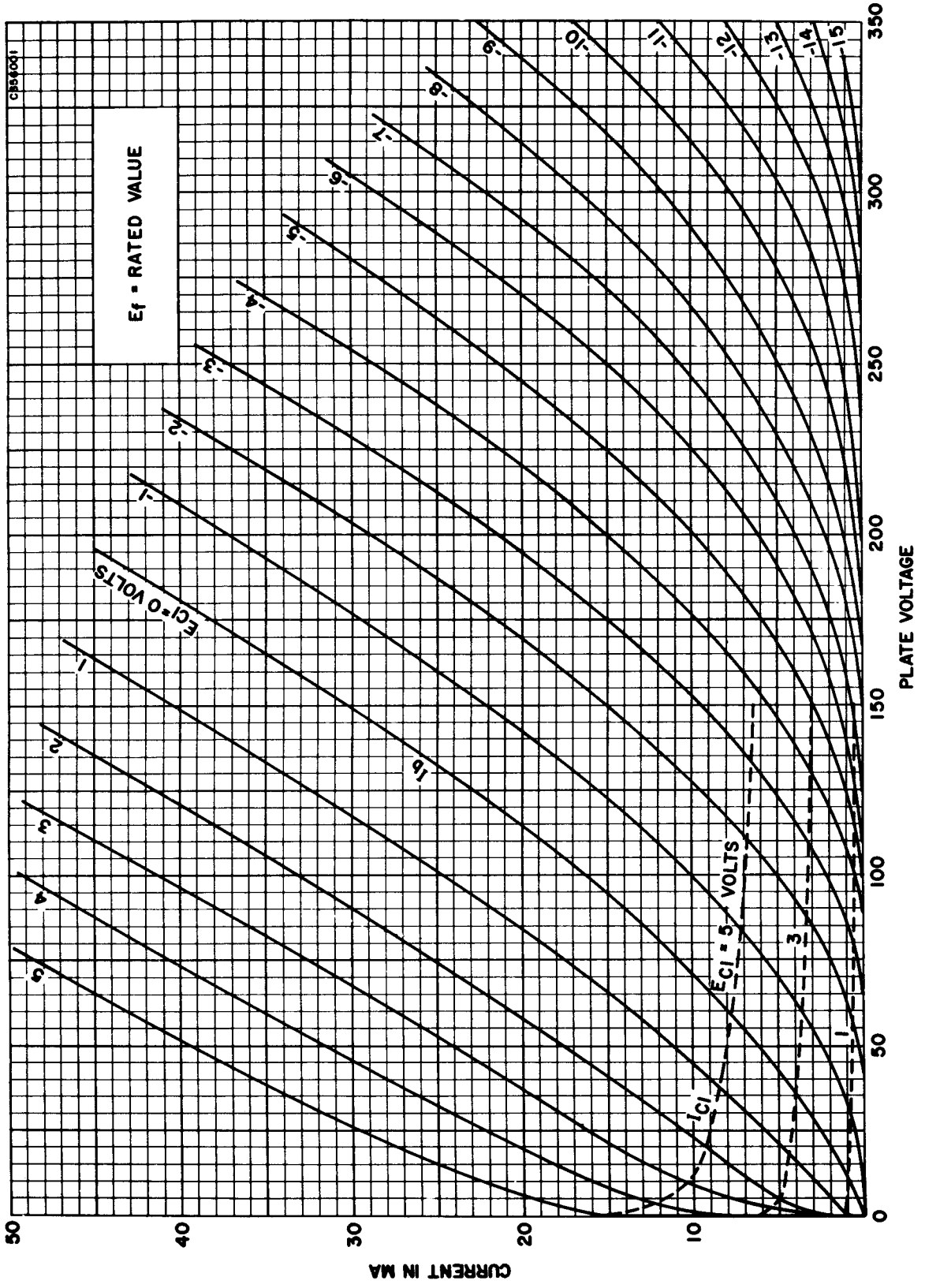
	Ebb = 100 Volts						Ebb = 200 Volts					
RB (megohms)	0.047		0.10		0.27		0.047		0.10		0.27	
Rcf (megohms)	0.10	0.27	0.27	0.47	0.27	0.47	0.10	0.27	0.27	0.47	0.27	0.47
Rk (ohms)	1000	1200	2200	2700	6800	8200	820	1000	1800	2200	4700	5600
Ib (ma)	1.16	1.10	0.59	0.56	0.226	0.214	2.61	2.46	1.30	1.22	0.52	0.49
Ec (volts)	−1.16	−1.32	−1.30	−1.56	−1.54	−1.75	−2.14	−2.46	−2.34	−2.69	−2.44	−2.74
Eb volts	46.5	48.5	41.0	44.0	39.0	42.2	77.5	85.5	70.0	78.0	59.5	68.0
Esig (volts, rms)	0.5	0.5	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0
Eout (volts, rms)	8.2	8.5	8.2	8.2	7.3	7.4	19.0	19.5	18.6	18.1	16.2	16.2
Gain	16.4	17.0	16.4	16.4	14.6	14.8	19.0	19.5	18.6	18.1	16.2	16.2
% Distortion	3.9	3.2	3.0	2.71	3.4	2.8	4.0	3.3	3.2	3.1	3.8	3.2
Esig* (volts, rms)	0.59	0.70	0.67	0.81	0.75	0.86	1.23	1.45	1.43	1.56	1.34	1.58
Eout (volts, rms)	9.7	11.75	11.0	13.1	11.0	12.7	23.4	28.0	26.0	28.2	21.6	25.0
Gain	16.4	16.8	16.4	16.2	14.6	14.8	19.0	19.3	18.2	18.1	16.1	15.8
% Distortion	4.5	4.7	4.1	4.6	5.0	5.0	5.0	5.0	4.9	5.0	5.1	5.1

*Maximum signal for 5% distortion or 1/8 microampere grid current.

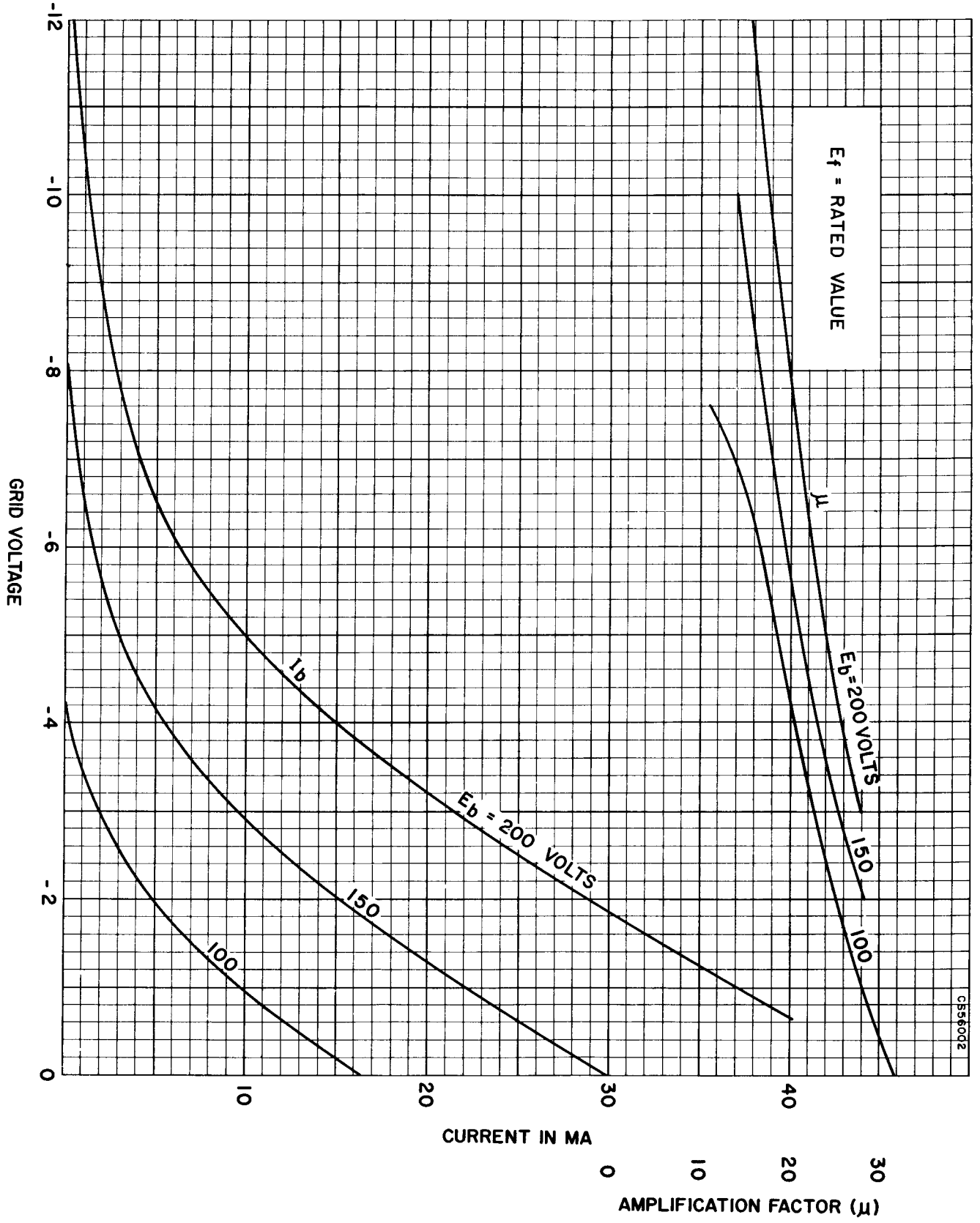


Resistance coupled amplifier circuit.

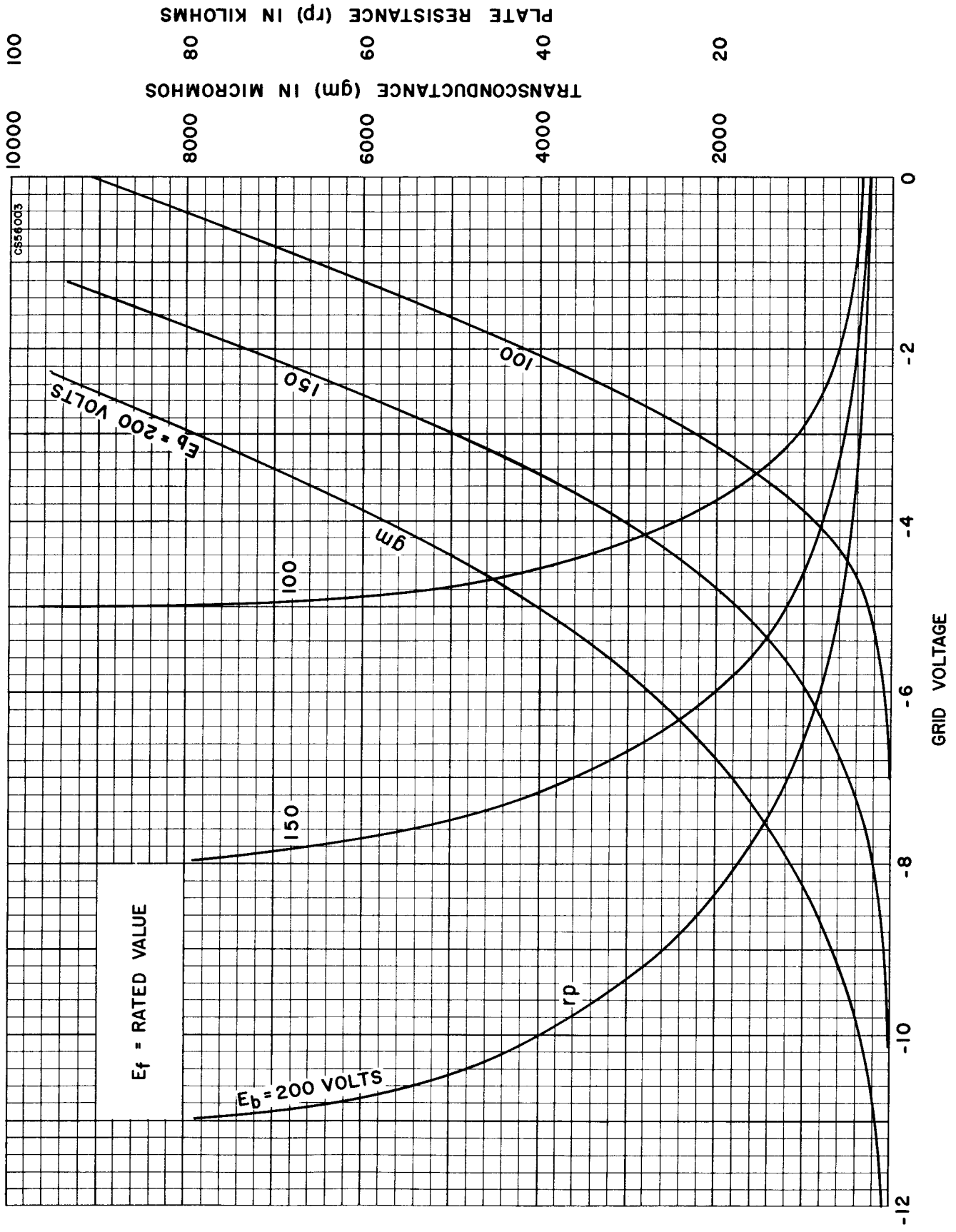
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA engineering data service 5719

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DK
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.	
Heater Voltage[3]	6.0	6.3	6.6	V
Heater Current		150		mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid to Plate	0.8	0.8 μμf
Input	1.9	1.7 μμf
Output	2.2	0.6 μμf

RATINGS[1 & 5] (Absolute Maximum)

Plate Voltage	165 Vdc
Peak Plate Forward Voltage[6]	330 v
Plate Dissipation	0.55 W
Plate Current	3.3 mAdc
DC Grid Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid Circuit Resistance	1.2 Meg

CHARACTERISTICS

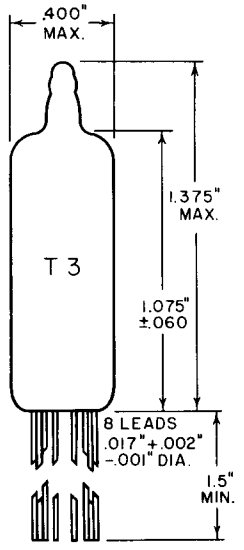
Plate Voltage	100	150 Vdc
Cathode Resistor	1500	680 Ohms
Plate Current	0.73	1.85 mAdc
Amplification Factor	70	70
Transconductance	1700	2300 μmhos
Grid Voltage for Ib = 50 μAdc Max.	−2.5	−3.8 Vdc

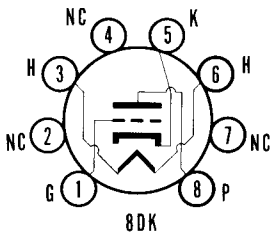
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Per MIL-E-1C par. 6.5 and General Section of this Sylvania Subminiature Tube Manual titled Specifications and Ratings.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5719 is a high mu triode designed for use in low level audio applications. It is intended for service under conditions of severe shock, vibration, high temperature and high altitude and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1	0 V
Plate Voltage	100 Vdc	Cathode Resistor MIL-E-1 Par. 3.2.2.1	1500 Ohms
Grid Voltage	0 V		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7	(Method A)							
4.10.8	Heater Current: ALD = 12	—	—	144	150	156	—	mA
4.10.8	Heater Current:	0.65	140	—	—	—	160	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid Current: Eb = 150 Vdc; Rk = 2700 Ohms; Rg = 1.0 Meg	0.65	0	—	—	—	−0.3	μAdc
4.10.4.1	Plate Current (1):	0.65	0.50	—	—	—	0.90	mAdc
4.10.4.1	Plate Current (2): Ec = −2.5 Vdc	0.65	—	—	—	—	50	μAdc
4.1.1.7	(Method A)							
4.10.9	Transconductance (1): ALD = 350 Sm	—	—	1550	1700	1850	—	μmhos
4.10.9	Transconductance (1): Sm	0.65	1400	—	—	—	2000	μmhos
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes:	2.5	—	—	—	—	—	
	g-all	—	100	—	—	—	—	Meg
	p-all	—	100	—	—	—	—	Meg
4.10.4.1	Plate Current (3): Ec = −1.8 Vdc	2.5	5	—	—	—	—	μAdc
4.10.9	Transconductance (2): $\frac{\Delta Sm}{\Delta Ef}$ Ef = 5.7 V	2.5	—	—	—	—	10	%
4.10.6.2	Grid Emission: Note 4 Ef = 7.5 V; Ec = −2.5 Vdc; Rg = 1.0 Meg	2.5	0	—	—	—	−0.3	μAdc
4.10.3.2	AF Noise: Esig = 45 mVac; Rg = 1.0 Meg; Rk = 1500 Ohms; Rp = 0.2 Meg; Ck = 1000 μf	2.5	—	—	—	—	16	VU
4.10.11.1	Amplification Factor:	6.5	60	—	70	—	80	
4.10.11.2	AC Amplification: Ebb = 100 Vdc; Ecc = O V; Esig = 0.2 Vac; Rk = 0 Ohms	6.5	8.0	—	—	—	—	Vac
4.10.14	Capacitance:	6.5	—	—	—	—	—	
	No Shield Cgp	—	0.6	—	—	—	1.0	μμf
	No Shield Cin	—	1.2	—	—	—	2.2	μμf
	No Shield Cout	—	0.4	—	—	—	0.8	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 20 ±5 mm Hg.; Voltage = 300 Vac	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 2 (Continued)								
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
4.9.19.1	Vibration (2): Rp = 10,000 Ohms; Ck = 1000 μf; F = 40 cps; G = 15	2.5	—	—	—	—	25	mVac
4.9.19.1	White Noise: Note 5; Rp = 10,000 Ohms; Ck = 1000 μf; Peak Acceleration = 15 G	2.5 2.5	— —	— —	— —	— —	40 5	mv pk-pk mVac
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc; Rg = 0.1 Meg	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
- - - -	Post Shock and Fatigue Test End Points: Vibration (2) Heater-Cathode Leakage Ehk = +100 Vdc Ehk = -100 Vdc Change in Transconductance (1) of Individual Tubes Δ_t Sm	— — — —	— — — —	— — — —	— — — —	— — — —	100 15 15 15	mVac μAdc μAdc %
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic 1st Sample	Combined Samples	Limits Min.	Max.	Units
Acceptance Life Tests, Note 2							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Eb = Ec = O V	2.5	—	—	—	—	
4.11.3.1	Stability Life Test: (1 Hour) Eb = 150 Vdc; Ehk = +200 Vdc; Rg = 1.0 Meg; Rk = 680 Ohms; TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes Δ_t Sm	—	—	—	—	10	%
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives) Transconductance (1) Sm	0.65 1.0	— —	— —	— 1200	— —	 μmhos
4.11.5 4.11.3.1	Intermittent Life Test: Note 3 Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2 (Continued)							
4.11.4 4.11.3.1	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Grid Current	—	1	3	0	-0.6	μAdc
	Heater Current	—	2	5	138	164	mA
	Change in Transconductance (1) of Individual Tubes $\triangle \frac{Sm}{t}$	—	1	3	—	20	%
	Transconductance (2) $\triangle \frac{Sm}{Ef}$	—	2	5	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	10	μAdc
	Ehk = -100 Vdc	—	—	—	—	10	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	g-all	—	—	—	25	—	Meg
	p-all	—	—	—	25	—	Meg
	Transconductance (1) Average Change, Avg $\triangle \frac{Sm}{t}$	—	—	—	—	15	%
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature lead fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater cycling life test
4.11.5	Intermittent life test

3: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

4: Prior to this test tubes shall be preheated five (5) minutes at conditions indicated below. Test within three (3) seconds after preheating. Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission Test.

Ef	Ec	Eb	Rk	Rg
V	Vdc	Vdc	Ohms	Meg
7.5	0	100	1500	1.0

5: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "White Noise" spectrum which is free from discontinuities from 100 cps to 5000 cps. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 G's rms acceleration. With this the case, the rms value of acceleration for any bandwidth within the specified spectrum is equal to

$$G\ rms = 2.3\ G \sqrt{3.32 \log_{10} (f2/f1)}$$

f2 and f1 are the upper and lower frequencies, respectively, of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (0.25 megohm or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 40 db at 13,000 cps. For reading the peak to peak value of output voltage the filter output shall be fed directly to the input of a Ballantine Model 305 peak to peak electronic voltmeter or equal, while the rms value shall be measured with a Hewlett-Packard Model 400C or equal.

APPLICATION DATA

The Sylvania Premium Subminiature Type 5719 is a high mu triode designed for operation under conditions of severe vibration, shock, high temperature and high altitude. The 5719 is manufactured and inspected to meet the applicable MIL-E-1 specification.

This type is characterized by its high mu and low hum output resulting from incorporation of a folded coiled heater. These features make the tube particularly useful in low level audio applications.

Resistance coupled amplifier data is shown for both self bias operation and zero bias operation. A voltage gain of approximately 50 is easily obtained under either condition with low distortion and low plate supply voltage. When operated under external zero bias conditions, a grid resistance of from 5 to 10 megohms should be employed to reduce contact potential loading and provide a better plate current balance between individual tubes.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tubes to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

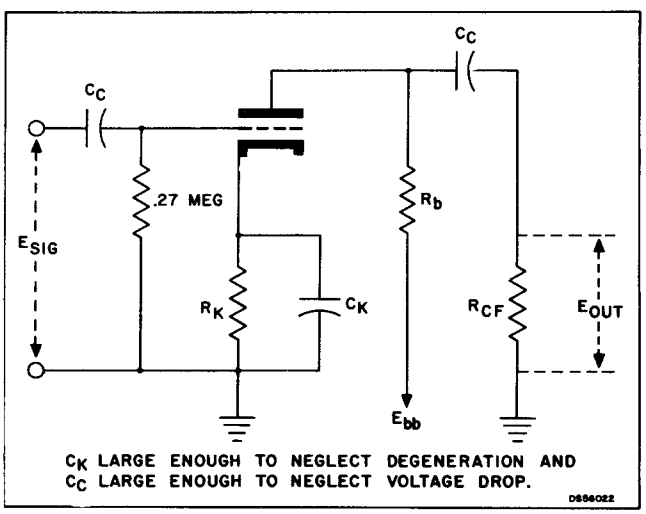
RESISTANCE COUPLED AMPLIFIER DATA
SELF-BIAS OPERATION

	Ebb = 100 Volts						Ebb = 200 Volts					
Rb (megohms)	0.10		0.27		0.47		0.10		0.27		0.47	
Rcf (megohms)	0.27	0.47	0.47	1.0	0.47	1.0	0.27	0.47	0.47	1.0	0.47	1.0
Rk (ohms)	2700	2700	5600	6800	10000	10000	1500	1800	3300	3900	5600	6800
Ib (ma)	0.335	0.335	0.165	0.149	0.100	0.100	0.86	0.80	0.400	0.36	0.238	0.22
Ec (volts)	-0.905	-0.905	-0.925	-1.122	-1.0	-1.0	-1.29	-1.44	-1.32	-1.403	-1.332	-1.497
Eb (volts)	66.5	66.5	55.5	59.8	53.0	53.0	114	120.0	92.0	102.8	88.0	96.5
Esig (volts, rms)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Eout (volts, rms)	3.7	3.9	4.1	4.2	3.95	4.3	4.4	4.6	4.9	5.0	4.8	5.0
Gain	37	39	41	42	39.5	43	44	46	49	50	48	50
% Distortion	2.4	2.1	2.1	1.8	2.4	1.7	0.7	0.7	0.9	0.7	0.9	0.7
Esig* (volts, rms)	0.20	0.20	0.20	0.26	0.20	0.25	0.51	0.61	0.50	0.59	0.49	0.64
Eout (volts, rms)	7.3	7.7	8.1	10.7	7.8	10.7	22.0	27.0	24.2	29.0	23.2	31.6
Gain	36.5	38.5	40.5	41.2	39.0	42.8	43.1	44.3	48.4	49.2	47.3	49.4
% Distortion	5.0	4.5	4.3	4.9	5.0	4.5	3.9	5.0	4.5	4.5	5.0	5.0

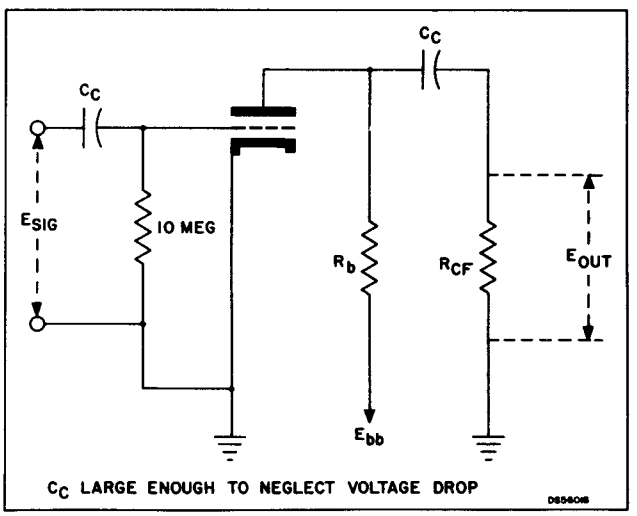
RESISTANCE COUPLED AMPLIFIER DATA
ZERO-BIAS OPERATION

	Ebb = 100 Volts						Ebb = 200 Volts					
Rb (megohms)	0.1		0.27		0.47		0.1		0.27		0.47	
Rcf (megohms)	0.27	0.47	0.47	1.0	0.47	1.0	0.27	0.47	0.47	1.0	0.47	1.0
Rk (ohms)	—	—	—	—	—	—	—	—	—	—	—	—
Ib (ma)	0.355	0.355	0.174	0.174	0.112	0.112	1.10	1.10	0.49	0.49	0.300	0.300
Ec (volts)	—	—	—	—	—	—	—	—	—	—	—	—
Eb (volts)	64.5	64.5	53.0	53.0	47.4	47.4	90.0	90.0	67.8	67.8	59.0	59.0
Esig (volts, rms)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Eout (volts, rms)	3.8	4.0	4.3	4.55	4.2	4.55	4.7	4.9	5.35	5.4	5.2	5.4
Gain	38.0	40.0	43.0	45.5	42.0	45.5	47.0	49.0	53.5	54.0	52.0	54.0
% Distortion	2.2	2.0	1.9	1.6	2.1	1.6	0.4	0.4	0.8	0.7	0.9	0.7
Esig* (volts, rms)	0.20	0.21	0.22	0.26	0.20	0.27	0.59	0.63	0.54	0.65	0.50	0.63
Eout (volts, rms)	7.25	7.9	8.95	11.0	7.9	11.3	25.0	27.7	25.8	31.5	23.5	30.5
Gain	36.2	37.6	40.6	42.4	39.5	41.8	42.4	43.9	47.7	48.5	47.0	48.4
% Distortion	5.0	4.8	4.9	4.8	4.8	5.0	4.9	5.0	4.9	5.0	5.0	4.8

* Maximum signal for 5% distortion or 1/8 microampere grid current.

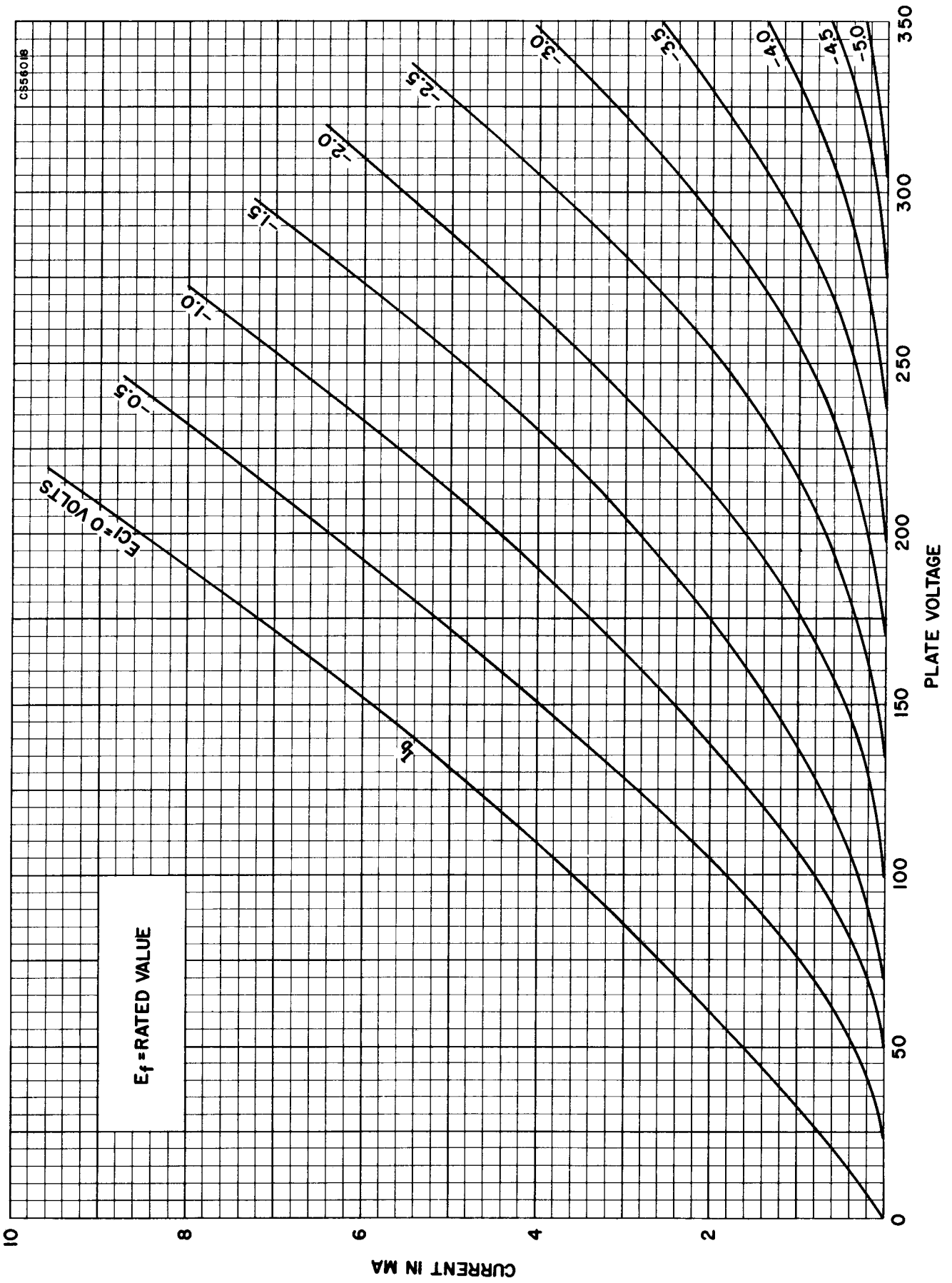


Resistance coupled amplifier circuit (Self-Bias)

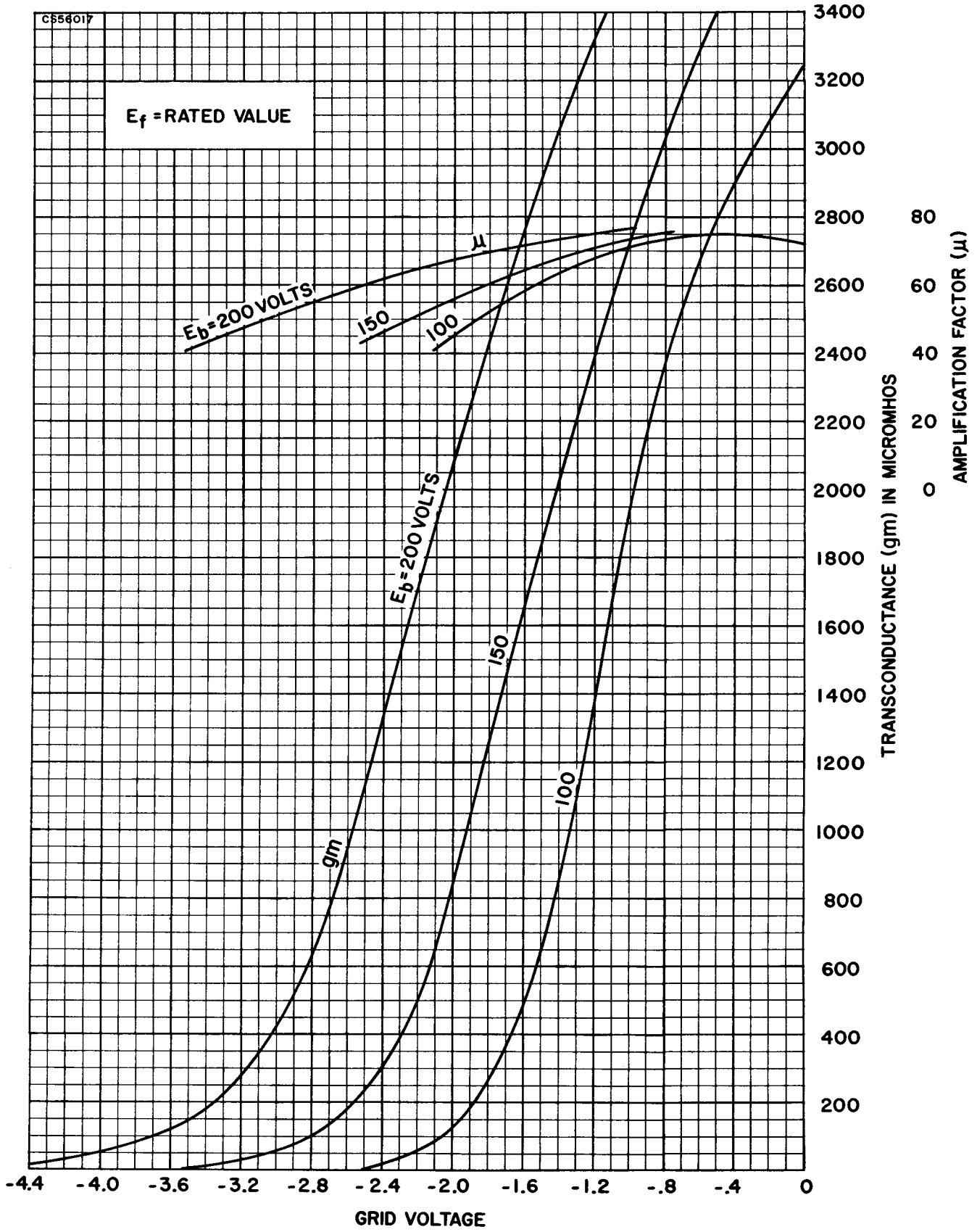


Resistance coupled amplifier circuit (Zero-Bias)

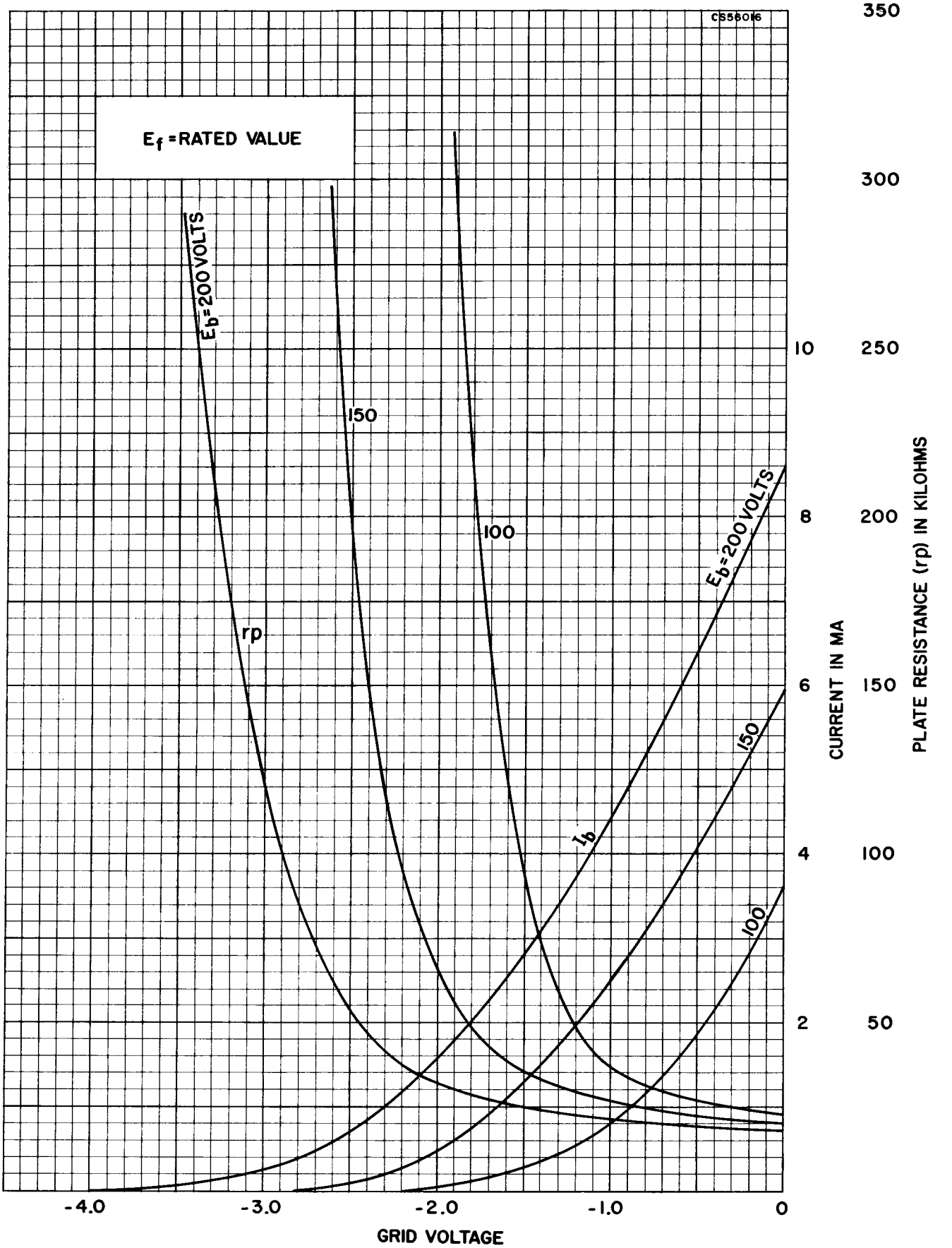
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



TECHNICAL DATA

5722

Sylvania

TYPE 5722

NOISE GENERATING DIODE

RATINGS AND CHARACTERISTICS

Maximum Filament Voltage	5.5	Volts
Minimum Filament Voltage	2.0	Volts
Filament Current at 4.9 Volts	1.6	Amperes
Maximum DC Plate Voltage	200	Volts
Maximum Plate Current	35	Ma.
Maximum Plate Dissipation		
Continuous Service	3.5	Watts
Intermittent Service	5.0	Watts
Maximum On Period in 50% Duty Cycle	5	Min.
Direct Interelectrode Capacitances:**		
Plate to Filament	1.5	μμf

* *Horizontal operation permitted if Pins 1 and 2 are in vertical plane.*

** *With no external shield.*

PHYSICAL SPECIFICATIONS

Style	Miniature
Bulb	T 5 1/2
Diameter	3/4" Max.
Seated Height	1 7/8" Max.
Overall Length	2 1/8" Max.
Mounting	Vertical*

BASE PIN CONNECTIONS

Pin 1 - Plate
Pin 2 - No Connection
Pin 3 - Filament
Pin 4 - Filament
Pin 5 - No Connection
Pin 6 - Plate
Pin 7 - Filament Center

RMA Basing 5 CB

TYPICAL OPERATING CONDITIONS

Plate Voltage	150	Volts
Filament Voltage	Adjust to give desired Plate Current or Noise Output	

CIRCUIT APPLICATION

Sylvania Type 5722 is a tungsten filament diode designed for use as a noise generator at frequencies up to 400 or 500 mc. The filament center tap allows better RF grounding of the filament when used in the recommended circuit shown on a following page.

Since the tube has a tungsten filament the "shot effect" may be used as a standard noise source if sufficient plate voltage is applied to obtain saturation. The noise factor (NF) may be obtained from the equation NF = 20 IR where R is the total generator resistance and I is the diode plate current in amperes. To convert to decibels $NF_{db} = 10 \text{ Log}_{10} 20 IR$.

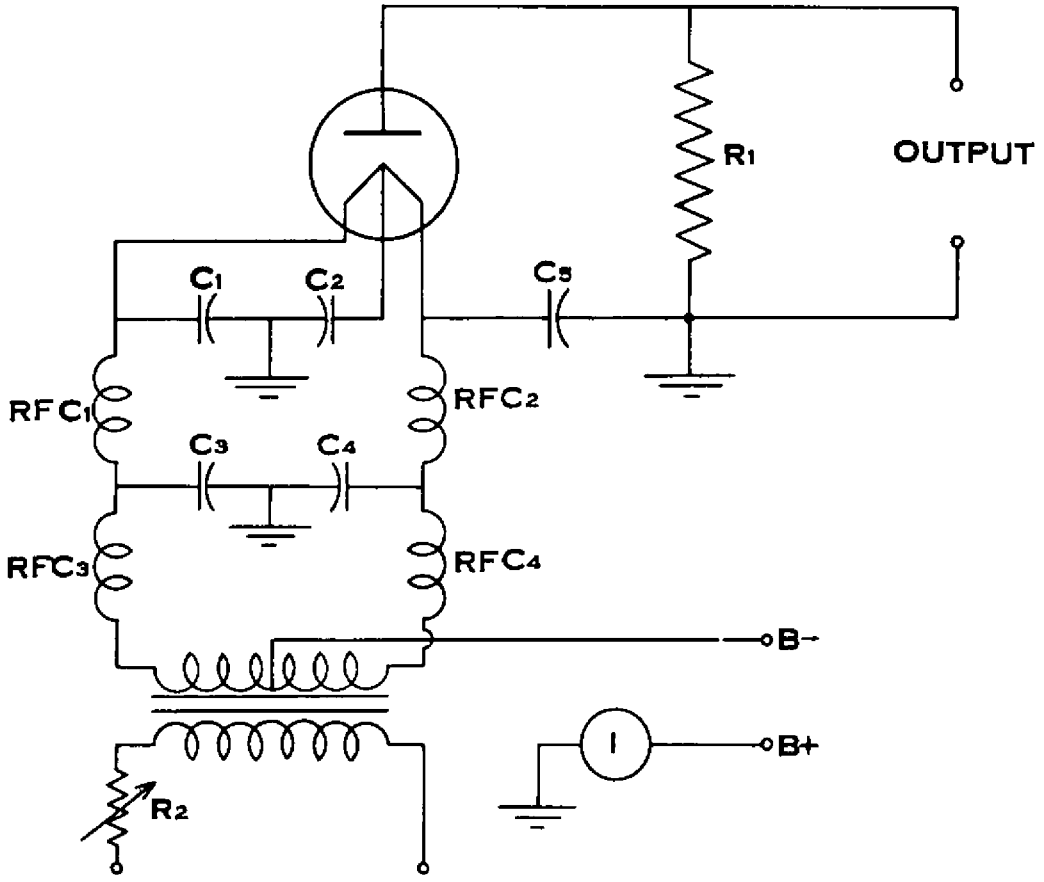
In use, the diode is coupled to the input of the amplifier under test and the filament voltage is increased until the noise output power is double that read without the diode. From the plate current reading and the generator resistance the noise factor can be calculated. Additional construction details may be obtained from the article "How Sensitive is Your Receiver", by Byron Goodman in the September 1947 issue of Q.S.T. and also "Coaxial Noise Diode" by H. Johnson, RCA Review, March, 1947, Volume VIII, No. 1.

The useful life is dependent on the operating voltages since the usual causes of failure are burnout or vaporization of the tungsten filament. A curve is given on a following page which shows this relationship.

NOV. 29, 1948 COMMERCIAL ENGINEERING DEPARTMENT
Sylvania Electric Products Inc., Emporium, Pennsylvania
PRINTED IN U.S.A.

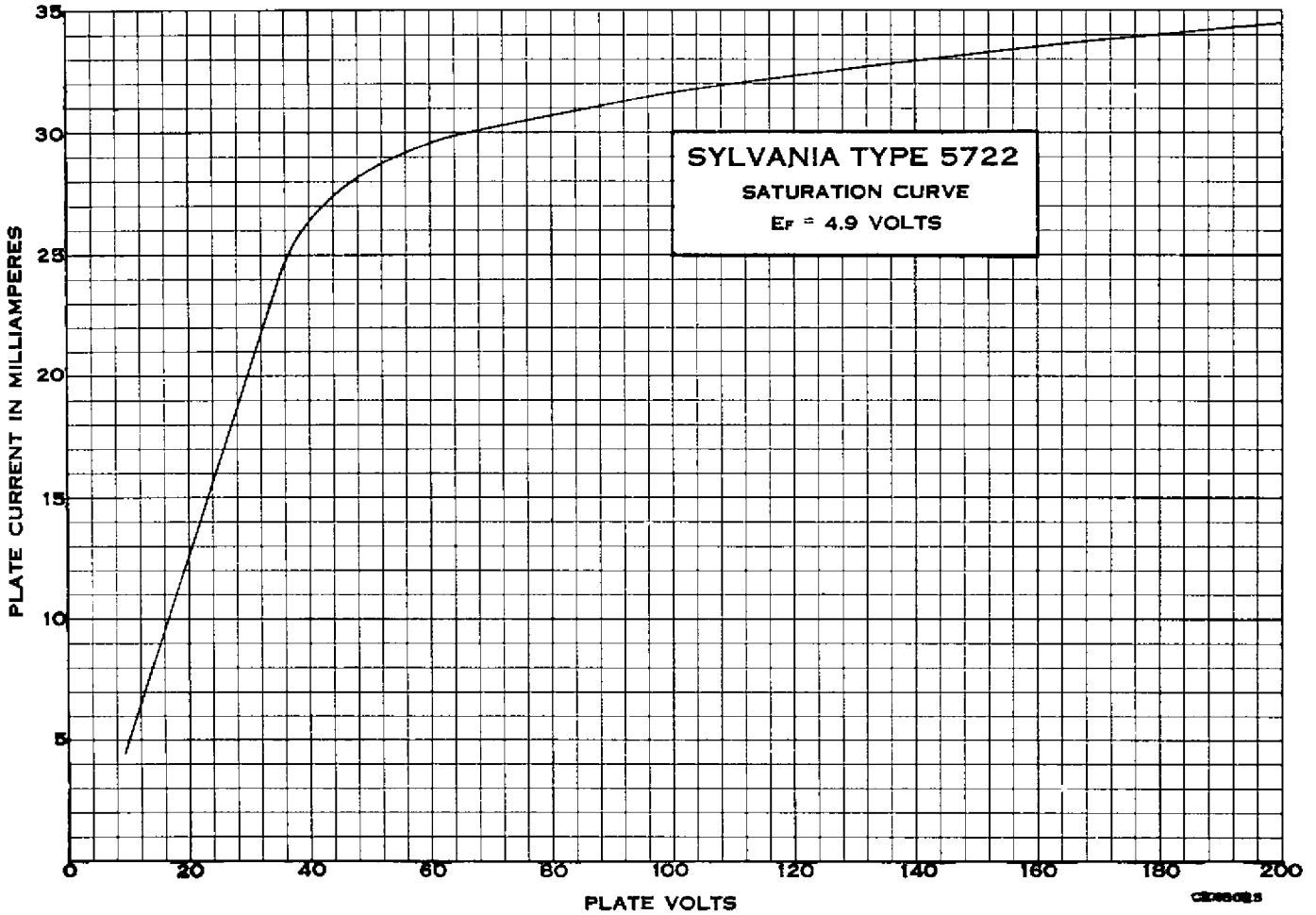
from RMA release # 668B, March 3, 1949

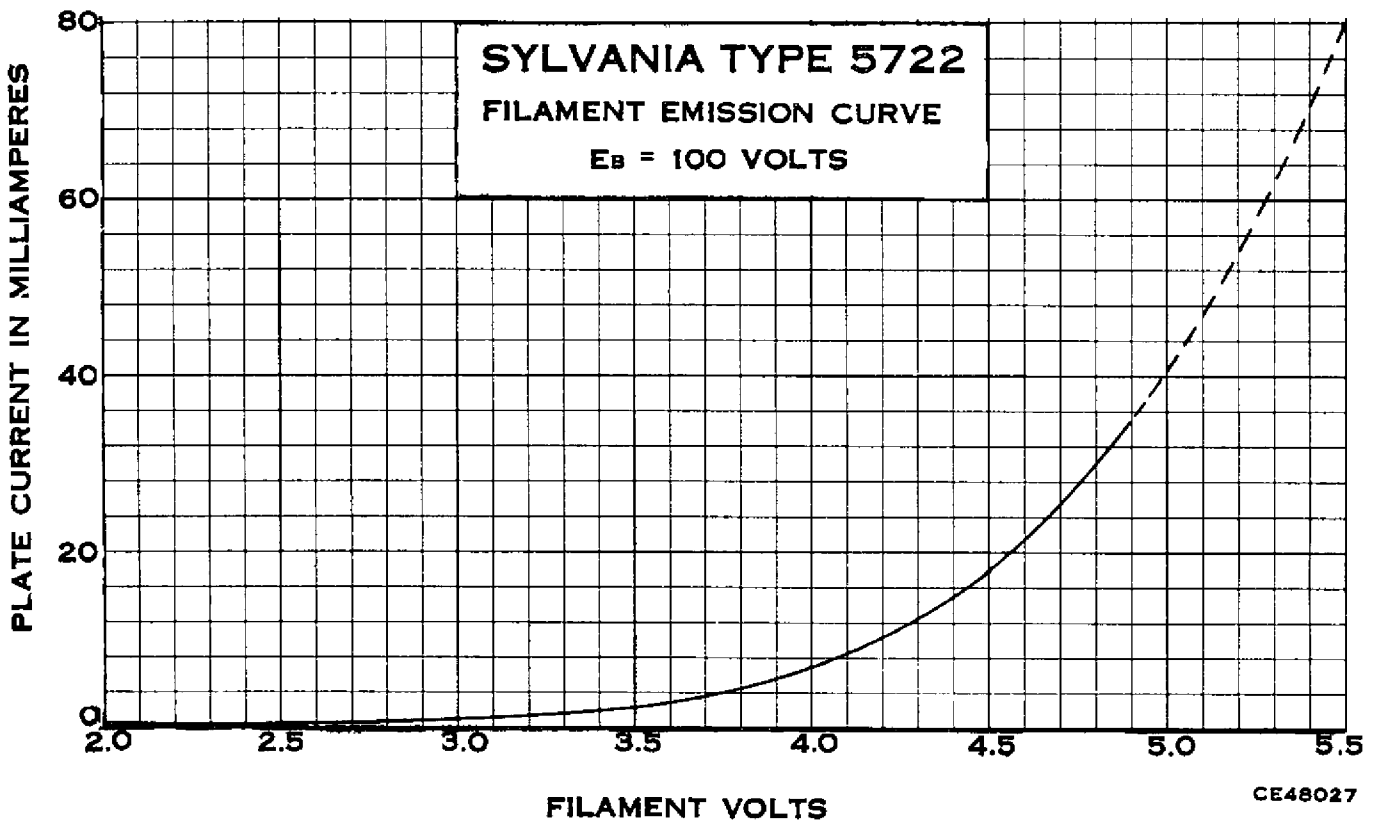
RECOMMENDED CIRCUIT

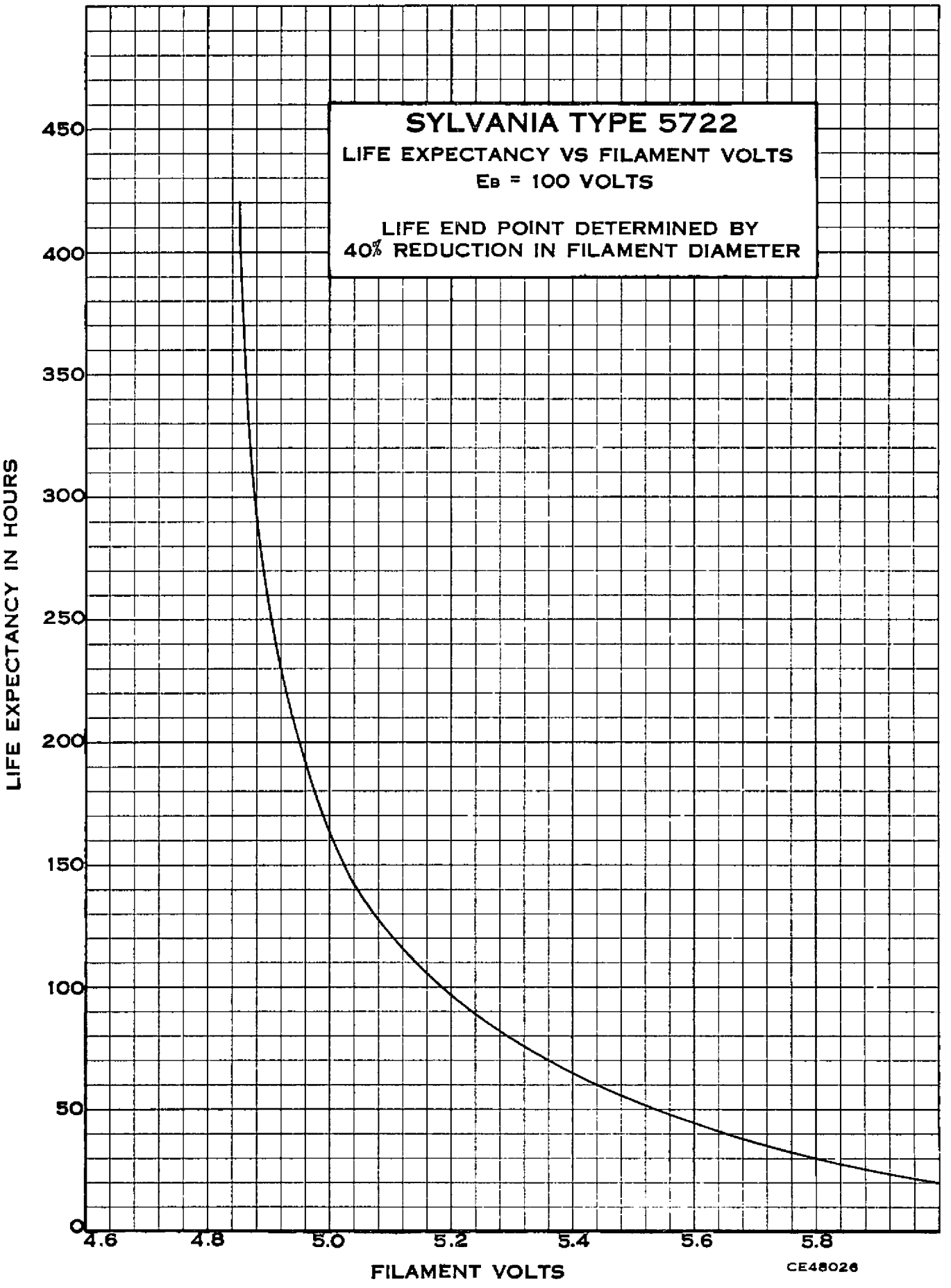


PARTS LIST

C_1, C_2, C_3, C_4, C_5	500 μμf
RFC_1, RFC_2	6 Turns #16 Enamel Wire on 3/16" Air Core
RFC_3, RFC_4	30 Turns #16 Enamel Wire on 3/8" O.D., 1/4" I.D. Bakelite Coil Form With Powdered Iron Core
R_1	50 to 300 Ohms as Required to Match Load
R_2	Filament Voltage Control


SYLVANIA TYPE 5722
SATURATION CURVE
Ef = 4.9 VOLTS
PLATE CURRENT IN MILLIAMPERES
35
30
25
20
15
10
5
0
20
40
60
80
100
120
140
160
180
200
PLATE VOLTS


SYLVANIA TYPE 5722
FILAMENT EMISSION CURVE
EB = 100 VOLTS
PLATE CURRENT IN MILLIAMPERES
80
60
40
20
0
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
FILAMENT VOLTS
CE48027


SYLVANIA TYPE 5722
LIFE EXPECTANCY VS FILAMENT VOLTS
EB = 100 VOLTS
LIFE END POINT DETERMINED BY
40% REDUCTION IN FILAMENT DIAMETER
LIFE EXPECTANCY IN HOURS
450
400
350
300
250
200
150
100
50
0
4.6
4.8
5.0
5.2
5.4
5.6
5.8
FILAMENT VOLTS
CE48026

SYLVANIA

engineering data service

SYLVANIA

5764

MECHANICAL DATA

Maximum Overall Length	2.375 Inches
Maximum Overall Diameter	1.005 Inches

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (AC or DC)	6.3 Volts
Heater Current	.425 Ma

DIRECT INTERELECTRODE CAPACITANCES (MAX.)

Grid to Plate	1.50 $\mu\mu$f
Grid to Cathode	1.40 $\mu\mu$f
Plate to Cathode	.025 $\mu\mu$f

RATINGS (Absolute Values)

Plate Dissipation	5 Watts	Max.
Plate Voltage (Pulsed)	1500 Volts	Max.
Plate Voltage (CW)	1000 Volts	Max.
Operating Frequency	3300 Mc	Max.
Seal Temperature	175° C	Max.

CHARACTERISTICS

Conditions: (E_b=180 volts dc, R_k=400 ohms)

Transconductance	4500 μmhos
Amplification Factor	25
Plate Current	12 Ma

TYPICAL OPERATION

UHF Oscillator, CW — 1000 MC

Plate Voltage	150 Volts
Plate Current	25 Ma
Grid Resistor	100 Ohms

UHF Oscillator, CW — 3300 MC

Plate Voltage	150	200 Volts
Plate Current	25	25 Volts
Grid Resistor	100	100 Ohms
Cathode Resistor (approx. [1]	100	100 Ohms
Power Output	200	450 MW Min.

Pulse Operation — 3300 MC

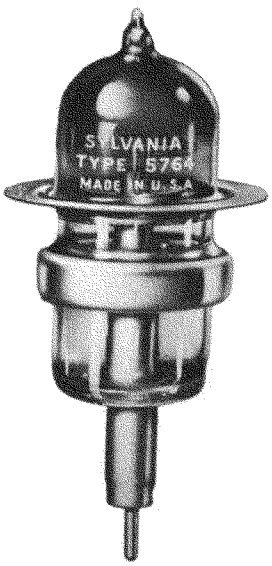
Peak Plate Voltage[2]	1500 Volts
Peak Power Output	175 Watts
Peak Emission	1500 Ma Min.

NOTES:

1. *Adjust for rated plate current.*
2. *Test conditions: Pulse Width, 1 μsec.; Pulse Rep. Rate, 2000 pps.*

QUICK REFERENCE DATA

The Sylvania Type 5764 is a uhf planar triode designed for service at frequencies up to 3300 mc as a cw or pulse modulated oscillator.



SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

12-53-46

SYLVANIA
5764

APPLICATION DATA

The Sylvania Type 5764 is a medium mu uhf triode employing planar construction. It is designed for service as a CW or pulse modulated oscillator at frequencies up to 3300 mc with medium power output. Frequency ratios of about 4 to 1 (250 mc to 1000 mc) for continuous tuning can be obtained up to 1000 mc with no dead spots throughout the range, ratios of about 3 to 1 can likewise be obtained up to 3300 mc.

SYLVANIA

engineering data service

SYLVANIA

5765

MECHANICAL DATA

Maximum Overall Length	2.38 Inches
Maximum Overall Diameter	1.01 Inches

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES

Grid to Plate	1.95 $\mu\mu$f
Grid to Cathode	1.30 $\mu\mu$f
Plate to Cathode	.07 $\mu\mu$f

RATINGS

Heater Voltage (a c or d c)	6.3 Volts
Heater Current	400 Ma
Maximum Plate Dissipation	5.0 Watts
Maximum Seal Temperature	175° C
Maximum Plate Voltage	350 Volts
Maximum Operating Frequency	2900 Mc

CHARACTERISTICS

Conditions: (E_b = 180 volts dc, R_k = 400 ohms)

Transconductance	4500 μmhos
Amplification Factor	25
Plate Current	12.0 Ma

TYPICAL OPERATING CONDITIONS

UHF Oscillator, CW

Plate Voltage	180 Volts DC
Plate Current, R_g/I_b	25 Ma DC
Frequency	900-2900 Mc
Power Output	250 Mw Avg. Over the Band

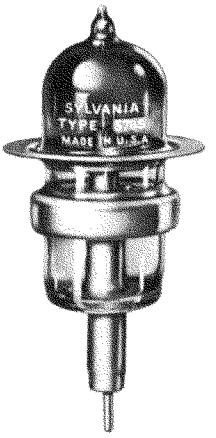
APPLICATION DATA

The Sylvania Type 5765 was designed for use as a cw oscillator at frequencies up to 2900 mc. The 5765 has a built-in internal feedback circuit between cathode and anode and fits into a concentric circuit. A small amount of adjustable, external feedback is generally necessary in order to obtain optimum power output at any given frequency. A feedback probe between the output and input lines may be used.

The Type 192 or 192A cavities as supplied by Amerac Inc., are recommended for the 5765.

QUICK REFERENCE DATA

The Sylvania Type 5765 is a UHF triode oscillator designed for service at frequencies up to 2900 mc. The 5765 has a built-in internal feedback circuit between cathode and anode and fits into a concentric line oscillator.



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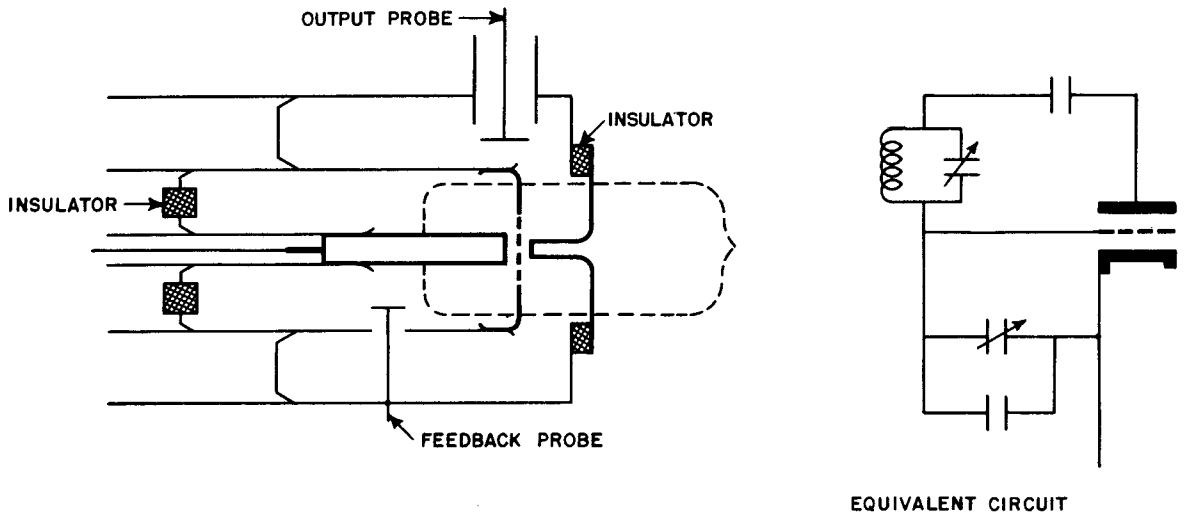
7-54-89

APPLICATION DATA CONT'D



The Type 5765 in a typical quarter wave concentric line circuit. An external probe may be used to provide the feedback necessary for oscillation.

OUTLINE DRAWING

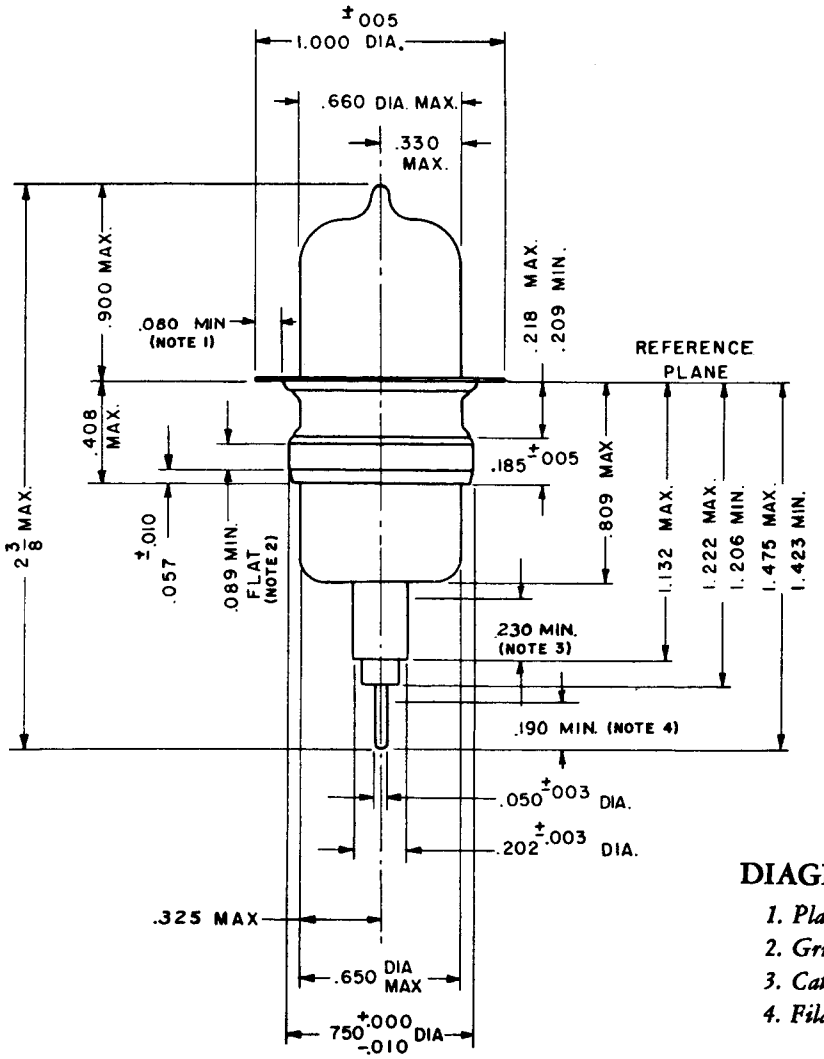


DIAGRAM NOTES:

1. *Plate contact area.*
2. *Grid contact area.*
3. *Cathode and filament contact area.*
4. *Filament contact area.*

SYLVANIA ROCKET TUBES are planar-electrode, disc-seal triodes which operate efficiently and can be used in simplified circuits at frequencies up to the 3300 mc. region. As oscillators and amplifiers these types may be used as integral parts of tuned cavities and, because of their low internal lead inductance, are well adapted to lumped-constant circuits in the 500-mc. region.

Three design features of this group of tubes are of major importance to simplified, efficient operation at ultra-high frequencies:

1) The stretched, parallel-wire grid construction results in stable, uniform operation because this type of planar grid does not buckle.

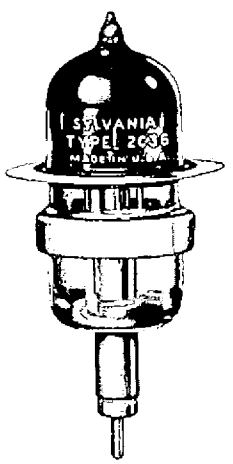
2) The unique cathode design minimizes mechanical and electrical discontinuities in the cathode structure.

3) The disc-seal type of construction satisfies the requirements for low lead inductance, and the variety of disc-shapes now available allows the use of these types in several kinds of mechanical tuners.

Optimized tube design permits *broad band* operation. Frequency ratios of about 4 to 1 (250 mc. to 1000 mc.) for continuous tuning can be obtained up to 1000 mc. with no deadspots throughout the range. Ratios of about 3 to 1 can likewise be obtained up to 3300 mc.

Since the tuning operation for these types is simpler and covers a greater continuous range than that of many other types of uhf tubes, the SYLVANIA planar triodes may be used to advantage in a wide variety of applications in electronics, communications, radar, and navigation. Some types are designed for c.w. and others for pulsed operation.

DESCRIPTION OF TYPES

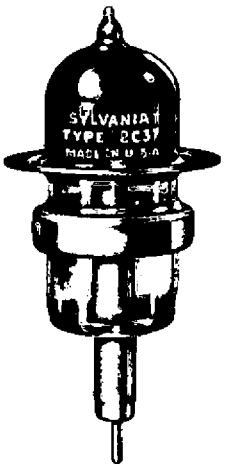


TYPE 2C36

This type was designed for use as a pulse-modulated oscillator at frequencies up to 1200 mc. The 2C36 has a built-in internal feedback circuit between cathode and anode and fits into a concentric-line circuit similar to that shown for the 2C37 in Fig. 8. A small amount of adjustable, external feedback is generally necessary in order to obtain optimum power output at any given frequency. A feedback probe between the output and input lines may be used as indicated in the drawing. With plate-pulse modulation the grid may be operated at zero bias, eliminating the necessity of insulating the cathode from the grid in the input-line plunger. Ratings and characteristics are listed in Table I.

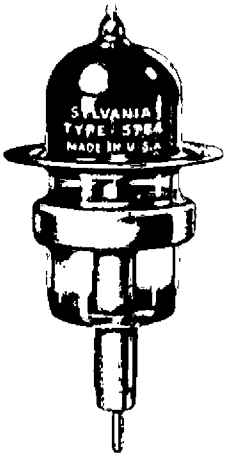
from RMA release #728, Jan. 15, 1949

TYPE 2C37



This type was designed primarily for use as a c.w. oscillator at frequencies up to 3300 mc. It can also be used for amplifier and frequency-multiplier applications.

The 2C37 is similar in appearance to the 2C36, but has no internal feedback. Ratings and characteristics are given in Table II, characteristic curves in Figs. 5 and 6.



TYPE 5764

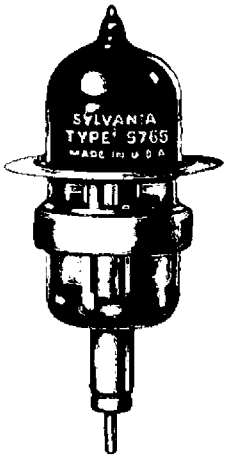
This type was designed for use as a pulse-modulated oscillator at frequencies up to 3300 mc.

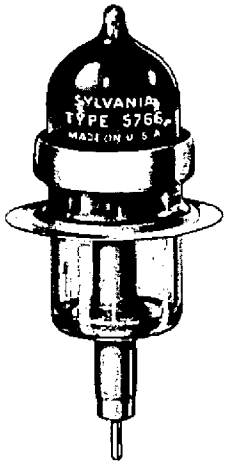
The 5764 is identical with the 2C37 except for special cathode design and processing that makes it suitable for pulsed operation. Previously, it was termed experimental type SB846B. A typical circuit for pulse-modulated operation is the half-wave re-entrant-cavity circuit shown in Fig. 9. Typical frequency drift characteristics caused by variations in heater voltage, plate voltage, and duty cycle in this circuit appear in Fig. 7. Ratings and characteristics are given in Table III.

TYPE 5765

This type was designed for use as a c.w. oscillator without external feedback in the range from 900-2900 mc.

The 5765 is similar to the 2C37 except for a specially designed built-in feedback similar to that of the 2C36 and requires no feedback in the external circuit over the specified frequency range. Ratings and characteristics are given in Table IV.

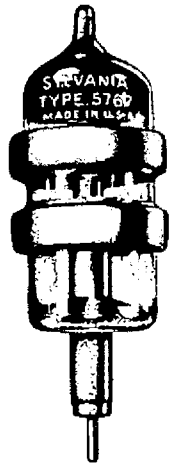




TYPE 5766

This type was designed primarily for use as a c.w. oscillator at frequencies up to 3300 mc.

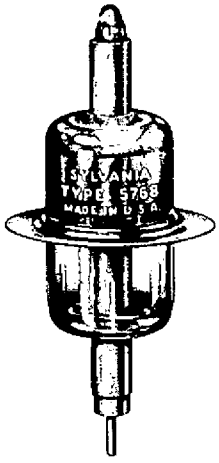
The 5766 is identical with the 2C37 except that the plate disc is folded and the grid disc is flat. This allows the tube to be used in cavity shapes different from those used with the 2C37. Ratings and characteristics are given in Table II. This tube was previously termed experimental type SB846D.



TYPE 5767

This type was designed for use as a c.w. oscillator at frequencies up to 3300 mc.

The 5767 is identical with the 2C37 except that both discs are folded. This construction is particularly adapted to applications in lumped-constant circuits or butterfly circuits. Ratings and characteristics are given in Table II. This type was previously termed experimental type SB846H.



TYPE 5768

This type was designed for use as an amplifier at frequencies up to 3000 mc.

The cylindrical anode design of the 5768 lends itself to use in high-impedance output cavities. Ratings and optimum characteristics are given in Table V.

In order to cover a 3 to 1 frequency range a considerable sacrifice in gain must be made in certain portions of the band, especially the low end. A cavity properly designed for any given fixed frequency between 1000 mc and 3000 mc will thus have a considerably higher gain than that shown in Table V.

For all of the above tubes, the area of contact with the anode disc (or anode rod, in the case of type 5768) should be sufficiently large to allow adequate cooling so that 5.0 watts can be dissipated without exceeding the maximum allowable temperature for the glass-to-metal seal.

CHARACTERISTICS AND RATINGS

TABLE I
Type 2C36
Ultra-High-Frequency Oscillator
Ratings and Characteristics

ELECTRICAL RATINGS

Heater voltage (A.C. or D.C.)	6.3 volts
Heater current	0.4 amperes
Maximum plate dissipation	5.0 watts
Maximum seal temperature	175 degrees C.
Maximum plate voltage (pulsed)	1500 volts
Maximum operating frequency	1200 megacycles
Direct Interelectrode Capacitances (average)	
Grid-plate	2.40 micromicrofarads
Grid-cathode	1.40 micromicrofarads
Plate-cathode	0.36 micromicrofarads

TUBE CHARACTERISTICS

Transconductance (E_b = 180 volts D.C., R_k = 400 ohms)	4500 micromhos
Amplification factor " " " " " "	25
Plate current " " " " " "	11.5 milliamperes

TYPICAL OPERATING CONDITIONS

ULTRA-HIGH-FREQUENCY OSCILLATOR - PLATE PULSE MODULATED

Plate voltage (peak)	1000 volts
Plate current (peak)	0.9 amperes
Grid voltage	0.0 volts
Pulse repetition frequency	2000 pulses per second
Pulse width	2.0 microseconds
Frequency of operation	1000 megacycles
Power output (peak)	200 watts

MECHANICAL SPECIFICATIONS

Maximum over-all length	2.38 inches
Maximum over-all diameter	1.01 inches

TABLE II

Types 2C37, 5766, 5767

Ultra-High-Frequency, General-Purpose Triodes

Ratings and Characteristics

ELECTRICAL RATINGS

Heater voltage (A.C. or D.C.)	6.3 volts
Heater current	0.4 amperes
Maximum plate voltage	350 volts D.C.
Maximum plate dissipation	5.0 watts
Maximum seal temperature	175 degrees C.
Maximum operating frequency	3300 megacycles
Direct Interelectrode Capacitances (Average)	
Grid-plate	1.85 micromicrofarads
Grid-cathode	1.40 micromicrofarads
Plate-cathode	0.02 micromicrofarads

TUBE CHARACTERISTICS

Heater voltage	6.3 volts
Heater current	0.4 amperes
Plate voltage	180 volts D.C.
Cathode bias resistor	400 ohms
Plate current	11.5 milliamperes D.C.
Transconductance	4500 micromhos
Amplification factor	25
Grid voltage for I_b = 10 microamperes D.C.	-13.0 volts D.C.

TYPICAL OPERATING CONDITIONS

ULTRA-HIGH-FREQUENCY OSCILLATOR - CONTINUOUS WAVE

Plate voltage	150 volts D.C.
Plate current	15 milliamperes D.C.
Grid resistor	3000 ohms
Developed grid voltage (approximate)	-11.0 volts D.C.
Frequency	1000 megacycles
Power output	0.5 watts

ULTRA-HIGH-FREQUENCY OSCILLATOR - CONTINUOUS WAVE

Heater voltage	6.3 volts
Plate voltage	150.0 volts
Cathode resistor	100 ohms*
Grid resistor	100 ohms
Plate current	25 milliamperes
Frequency	3300 megacycles
Power Output	100 milliwatts

**Cathode resistor variable*

MECHANICAL SPECIFICATIONS

TYPES 2C37, 5766

Maximum over-all length	2.38 inches
Maximum over-all diameter	1.01 inches

TYPE 5767

Maximum over-all length	2.38 inches
Maximum over-all diameter	0.75 inches

TABLE III
Type 5764
Ultra-High-Frequency Oscillator for Pulse Operation
Ratings and Characteristics

ELECTRICAL RATINGS

Heater voltage (A.C. or D.C.)	6.3	volts
Heater current	0.4	amperes
Maximum plate dissipation (continuous)	5.0	watts
Maximum seal temperature	175	degrees C.
Maximum plate voltage (pulsed)	1500	volts
Maximum operating frequency	3300	megacycles
Direct Interelectrode Capacitances (Average)		
Grid-plate	1.85	micromicrofarads
Grid-cathode	1.40	micromicrofarads
Plate-cathode	0.02	micromicrofarads

TUBE CHARACTERISTICS

(E_b = 180 volts D.C., R_k = 400 ohms)

Transconductance	4500 micromhos
Amplification Factor	25
Plate Current	11.5 milliamperes

TYPICAL OPERATING CONDITIONS

Heater voltage	6.3	volts
Heater current	0.4	amperes
Plate voltage (peak)	1000	volts
Plate current (peak)	1.3	amperes
Grid voltage	0.0	volts
Pulse repetition frequency	2000	pulses per second
Pulse width	1.0	microsecond
Frequency of operation	3300	megacycles
Power output (peak)	200	watts

MECHANICAL SPECIFICATIONS

Maximum over-all length	2.38 inches
Maximum over-all diameter	1.01 inches

TABLE IV
Type 5765
Ultra-High-Frequency Oscillator for C.W. Operation
Ratings and Characteristics

ELECTRICAL RATINGS

Heater voltage (A.C. or D.C.)	6.3 volts
Heater current	0.4 amperes
Maximum plate voltage	350 volts D.C.
Maximum plate dissipation	5.0 watts
Maximum seal temperature	175 degrees C.
Maximum operating frequency	2900 megacycles
Direct Interelectrode Capacitances (average)	
Grid-plate	2.10 micromicrofarads
Grid-cathode	1.30 micromicrofarads
Plate-cathode	0.03 micromicrofarads

TUBE CHARACTERISTICS

Heater voltage	6.3 volts
Heater current	0.4 amperes
Plate voltage	180 volts D.C.
Cathode bias resistor	400 ohms
Plate current	11.5 milliamperes D.C.
Transconductance	4500 micromhos
Amplification factor	25
Grid voltage for I_b = 10 microamperes D.C.	-13.0 volts D.C.

TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS *(tentative)*

ULTRA-HIGH-FREQUENCY OSCILLATOR - CONTINUOUS WAVE-TUNABLE, BROAD BAND

Plate voltage	180 volts
Plate current	25 milliamperes
Grid resistor	10,000 ohms*
Frequency band	900 to 2900 megacycles
Power output (average over band)	175 milliwatts
Power output (at 1900 megacycles)	225 milliwatts

**Grid resistor variable*

MECHANICAL SPECIFICATIONS

Maximum over-all length	2.38 inches
Maximum over-all diameter	1.01 inches

Cavity information will be furnished upon request.

TABLE V
Type 5768
Ultra-High-Frequency Amplifier for C.W. Operation
Ratings and Characteristics

ELECTRICAL RATINGS

Heater voltage	6.3 volts
Heater current	0.4 amperes
Maximum plate voltage	350 volts
Maximum plate dissipation	5.0 watts
Maximum seal temperature	175 degrees C.
Maximum operating frequency	3000 megacycles
Direct Interelectrode Capacitances (average)	
Grid-plate	1.30 micromicrofarads
Grid-cathode	1.25 micromicrofarads
Plate-cathode	.01 micromicrofarads

TUBE CHARACTERISTICS

Heater voltage	6.3 volts
Heater current	0.4 amperes
Plate voltage	180 volts D.C.
Cathode bias resistor	400 ohms
Plate current	4 milliamperes
Transconductance	4500 micromhos
Amplification factor	85

TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS (*tentative*)

ULTRA-HIGH-FREQUENCY AMPLIFIER - CONTINUOUS WAVE-TUNABLE, BROAD BAND

Plate voltage	250 volts
Fixed bias voltage	-1 volt
Plate current	9.3 milliamperes
Frequency band	1000 to 3000 megacycles
Power gain (average over band)	7 decibels
Power gain (at 3000 megacycles)	3 decibels

MECHANICAL SPECIFICATIONS

Maximum over-all length	2.38 inches
Maximum over-all diameter	1.01 inches

OUTLINE DRAWINGS

TYPES 2C36, 2C37, 5764, 5765

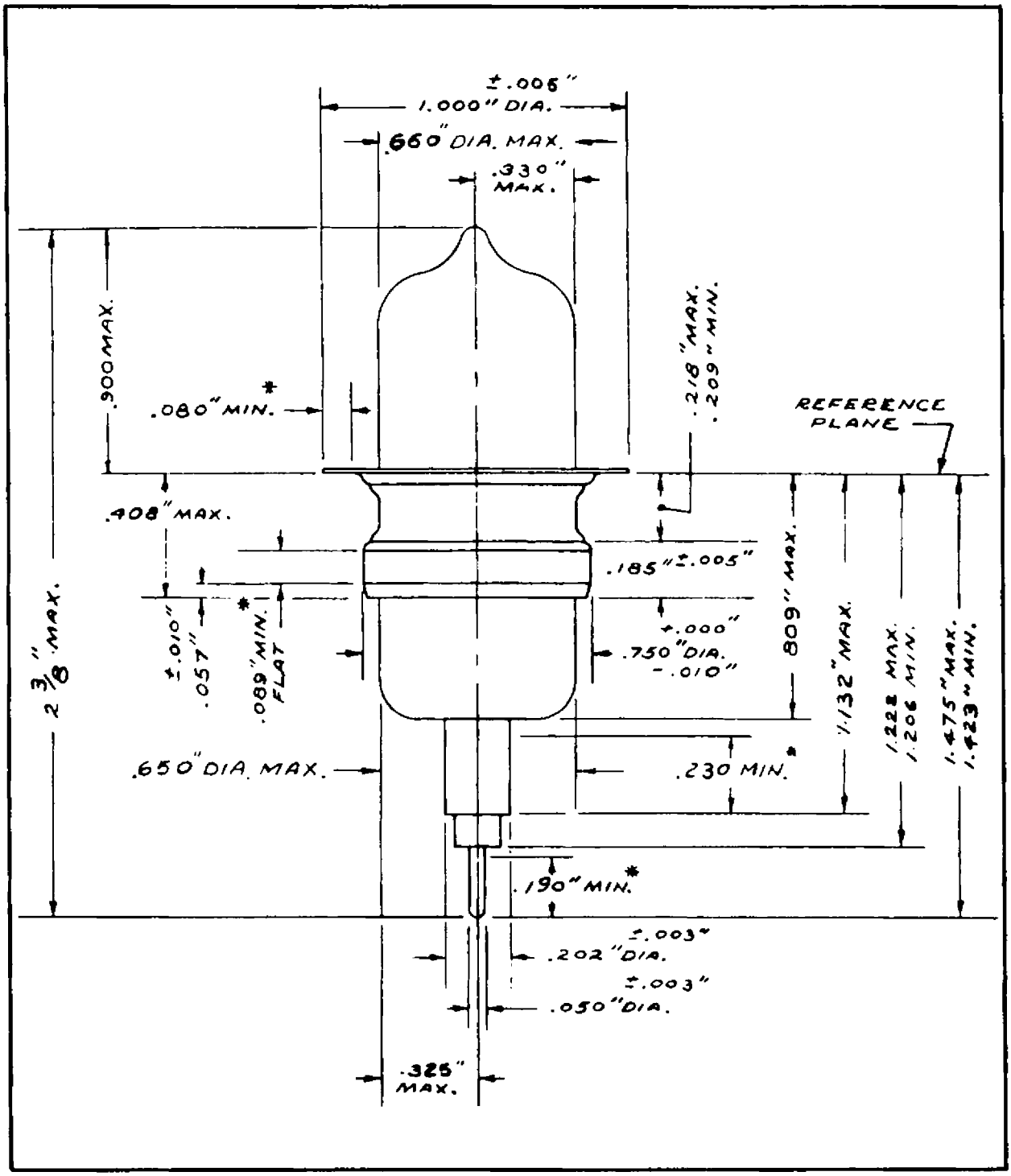


Fig. 1 Outline drawing showing the dimensions that are necessary for designing cavities. The dimensions are for the 2C36, 2C37, 5764, and 5765.

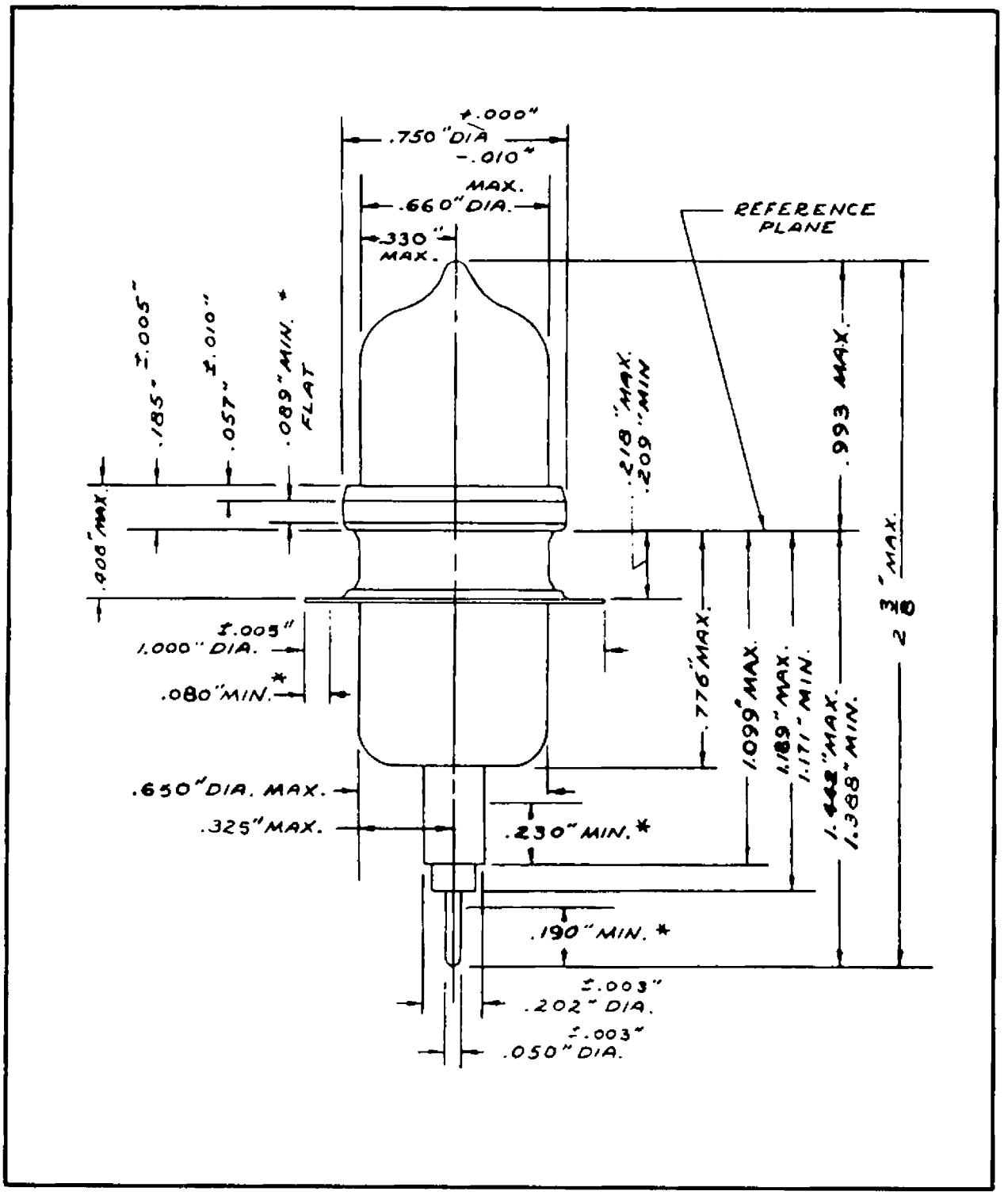


Fig. 2 Outline Drawing of the 5766.

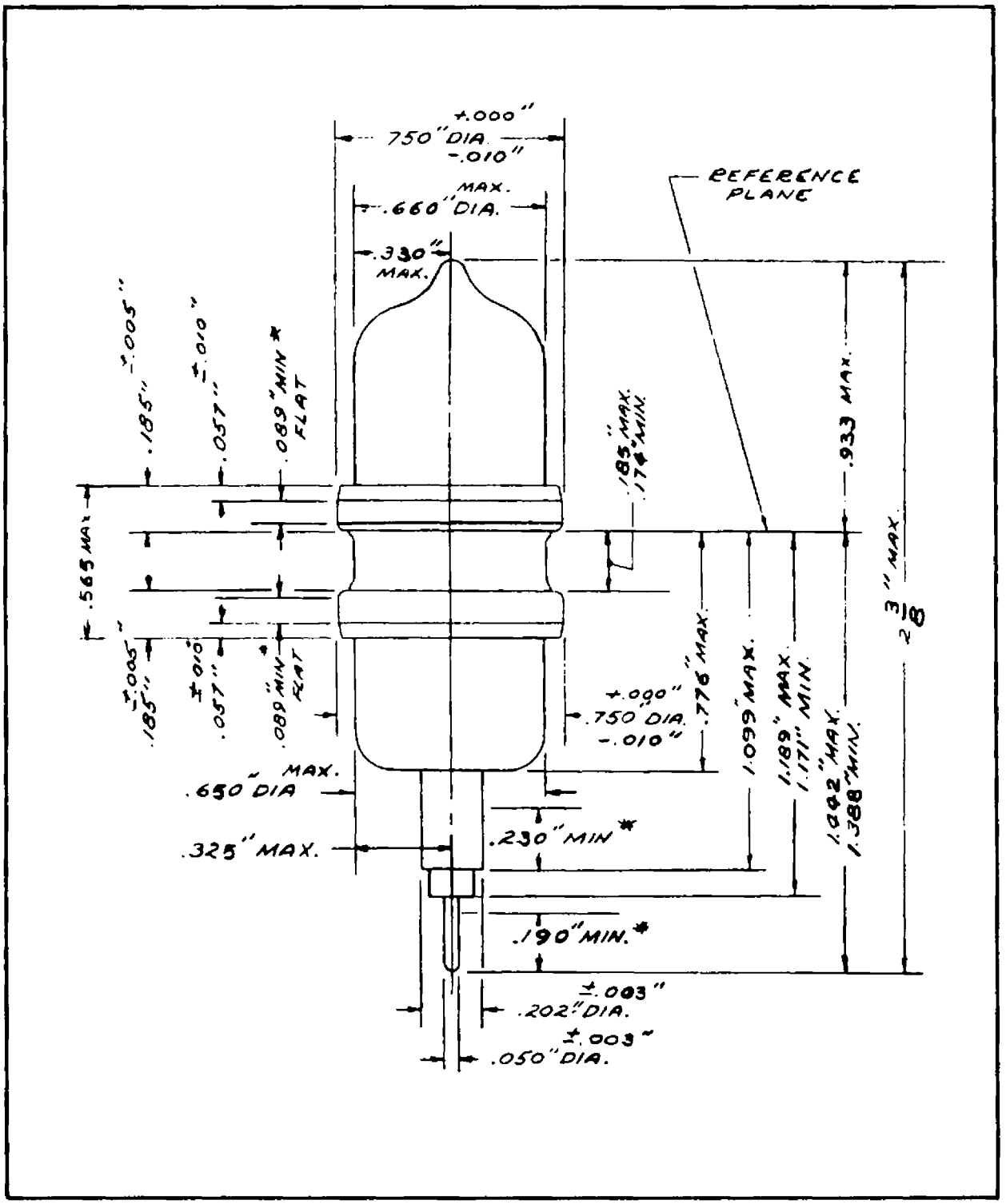


Fig. 3 Outline Drawing of the 5767.

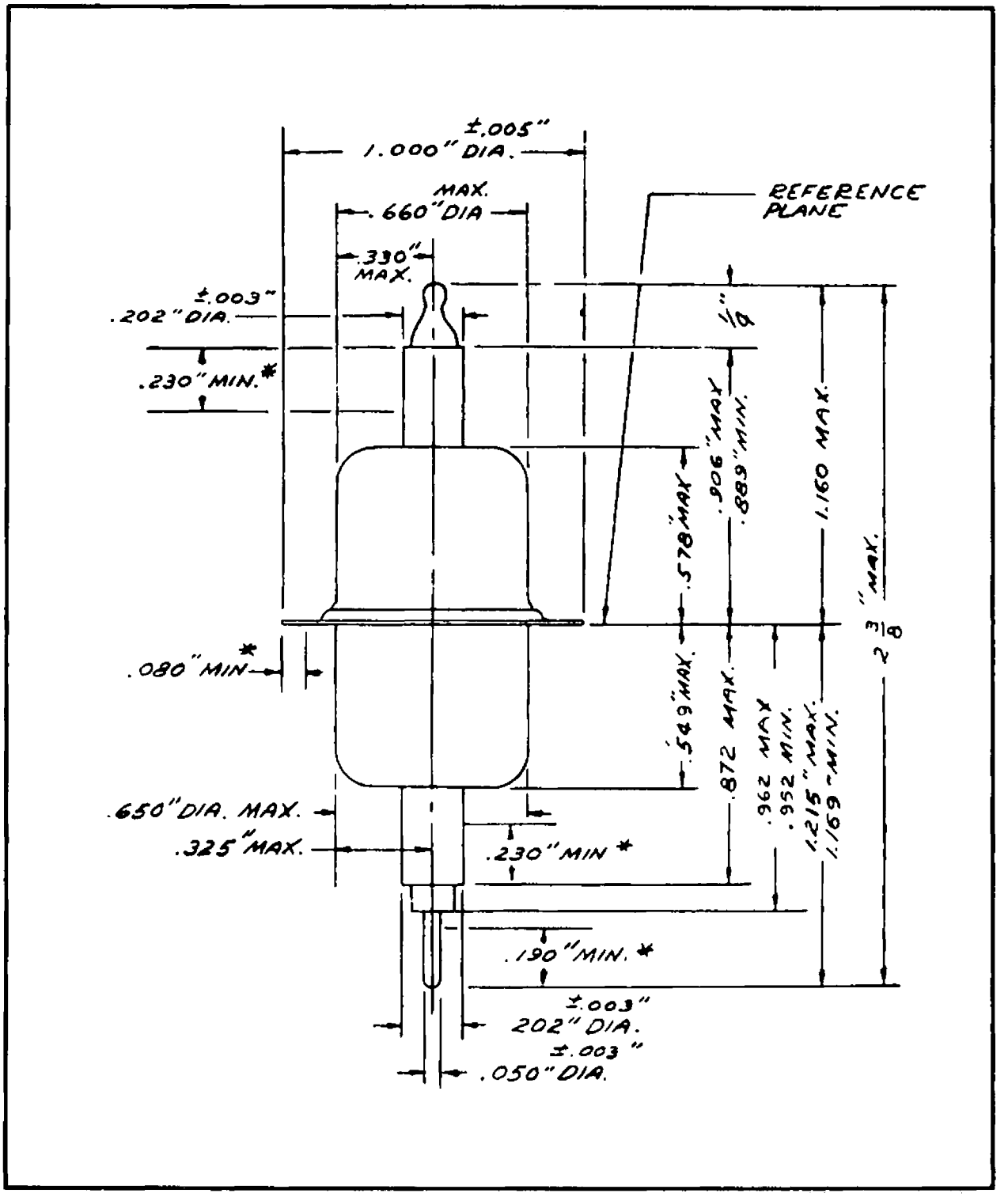


Fig. 4 Outline Drawing of the 5768.

CHARACTERISTIC CURVES

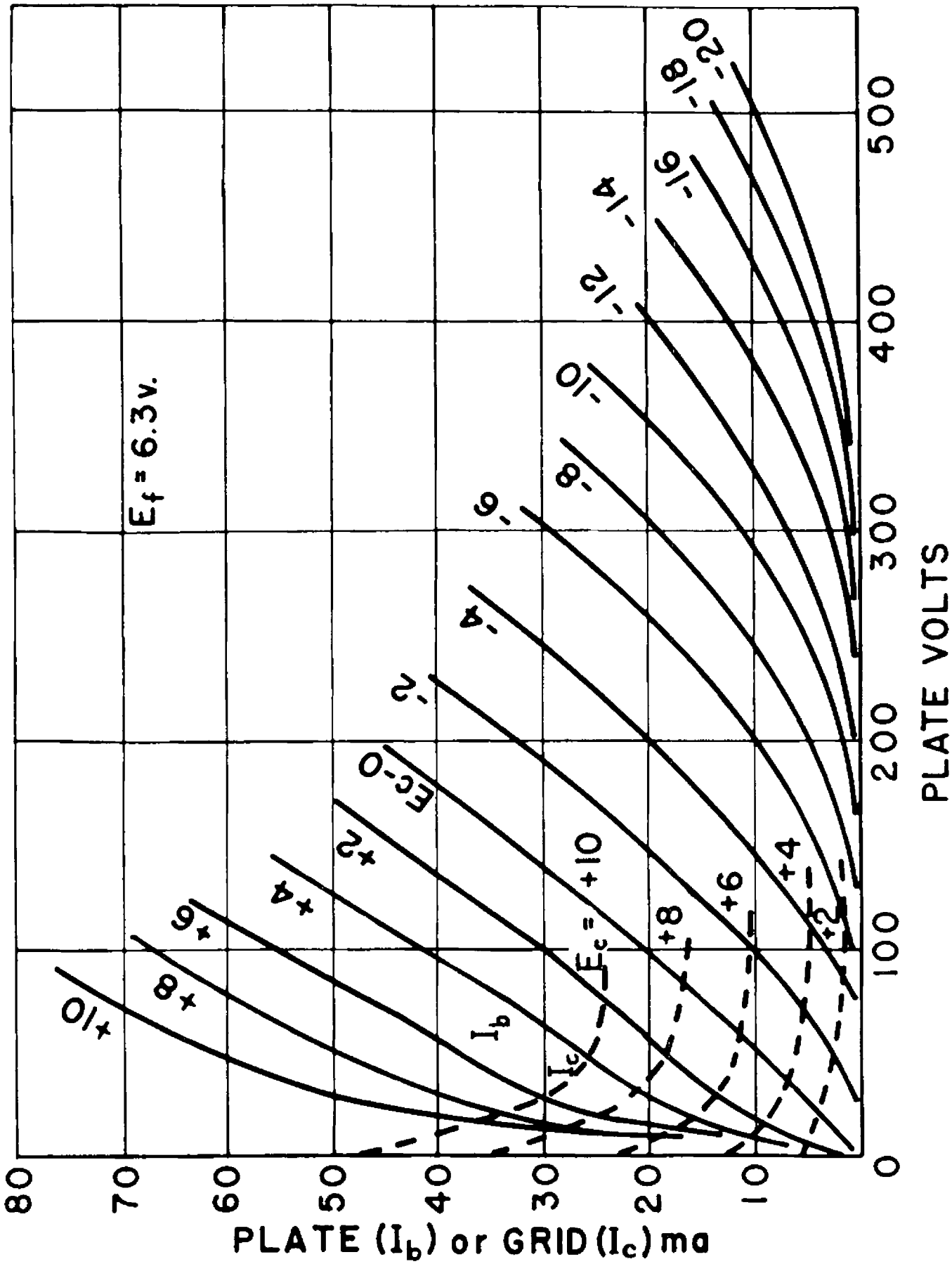


Fig. 5 SYLVANIA Type 2C37 Plate Characteristics.

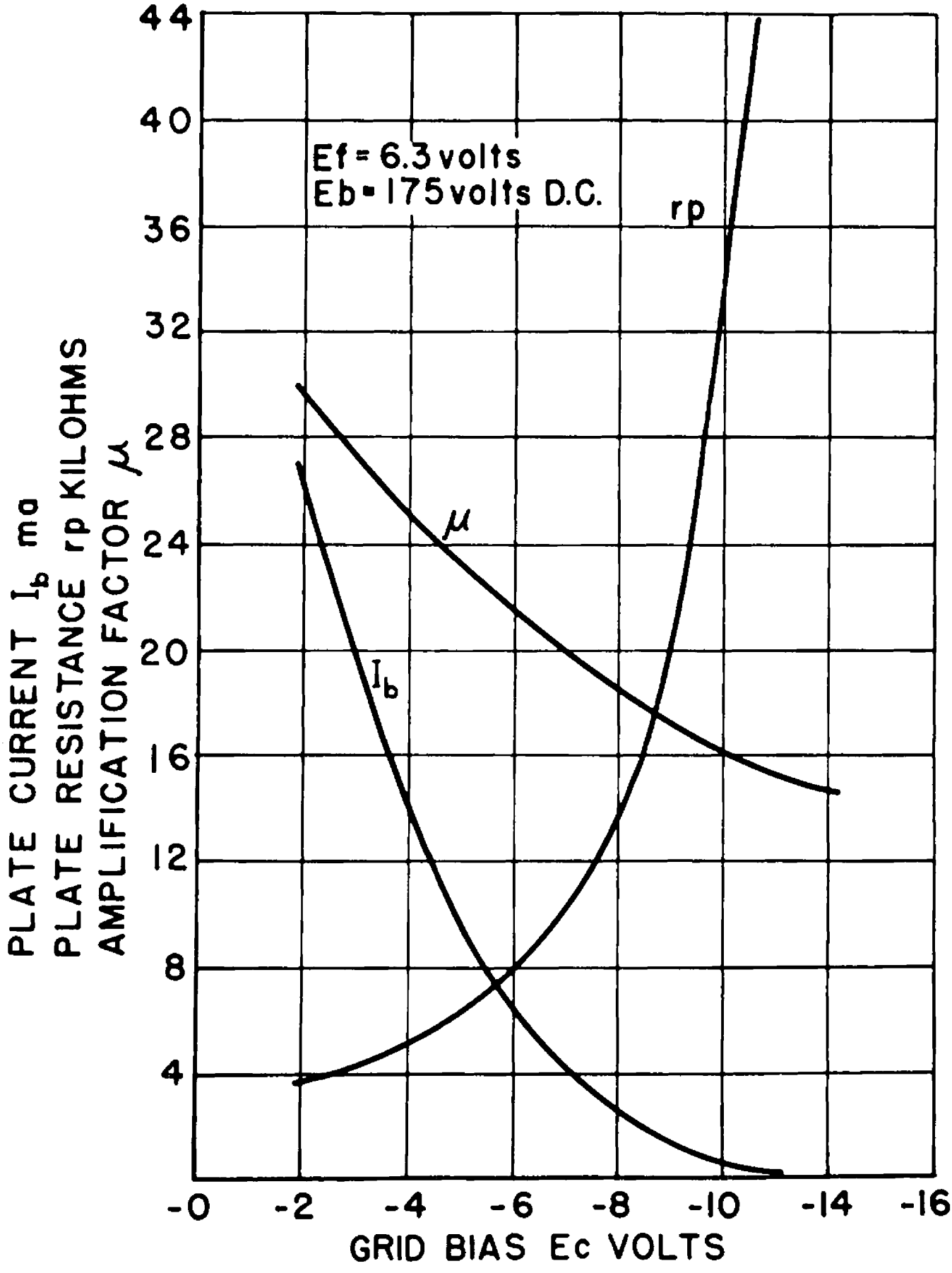
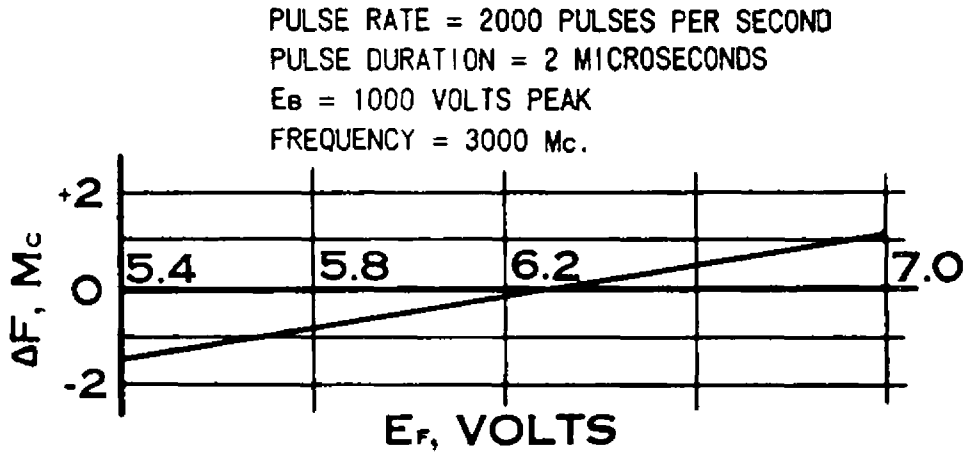
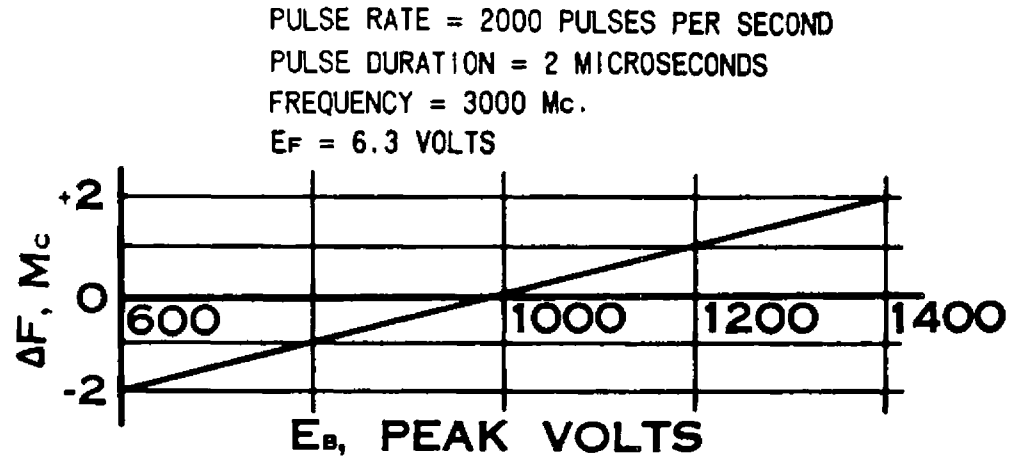


Fig. 6 SYLVANIA Type 2C37 Transfer Characteristics.

Typical Frequency Drift Characteristics, Pulse-Modulated Oscillator





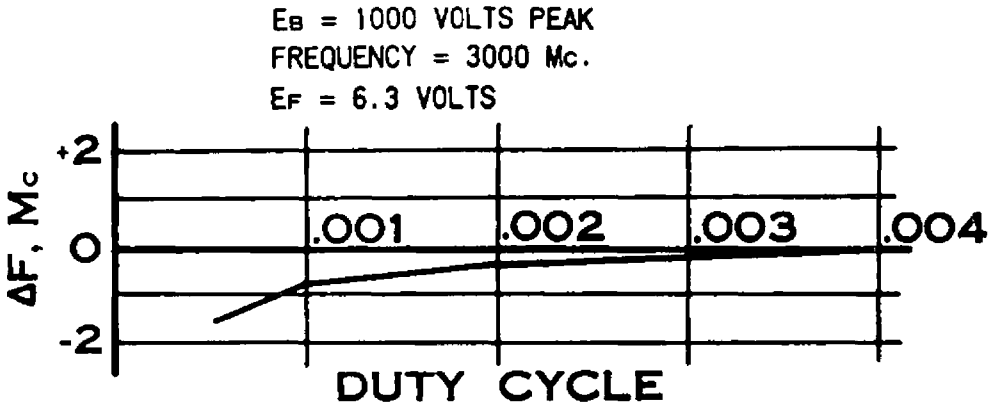


Fig. 7. At 3000 megacycles center frequency, the frequency drift in changing the heater voltages from 5.4 to 7.0 is in the order of 2 megacycles per volt. Likewise, the drift in changing the peak plate voltage from 600 to 1400 is approximately one-half megacycle per 100 volts. The total drift in changing the duty cycle from 0.0005 to 0.004 is in the order of 2 megacycles.

APPLICATIONS

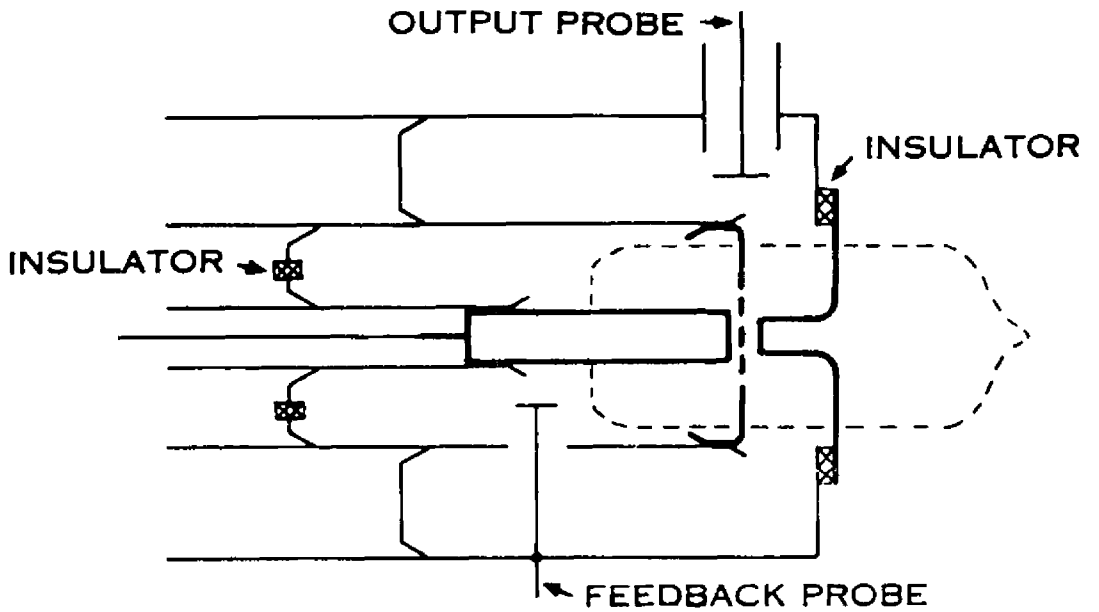


Fig. 8. A type 2C37 in a typical quarter-wave concentric-line circuit. An external probe provides the external feedback necessary for oscillation. If the tube is used as an amplifier, the feedback probe may be removed and a loop or probe connected to the input line.

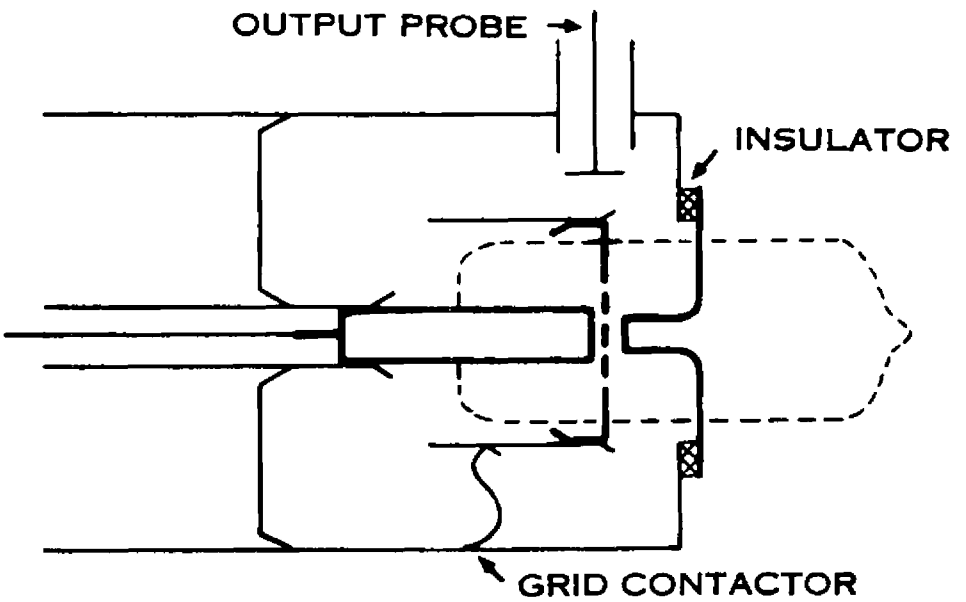


Fig. 9. A type 5764 is shown in this circuit in which the length of cylinder on the grid forming a half-wave transmission line determines the frequency of operation. Direct current contact to the grid is made through a spring clip from the wall of the cavity, and it may be insulated from the cavity with a capacitance by-pass. For plate-pulse modulation the grid is operated at D.C. ground potential so that no insulation is necessary. Tuning the plunger optimizes power output with very little effect on frequency. Feedback is accomplished by the open-ended grid cylinder, allowing currents to flow from the output circuit to the input circuit. Power is coupled by means of a probe or loop as usual.

SYLVANIA

engineering data service
electronic products

SYLVANIA
5767

DESCRIPTION: ULTRA-HIGH FREQUENCY GENERAL PURPOSE TRIOD

FORMER DESIGNATION: SB846H

The planar triode 5767 was designed for use as a cw oscillator at frequencies up to 3300 mc. It is identical with Sylvania Type 2C37 except that both discs are folded, making it particularly adapted to applications in lumped-constant or butterfly circuits.

RATINGS AND CHARACTERISTICS

ELECTRICAL RATINGS

Heater voltage	6.3 volts
Heater current	0.4 amps
Maximum plate voltage	350 volts DC
Maximum plate dissipation	6 watts
Maximum seal temperature	175° C
Maximum operating frequency	3300 mc min.
Direct interelectrode capacity (average)	
Grid-plate	1.37 $\mu\mu$f
Grid-cathode	1.27 $\mu\mu$f
Plate-cathode	.025 max.

TUBE CHARACTERISTICS

Cathode bias resistor	400 ohms
Plate current	12 ma
Transconductance	4500 μmhos
Amplification factor	25
Grid voltage for 10 microamperes DC	—28 V DC

TYPICAL OPERATING CONDITIONS

(1) UHF Oscillator CW

Plate voltage	150 V DC
Plate current	15 ma DC
Grid resistor	3000 ohms
Frequency	1000 mc
Power output	500 mw

(2) UHF Oscillator CW

Plate voltage	150 V DC
Plate current	25 ma DC
Grid resistor	100 ohms
Cathode resistor*	100 ohms approx.
Frequency	3300 mc
Power output	200 mw min.

* Adj. for rated plate current

(3) UHF Oscillator CW

Plate voltage	200 V DC
Plate current	25 ma DC
Grid resistor	100 ohms
Cathode resistor*	100 ohms approx.
Frequency	3300 mc
Power output	450 mw min.

* Adj. for rated plate current

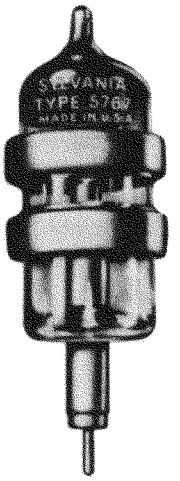
(4) Pulse Operation

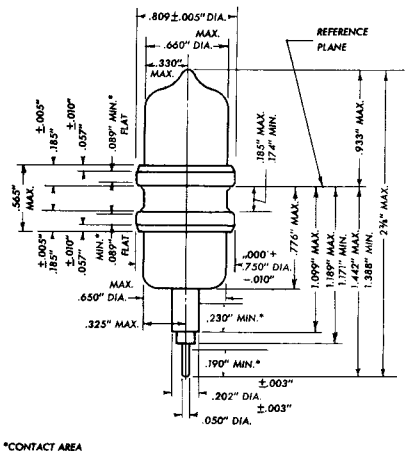
Plate voltage (Peak)*	1500 volts
Frequency	3300 mc
Power output (Peak)	175 watts
Peak emission	1500 ma min.

*Test Conditions:
Pulse width, 1 μsec
Pulse rep. rate = 2000 pps.

**Test Conditions:
Plate voltage (peak) = 100 V
Pulse width = 3 μsec
Pulse rep. rate = 500 pps.

MECHANICAL DATA





*CONTACT AREA

SYLVANIA ELECTRIC PRODUCTS INC.
1740 Broadway New York 19, N. Y.

SYLVANIA

engineering data service

SYLVANIA

5768

MECHANICAL DATA

Maximum Overall Length	2-7/16 Inches
Maximum Overall Diameter	1.005 Inches

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	400 Ma

DIRECT INTERELECTRODE CAPACITANCES (Max.)

Grid to Plate	1.40 $\mu\mu$f
Grid to Cathode	2.00 $\mu\mu$f
Plate to Cathode	0.15 $\mu\mu$f

RATINGS (Absolute Values)

Plate Voltage	350 Volts	Max.
Plate Dissipation	4 Watts	Max.
Operating Frequency	3000 Mc	Max.
Maximum Seal Temperature	175° C	

CHARACTERISTICS

Conditions: (E_b=180 volts dc, R_k=400 ohms)

Plate Current	4.0 Ma
Transconductance	4500 μmhos
Amplification Factor	85

TYPICAL OPERATION

Grounded Grid Amplifier, 3000 mc

Plate Voltage	150 Volts
Plate Current	7.0 Ma
Cathode Resistor	100 Ohms
Power Gain	5 DB

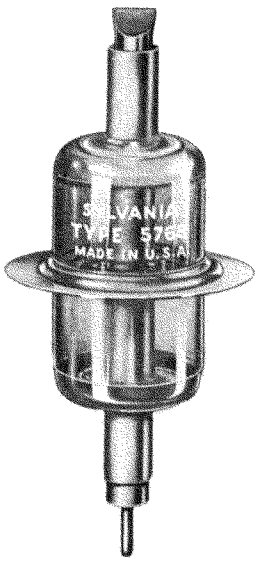
APPLICATION DATA

The Sylvania Type 5768 is designed for service as a grounded grid amplifier at frequencies up to 3000 mc and may be used with a tuned or untuned input and tuned coaxial line output. Frequency ratios of about 4 to 1 (250-1000 mc) for continuous tuning can be obtained up to 1000 mc with no dead spots throughout the range. Ratios of about 3 to 1 can likewise be obtained up to 3300 mc.

The Sylvania Type 5768 planar triode features a stretched, parallel-wire grid that results in stable, uniform operation; a unique cathode design that minimizes discontinuities in the cathode structure; and a disc-seal type of construction that satisfies the requirements for low lead inductance. The mechanical configuration provides maximum isolation between input and output circuits.

QUICK REFERENCE DATA

The Sylvania Type 5768 is a high mu planar triode designed primarily for operation as a grounded grid cw amplifier in the 1000-3000 mc range.



SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

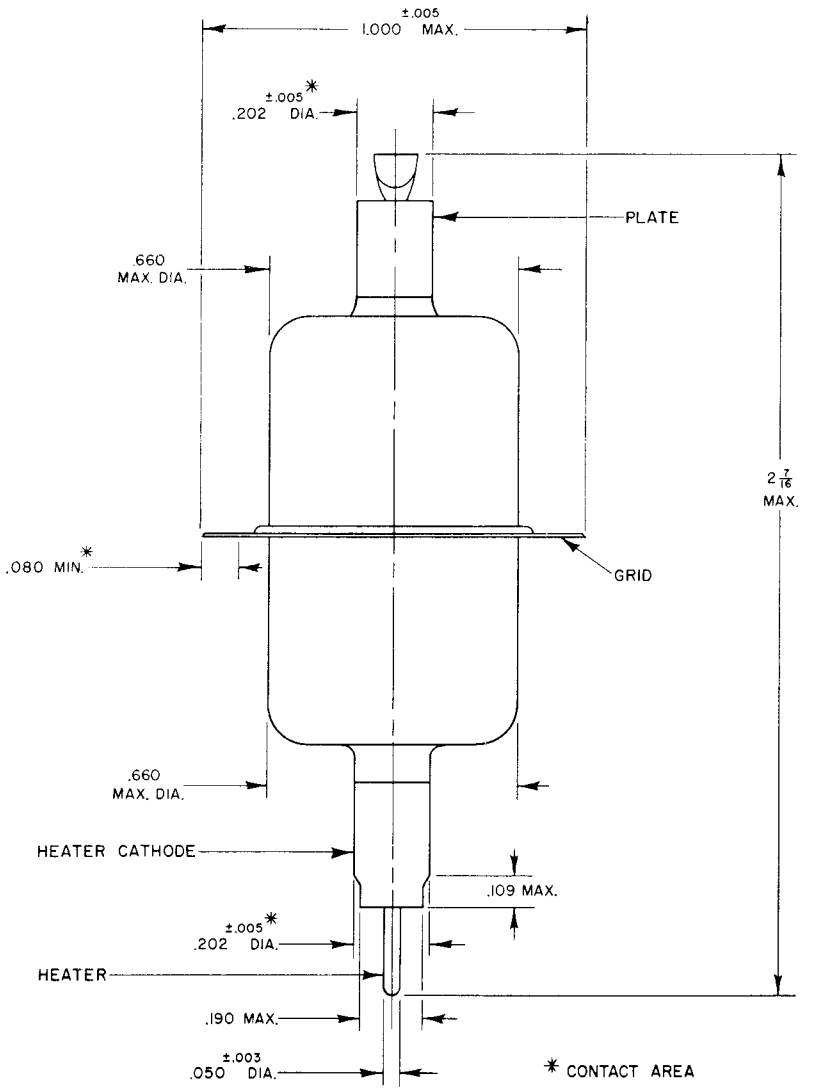
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

12-53-49

SYLVANIA

5768

OUTLINE DRAWING



SYLVANIA ELECTRIC

RMA Registration Data

TYPE 5789

MAGNETRON

The Type 5789 is a magnetron for pulse operation. It is of the fixed frequency type and the cavity and magnet are integral parts of the tube.

RATINGS

Maximum Heater Voltage (ac or dc)	7.0	volts
Minimum Cathode Heating Time	240	seconds
Maximum Peak Anode Voltage	14	kilovolts
Maximum Peak Anode Current	20	amperes
Maximum Peak Input Power	240	kilowatts
Maximum Duty Cycle	.0006	
Maximum Pulse Duration	1.0	microsecond
Maximum Anode Temperature	135	degrees centigrade

TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS

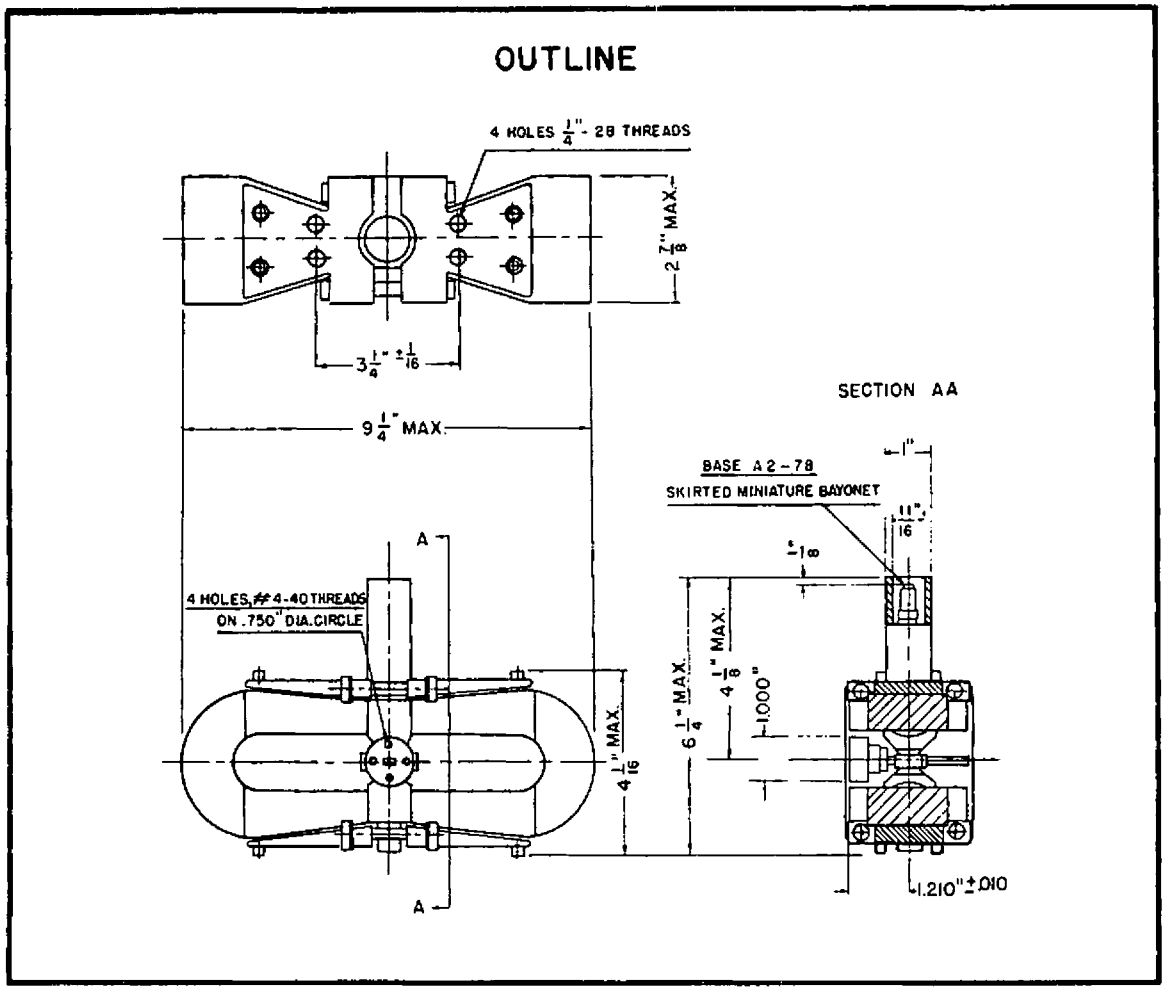
Starting Heater Voltage	6.0	volts
Heater Current at 6.0 Volts	2.0	amperes
Operating Heater Voltage	1.6	volts
Peak Anode Voltage	12	kilovolts
Peak Anode Current	16	amperes
Average Anode Current	4.0	milliamps
Peak Power Output	40	kilowatts
Average Power Output	10	watts
Pulse Duration	0.25	microsecond
Pulse Repetition Rate	1,000	pulses per second
Frequency (fixed)	35,208	megacycles, max
	34,512	megacycles, min
Pulling Figure	30	megacycles
RF Bandwidth	15	megacycles

DIMENSIONS

(See outline, page 2)

from RMA release #760, May 27, 1949

TYPE 5789


OUTLINE
4 HOLES 1/4"-28 THREADS
2 7/8" MAX.
3 1/4" ± 1/16
9 1/4" MAX.
SECTION AA
BASE A2-78
SKIRTED MINIATURE BAYONET
1"
11/16"
5/16
A
4 HOLES, #4-40 THREADS
ON .750" DIA. CIRCLE
4 1/16" MAX.
6 1/4" MAX.
4 1/8" MAX.
1.000"
1.210" ± .010
A

SYLVANIA

engineering data service 5790

MECHANICAL DATA

Mounting Position: . . . . . Any
Between rf choke flanges in 0.360 x 0.220 O.D. 0.040 WT waveguide.

Ambient Temperature Range: . . . . . −40 to +100° C
(non-operating)

Frequency Change: . . . . . $\triangle fo = \pm 50$ Mc Max.
with Temperature (0 to 100°C at 34,860 Mc)

Dimensions: . . . . . See Outline

ELECTRICAL DATA

IGNITOR CHARACTERISTICS

Ignitor Open Circuit Voltage . . . . . −750 to −1000 Vdc
Ignitor Current . . . . . 200 μ Adc Max.
Ignitor Voltage Drop at 100 μa . . . . . 200 to 350 Vdc

LOW POWER LEVEL UNFIRED CHARACTERISTICS

Insertion Loss . . . . . 2.0 db Max.
Ignitor Interaction at 100 μa . . . . . 0.2 db Max.

HIGH POWER LEVEL FIRED CHARACTERISTICS

Leakage Power[1] . . . . . 30 Mw Max.
Recovery Time[1] . . . . . 4 μs Max.
at −3 db

NOTE:

1. *po = 8 kw; f = 34,860 mc; I_z = 100 μAdc;*
   prr = 2000 pps; tp = 0.25 μs or
   prr = 1000 pps; tp = 0.5 μs

APPLICATION DATA

Sylvania Type 5790 is a High-Q, tunable transmit-receiver tube used in high definition radar where fine resolution is the prime requisite. The specific function of this tube is to isolate the sensitive receiver from the magnetron during the transmitted pulse. The TR tube recovers within 4 microseconds using a −3 db reference level, affording minimum loss of received signal. The 5790 has an integral cavity and operates over the range between 33,815 mc and 35,905 mc.

The information in this EDS is furnished without assumption of responsibility on the part of Sylvania Electric Products, Inc. for its use or interpretation or for any infringement of patent or other rights of third parties resulting from such use or interpretation.

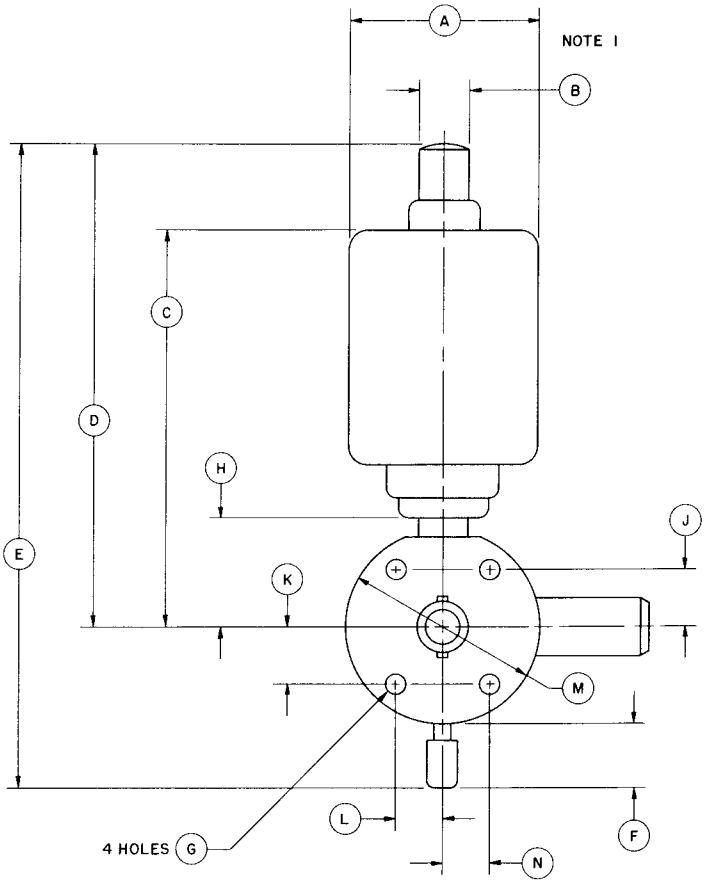
QUICK REFERENCE DATA

The Sylvania Type 5790 is an integral cavity tunable tube designed to operate between 33,815 mc and 35,905 mc. In duplexing systems Type 5791 may be used as the companion ATR.

SYLVANIA ELECTRIC PRODUCTS INC.
SPECIAL TUBE OPERATIONS
WOBURN, MASS.

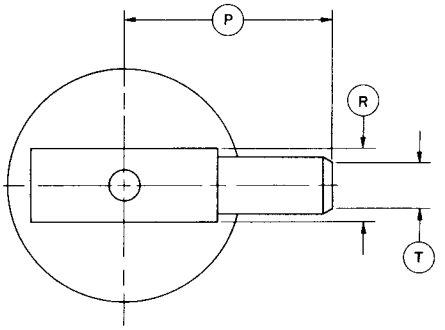
Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
APRIL, 1957

OUTLINE DRAWING



REF LTR	DIMENSIONS
A	$1\frac{1}{4}$ MAX DIA
B	.250 DIA
C	$2\frac{5}{16}$ MAX
D	$2\frac{3}{4}$ MAX
E	$3\frac{3}{4}$ MAX
F	$\frac{9}{16}$ MAX
G	.120 ± .002 DIA
H	$\frac{17}{32}$ MIN
J	.287 ± .002
K	.287 ± .002
L	.241 ± .002
M	1.009 - .999 DIA
N	.241 ± .002
P	$1\frac{1}{8}$ MAX
R	.368 - .360
T	.310 ± .005 DIA

NOTE 1:
MAX PROJECTION OF RESERVOIR LIES WITHIN CYLINDER OF $1\frac{1}{4}$ DIA WITH AXIS CO-LINEAR WITH TUBE AXIS



SYLVANIA ELECTRIC

RMA Registration Data

TYPE 5791

ATR GAS SWITCHING TUBE

The Type 5791 is a fixed tuned ATR gas switching tube with an operational band covering 34,160 to 35,560 megacycles.

RATINGS

Maximum Transmitter Peak Power	100	kilowatts
Ambient Temperature	−40 to + 100	degrees centrigrade

CHARACTERISTICS

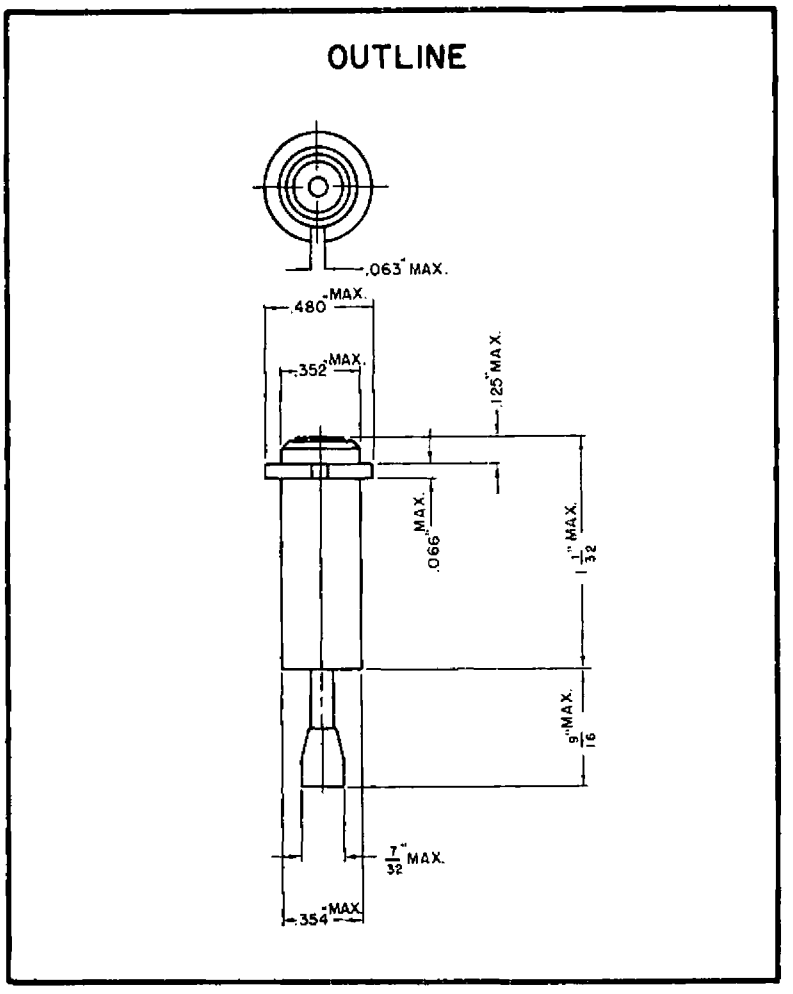
Frequency Band	34,160 to 35,560	megacycles
High Level VSW Ratio (at 34,860 megacycles)	1.1	
Maximum Normalized Equivalent Conductance	0.150	
Maximum Loaded Q	7.5	
Normalized Tuning Susceptance	±0.07	
Firing Time	10	seconds
Arc Loss	0.7	decibel
Conditions:		
Peak Power Input	4	kilowatts
Pulse Repetition Rate	2,000	pulses per second
Pulse Width	0.3	microsecond
Frequency	34,860	megacycles

DIMENSIONS

(See outline, page 2)

from RMA release #760, May 27, 1949

TYPE 5791


OUTLINE
.063" MAX.
.480" MAX.
.352" MAX.
.125" MAX.
.066" MAX.
1 1/32" MAX.
9/16" MAX.
7/32" MAX.
.354" MAX.

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 5792

ATR GAS SWITCHING TUBE

The Type 5792 is a fixed tuned ATR gas switching tube with an operational band covering 2,861 to 3,039 megacycles.

RATINGS

Maximum Transmitter Peak Power	1	megawatt
Ambient Temperature	-40 to +100	degrees centigrade

CHARACTERISTICS

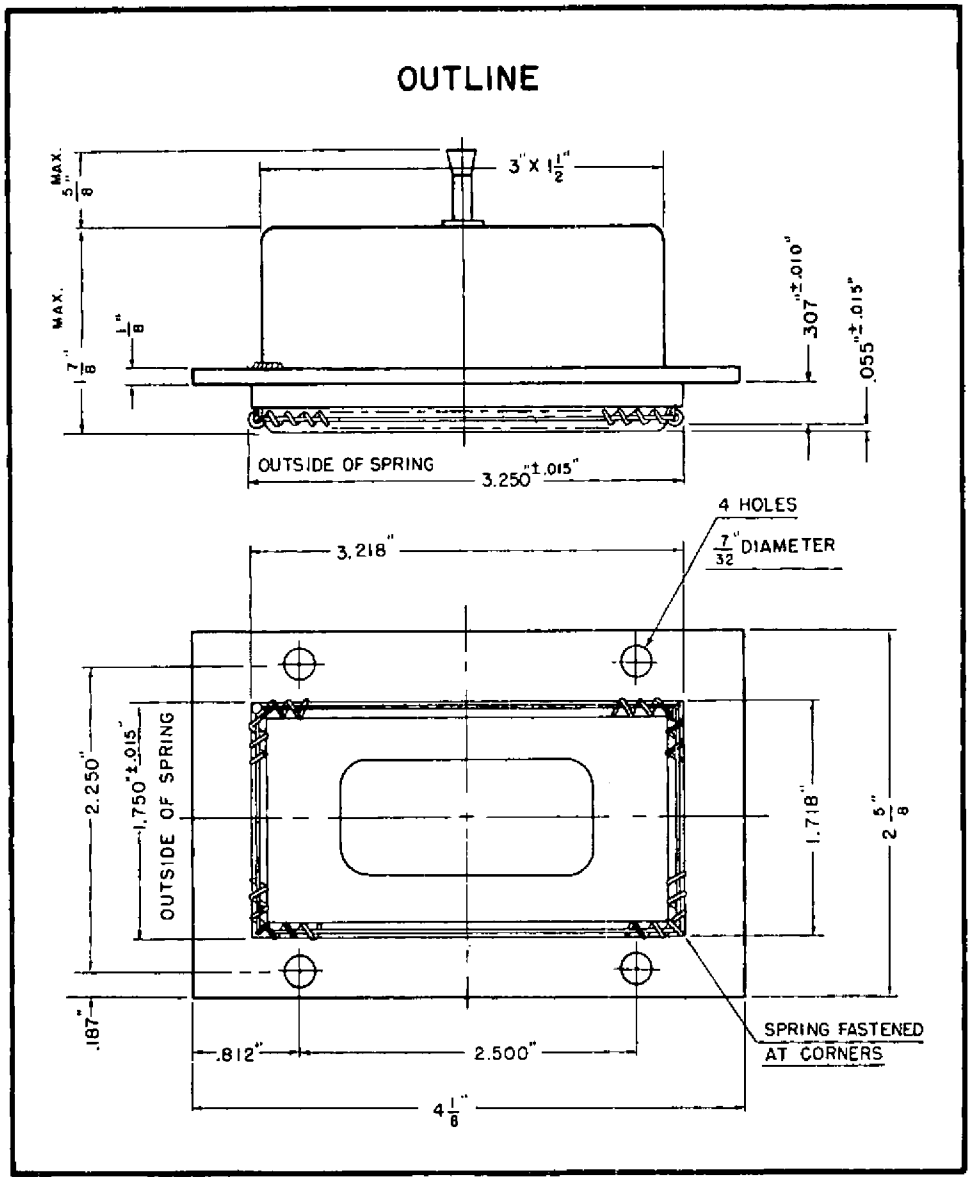
Frequency Band	2,861 to 3,039	megacycles
High Level VSW Ratio (at 2,950 megacycles)	1.15	
Maximum Normalized Equivalent Conductance	0.05	
Maximum Loaded Q	5.5	
Normalized Tuning Susceptance	±0.05	

DIMENSIONS

(See outline, page 2)

from RMA release #760, May 27, 1949

TYPE 5792


OUTLINE
MAX. 5/8"
3" X 1 1/2"
MAX. 1 7/8"
1/8"
.307"±.010"
.055"±.015"
OUTSIDE OF SPRING
3.250"±.015"
4 HOLES
7/32" DIAMETER
3.218"
2.250"
1.750"±.015"
OUTSIDE OF SPRING
1.718"
2 5/8"
.187"
.812"
2.500"
4 1/8"
SPRING FASTENED AT CORNERS

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 5793

ATR GAS SWITCHING TUBE

The Type 5793 is a fixed tuned ATR gas switching tube with an operational band covering 2,958 to 3,142 megacycles.

RATINGS

Maximum Transmitter Peak Power	1	megawatt
Ambient Temperature	-40 to +100	degrees centigrade

CHARACTERISTICS

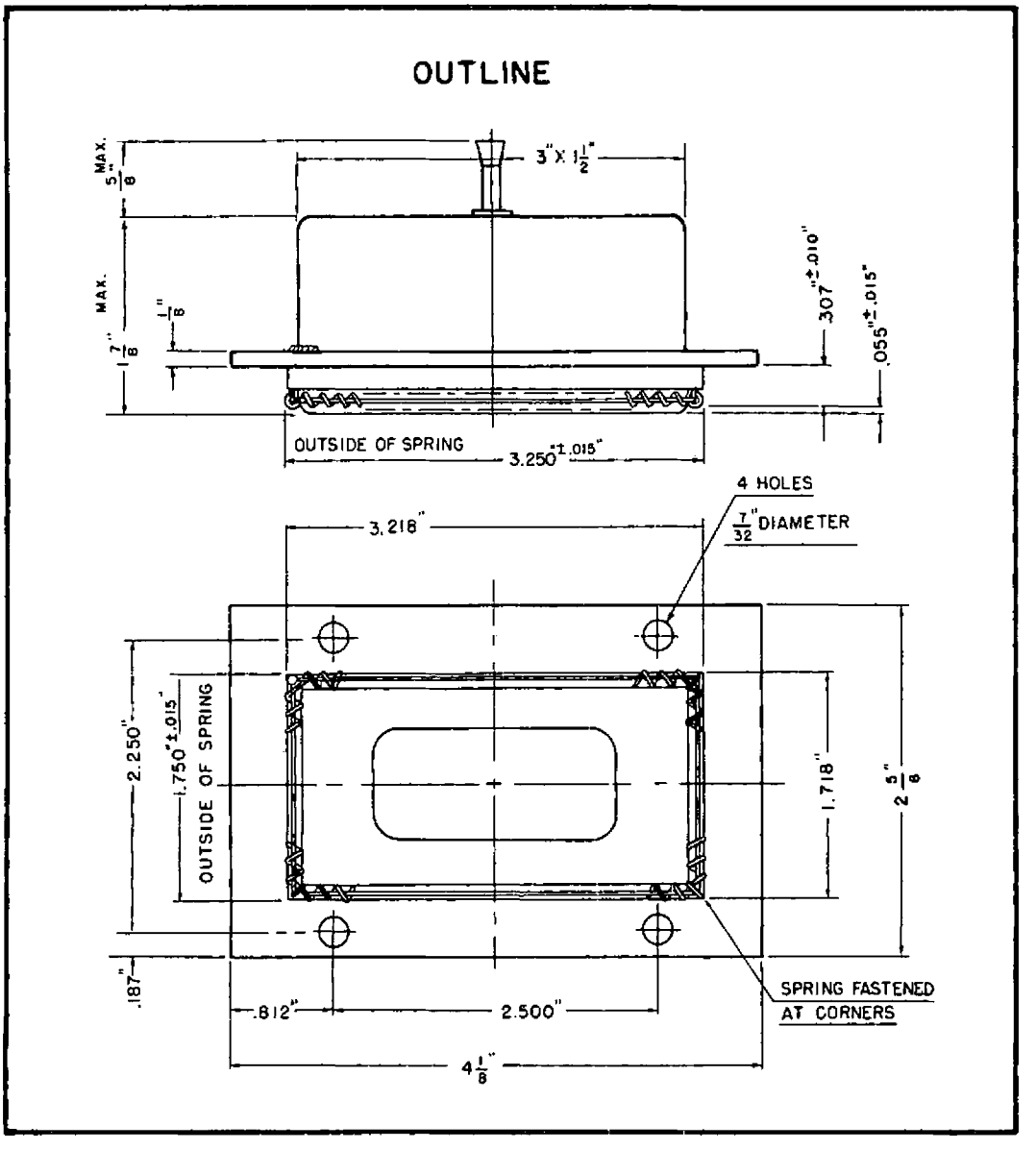
Frequency Band	2,958 to 3,142	megacycles
High Level VSW Ratio (at 3,000 megacycles)	1.15	
Maximum Normalized Equivalent Conductance	0.05	
Maximum Loaded Q	5.5	
Normalized Tuning Susceptance.....	±0.05	

DIMENSIONS

(See outline, page 2)

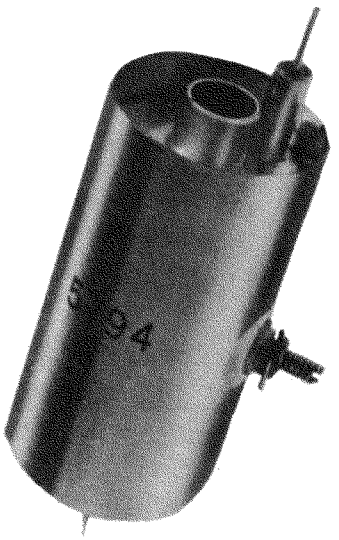
from RMA release #760, May 27, 1949

TYPE 5793


OUTLINE
MAX. 5/8"
3" X 1 1/2"
MAX. 1 7/8"
1/8"
.307" ± .010"
.055" ± .015"
OUTSIDE OF SPRING
3.250" ± .015"
4 HOLES
7/32" DIAMETER
3.218"
2.250"
1.750" ± .015"
OUTSIDE OF SPRING
1.718"
2 5/8"
.187"
.812"
2.500"
4 1/8"
SPRING FASTENED AT CORNERS

DESCRIPTION: CW FIXED TUNED OSCILLATOR
TYPE 5794

Pencil tube type 5794, designed for continuous wave operation, oscillates inside a cavity tuned to a fixed frequency of 1680 mc. This low Mu tube with its special heater at 5.2V is capable of delivering a power of 300 mw.



ELECTRICAL RATINGS

Heater Voltage	5.2 mAdc
Heater Current	146 mAdc
Max. Operation Frequency	1700 mc.
Max. Glass-to-Metal Seal Temp.	175°C

TUBE CHARACTERISTICS

Heater Voltage	5.2 mAdc
Heater Current	146 mA
Oscillation Plate Current*	34 mAdc max.
Power Oscillation**	300 mW min.

*Ef = 6.6V
Eb = 117Vdc

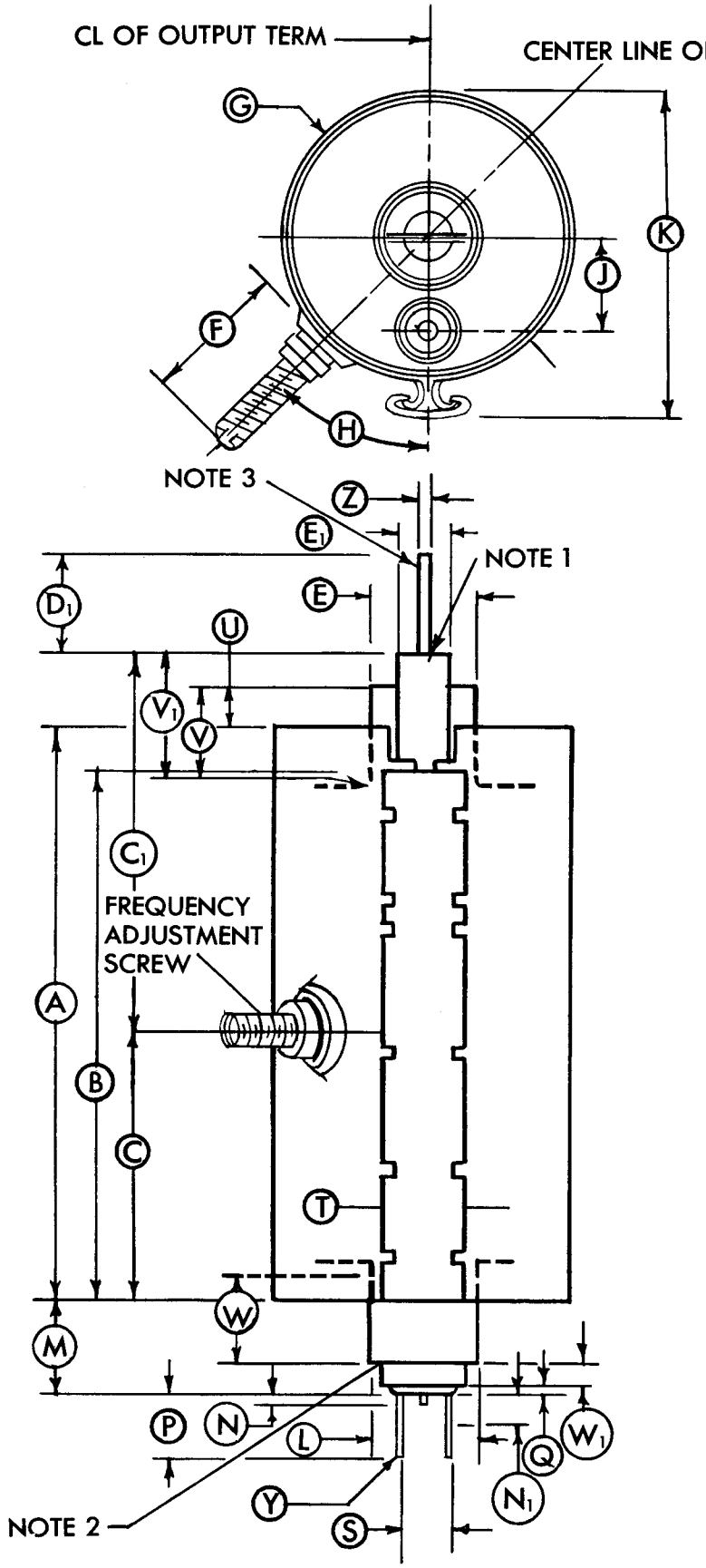
**Eb = 95Vdc
Rg/Ib = 24 mAdc
ZL = 50 ohms
F = 1670 ± 4mc

TYPICAL OPERATING CONDITIONS

Plate Voltage	95 V
Oscillation Plate Current (Adjust Cathode resistor for Plate Current)	24 mAdc
Power Output at 1700 mc	300 mW

SYLVANIA ELECTRIC PRODUCTS INC. ELECTRONICS DIVISION
1740 Broadway, New York 19, New York

5794



REF.	DIMENSIONS
A	1.730 max.
B	1.585 max.
C	.797 ± .010
C_1	1.016 ± .188
D_1	.283 ± .062
E	.305 ± .010 O.D. Anode Terminal
E_1	.151 ± .003 O.D. Coaxial Output R F Terminal
F	.425 max.
G	.865 ± .015 O.D. Grid Terminal
H	45° ± 7°
J	.275 ± .005 Cavity Center To Eyelet
K	.980 max.
L	.305 ± .010 O.D. Cathode Terminal
M	.400 max.
N	.040 max.
N_1	.080 max. Untinned
P	.220 ± .020
Q	.025
S	.115 ± .040 Heater Terminal Tips
T	.270 max.
U	.250 max.
V	.200 min.
V_1	.325 min.
W	.200 min.
W_1	.150 max.
Y	.016 $^{+.002}_{-.001}$ Dia.
Z	.040 ± .001 O.D.

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5814

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Basing	9A
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	Series/Parallel	12.6/6.3 Volts
Heater Current	Series/Parallel	175/350 Ma

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section 1[1]	Section 2
Grid to Plate	1.5	1.5 μμf
Input	1.6	1.6 μμf
Output	0.5	0.35 μμf

RATINGS (Absolute Maximum Values) Each Section

Plate Voltage	330 Volts
Plate Dissipation	3.0 Watts
Heater-Cathode Voltage	100 Volts
Cathode Current	22 Ma
Bulb Temperature	180 °C
Electrode Insulation (min.)	
Grid to All Other Elements[2]	100 Megohms
Plate to All Other Elements[3]	100 Megohms

TYPICAL OPERATION

Class A_1 Amplifier — Each Section

Plate Voltage	250 Volts
Grid Voltage	-8.5 Volts
Plate Current	10.5 Ma
Transconductance	2200 μmhos
Amplification Factor	17
Grid Voltage for I_b = 10 μa	-24 Volts

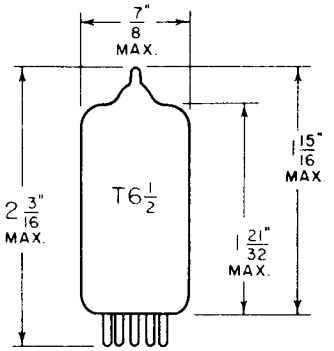
NOTES:

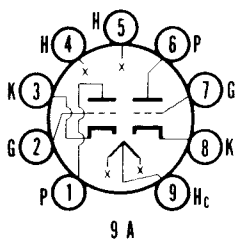
1. *Section No. 1 connects to pins 6, 7 and 8.*
2. *E_f = 12.6 volts; E_g to all other elements -100 volts D C.*
3. *E_f = 12.6 volts; E_p to all other elements = -300 volts D C.*

QUICK REFERENCE DATA

The Sylvania Type 5814 is a T-6½, medium mμ, double triode having separate cathode connections. Electrically, the 5814 is similar to the Type 12AU7, and, identical to, except for electrode insulation requirements, the Type 5814A.

The Sylvania Type 5814 is manufactured and inspected to meet the applicable MIL-E1 specification for reliable operation.





9 A

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RADIO TUBE DIVISION

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

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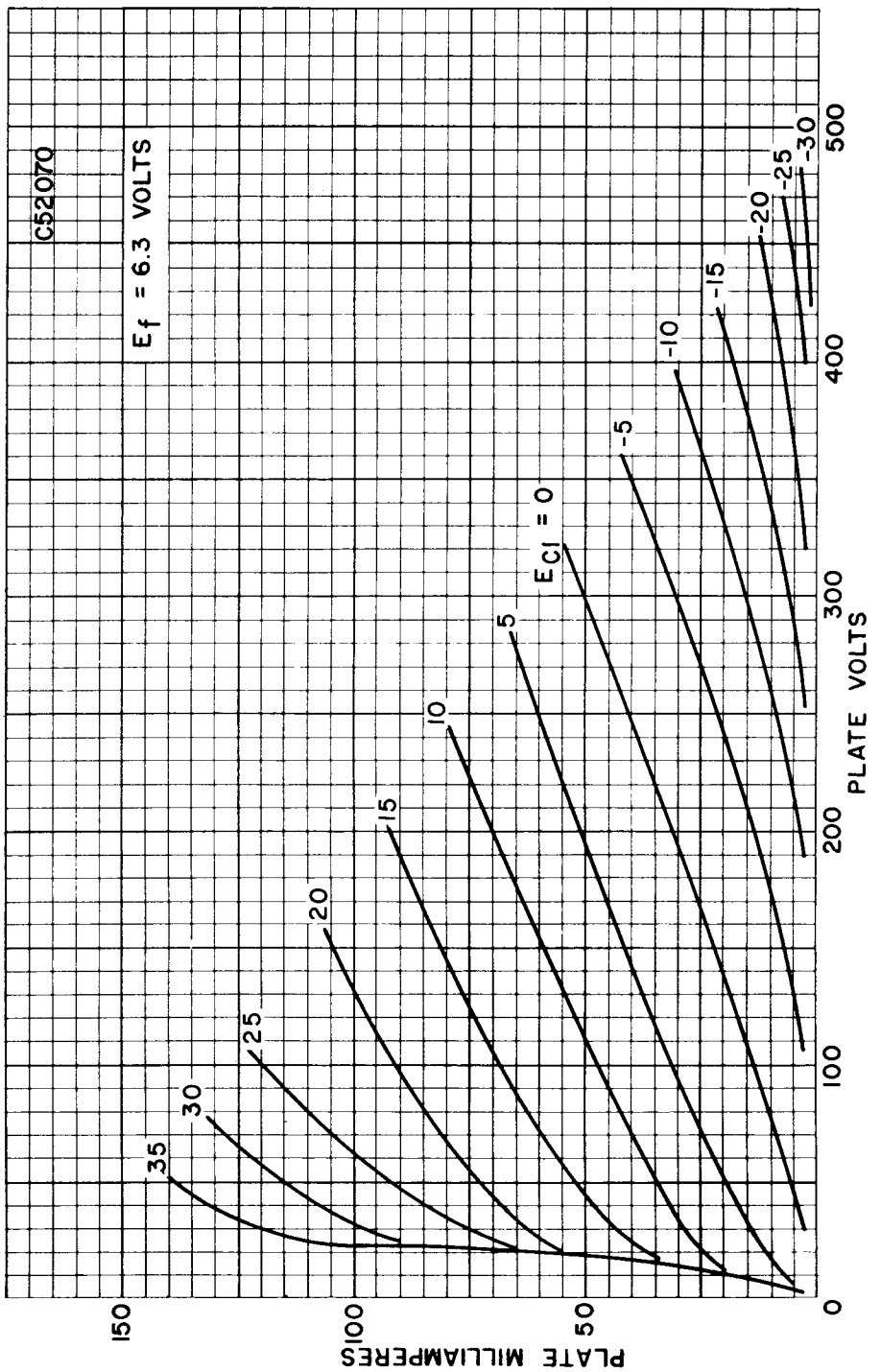
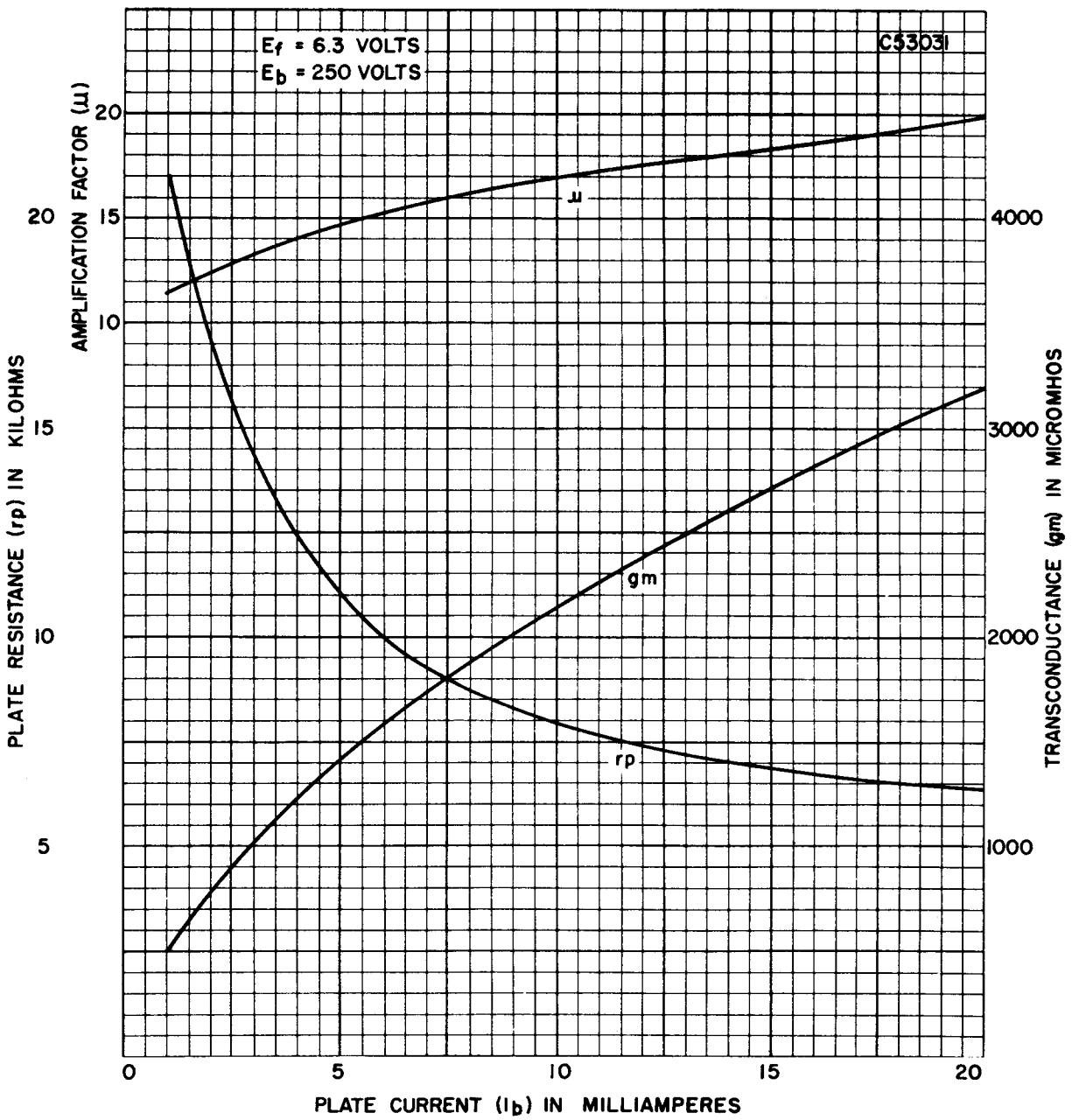
5814

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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5814A

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Basing	9A
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	Series/Parallel	12.6/6.3 Volts
Heater Current	Series/Parallel	175/350 Ma

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section 1[1]	Section 2
Grid to Plate	1.5	1.5 μμf
Input	1.6	1.6 μμf
Output	0.5	0.35 μμf

RATINGS (Absolute Maximum Values) Each Section

Plate Voltage	330 Volts
Plate Dissipation	3.0 Watts
Heater-Cathode Voltage	100 Volts
Cathode Current	22 Ma
Bulb Temperature	180 °C
Electrode Insulation (min.)	
Grid to All Other Elements[2]	500 Megohms
Plate to All Other Elements[3]	500 Megohms

TYPICAL OPERATION

Class A_1 Amplifier — Each Section

Plate Voltage	250 Volts
Grid Voltage	-8.5 Volts
Plate Current	10.5 Ma
Transconductance	2200 μmhos
Amplification Factor	17
Grid Voltage for I_b = 10 μa	-24 Volts

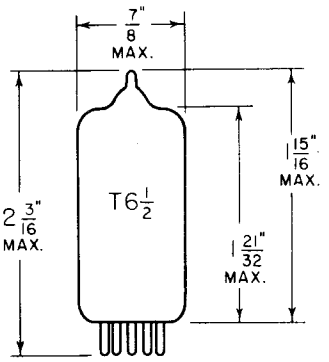
NOTES:

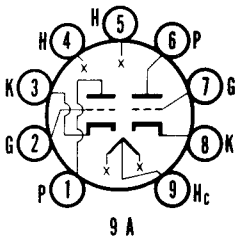
1. *Section No. 1 connects to pins 6, 7 and 8.*
2. *E_f = 12.6 volts; E_g to all other elements - 00 volts D C.*
3. *E_f = 12.6 volts; E_p to all other elements = -300 volts D C.*

QUICK REFERENCE DATA

The Sylvania Type 5814A is a T-6½, medium mμ, double triode having separate cathode connections. Electrically, the 5814A is similar to the Type 12AU7, and, identical to, except for electrode insulation requirements, the Type 5814.

The Sylvania Type 5814A is manufactured and inspected to meet the applicable MIL-E1 specification for reliable operation.





9 A

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RADIO TUBE DIVISION

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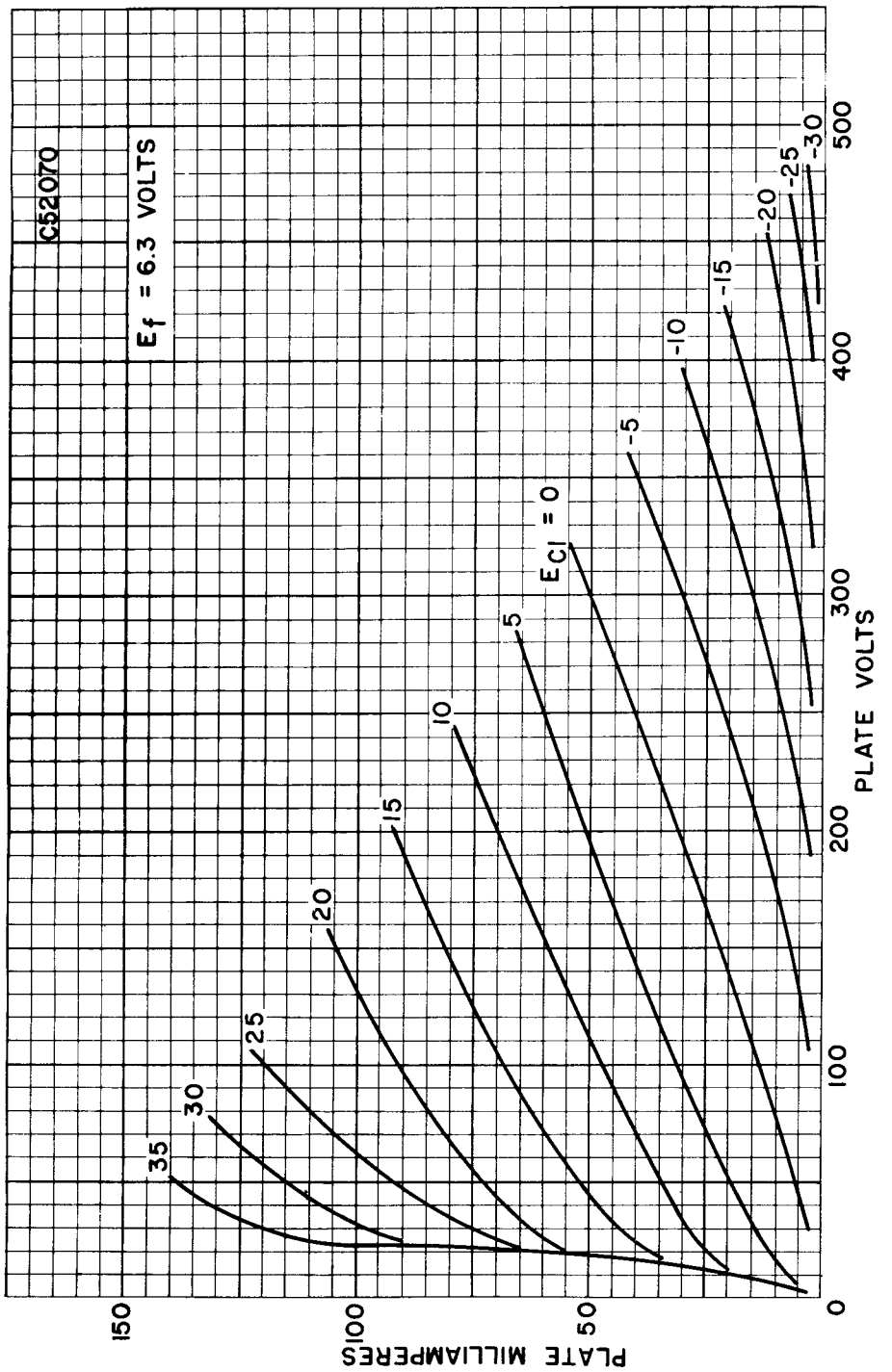
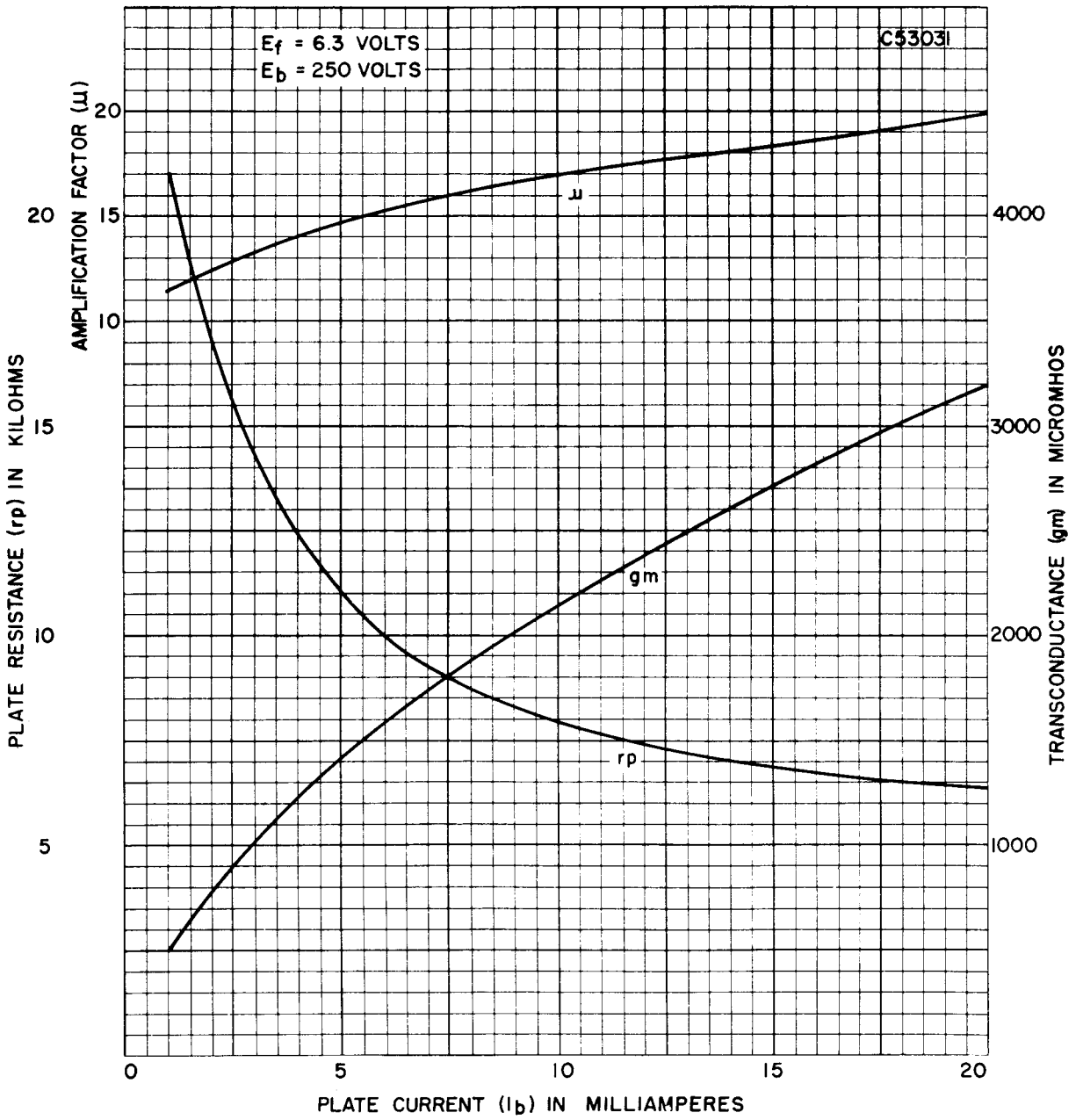
5814A

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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5823

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button, 7-Pin
Outline	5-2
Basing	4CK
Cathode	Cold
Mounting Position	Any

ELECTRICAL DATA

RATINGS (Absolute Values) 60 Cycle Supply

Peak Anode and Starter Electrode Voltage		
Inverse	200 Volts	Max.
Forward	200 Volts	Max.
Cathode Current		
Peak	100 Ma	Max.
Average[1]	25 Ma	Max.
Peak Starter-Electrode Current with Starter-Electrode Positive	100 Ma	Max.
Ambient Temperature	-60 to +75°C	Max.

CHARACTERISTICS

Conditions:

Instantaneous Anode Voltage	185 Volts
Peak Positive Starter-Electrode Prefiring Voltage	70 Volts
Peak Positive Starter-Electrode Triggering Voltage	50 Volts
Anode Circuit Series Resistance	820 Ohms
Starter-Electrode Series Resistor	100,000 Ohms
Ionization Time	20 μsec
Deionization Time	500 μsec
Anode Voltage Drop	68 Volts
Starter Electrode Voltage Drop	61 Volts
Anode Breakdown Voltage	290 Volts
Starter Electrode Breakdown Voltage	80 Volts
Required Transfer Current (DC or AC For Transition of Discharge to Anode at 140 Volts Peak	50 μamp

TYPICAL OPERATION

Relay Service with 60 Cycle AC Supply

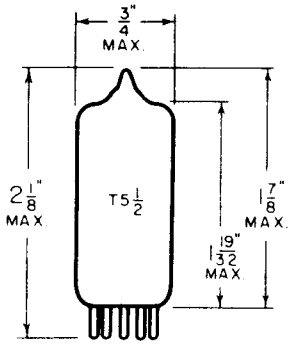
AC Anode Supply Voltage (RMS)	117 Volts
AC Starter Electrode Voltage	
Maximum Peak Positive Pre-Firing Voltage	70 Volts
Minimum Peak Positive Triggering Voltage	35 Volts
Minimum Firing Voltage: (Sum of In-Phase Instantaneous Pre-Firing Voltage And Instantaneous Triggering Voltage)	105 Volts

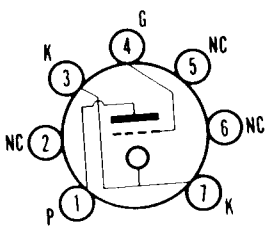
NOTE:

1. Averaged over any interval of 15 seconds maximum.

QUICK REFERENCE DATA

The Sylvania Type 5823 is a cold cathode, gas filled triode designed primarily for operation as a relay control tube.





4CK

SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

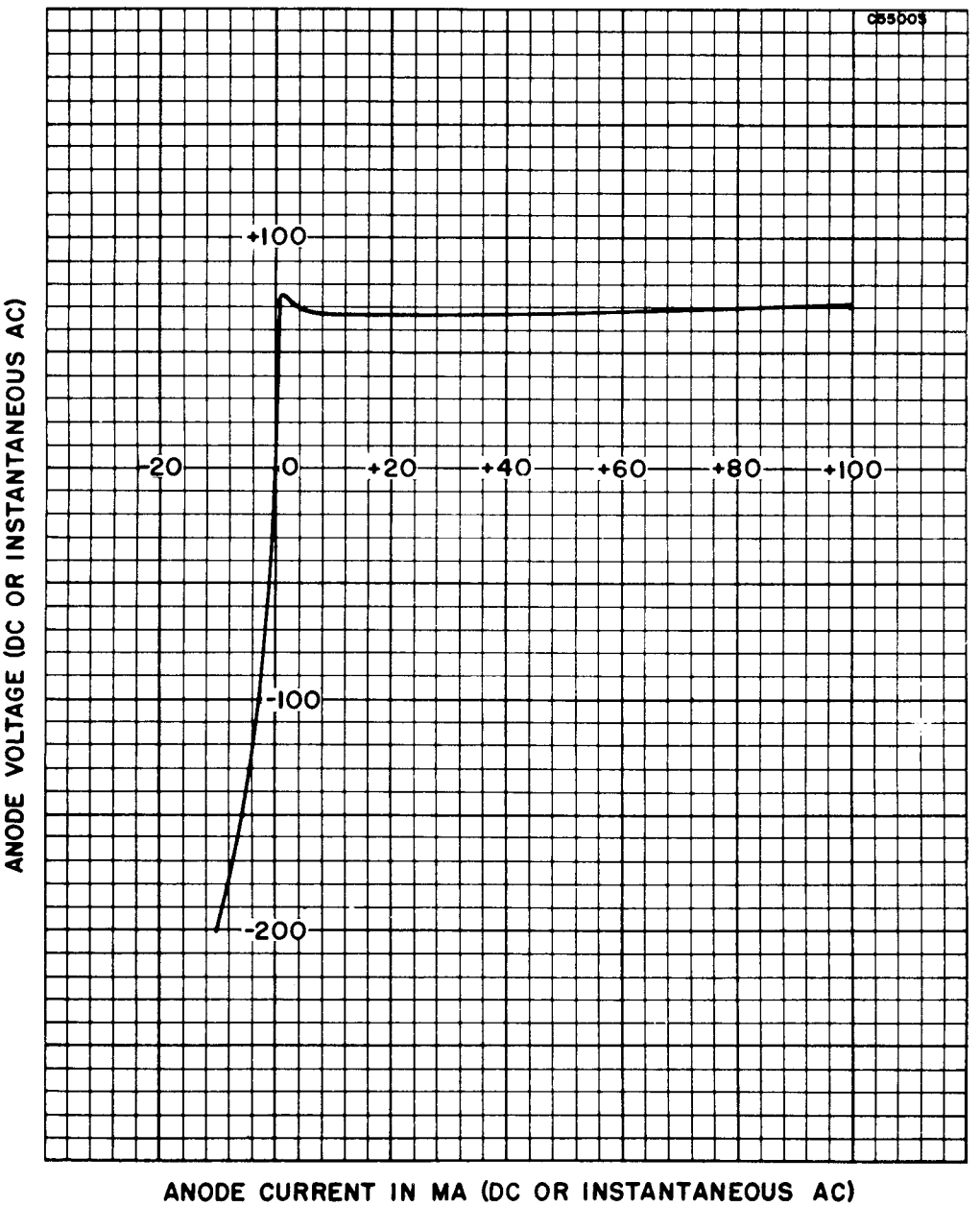
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

FEBRUARY, 1955

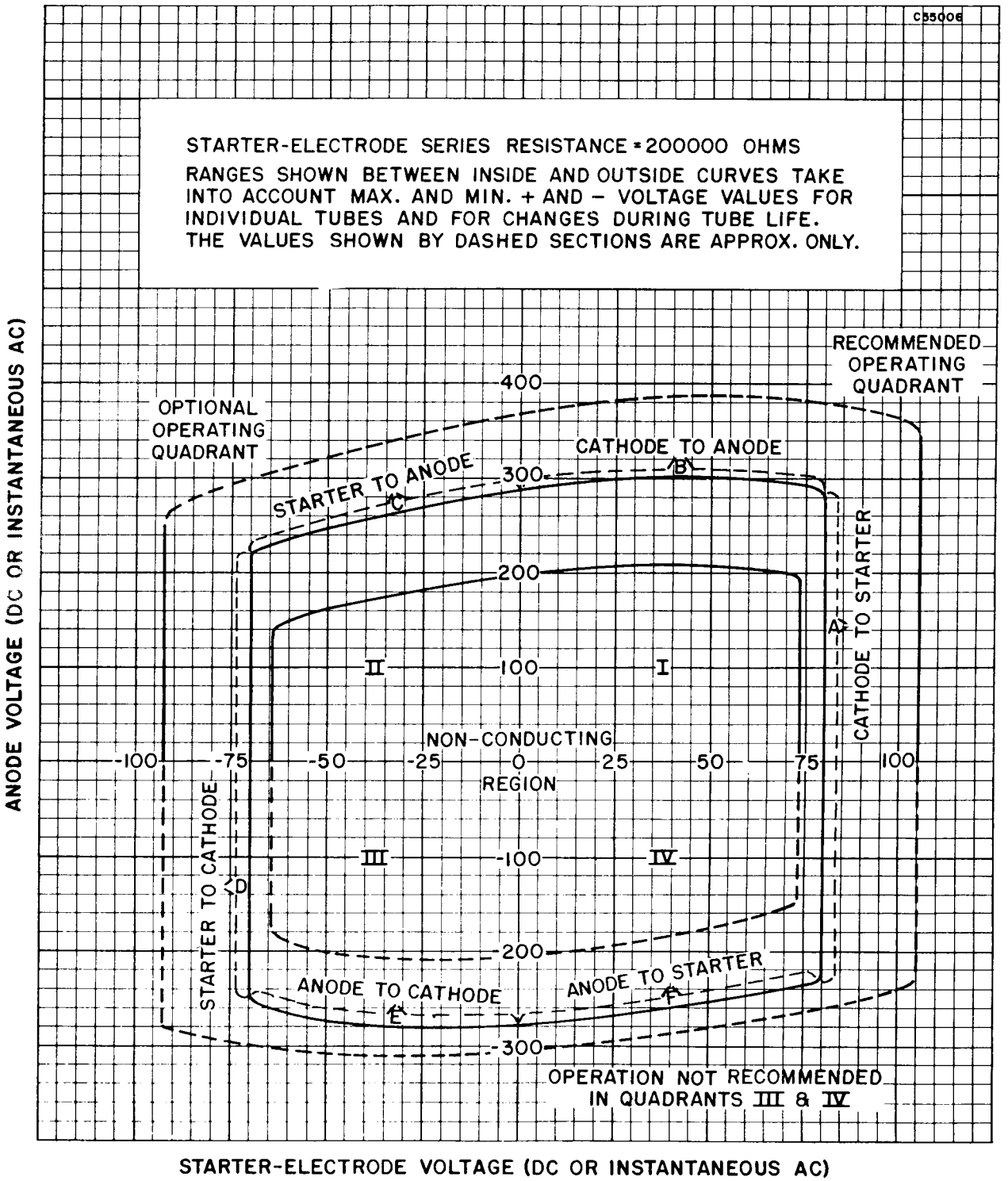
APPLICATION DATA

The 5823 may also be used as a rectifier. When so used (with starter-electrode connected through 50,000-Ohm resistor to anode), the 5823 has a maximum peak inverse anode voltage rating of 200 volts, a maximum peak cathode current of 100 milliamperes and a maximum dc cathode current of 25 milliamperes. Operation at values of dc cathode current less than 8 milliamperes is not recommended because of resulting instability.

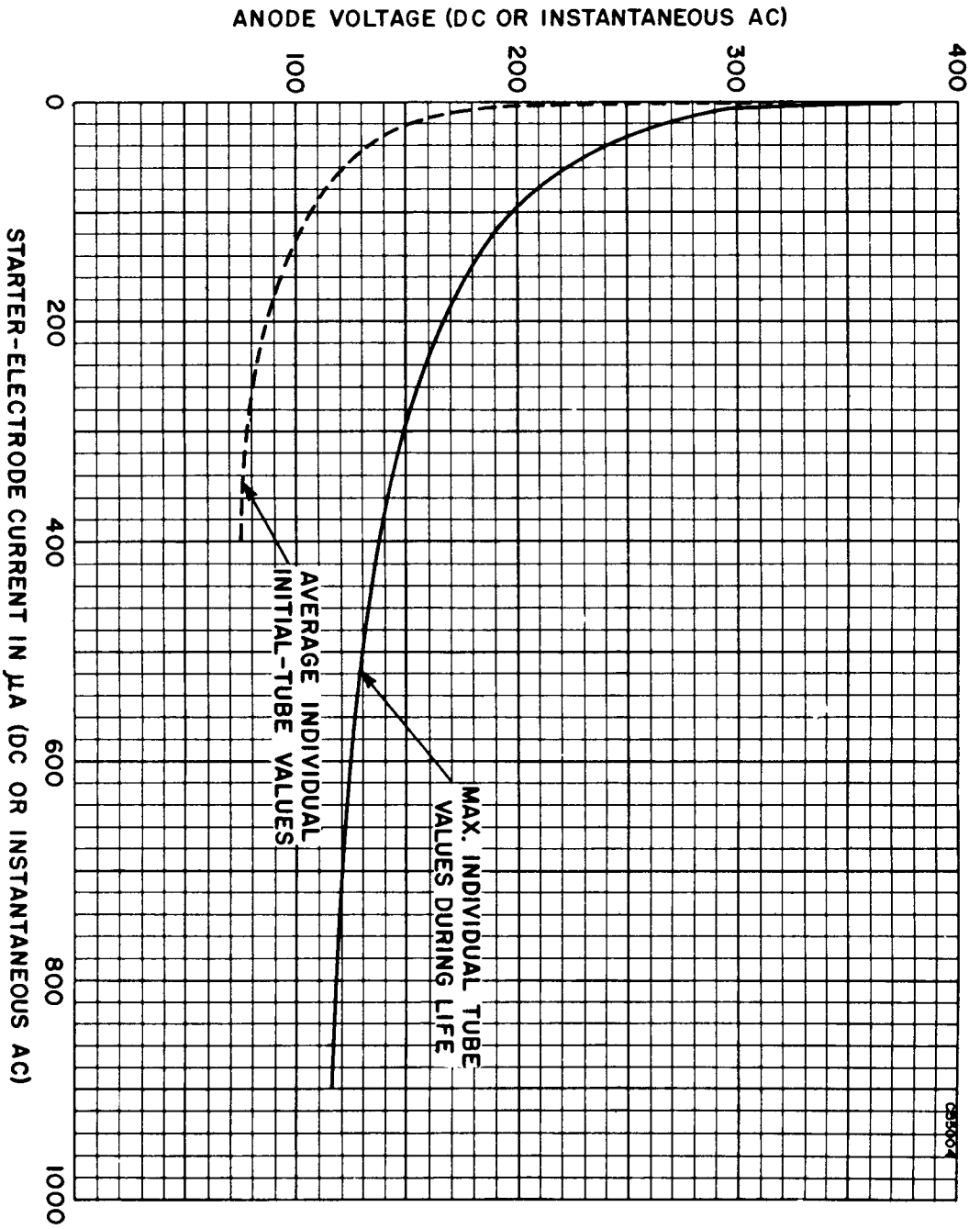
AVERAGE ANODE CHARACTERISTICS



BREAKDOWN CHARACTERISTICS



TRANSITION CHARACTERISTICS



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5836

MECHANICAL DATA

Base	A4-76, Peewee 4 Pin
Cap	C1-3, Skirted Miniature
Cooling	Convection and Conduction. Contact rings are to make direct peripheral contact with metallic parts of the external cavity.
Mounting Position	Any

Connections:

Pin 1 — Control Electrode	Lower Contact Ring — 1st Resonator
Pin 2 — Heater	Upper Contact Ring — 2nd Resonator
Pin 3 — Cathode	Cap — Reflector
Pin 4 — Heater	

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage, AC or DC (±8%)	6.3 Volts
Heater Current	750 Ma

RATINGS (Absolute Values)

Resonator Voltage	350 Volts	dc Max.
Resonator Current	35 Ma	dc Max.
Reflector Voltage	−700 Volts	dc Max.
	−15 Volts	dc Min.
Control Electrode Voltage	+20 to −150 Volts	dc Max.
Control Electrode Current	12 Ma	Max.
Heater Cathode Voltage	±45 Volts	dc Max.
Power Input	12 Watts	Max.
Seal Temperature	175°C	Max.

GENERAL

Reflector Mode	1-3/4	2-3/4	3-3/4	
Frequency	4000	4500	6500	Mc
	1600	2100	3600	Mc

TYPICAL OPERATION

CW Oscillator

Reflector Mode	1-3/4	2-3/4	3-3/4	
Cavity Mode	3/4	3/4	5/4	
Frequency	2800	3200	5000	Mc
Resonator Voltage	325	325	325	Volts
Cathode Current	28	26	25	Ma
Reflector Voltage (approx.)	−220	−120	−220	Volts
Control Electrode Voltage (Full Power Output)	+10	+10	+10	Volts
Power Output Cutoff Voltage	+3	+3	+3	Volts
Electronic Tuning Range (Between Half Power Points)	6	6	6	

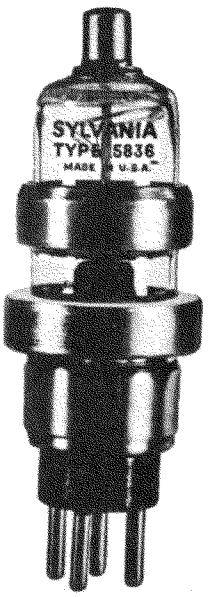
Pulse Modulated Oscillator

For pulse operation, the general conditions are the same except as shown below. The peak power output with the tube modulated by the control electrode is not more than 1.5 db below the cw output within the rated frequency range.

Control Electrode Voltage	−10 Volts
Pulse Modulation Voltage	+20 Volts
Pulse Repetition Rate	40-4000 PPS
Minimum Pulse Duration	0.5 μsec.
Rise Time	0.1 μsec.
Decay Time	0.1 μsec.
Jitter	0.15 μsec.

QUICK REFERENCE DATA

The Sylvania Type 5836 is a broadband reflex klystron designed for service as a CW or pulse modulated oscillator in conjunction with external cavity resonators. The 5836 operates over the range from 1600 to 6500 Mc.



SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

5-54-86

APPLICATION DATA

The Sylvania Type 5836 is a broadband reflex klystron designed for cw or pulsed operation in conjunction with external cavity resonators. This tube operates over the range from 1600 to 6500 Mc in three modes. The 5836 is particularly adapted for use in signal generators, spectrum analyzers, or local oscillator applications where broadband frequency coverage is needed.

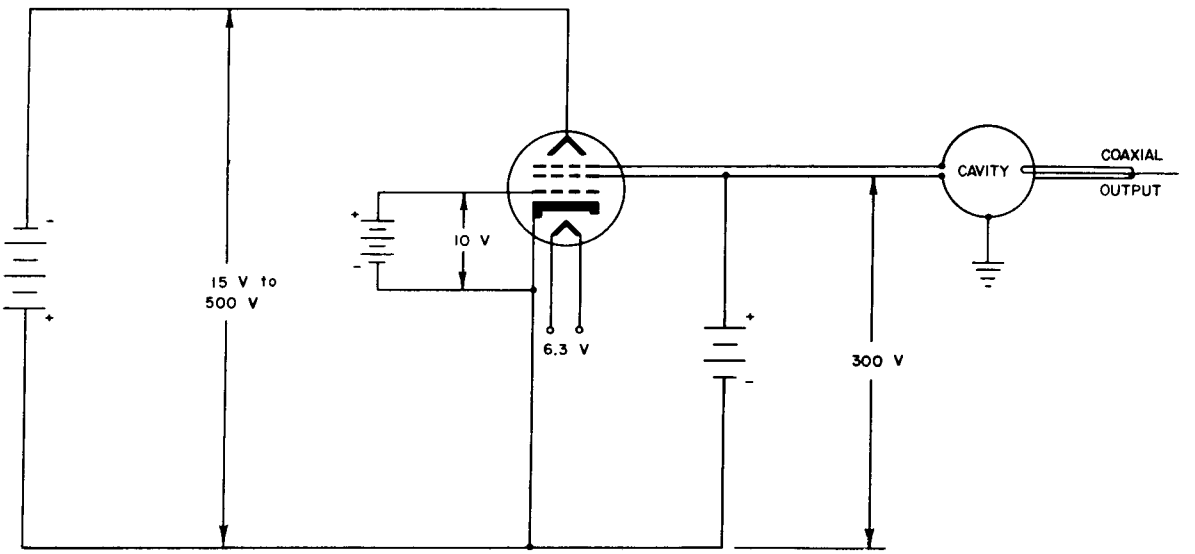


FIG. 1 — CW OSCILLATOR CIRCUIT EMPLOYING THE 5836 REFLEX KLYSTRON

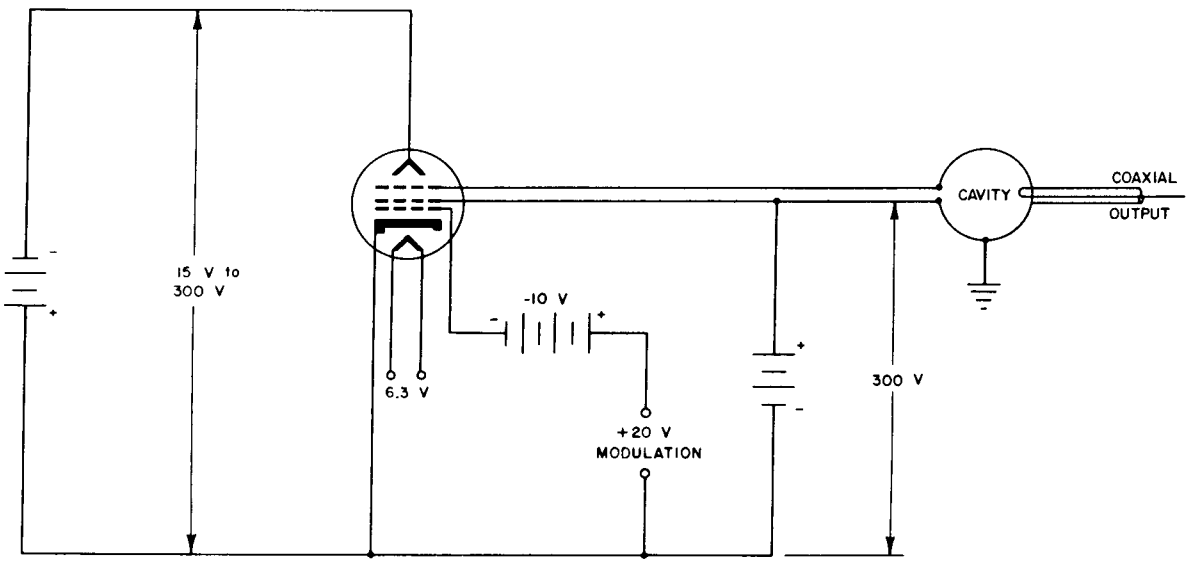
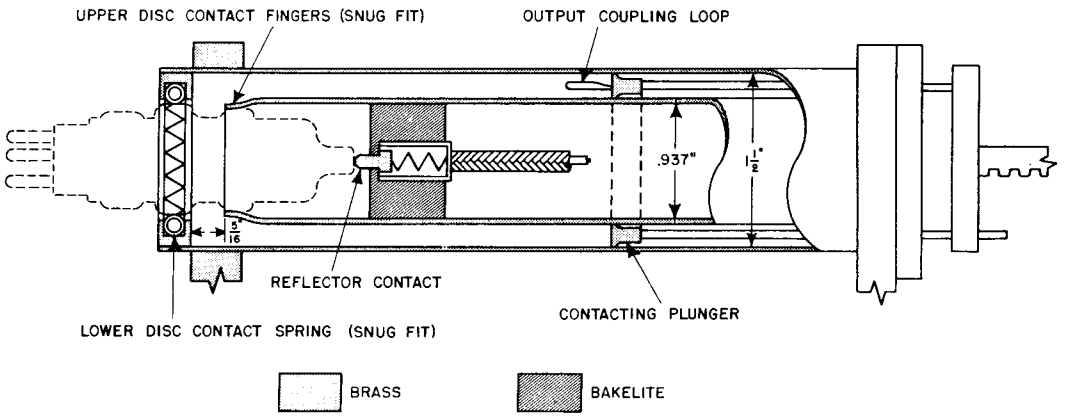


FIG. 2 — PULSE MODULATED OSCILLATOR CIRCUIT EMPLOYING THE 5836 REFLEX KLYSTRON

APPLICATION DATA

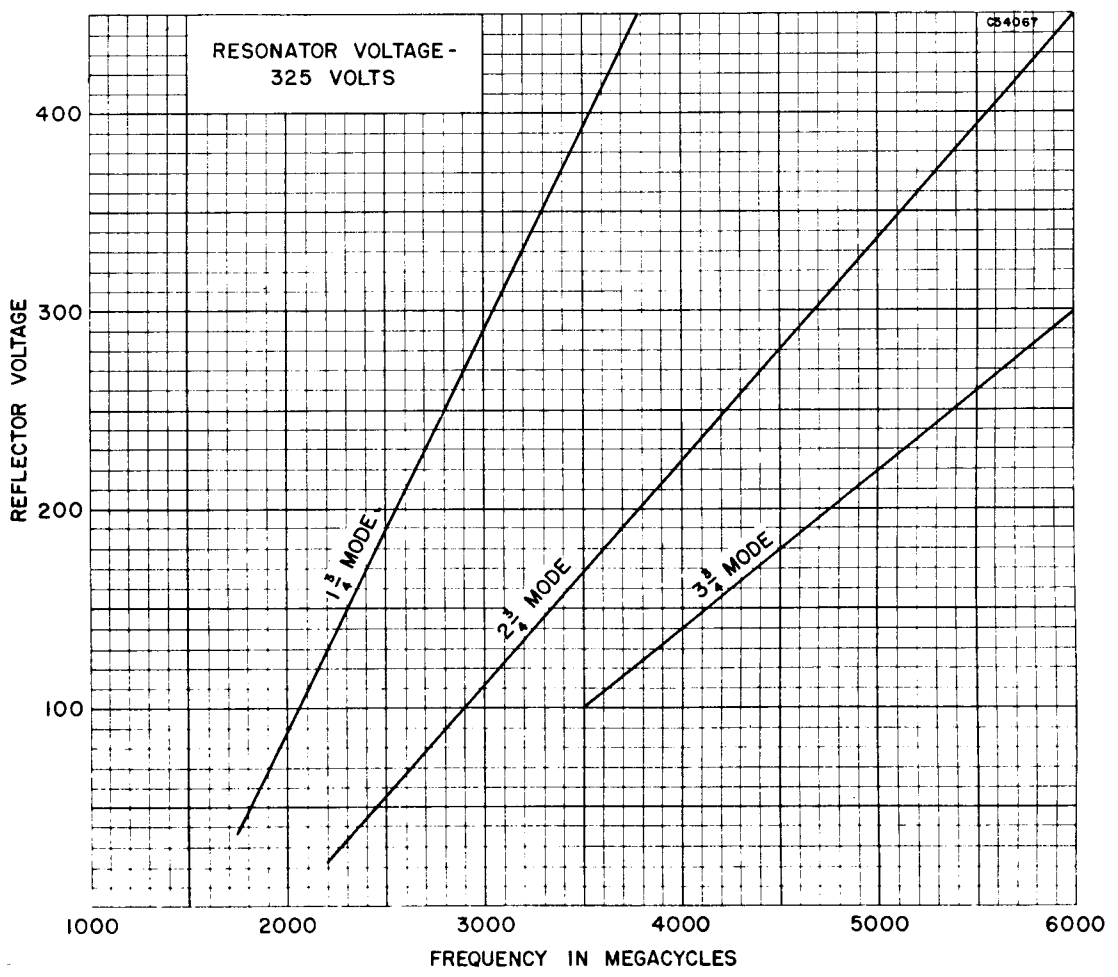


Recess in Contact Plunger	1/2"	Loop Size for 3000-5000 mc	9/32"
Loop Size for 800-3500 mc	9/16"	Loop Width for Both Ranges	.175"

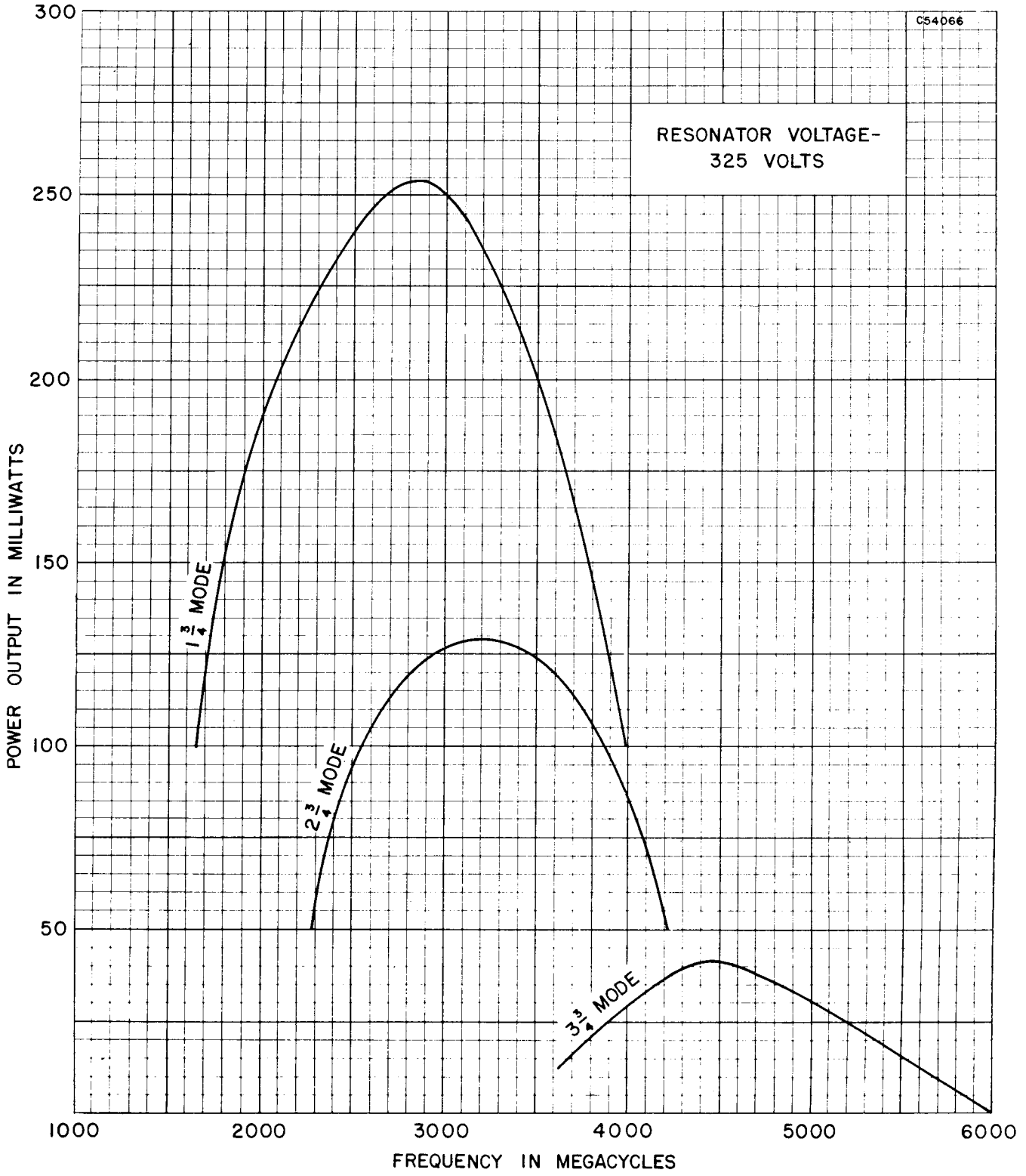
The length is determined by the frequency of operation and the range of plunger motion is set by the frequency band to be covered.

FIG. 3 — DIAGRAM OF A TYPICAL COAXIAL CAVITY FOR USE WITH THE 5836 REFLEX KLYSTRON

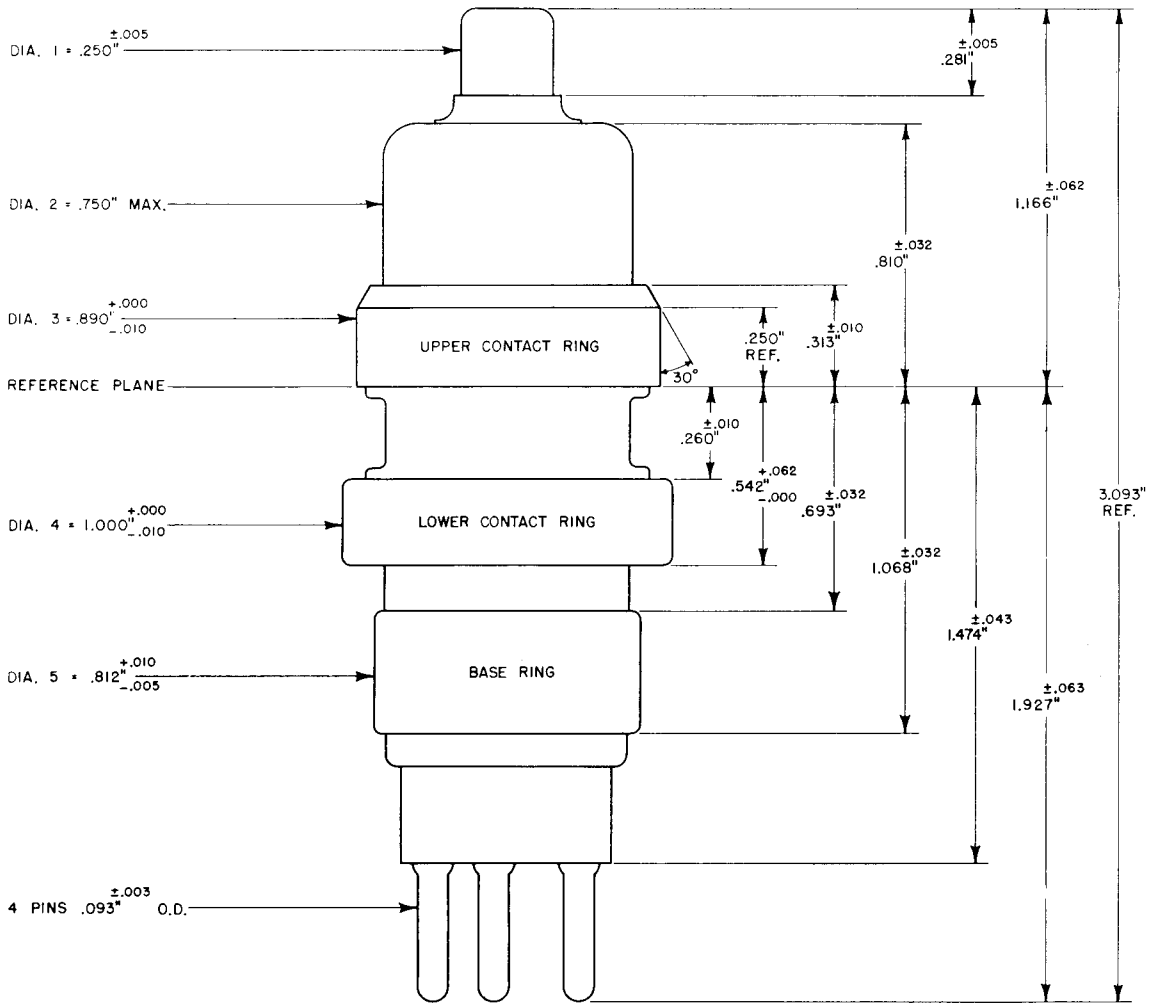
AVERAGE CHARACTERISTICS

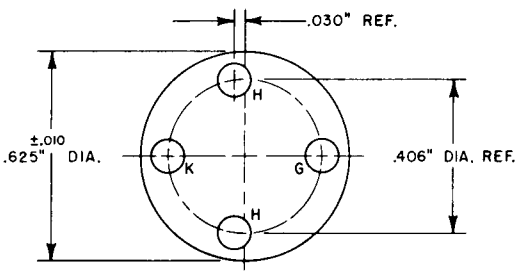


AVERAGE CHARACTERISTICS



OUTLINE DRAWING





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5837

MECHANICAL DATA

Base	A4-76, Peewee 4 Pin
Cap	C1-3, Skirted Miniature
Cooling	Convection and Conduction. Contact rings are to make direct peripheral contact with metallic parts of the external cavity.
Mounting Position	Any

Connections:

Pin 1 — Control Electrode	Lower Contact Ring — 1st Resonator
Pin 2 — Heater	Upper Contact Ring — 2nd Resonator
Pin 3 — Cathode	Cap — Reflector
Pin 4 — Heater	

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage, AC or DC (±8%)	6.3 Volts
Heater Current	675 Ma

RATINGS (Absolute Values)

Resonator Voltage	350 Volts	dc Max.
Resonator Current	29 Ma	dc Max.
Reflector Voltage	−700 Volts	dc Max.
	−15 Volts	dc Min.
Control Electrode Voltage	+20 to −150 Volts	Max.
Control Electrode Current	12 Ma	Max.
Heater-Cathode Voltage	±45 Volts	dc Max.
Power Input	12 Watts	Max.
Seal Temperature	175°C	Max.

GENERAL

Reflector Mode	1-3/4	2-3/4	3-3/4	
Frequency	2300	3000	3800	Mc
	550	1100	1500	Mc

TYPICAL OPERATION

CW Oscillator

Reflector Mode	1-3/4	2-3/4	3-3/4	
Cavity Mode	1/4	1/4	1/4	
Frequency	1500	2200	3000	Mc
Resonator Voltage	325	300	325	Volts
Cathode Current	28	28	28	Ma
Reflector Voltage (approx.)	−235	−215	−215	Volts
Control Electrode Voltage (Full Power Output)	+10	+10	+10	Volts
Power Output Cutoff	+3	+3	+3	Volts
Electronic Tuning Range (Between Half Power Points)	8	8	8	Mc

Pulse Modulated Oscillator

For pulse operation, the general conditions are the same except as noted below: The peak power output with the tube modulated by the control electrode is not more than 1.5 db below the cw output within the rated frequency range.

Control Electrode	−10 Volts
Pulse Modulation Voltage	+20 Volts
Pulse Repetition Rate	40-4000 PPS
Minimum Pulse Duration	0.5 μsec.
Rise Time	0.1 μsec.
Decay Time	0.1 μsec.
Jitter	.15 μsec.

QUICK REFERENCE DATA

The Sylvania Type 5837 is a broadband reflex klystron designed for operation from 1600-3000 Mc. It functions as a CW or pulsed oscillator with an external cavity.



SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

5-54-87

APPLICATION DATA

The Sylvania Type 5837 is a broadband reflex klystron designed for cw or pulsed operation in conjunction with external cavity resonators. This tube operates over the range from 1500 to 3000 Mc in three modes. The 5837 is particularly adapted for use in signal generators, spectrum analyzers, or local oscillator applications where broadband frequency coverage is needed.

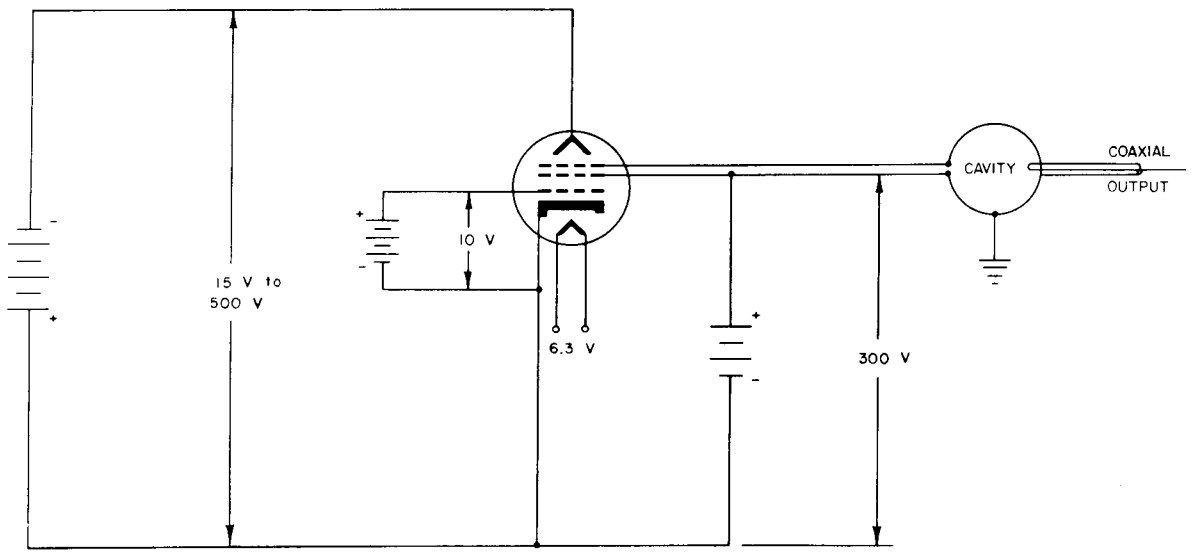


FIG. 1 — CW OSCILLATOR CIRCUIT EMPLOYING THE 5837 REFLEX KLYSTRON

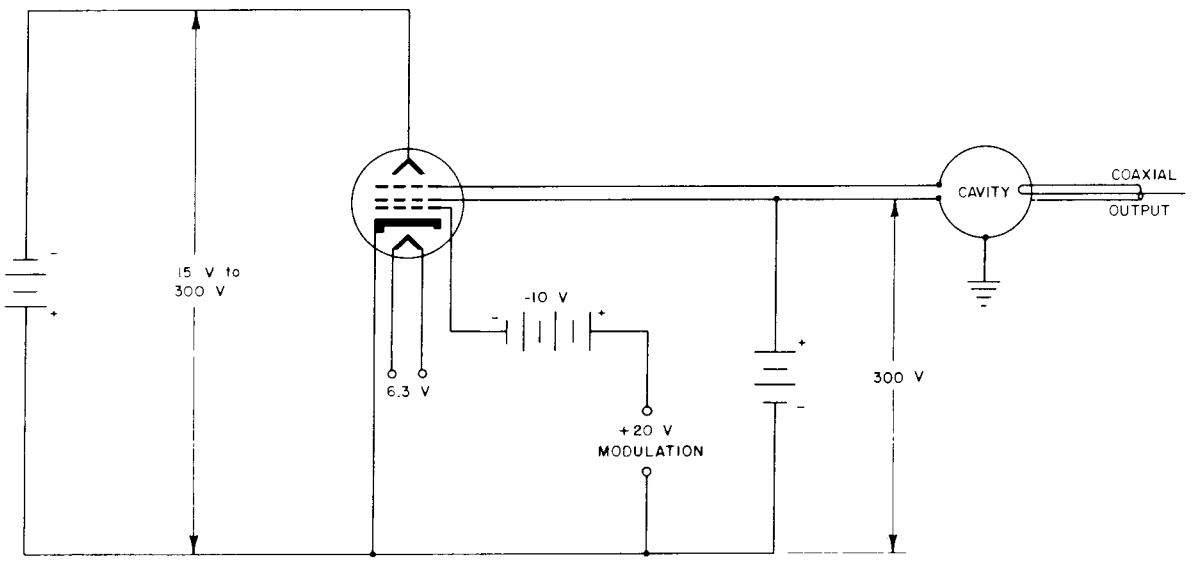


FIG. 2 — PULSE MODULATED OSCILLATOR CIRCUIT EMPLOYING THE 5837 REFLEX KLYSTRON

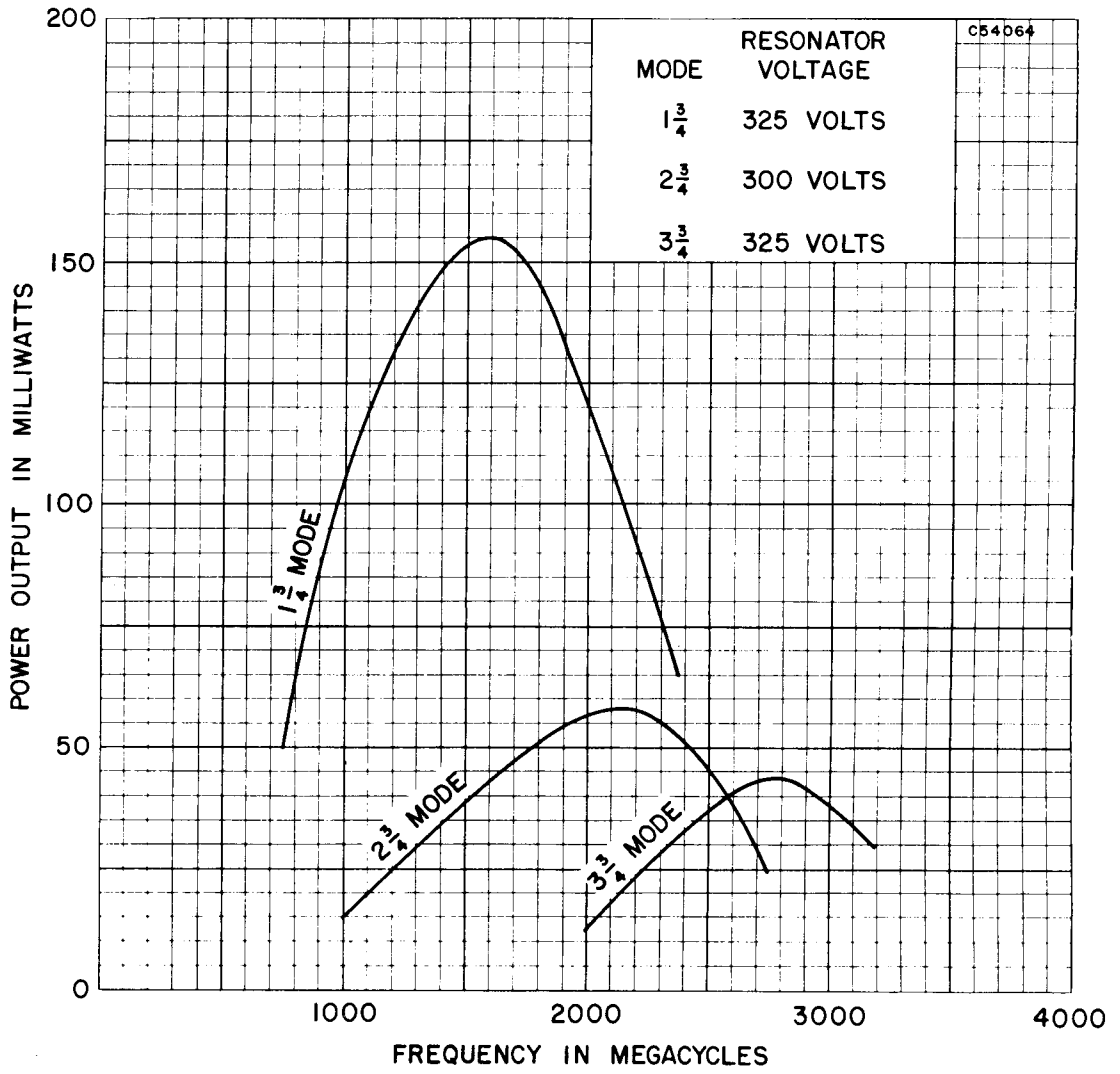
APPLICATION DATA

Recess in Contact Plunger	1/2"	Loop Size for 3000-5000 mc	9/32"
Loop Size for 800-3500 mc	9/16"	Loop Width for Both Ranges	.175"

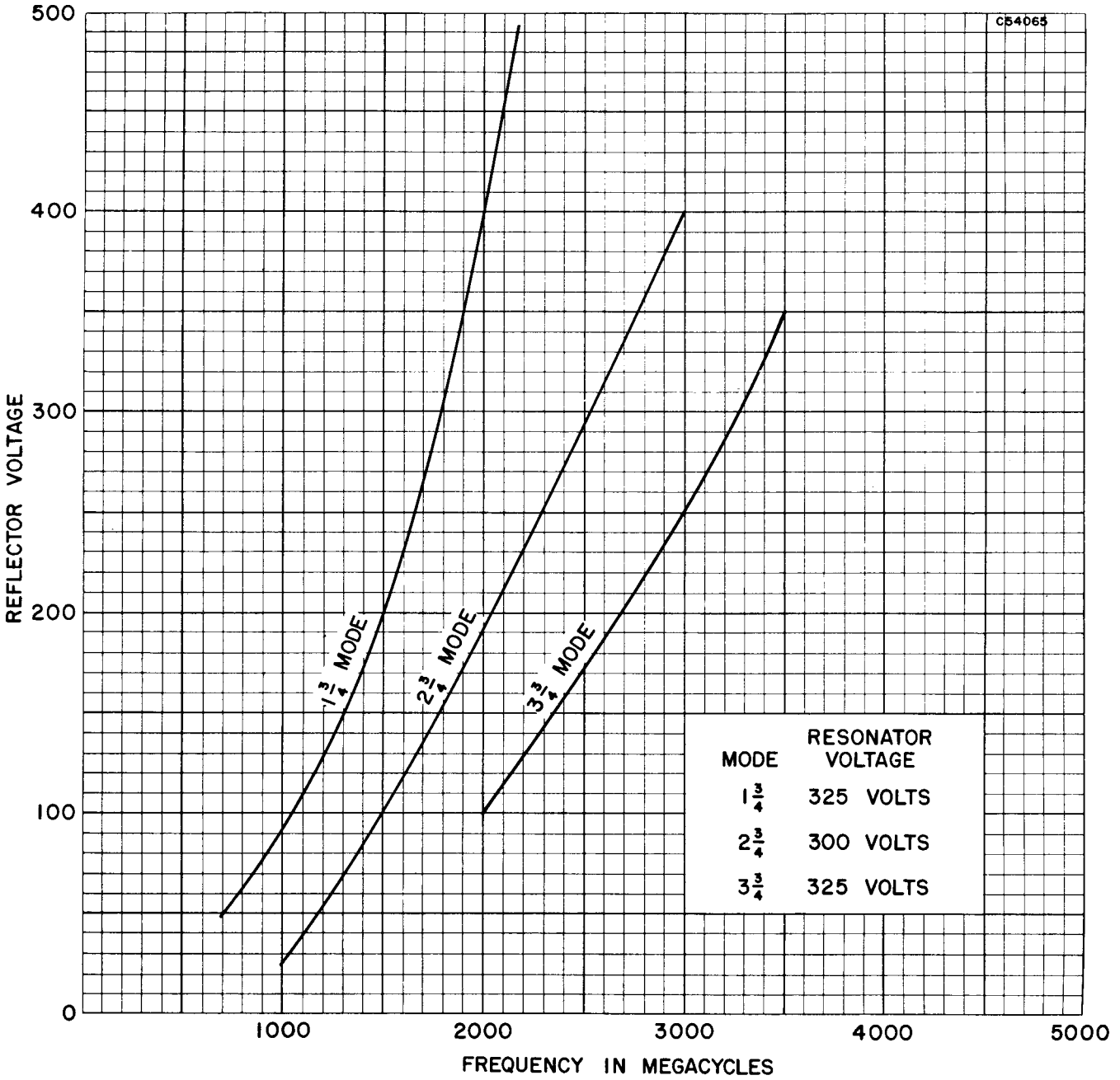
The length is determined by the frequency of operation and the range of plunger motion is set by the frequency band to be covered.

FIG. 3 — DIAGRAM OF A TYPICAL COAXIAL CAVITY FOR USE WITH THE 5837 REFLEX KLYSTRON

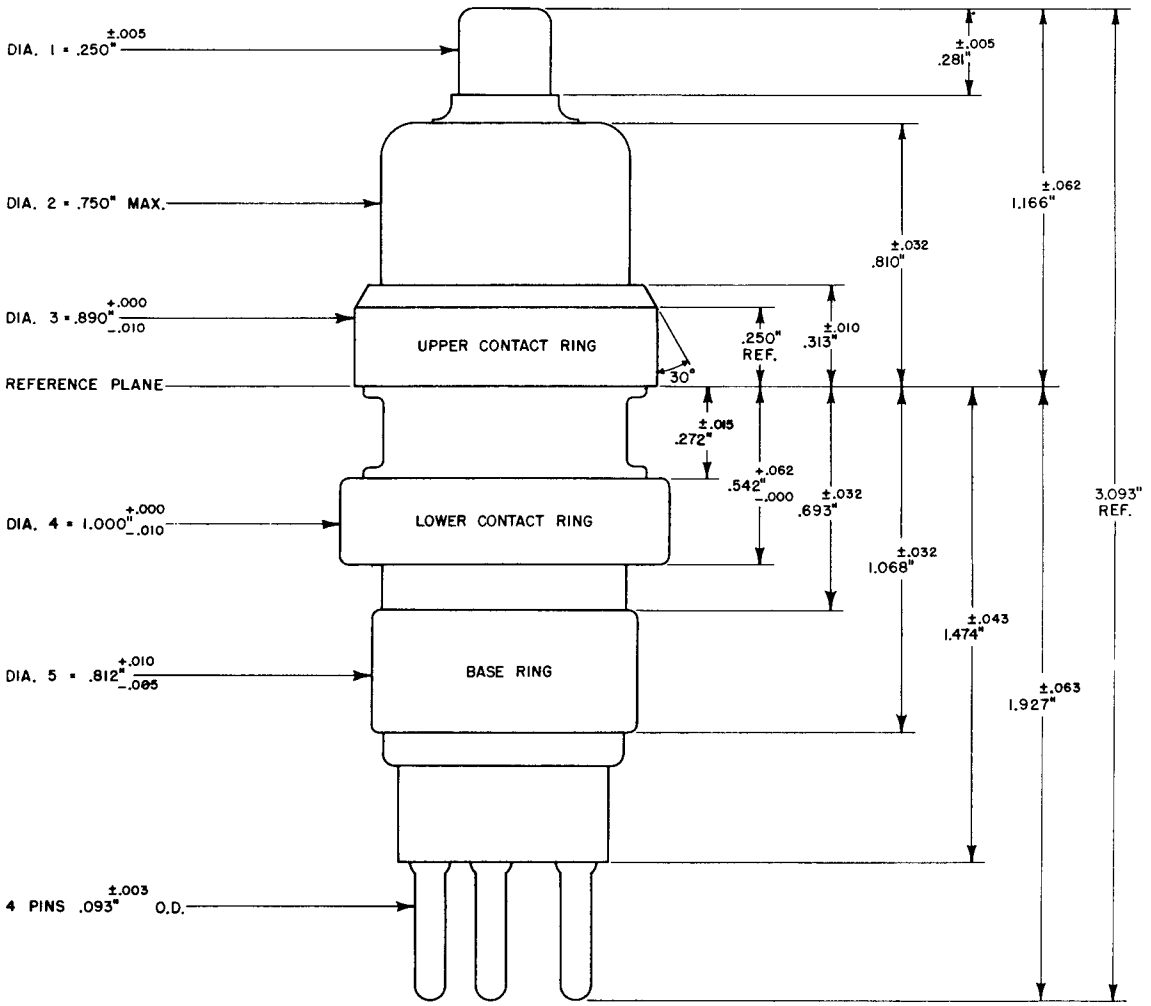
AVERAGE CHARACTERISTICS

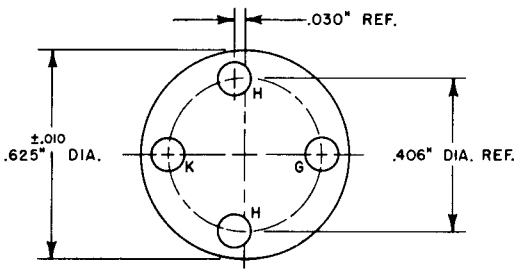


AVERAGE CHARACTERISTICS



OUTLINE DRAWING





MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DL
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		150	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid No. 1 to Plate	0.015	0.03 μμf Max.
Input	4.2	4.0 μμf
Output	3.4	1.9 μμf

RATINGS[1 & 5] (Absolute Maximum)

Plate Voltage	165 Vdc
Peak Plate Forward Voltage[6]	330 v
Grid No. 2 Voltage	155 Vdc
Plate Dissipation	1.1 W
Grid No. 2 Dissipation	0.55 W
Cathode Current	16.5 mAdc
Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid No. 1 Circuit Resistance	1.1 Meg

CHARACTERISTICS

Plate Voltage	100 Vdc
Grid No. 2 Voltage	100 Vdc
Cathode Resistor	150 Ohms
Plate Current	7.5 mAdc
Grid No. 2 Current	2.4 mAdc
Transconductance	5000 μmhos
Plate Resistance	260000 Ohms
Grid No. 1 Voltage for Ib = 50 μAdc Max.	-9.0 Vdc

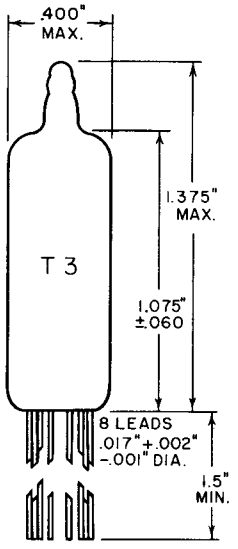
NOTES:

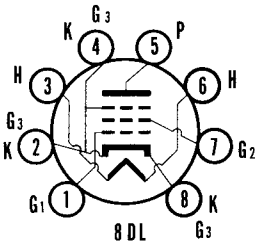
1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltage (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Per MIL-E-1C Par. 6.5 and General Section of this Sylvania Subminiature Tube Manual titled Specifications and Ratings.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5840 is a sharp cutoff pentode characterized by long life and stable performance under conditions of severe shock, vibration, high temperature and high altitude. Electrically the 5840 is similar to the 6AK5 and is intended for use as an amplifier at frequencies up to 400 mc.

The 5840 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Grid No. 2 Voltage	100 Vdc
Plate Voltage	100 Vdc	Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1	0 V
Grid No. 1 Voltage	0 V	Cathode Resistor	150 Ohms

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7 4.10.8	(Method A) Heater Current: ALD = 12	—	—	144	150	156	—	mA
4.10.8	Heater Current:	0.65	140	—	—	—	160	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid Current: Ic1 Rg1 = 1.0 Meg	0.65	0	—	—	—	−0.3	μAdc
4.1.1.7 4.10.4.1	(Method A) Plate Current (1): ALD = 2.3	—	—	6.7	7.5	8.3	—	mAdc
4.10.4.1	Plate Current (1):	0.65	5.5	—	—	—	9.5	mAdc
4.10.4.1	Plate Current (2): Ec1 = −9.0 Vdc; Rk = 0 Ohms	0.65	—	—	—	—	50	μAdc
4.10.4.3	Screen Grid Current: Ic2	0.65	1.5	—	—	—	3.3	mAdc
4.1.1.7 4.10.9	(Method A) Transconductance (1): ALD = 900 Sm	—	—	4700	5000	5300	—	μmhos
4.10.9	Transconductance (1): Sm	0.65	4200	—	—	—	5800	μmhos
4.7.5	Continuity and Shorts (Inoperatives):	0.40	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes:	2.5	—	—	—	—	—	
	g1-all	—	100	—	—	—	—	Meg
	p-all	—	100	—	—	—	—	Meg
4.10.9	Transconductance (2): $\triangle$ Sm Ef = 5.7 V $\triangle$ Ef	2.5	—	—	—	—	10	%
4.10.6.2	Grid Emission: Note 4 Ic1 Ef = 7.5 V; Ec1 = −9.0 Vdc; Rg1 = 1.0 Meg; Rk = 0 Ohms	2.5	0	—	—	—	−0.5	μAdc
4.10.3.2	AF Noise: Esig = 70 mVac; Ec2 = 19 Vdc; Rg1 = 0.1 Meg; Rg2 = 1000 Ohms; Rp = 0.2 Meg; Ck = 1000 μf	2.5	—	—	—	—	17	VU
4.10.10	Plate Resistance:	6.5	0.175	—	—	—	—	Meg
4.10.14	Capacitance:	6.5	—	—	—	—	—	
	0.405 In. Dia. Shield Cg1p	—	—	—	—	—	0.015	μμf
	0.405 In. Dia. Shield Cin	—	3.5	—	—	—	4.9	μμf
	0.405 In. Dia. Shield Cout	—	2.9	—	—	—	3.9	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 20 ±5 mm Hg.; Voltage = 300 Vac	6.5	—	—	—	—	—	
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 2 (Continued)								
4.9.19.1	Vibration (2): Rp = 10,000 Ohms; Ck = 1000 μf; F = 40 cps; G = 15	2.5	—	—	—	—	60	mVac
4.9.19.1	White Noise: Note 5 Rp = 10,000 Ohms; Ck = 1000 μf; Peak Acceleration = 15 G	2.5 2.5	— —	— —	— —	— —	800 150	mv pk-pk mVac
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc; Rg1 = 0.1 Meg	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
- - - -	Post Shock and Fatigue Test End Points: Vibration (2) Heater-Cathode Leakage Ehk = +100 Vdc Ehk = −100 Vdc Change in Transconductance (1) of Individual Tubes Δ_t Sm	— — — —	— — — —	— — — —	— — — —	— — — —	200 20 20 20	mVac μAdc μAdc %
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec1 = Ec2 = Eb = O V	2.5	—	—	—	—	
4.11.3.1	Stability Life Test: (1 Hour) Ehk = +200 Vdc; Rg1 = 1.0 Meg; TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes Δ_t Sm	—	—	—	—	10	%
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives) Transconductance (1) Sm	0.65 1.0	— —	— —	— 3750	— —	 μmhos
4.11.5 4.11.3.1	Intermittent Life Test: Note 3 Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2 (Continued)							
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Grid Current Ic1	—	1	3	0	-0.8	μAdc
	Heater Current	—	2	5	138	164	mA
	Change in Transconductance (1) of						
	Individual Tubes $\Delta \frac{Sm}{t}$	—	1	3	—	20	%
	Transconductance (2) $\Delta \frac{Sm}{Ef}$	—	2	5	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	10	μAdc
	Ehk = -100 Vdc	—	—	—	—	10	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	g-all	—	—	—	50	—	Meg
	p-all	—	—	—	50	—	Meg
	Transconductance (1) Average Change, Avg $\Delta \frac{Sm}{t}$	—	—	—	—	15	%
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature lead fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater cycling life test
4.11.5	Intermittent life test

3: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

4: Prior to this test,tubes shall be preheated five (5) minutes at conditions indicated below. Test within three (3) seconds after preheating. Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission Test.

Ef	Ec1	Ec2	Ec3	Eb	Rk	Rg1
V	Vdc	Vdc	Vdc	Vdc	Ohms	Meg
7.5	0	100	0	100	150	1.0

5: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "White Noise" spectrum which is free from discontinuities from 100 cps to 5000 cps. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 G's rms acceleration. With this the case, the rms value of acceleration for any bandwidth within the specified spectrum is equal to

$$G\ rms = 2.3\ G \sqrt{3.32 \log_{10} (f2/f1)}$$

f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (0.25 megohm or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 40 db at 13,000 cps. For reading the peak to peak value of output voltage the filter output shall be fed directly to the input of a Ballantine Model 305 peak to peak electronic voltmeter or equal, while the rms value shall be measured with a Hewlett-Packard Model 400C or equal.

APPLICATION DATA

The 5840 is a subminiature sharp cutoff pentode characterized by long life and stable performance under conditions of severe shock. vibration, high altitude and high temperature. Electrically, the 5840 is similar to the miniature Type 6AK5. It is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.

The 5840 is suited to a variety of low frequency applications as well as r f amplifier service at frequencies up to 400 mc.

As the frequency of operation is increased, consideration should be given to the resultant decrease in input and output resistance, Figure 1. Assuming matched input and output impedances, approximate tube gain can be obtained from the formula:

$$\text{Voltage Gain} = Gm \sqrt{\frac{Rinput \times Routput}{2}}$$

where the values of Rinput and Routput are obtained from the curves of Figure 1. The use of this formula assumes matched impedances into and out of the amplifier stage under consideration. If the source impedance is lower than the input resistance or if the load resistance is higher than the output resistance, much greater voltage gain per stage can be obtained than that indicated by the above formula. The voltage gain of a matching circuit is equal to the square root of the impedance ratio.

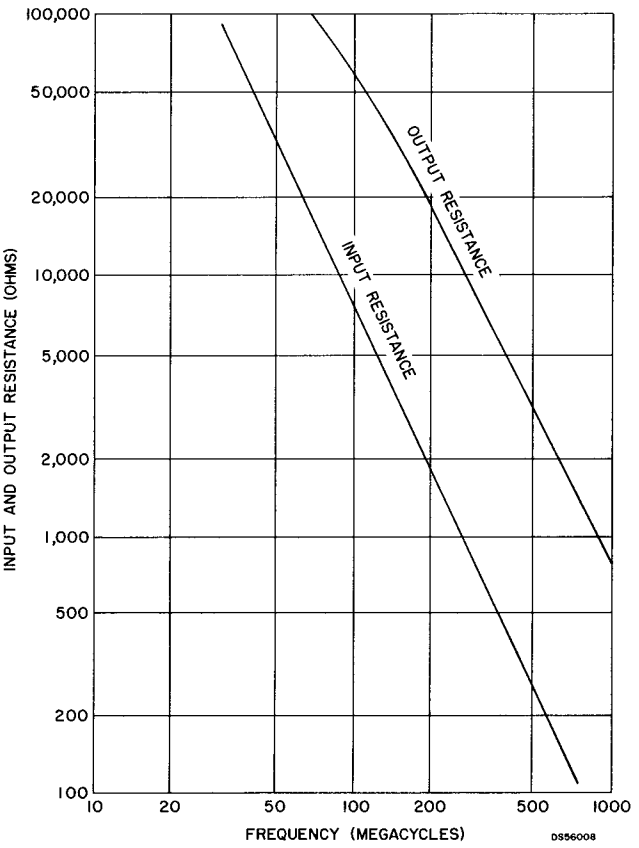


Figure 1—Input and output resistance vs. frequency

In some applications it may be advantageous to employ an unbypassed resistance in the cathode circuit to compensate for the change in input capacitance with bias. This unbypassed resistance reduces the effective Gm of the tube by the factor $\frac{1}{1 + Gm\ Rk \left(\frac{Ib + Ic2}{Ib}\right)}$ However, this unbypassed resistance also has the effect of raising the input resistance of the tube under certain operating conditions so that both a net increase in gain and a net decrease in input capacitance change may result. Some increase in effective grid-plate coupling may accompany these advantages.

The self neutralization frequency of the 5840 is approximately 200 mc. At this point the inductance of tube leads resonate with the gridplate capacitance to effect neutralization. At higher frequencies the feedback is inductive and takes place through the tube leads. Three cathode leads are provided to permit isolation of the input and output circuits.

Resistance coupled amplifier data is presented in the accompanying table.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at an rms level of 2.3 G's per octave and a peak level of 15 G's. Lmits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tube in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

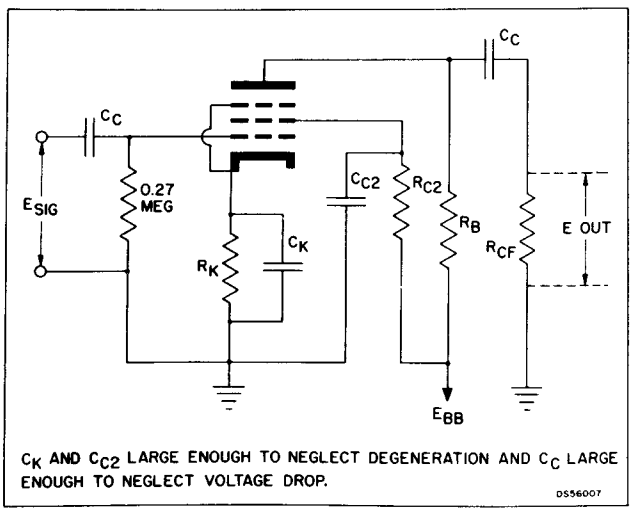
When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

RESISTANCE COUPLED AMPLIFIER DATA

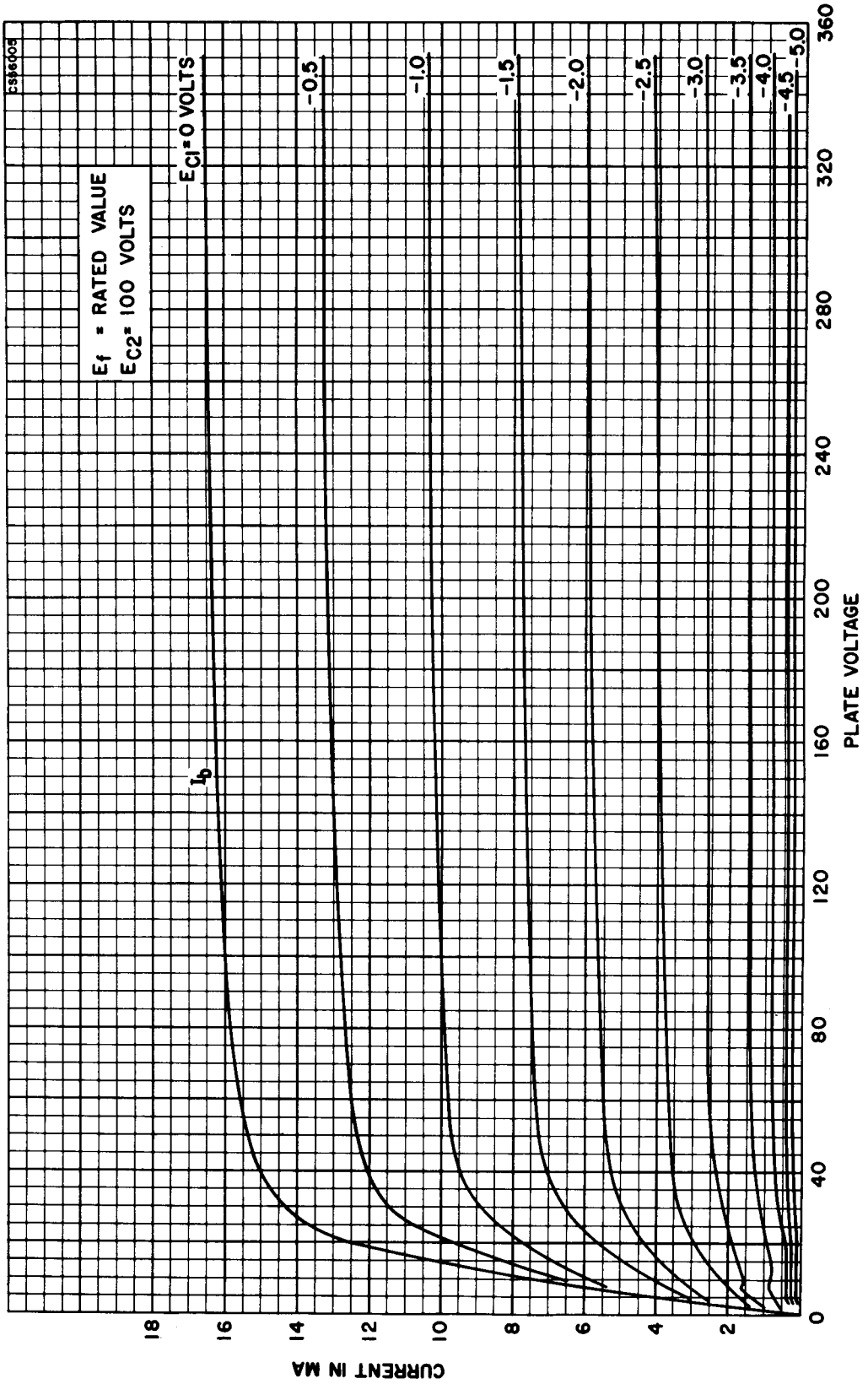
	Ebb = 100 Volts						Ebb = 150 Volts					
Rb (megohms)	0.100		0.270		0.470		0.100		0.270		0.470	
Rc2 (megohms)	0.220		0.680		1.20		0.270		0.820		1.50	
Rcf (megohms)	0.27	0.47	0.47	1.0	0.47	1.0	0.27	0.47	0.47	1.0	0.47	1.0
Rk (ohms)	820	820	2200	2200	3300	3300	560	560	1500	1500	2200	2200
Ib (ma)	0.75	0.75	0.273	0.273	0.164	0.164	1.13	1.13	0.42	0.42	0.247	0.247
Ic2 (ma)	0.292	0.292	0.102	0.102	0.062	0.062	0.41	0.41	0.143	0.143	0.083	0.083
Ec1 (volts)	-0.855	-0.855	-0.825	-0.825	-0.746	-0.746	-0.862	-0.862	-0.845	-0.845	-0.726	-0.726
Ec2 (volts)	35.8	35.8	31.4	31.4	25.5	25.5	39.3	39.3	32.8	32.8	25.6	25.6
Eb (volts)	25.0	25.0	26.3	26.3	22.9	22.9	37.0	37.0	36.7	36.7	34.0	34.0
Esig (volts, rms)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Eout (volts, rms)	8.2	9.0	9.5	11.8	9.2	11.7	11.5	12.5	13.2	15.5	13.0	16.7
Gain	82	90	95	118	92	117	115	125	132	155	130	167
% Distortion	2.8	3.8	2.5	3.0	3.1	2.3	1.5	2.2	2.4	2.4	3.7	3.0
Esig* (volts, rms)	0.23	0.22	0.15	0.16	0.12	0.14	0.20	0.18	0.16	0.16	0.11	0.14
Eout (volts, rms)	17.7	18.6	13.6	17.0	11.0	16.0	21.7	21.7	20.5	24.0	14.0	22.2
Gain	77	85	91	106	92	114	109	120	128	150	127	159
% Distortion	4.9	4.8	4.7	4.4	4.8	5.0	4.8	5.0	4.9	4.8	4.2	4.8

*Maximum signal for 5% distortion or 1/8 microampere grid current.

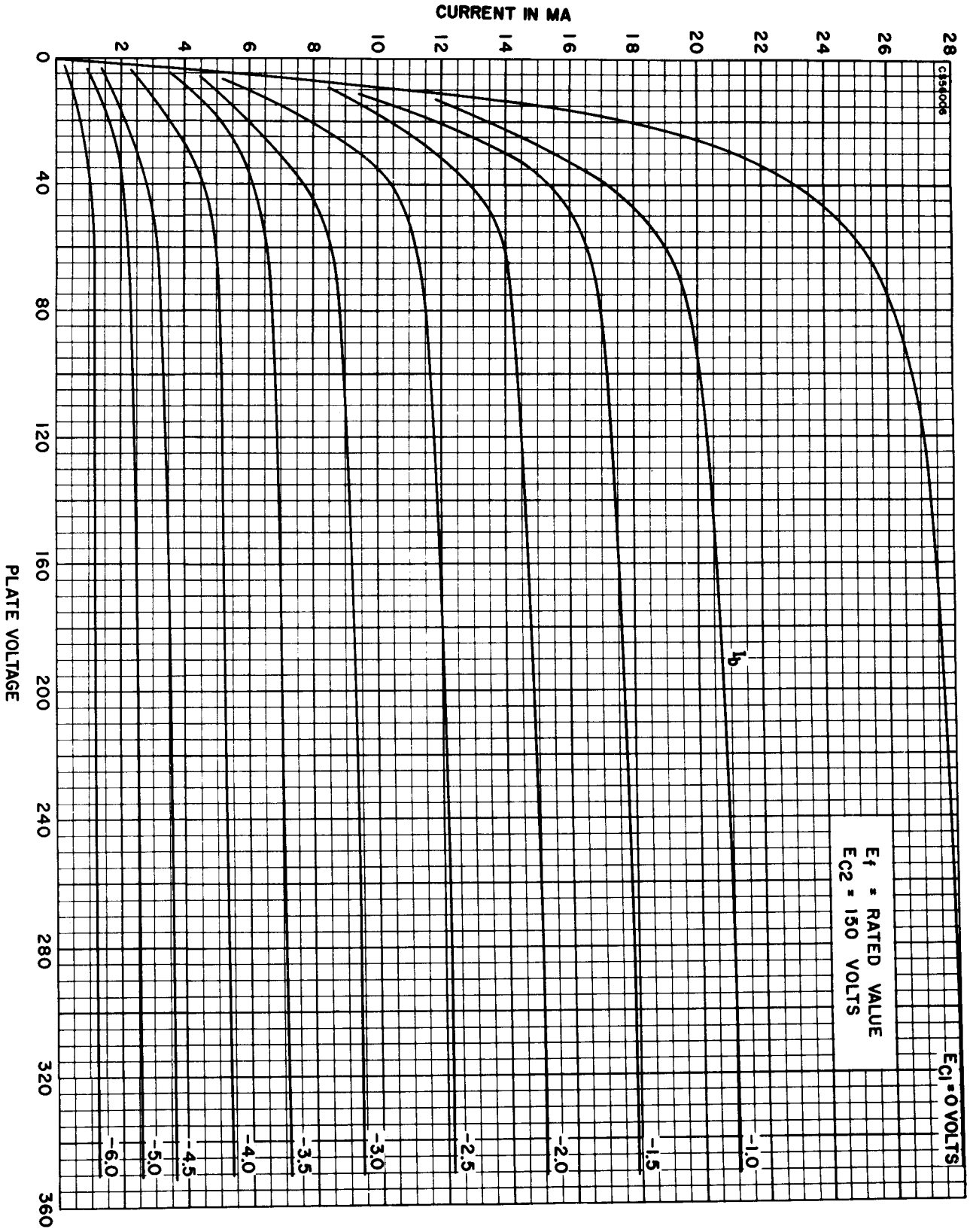


Resistance coupled amplifier circuit.

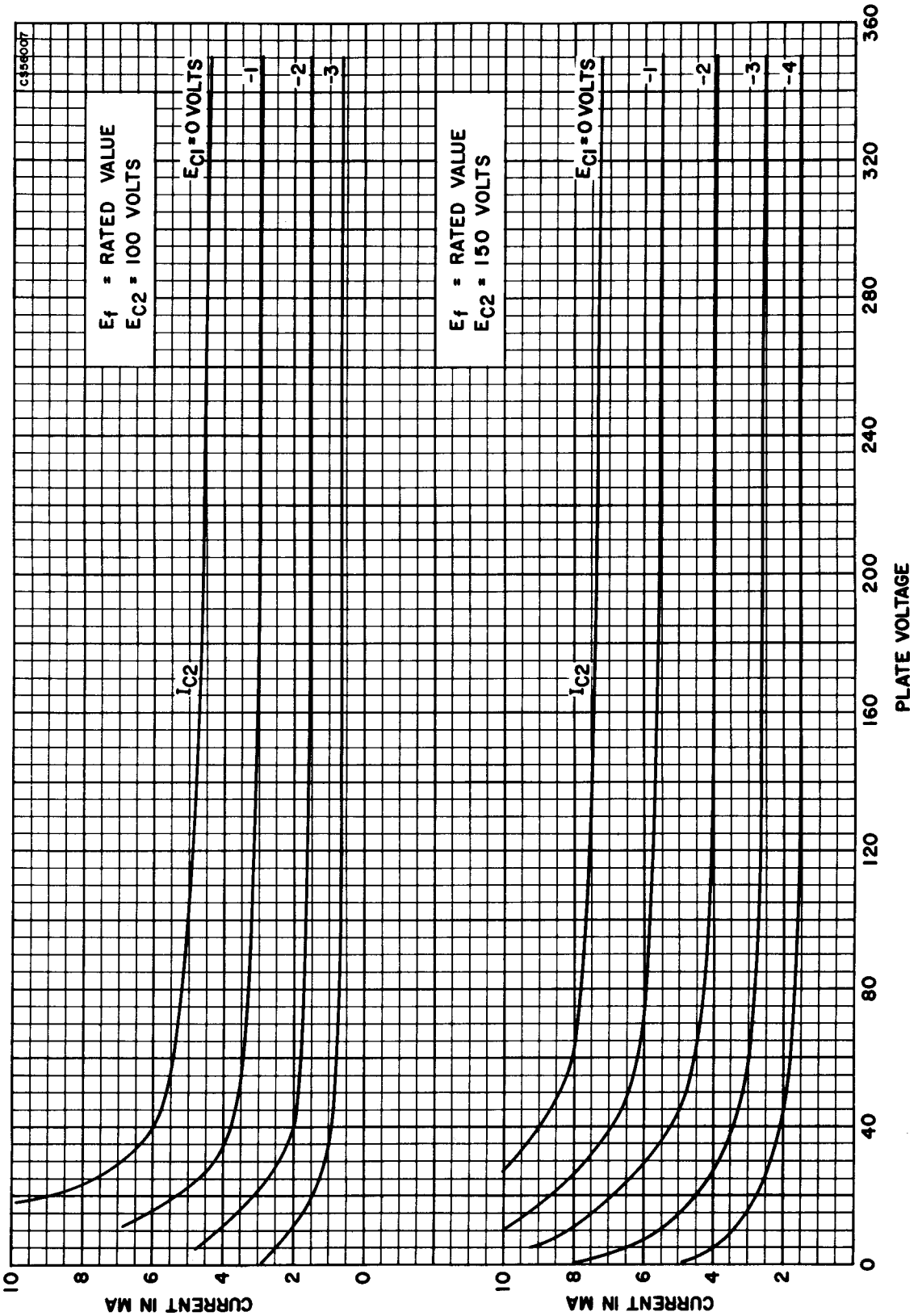
AVERAGE PLATE CHARACTERISTICS
(PENTODE CONNECTED)



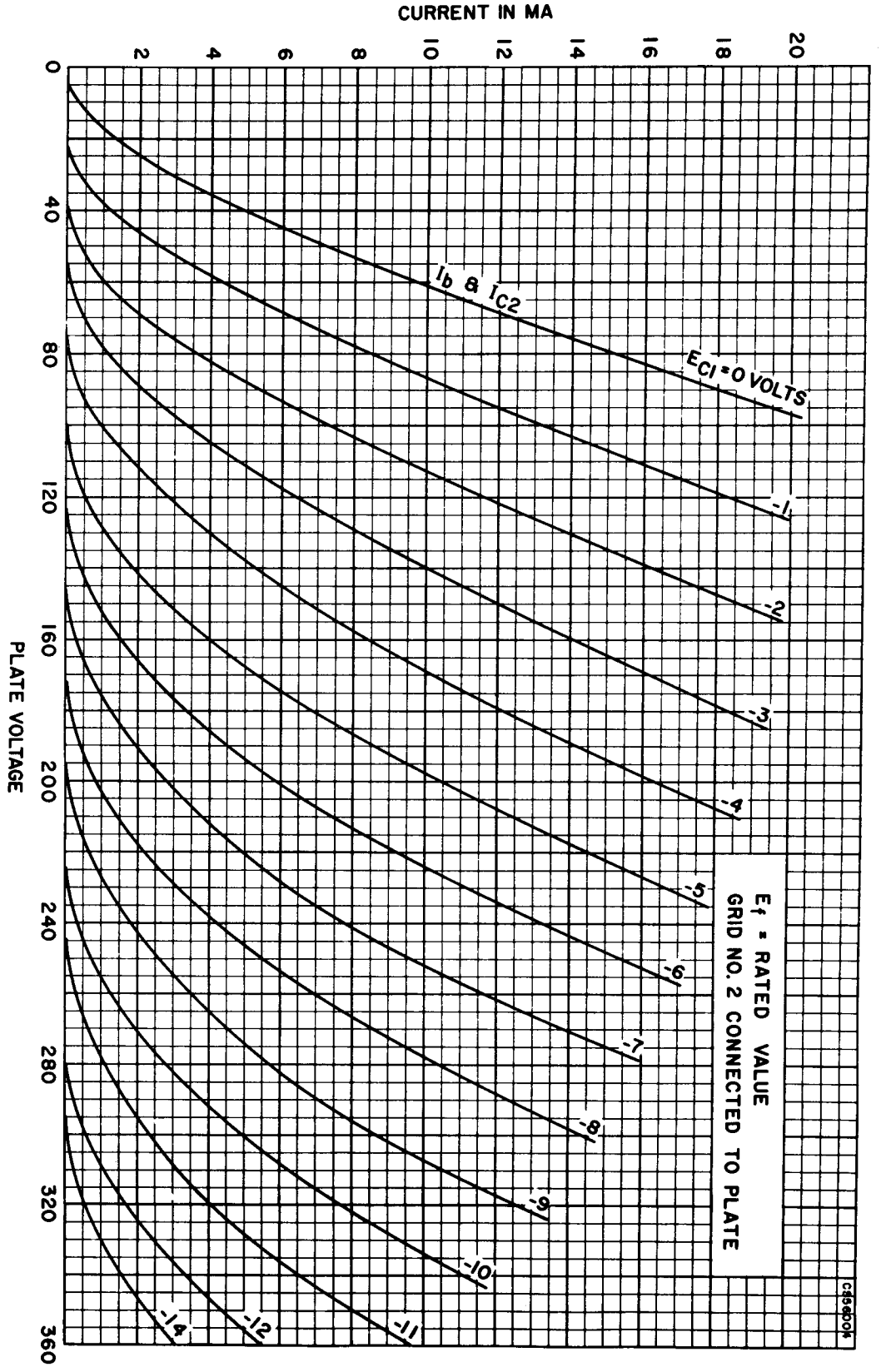
AVERAGE PLATE CHARACTERISTICS
(PENTODE CONNECTED)



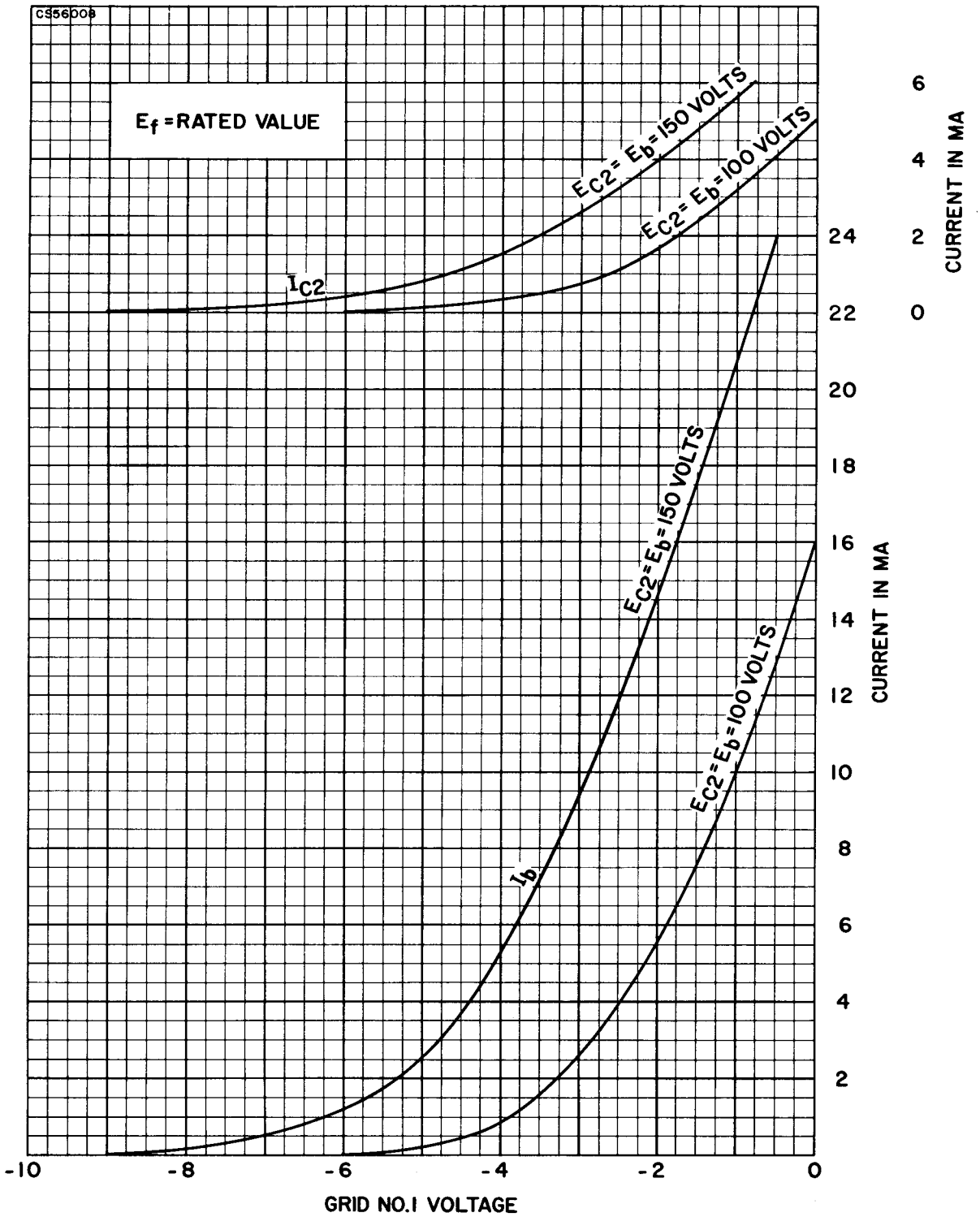
AVERAGE GRID No. 2 CHARACTERISTICS
(PENTODE CONNECTED)



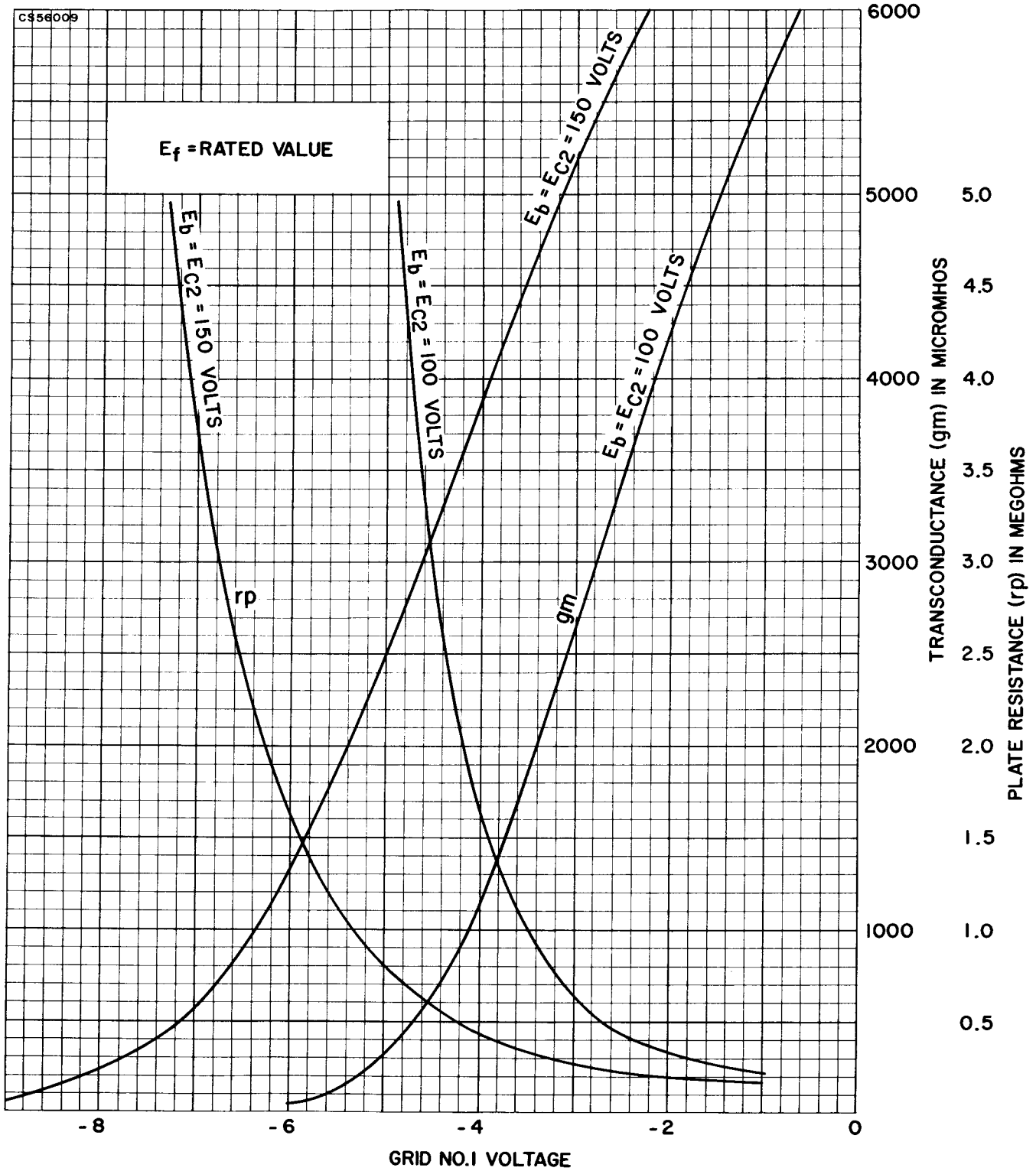
AVERAGE PLATE CHARACTERISTICS
(TRIODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE CONNECTED)



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5844

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Basing	7BF
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts	
Heater Current	300 Ma	
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode		
DC Component	90 Volts	Max.
Total DC and Peak	180 Volts	Max.
Heater Negative with Respect to Cathode		
Total DC and Peak	180 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate (Each Section)	2.7 μμf
Input (Each Section)	2.4 μμf
Output (Section 1)[1]	0.5 μμf
Output (Section 2)[1]	0.4 μμf
Plate to Plate	0.8 μμf

RATINGS (Design Center Values — Each Section)

Plate Voltage	175 Volts	Max.
Plate Dissipation	0.5 Watts	Max.
Cathode Current	9.0 Ma	Max.
Positive DC Grid Voltage	0 Volts	Max.
Grid Circuit Resistance		
Fixed Bias	.05 Megohm	Max.
Cathode Bias	0.1 Megohm	Max.

CHARACTERISTICS AND TYPICAL OPERATION (Each Section)

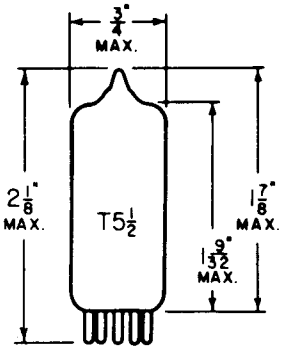
Average Characteristics

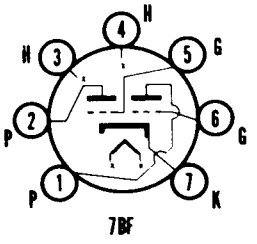
Plate Voltage	100 Volts
Cathode Bias Resistor	470 Ohms
Plate Current	4.8 Ma
Amplification Factor	27
Transconductance	3400 μmhos
Plate Resistance (approx.)	7950 Ohms

Computer Service	On Condition	Off Condition
Plate Supply Voltage	150	150 Volts
Grid Voltage	0	−10 Volts
Plate Current (Minimum)		0.10 Ma
Plate Current (Maximum)	4.8	Ma
Grid Resistor	47,000	47,000 Ohms
Plate Load Resistor	20,000	20,000 Ohms

QUICK REFERENCE DATA

Miniature, medium mu twin triode designed for use in moderately high-speed electronic computers. (See Application.)





SYLVANIA ELECTRIC PRODUCTS INC.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

APRIL 1953

SYLVANIA

5844

NOTE:

1. Section 1 connects to pins 2 and 5. Section 2 connects to pins 1 and 6.

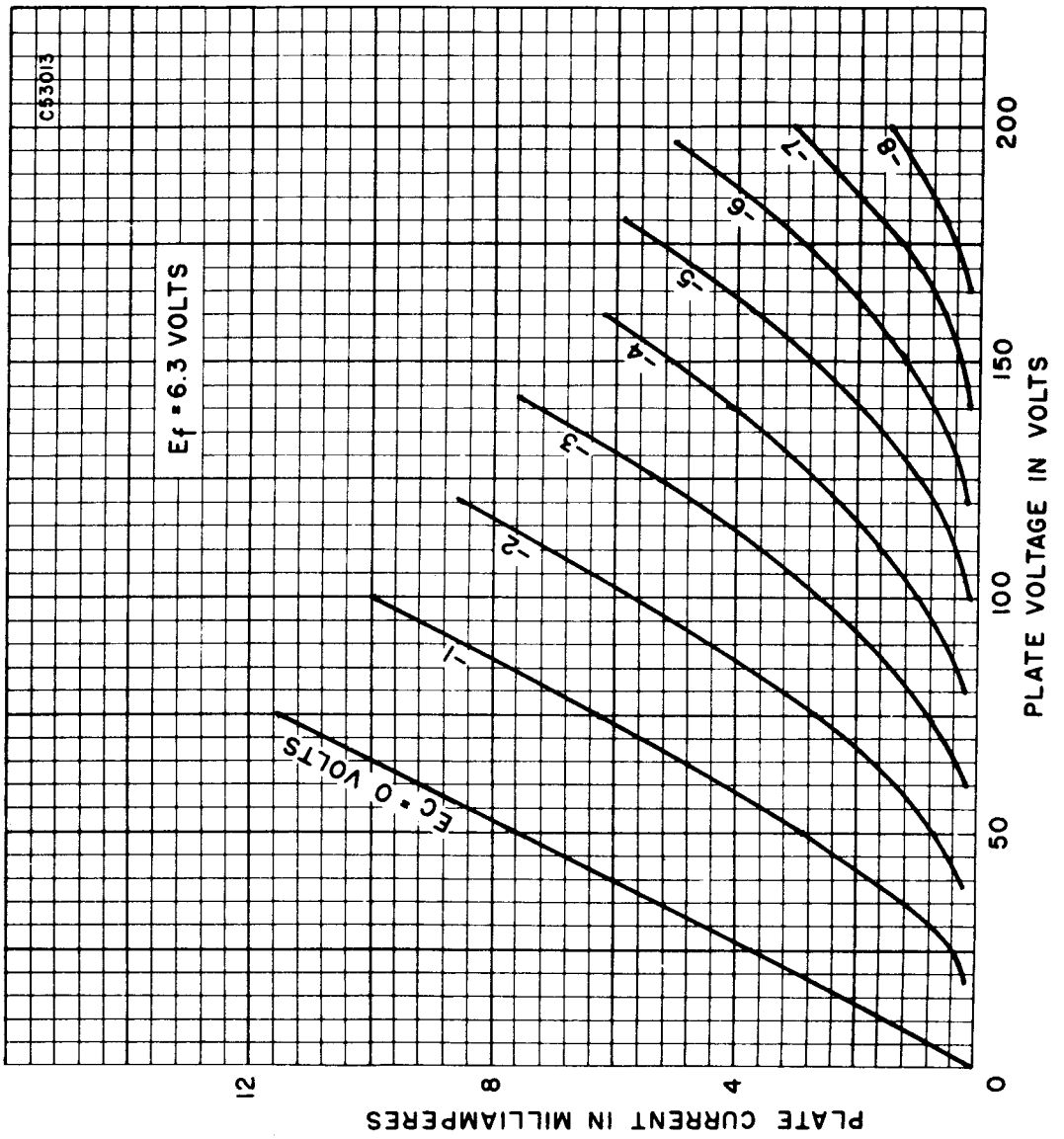
APPLICATION

Sylvania type 5844 features relatively high zero-bias plate current and sharp cutoff, heater cathode construction designed for dependable service under conditions of intermittent operation, and a cathode constructed to maintain its emission capabilities after long periods of operation under cutoff conditions.

The grid voltage required to produce 100 microamperes in one section must not differ by more than 1.0 volt from the grid voltage required to produce 100 microamperes in the other section with a plate supply voltage of 150 volts and a plate load resistor of 20,000 ohms.

5844

AVERAGE PLATE CHARACTERISTICS



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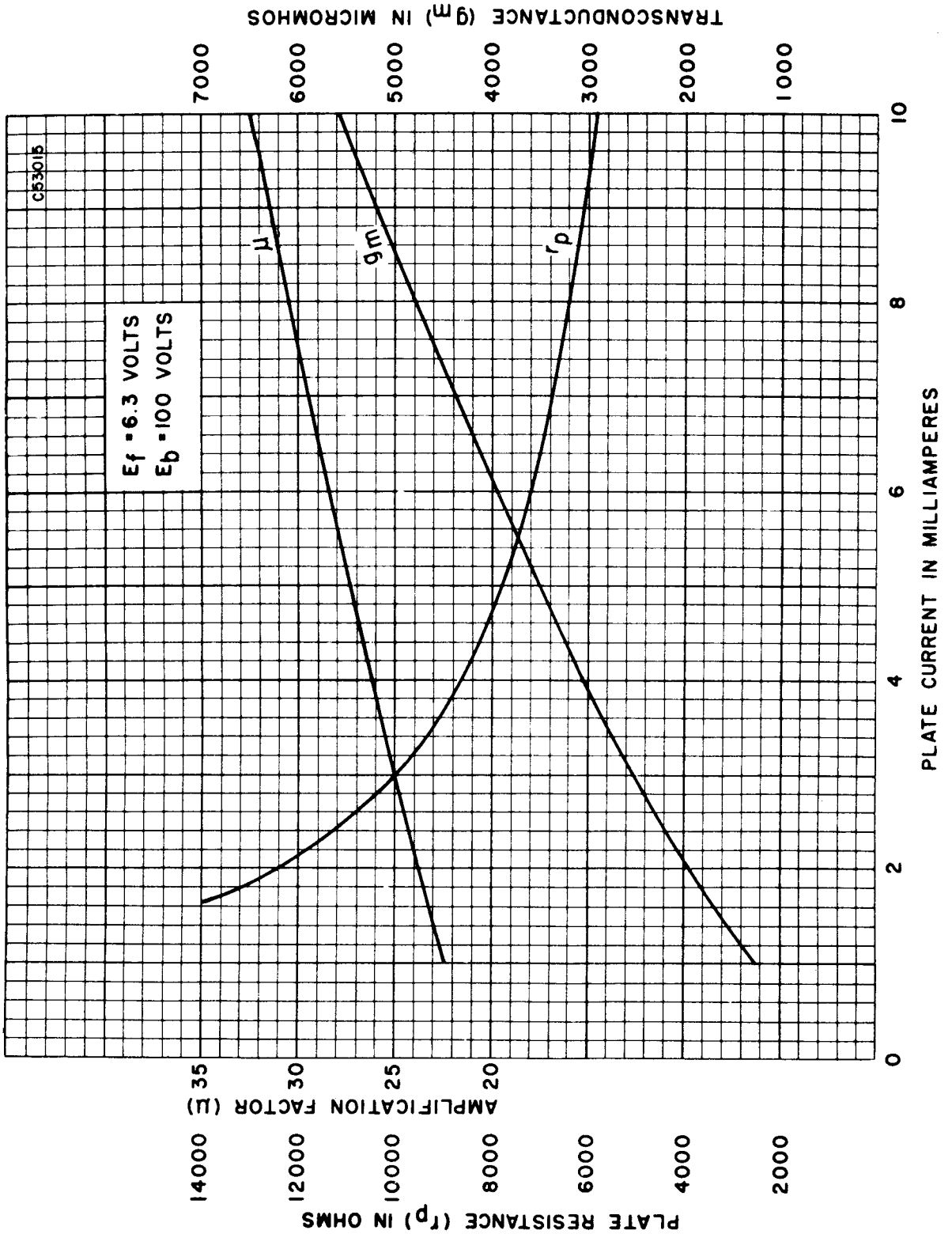
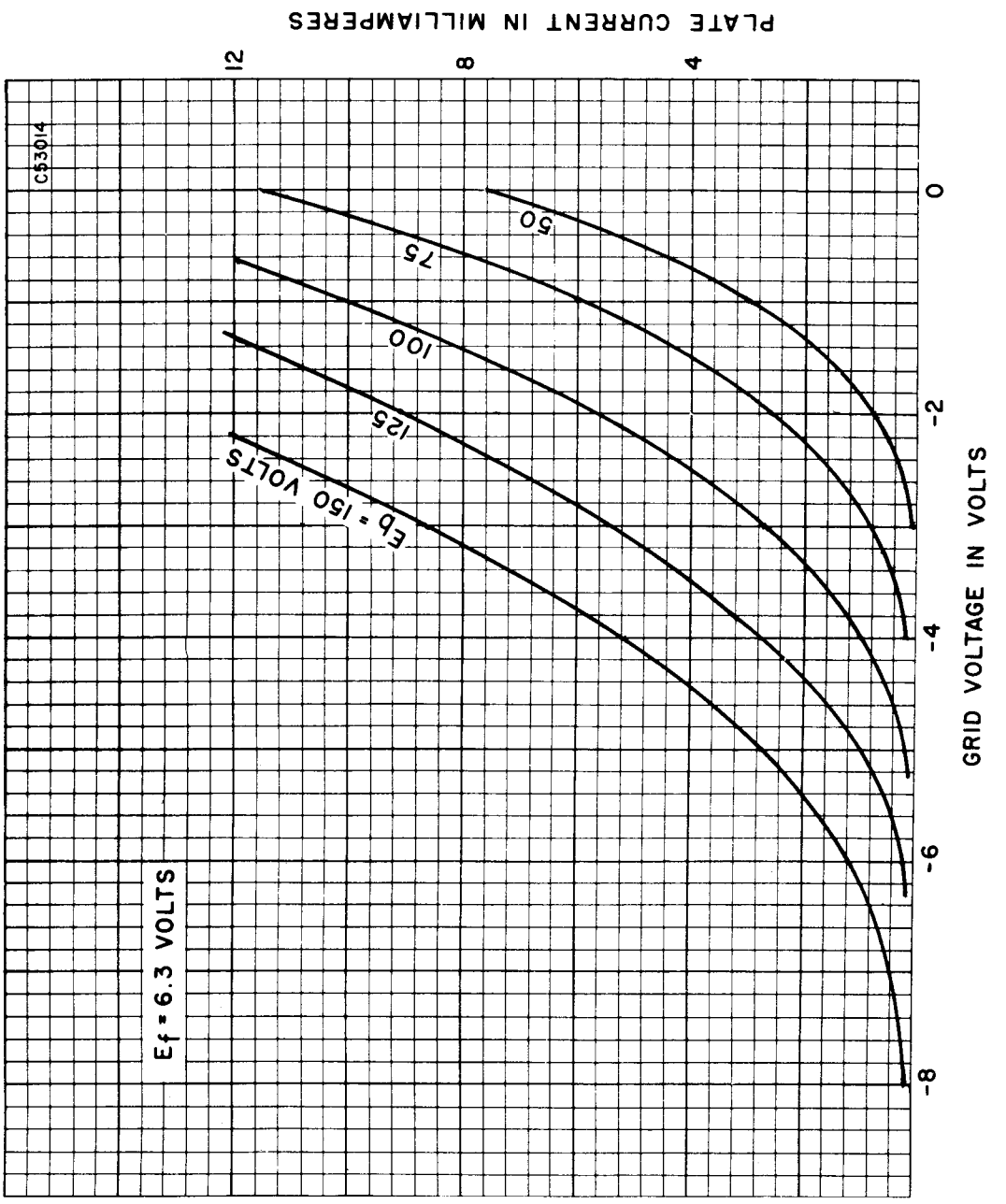
5844

AVERAGE TRANSFER CHARACTERISTICS



5844

AVERAGE CHARACTERISTICS



SYLVANIA ELECTRIC

RTMA Registration Data

TYPE 5845

TEMPERATURE-LIMITED DOUBLE DIODE

The Type 5845 is double diode with a tungsten filament which is operated under the condition of temperature-limited emission. The plate current is dependent on filament voltage.

MECHANICAL DATA

Style ..... miniature
Cathode ..... tungsten filament
Bulb T-5 1/2
Base ..... E7-1, Miniature Button 7-Pin
Outline 5-2
Maximum Diameter ..... 3/4 inch
Maximum Overall Length ..... 2 1/8 inches
Maximum Seated Height ..... 1 7/8 inches
Mounting Position:
  Vertical ..... base up or down
  Horizontal ..... pins 3 and 4 in vertical plane
Basing 5CA

Pin Connections:

Pin 1 .. plate #2	Pin 5 .. plate #1
Pin 2 .. no connection	Pin 6 .. no connection
Pin 3 .. filament	Pin 7 .. filament center tap
Pin 4 .. filament	

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCE

Diode Input (each section)	0.8	$\mu\mu$f

RATINGS -- *Design Center System*

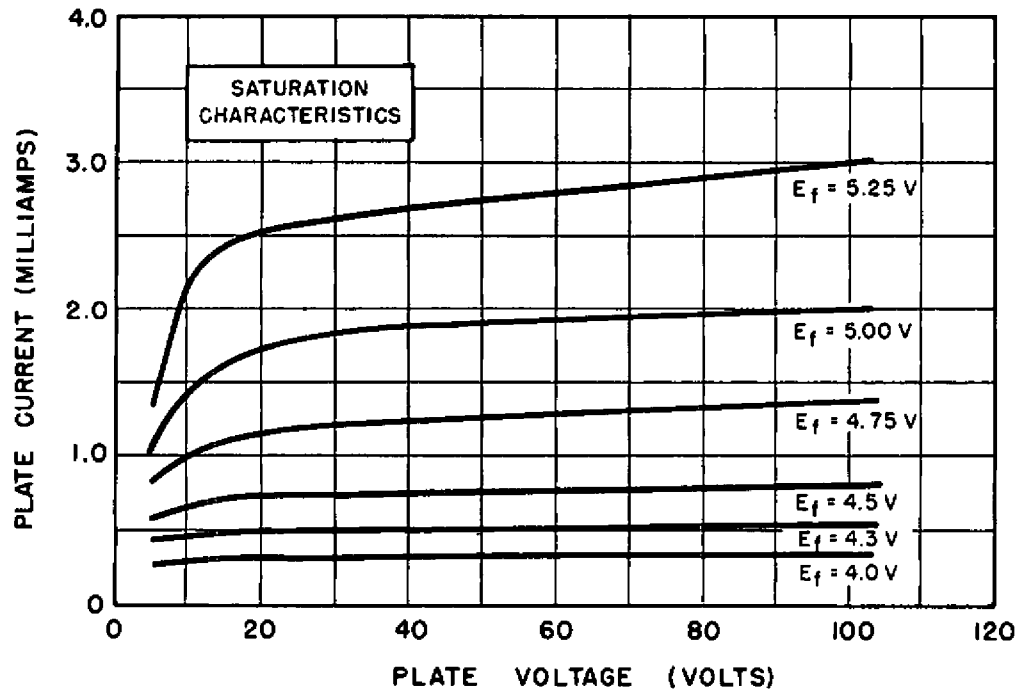
Maximum Filament Voltage (series)	5.0	volts
Maximum Plate Voltage (dc)	300	volts
Maximum Plate Current (dc) (each plate)	2.0	milliamps
Maximum On Period, with 50% Duty Cycle	5.0	minutes

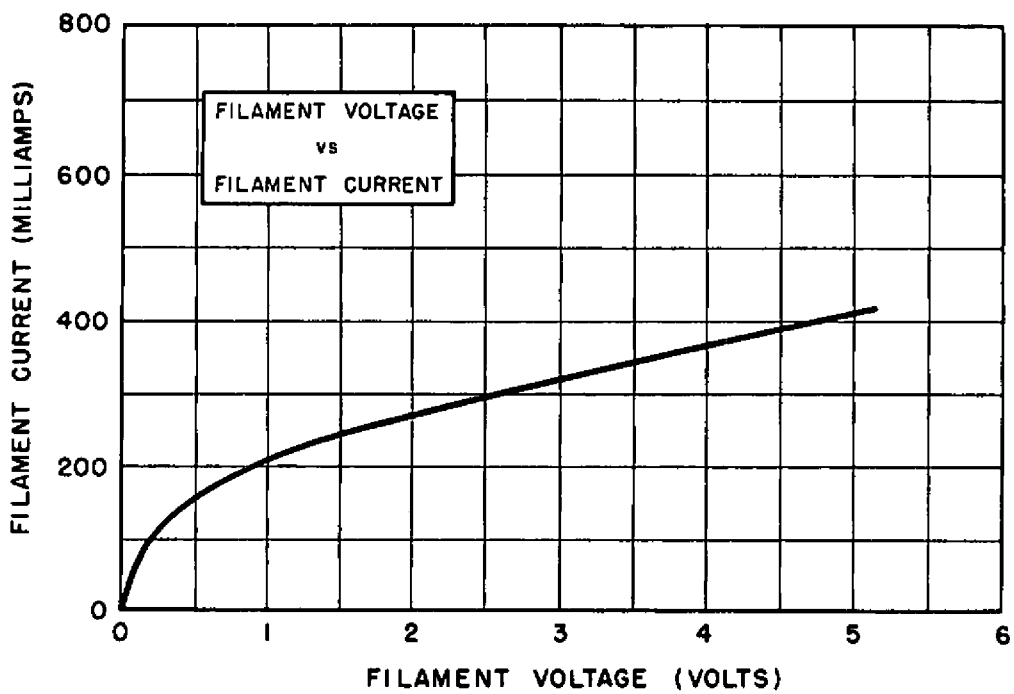
TYPICAL OPERATION -- *Plates Connected Together*

Filament Voltage (series)	4.3	volts
Filament Current (series)	435	milliamps
Plate Voltage (dc)	300	volts
Plate Load Resistor	0.6	megohm
Plate Current (dc) (both plates)	0.5	milliamp

from RMA release #909A, March 15, 1951

TYPE 5845


SATURATION CHARACTERISTICS
PLATE CURRENT (MILLIAMPS)
PLATE VOLTAGE (VOLTS)
E_f = 5.25 V
E_f = 5.00 V
E_f = 4.75 V
E_f = 4.5 V
E_f = 4.3 V
E_f = 4.0 V
0
1.0
2.0
3.0
4.0
0
20
40
60
80
100
120


FILAMENT VOLTAGE
vs
FILAMENT CURRENT
FILAMENT CURRENT (MILLIAMPS)
FILAMENT VOLTAGE (VOLTS)
0
200
400
600
800
0
1
2
3
4
5
6

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TYPE 5853

JETEC Registration Data

TR SWITCHING TUBE

The Type 5853 is a band-pass transmit-receive tube designed for operation at approximately 3,000 megacycles.

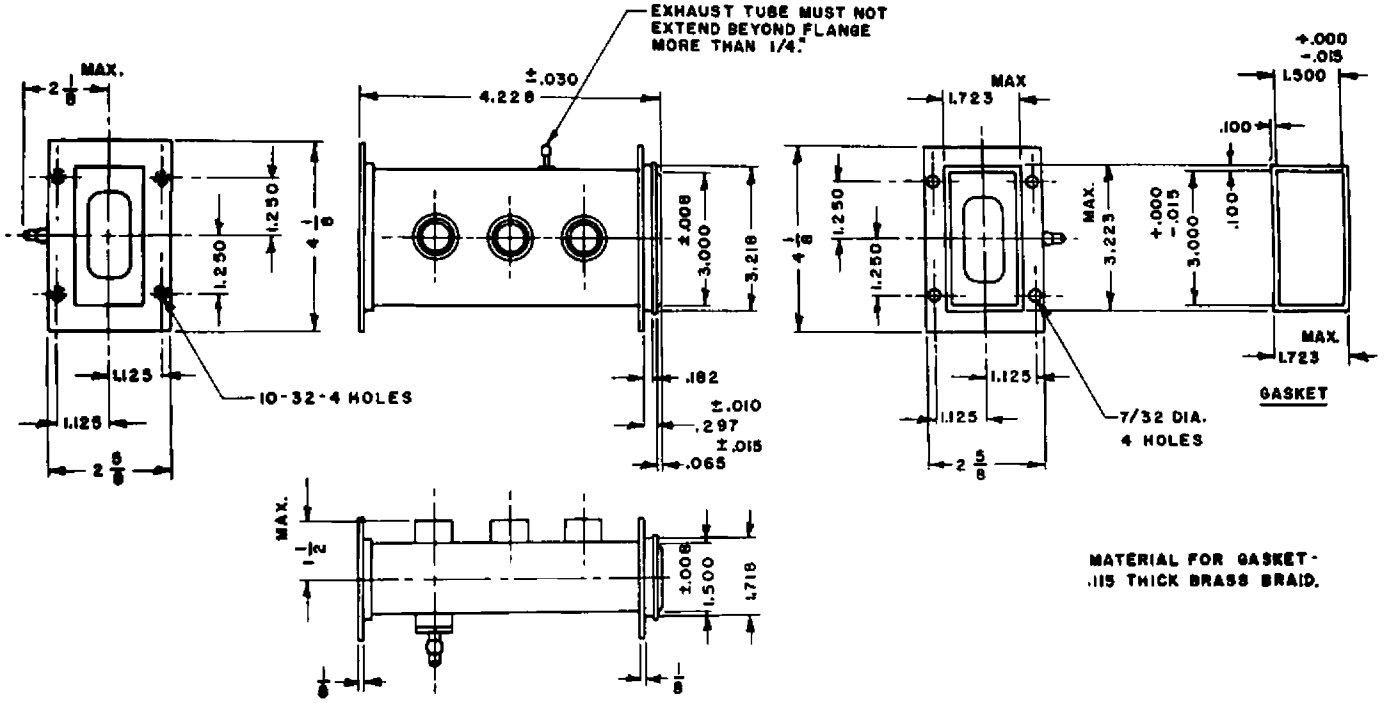
ELECTRICAL DATA

Frequency Range(1)	2900 to 3200 mc
Transmitter Peak Power(min.)	10 kw
Ignitor Characteristics:	
Ignitor Voltage	-700 volts
Ignitor Current	200 μa
Ignitor Voltage Drop	200 to 450 volts
Low Power Level Unfired Characteristics:	
Insertion Loss(max.)	0.7 db
Ignitor Interaction(max.)	0.3 db
High Power Level Fired Characteristics:	
Flat Leakage Energy(max.)	0.4 erg
Spike Leakage Energy(max.)	0.3 erg
Recovery Time(750 kw)(max.)	15 μsec

MECHANICAL DATA

Mounting Position	any
Ambient Temperature Range	-40 to 100 °C

(1) With Voltage Standing Wave Ratio of 1.4 maximum.



from JETEC release #1303, April 23, 1954

SYLVANIA

engineering data service

SYLVANIA

5864

MECHANICAL DATA

Dimensions	Per Outline	
Mounting Position	Any (two gaskets supplied with each tube)	
Ambient temperature range	(non-operating) −40 to+100°	C
Net weight (Approximately)	0.11	lbs.

ELECTRICAL DATA

GENERAL DATA

Center Frequency	9375	Mc

RATINGS (Absolute)

Transmitter Peak Power (min.)	4	KW
(max.)	500	KW

TYPICAL OPERATION

Power Output	200	KW
Duty Cycle	0.001	
σ	1.2 to 1.0	
Frequency	9375	Mc

LOW LEVEL CHARACTERISTICS

Loaded Q (Center Frequency)	8.0
Tuning Conductance (Center Frequency) G/Y_o	0.1
Tuning Susceptance (Center Frequency) B/Y_o	±.06

HIGH LEVEL CHARACTERISTICS

Arc Loss (max.) (Note 1)	0.8	db
High Level VSWR (Note 2)	1.10	
Firing Time (Note 3)	.10	sec.

Note 1: The power loss in the arc shall be less that 680 peak watts.

$$\frac{P}{P\text{-}PL} = \frac{4000}{4000\text{-}680} = 1.20\ (0.8\ db)$$

Note 2: $P_o = 200$ kw; $t_p = 1.0$ μsec; prr = 1000; 9375 Mc;
Load VSWR = 1.03 (max.), VSWR of tube 1.1 to 1.0

Note 3: $P_o = 4$ kw; $t_p = 0.45$ to 0.65 μsec; prr = 1000

QUICK REFERENCE DATA

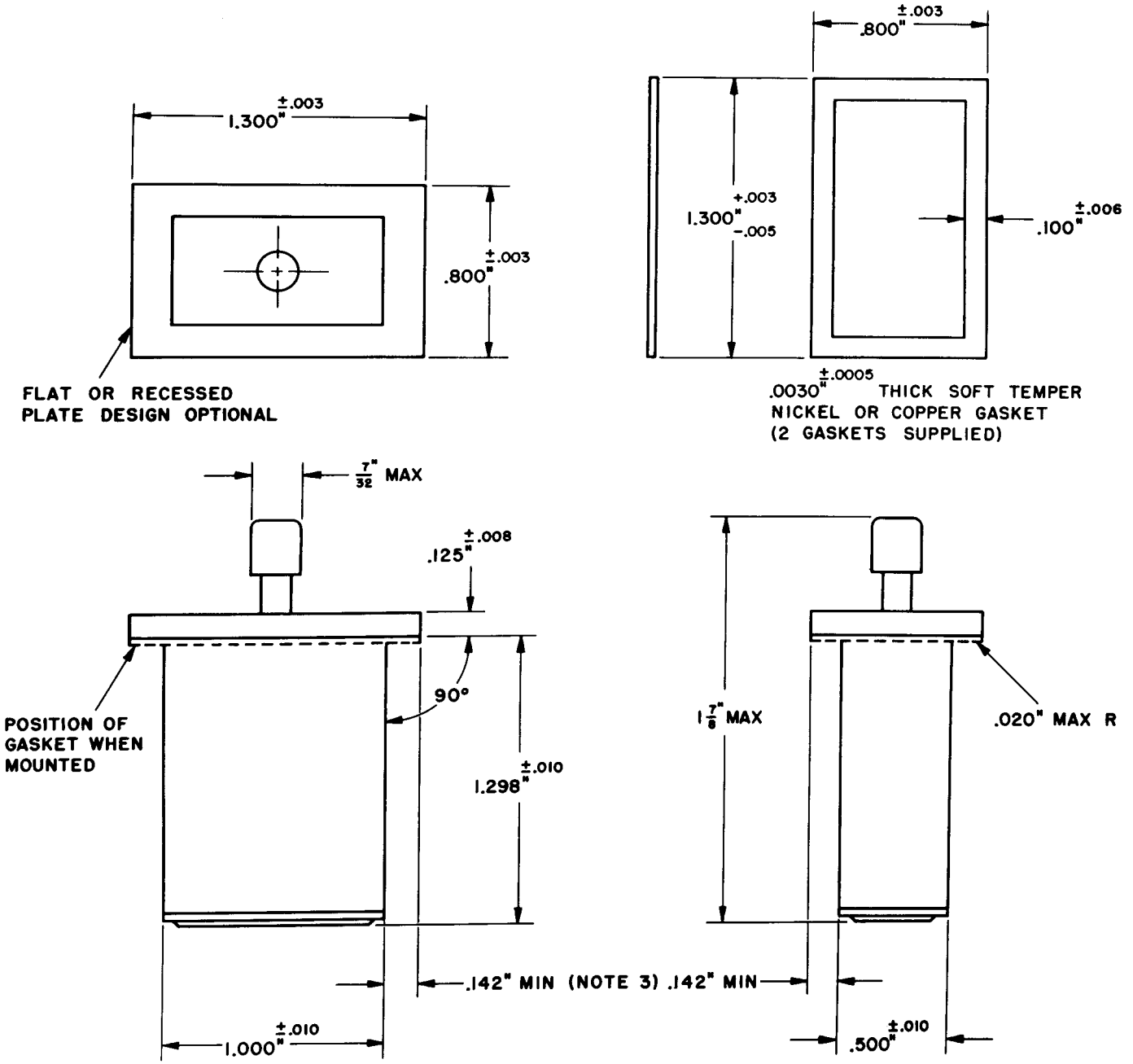
The Sylvania Type 5864 is a broadband X-Band ATR gas switching tube designed to decouple effectively the transmitter from a common transmitting and receiving antenna during a non-transmitting period (used in Hi-power X-Band wave-guide RG51/U). The operational band is nominally ± 3% depending on specific application. Former type designation was ATR 321.

SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JULY 1956



NOTES:

1. *The tubulation shall fall within a circle of 3/8 inch max. diameter located from the centerlines of the flange.*
2. *Silver plate 100 M.S.I. or equivalent.*
3. *Applies at all edges of bottom face of end plate only.*
4. *Centerlines of window shall coincide with corresponding centerlines of body within .015 inch. This measurement shall be made in the plane of the window.*

DESCRIPTION

The Sylvania Type 5865 is a band-pass transmit-receive tube. It will protect a crystal detector from pulsed power greater than 4 kilowatts peak from 5395 to 5905 megacycles with a maximum voltage standing wave ratio of 1.9 and from 5450 to 5825 mc at a maximum VSWR of 1.4. In duplexing systems Sylvania Type 6081 may be used as the companion ATR.

TRANSMITTER PEAK POWER . . . . . 4 kw min.

IGNITOR CHARACTERISTICS

Ignitor Voltage	—700 volts
Ignitor Current	100 μa
Ignitor Voltage Drop	200 to 400 volts

HIGH POWER LEVEL FIRED CHARACTERISTICS*

Leakage Power Peak (300 kw)	70 mw max.
Spike Leakage Energy	0.25 erg max.
Recovery Time (40 kw)	4 μsec @ 3 db max.
Recovery Time (300 kw)	10 μsec @ 3 db max.

*$prr = 1000; Du = 0.001; f = 5650$ mc

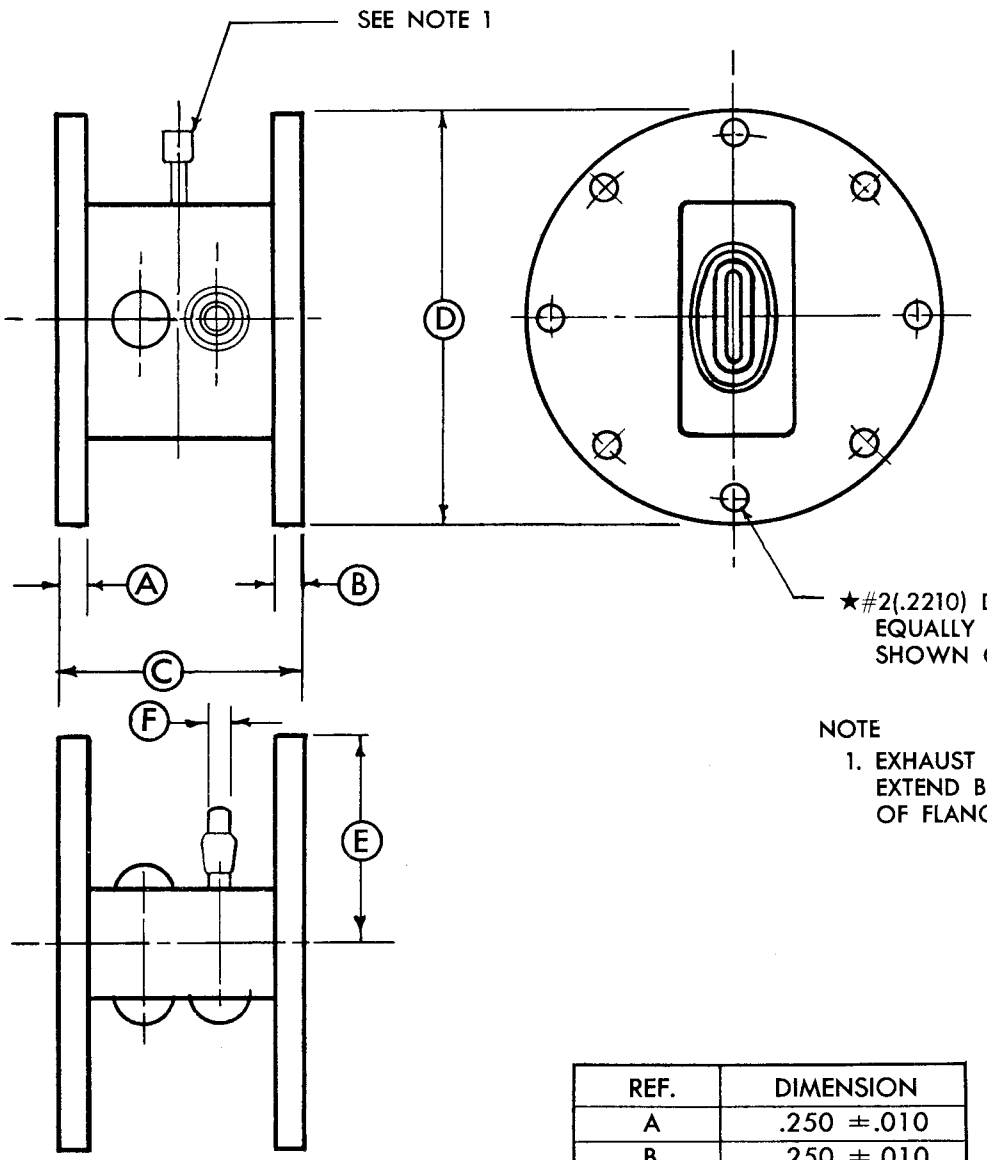
LOW POWER LEVEL UNFIRED CHARACTERISTICS

Insertion Loss	0.8 db max.
Ignitor Interaction	0.2 db max.
Arc Loss (4 kw)	0.8 db max.

TEMPERATURE AND MECHANICAL CHARACTERISTICS

Ambient Temperature Range (non-operating): —40° to +100°C
Mounting: Between r f choke flanges (UG-148B/U or equiv.)
in 2" x 1" OD waveguide.

SYLVANIA ELECTRIC PRODUCTS INC. ELECTRONICS DIVISION
1740 Broadway, New York 19, New York



NOTE

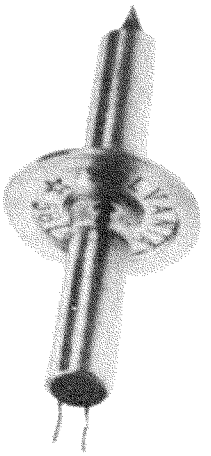
1. EXHAUST TUBE NOT TO EXTEND BEYOND EDGE OF FLANGE.

REF.	DIMENSION
A	.250 ±.010
B	.250 ±.010
C	2.110 ±.010
D	3⅝ ±1/64
E	1 13/16 max.
F	.250

DESCRIPTION: UHF TRIODE

TYPE 5876

Pencil Tube Type 5876 is a high Mu triode designed for continuous wave operation up to 3000 megacycles.



ELECTRICAL RATINGS

Heater Voltage	6.3 V
Heater Current	135 mA
Max. Operating Frequency	3000 mc
Max. Glass-to-Metal Seal Temperature	175°C

TUBE CHARACTERISTICS

Heater Voltage	6.3 V
Heater Current	135 mA
Plate Current	18 mAdc
Amplification Factor	56 Avg. value
Transconductance	6500 μmhos
Power Oscillation*	35 mW Min.

*Eb = 250V
Rg/Ib = 25 mAdc
Rk = 0
F = 3000 ± 25mc

TYPICAL OPERATING CONDITIONS

Plate Voltage	200 V
Plate Current (Adjust Cathode Resistor for Plate Current)	19 mAdc
Power Output at 1700 mc	450 mW

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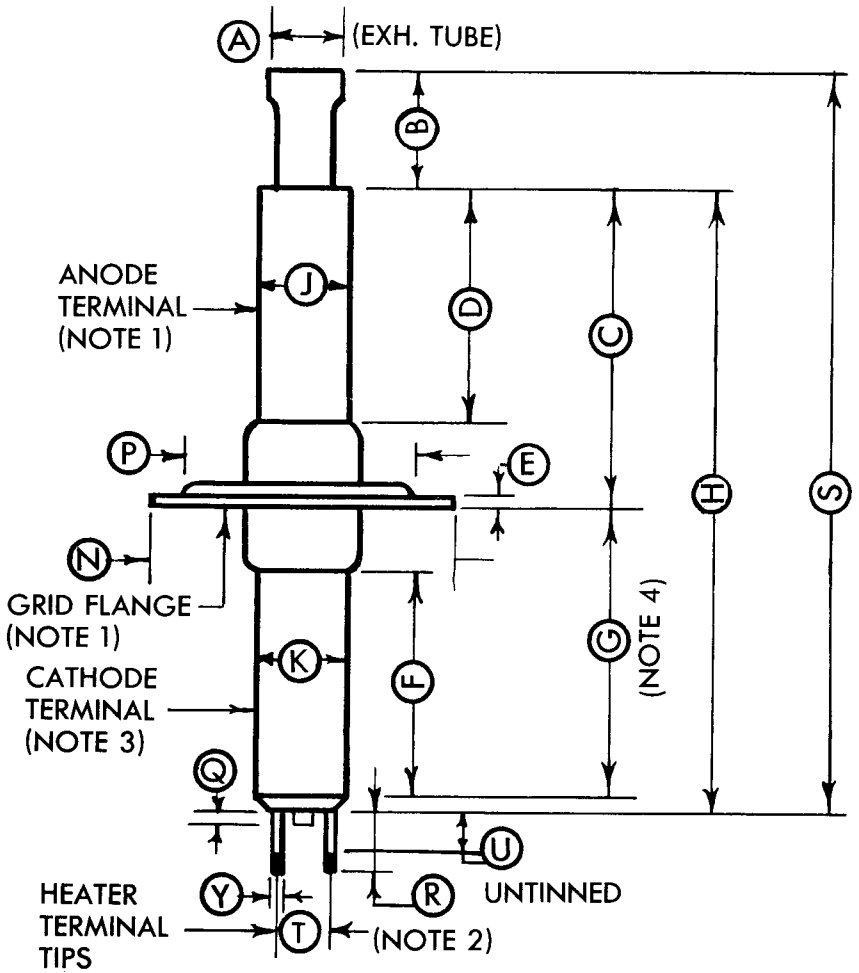
1740 Broadway, New York 19, New York

5876



REF.	DIMENSIONS
A	.187 max.
B	.312 max.
C	.863 ±.025
D	.600 min.
E	.032 ±.003
F	.600 min.
G	.793 ±.025
H	1.656 $^{+.075}_{-.050}$
J	.250 ±.003 dia.
K	.250 ±.003 dia.
N	.812 ±.0035 dia.
P	.687 dia. max.
Q	.040 max.
R	.220 ±.020
Y	.016 ± $^{.002}_{.001}$ dia.
T	.115 ±.040
S	2.043 max.
U	.080 max.

Note 1: Maximum allowable eccentricity of anode terminal or grid flange with respect to cathode terminal is .008 in. measured .080 in. from end of anode and cathode. Tube to be chucked .050 in. to .100 in. from the cathode flange.

Note 2: Leads trimmed and tinned.

Note 3: No glass from stem sealing to be present on the cathode terminal surface and the outer edge of the glass button at no point shall protrude radially beyond the extended cylindrical surface of the cathode terminal.

Note 4: Maximum allowable tilt of grid flange is .020 in. with respect to rotational axis of cathode terminal as determined by chucking the cathode terminal, rotating the tube, and gauging the total travel distance of the flange parallel to the axis at a point approximately .020 in. inward from its edge for one complete revolution.

ELECTRICAL DATA

RATINGS

Transmitter Peak Power (min.)	4 kw

GENERAL DATA

Center Frequency	8800 mc
Loaded Q (max.)	8.0
Low Level Characteristics:	
Equivalent Conductance at Center Frequency (max.)	0.06
Tuning Susceptance at Center Frequency	±0.06
High Level Characteristics:	
Firing Time (max.) (1)	10 sec
Arc Loss (max.) (1)	0.6 db

NOTES:

(1) Tested with line RF power of 4 kw peak; 0.45 to 0.65 usec pulse length; 1000 pps; and 9025 ± 4% mc.

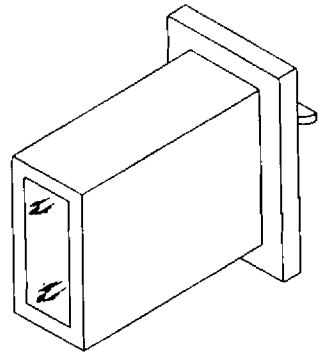
MECHANICAL DATA

Dimensions:	Per outline.
Mounting Position:	Any.
Ambient Temperature Range:	-40°C to +100°C

from JETEC release #1370, Nov. 8, 1954

QUICK REFERENCE DATA

The Sylvania Type 5883 is an anti-transmit-receive tube designed for use at a center frequency of 8800 megacycles.



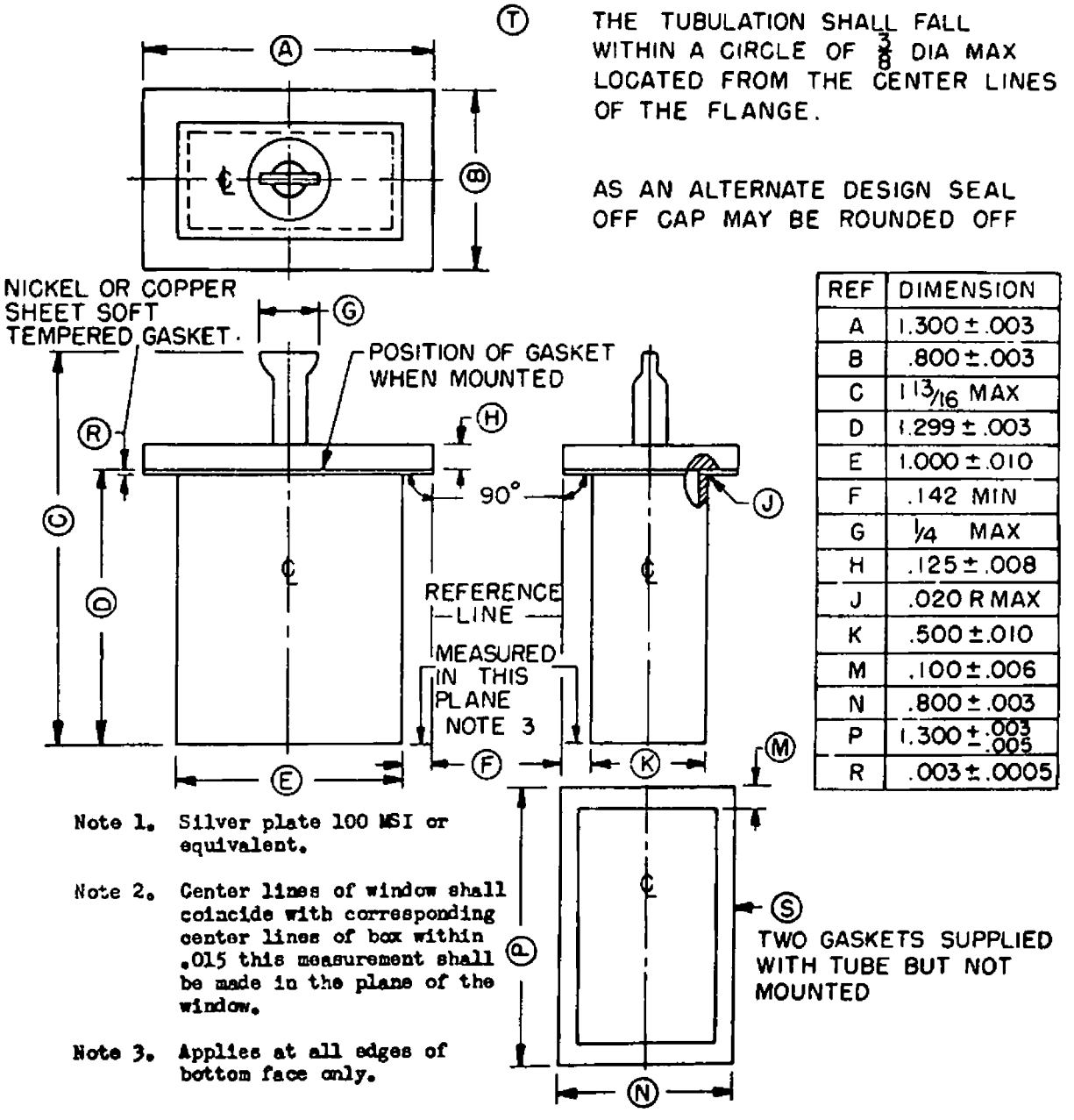
SYLVANIA ELECTRIC PRODUCTS, INC.

Electronics Division
Woburn, Mass.

AUGUST 25, 1954

SYLVANIA

5883



THE TUBULATION SHALL FALL WITHIN A CIRCLE OF $\frac{3}{8}$ DIA MAX LOCATED FROM THE CENTER LINES OF THE FLANGE.

AS AN ALTERNATE DESIGN SEAL OFF CAP MAY BE ROUNDED OFF

REF	DIMENSION
A	1.300 ± .003
B	.800 ± .003
C	1 13/16 MAX
D	1.299 ± .003
E	1.000 ± .010
F	.142 MIN
G	¼ MAX
H	.125 ± .008
J	.020 R MAX
K	.500 ± .010
M	.100 ± .006
N	.800 ± .003
P	1.300 $\pm^{.003}_{.005}$
R	.003 ± .0005

Note 1. Silver plate 100 MSI or equivalent.

Note 2. Center lines of window shall coincide with corresponding center lines of box within .015 this measurement shall be made in the plane of the window.

Note 3. Applies at all edges of bottom face only.

TWO GASKETS SUPPLIED WITH TUBE BUT NOT MOUNTED

SYLVANIA

engineering data service 5896

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DJ
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	60000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		300	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Plate to Plate	0.026	0.15 μμf Max.
Plate to All Other Electrodes[5] (Each Section)	3.0	2.4 μμf
Cathode to All Other Electrodes[6] (Each Section)	4.2	4.0 μμf

RATINGS[1 & 7] (Absolute Maximum)

Plate Supply Voltage (Each Plate)	165 Vac
Peak Inverse Plate Voltage[8]	460 v
Steady State Peak Plate Current (Each Plate)	60 ma
Transient Peak Plate Current (Each Plate)	350 ma
Output Current (Each Plate)	10 mAdc
Heater-Cathode Voltage[8]	
Heater Positive with Respect to Cathode	360 v
Heater Negative with Respect to Cathode	360 v

CHARACTERISTICS

Tube Voltage Drop for Ib = 18 mAdc (Each Plate)	4.5 Vdc

TYPICAL OPERATION

Full-Wave Rectifier—Capacitor Input to Filter	
Plate Voltage (Each Plate)	150 Vac
Filter Input Capacitance	8 μf
Load Resistor	11000 Ohms
Effective Plate Supply Impedance (Each Plate)	300 Ohms
Output Current	18 mAdc

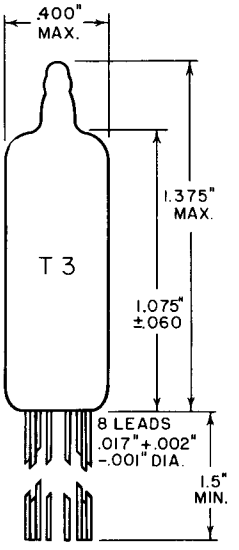
NOTES:

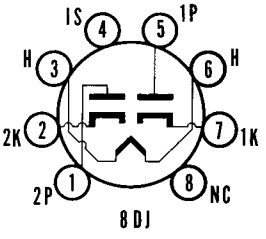
1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to heater.*
5. *Diode input; plate to cathode, heater, internal shield and external shield (other section grounded).*
6. *Cathode to heater, plate, internal shield and external shield (other section grounded)*
7. *Values shown are as registered with RETMA.*
8. *The maximum voltage appearing between any pair of leads shall be no greater than the maximum peak inverse plate voltage.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5896 is a high perveance double diode having separate cathode connections for each section. Electrically this type is similar to the 6AL5 and is intended for a variety of detector applications at UHF as well as low frequencies.

The 5896 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability and is designed to provide dependable service under conditions of severe shock, vibration, high temperature and high altitude.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Load Resistance	11000 Ohms
Plate Supply Voltage Per Plate	165 Vac	Load Capacitance	8 μf
Heater-Cathode Voltage	0 V		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7 4.10.8	(Method A) Heater Current: ALD = 24	--	—	288	300	312	—	mA
4.10.8	Heater Current:	0.65	280	—	—	—	320	mA
4.10.15	Heater-Cathode Leakage: Note 2	0.65	—	—	—	—	—	
	Ehk = +360 Vdc	—	—	—	—	—	40	μAdc
	Ehk = -360 Vdc	--	—	—	—	—	40	μAdc
4.10.13	Operation: Note 5 Io	0.65	16	—	—	—	—	mAdc
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes: Note 2 p-all	2.5	100	—	—	—	—	Meg
4.10.1.1	Emission: Note 2 Is Eb = 10 Vdc	2.5	30	—	—	—	--	mAdc
4.10.4.1	Plate Current: Note 2 Ebb = O V; Rp = 40,000 Ohms	2.5	5.0	—	—	—	25	μAdc
4.10.4.1	Plate Current Difference Between Sections:	2.5	—	—	—	—	5.0	μAdc
4.10.14	Capacitance: 0.405 In. Dia. Shield	6.5	—	—	—	—	—	
	C1p to 2p	—	—	—	—	—	0.026	μμf
	C1p to h+1k+sd	—	2.5	—	—	—	3.5	μμf
	C2p to h+2k+sd	—	2.5	—	—	—	3.5	μμf
	C1k to h+1p+sd	—	3.5	—	—	—	4.9	μμf
	C2k to h+2p+sd	—	3.5	—	—	—	4.9	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 55 ±5 mm Hg.; Voltage = 330 Vac	6.5	—	—	—	—	—	
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
Degradation Rate Acceptance Tests, Note 3								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
- - - -	Post Shock and Fatigue Test End Points: Heater-Cathode Leakage							
	Ehk = +360 Vdc	—	—	—	—	—	80	μAdc
	Ehk = -360 Vdc	—	—	—	—	—	80	μAdc
	Operation Io	—	14	—	—	—	—	mAdc
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 3							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; E1b = E2b = O V	2.5	—	—	—	—	
4.11.3.1	Stability Life Test: (1 hour) Note 6 TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Operation of Individual Tubes Δ_t Io	—	—	—	—	10.0	%
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
- - - -	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	
	Operation Io	1.0	—	—	14.0	—	mAdc
4.11.5 4.11.3.1	Intermittent Life Test: Note 4 Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Heater Current	—	2	5	276	328	mA
	Operation Io	—	1	3	14	—	mAdc
	Change in Operation of Individual Tubes Δ_t Io	—	1	3	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +360 Vdc	—	—	—	—	80	μAdc
	Ehk = -360 Vdc	—	—	—	—	80	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	p-all	—	—	—	25	—	Meg
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Test each section separately.

3: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature lead fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater cycling life test
4.11.5	Intermittent life test

4: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

5: In a full-wave circuit, adjust Zp/p so that a bogey tube gives Io = 18 mAdc. A bogey tube has a tube drop Etd = 10 Vdc at Is = 50 mAdc per plate. Ehk = Eo +117 Vac.

6: In a full-wave life test circuit, the values specified for RL and CL may be considered approximate and shall be adjusted initially to give not less than Io = 18 mAdc and ib = 50 ma with a bogey tube. Ehk = Eo +117 Vac.

APPLICATION DATA

The Premium Subminiature Type 5896 is a high perveance subminiature double diode. Separate cathode connection permit independent operation of each section. Electrically, this type is very similar to the miniature Type 6AL5. It is particularly useful in a variety of detector application including discriminators or ratio detectors at uhf as well as low frequencies.

The resonant frequency of each diode section is greater than 900 megacycles, making the type applicable to use in automatic frequency control discriminator circuits in the uhf region. The line length in push-pull applications of this nature is plotted against frequency in Figure 1.

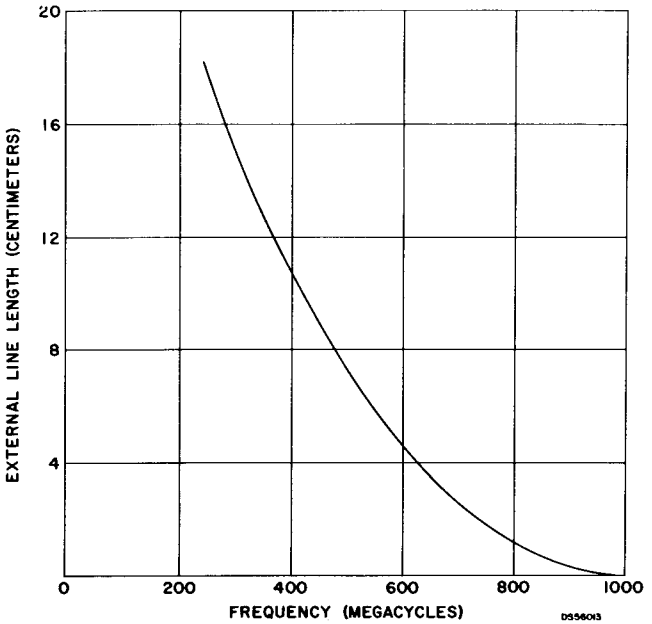


Figure 1 Approximate resonant-line length vs frequency

In critical detector applications, a reduction in hum output and contact potential voltage may be realized by lowering the operating heater voltage. Such a reduction will, however, result in a plate characteristic curve which departs from that obtained with rated heater voltage, Figure 2. With practical values of reduced heater voltage, hum output may be lowered by as much as 60% and contact potential by 20 to 30%. Operation under these conditions is satisfactory, providing the current requirements are consistent with values normally encountered in low level detection. An alternative method of lowering hum output and contact potential is to bias the heater with respect to the cathode.

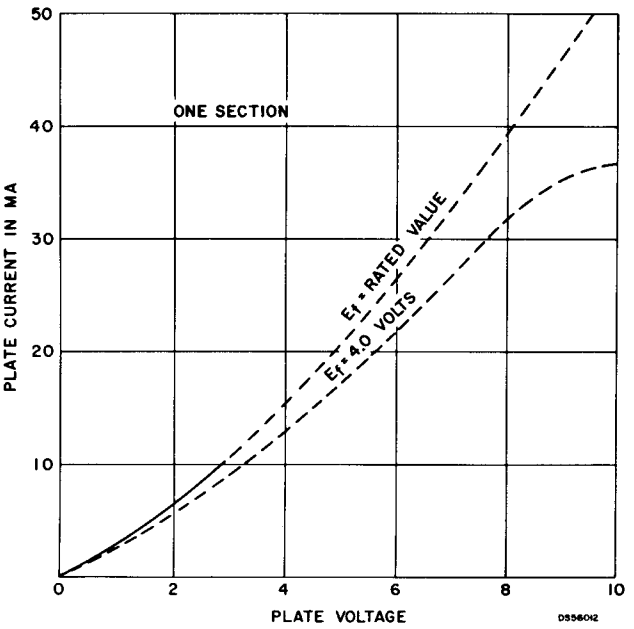


Figure 2 Approximate Plate Characteristics at reduced heater voltage

The 5896 is also useful in clamping and gating applications.

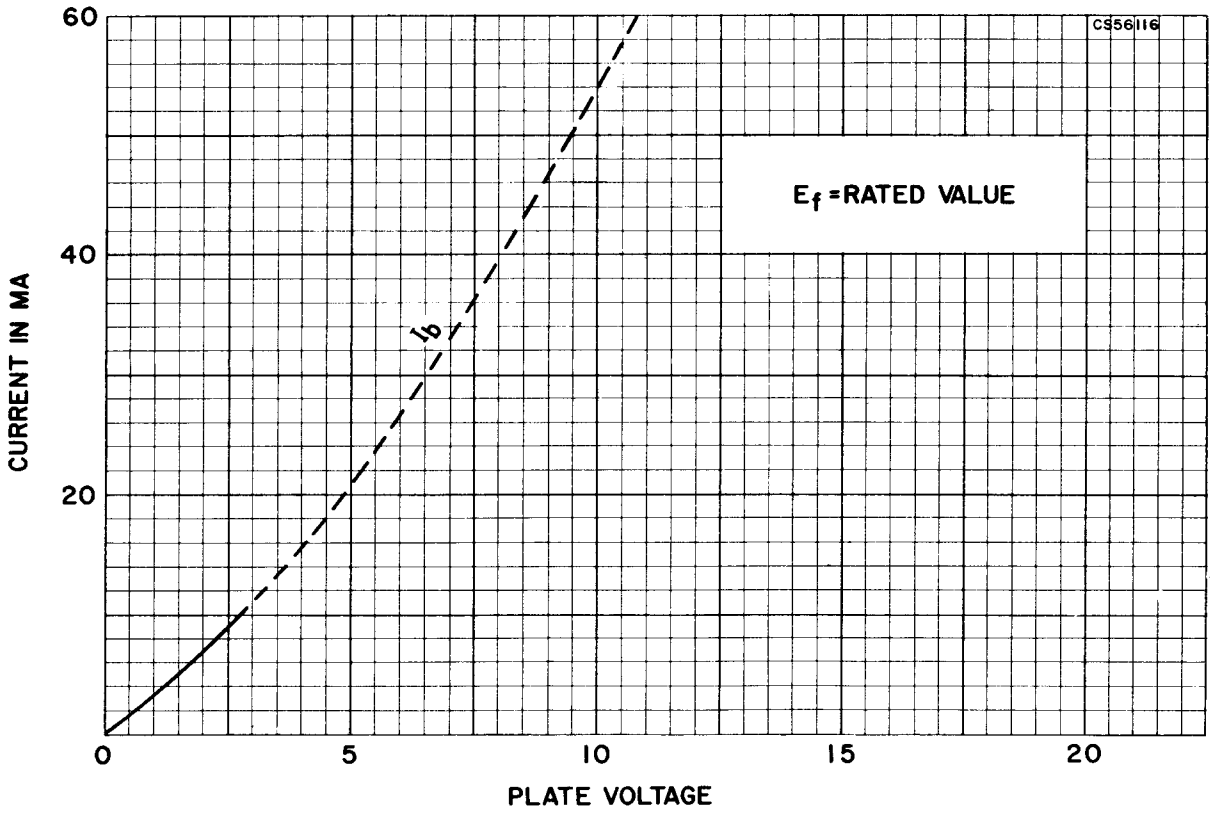
The 5896 is intended for operation under conditions of severe shock, vibration, high altitude and high temperature and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

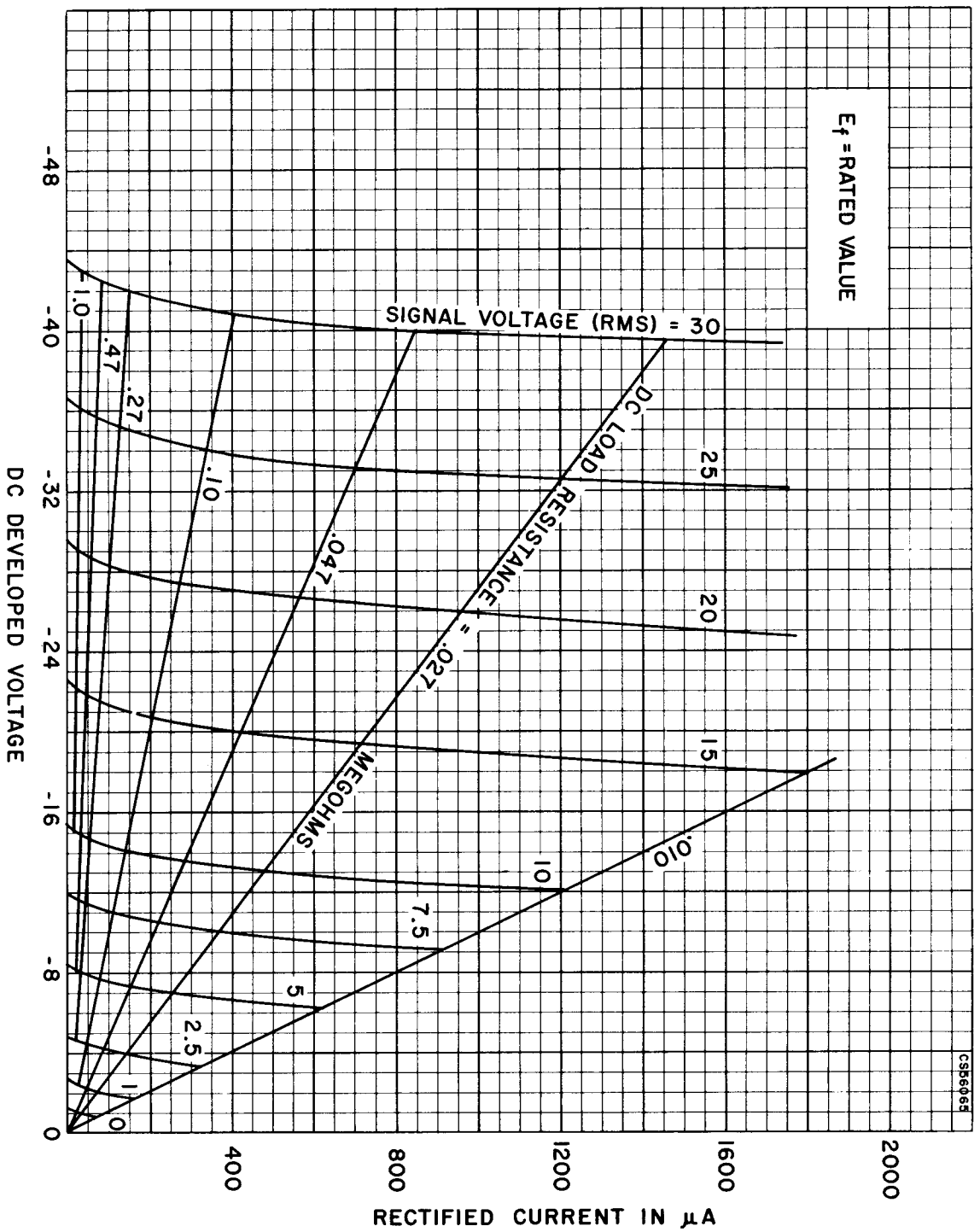
When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

AVERAGE PLATE CHARACTERISTICS
(EACH SECTION)



AVERAGE CHARACTERISTICS
(EACH SECTION)



from RMA release #842A
Sept. 15, 1950

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 5897

TRIODE

The Type 5897 is a subminiature medium-mu triode capable of operation in the uhf region. This type is characterized by long life and stable operation. It is designed for service where severe conditions of mechanical shock and vibration are encountered, and it is suitable for high operating temperatures.

MECHANICAL DATA

GENERAL

Style	subminiature
Cathode	coated, unipotential
Bulb	T-3
Base	K8-1,(1) Subminiature Button--Flexible Leads
Outline	3-1
Maximum Bulb Diameter	0.400 inch
Maximum Overall Bulb Length	1.375 inches
Minimum Lead Length	1.500 inches
Mounting Position	any
Basing	8DK

Lead Connections:

Lead 1 .. grid	Lead 5 .. cathode
Lead 2 .. no connection	Lead 6 .. heater
Lead 3 .. heater	Lead 7 .. no connection
Lead 4 .. no connection	Lead 8 .. plate

RATINGS(2)

Maximum Impact Acceleration(3)	450	G
Maximum Uniform Acceleration(4)	1,000	G
Maximum Vibrational Acceleration for Extended Periods(5)	2.5	G

ELECTRICAL DATA

GENERAL

Direct Interelectrode Capacitances:		
Grid to Plate	1.40	μμf
Input	2.20	μμf
Output	0.7	μμf
Heater Voltage (ac or dc)	6.3	volts
Heater Current	150	milliamps

RATINGS(2) -- *Absolute System*

Heater Voltage (ac or dc)(6)	6.3 (±10%)	volts
Maximum Plate Voltage (dc)	165	volts
Maximum Plate Current	22	milliamps
Maximum Grid Current	5.5	milliamps
Maximum Plate Dissipation	3.3	watts
Maximum Heater-Cathode Voltage	±200	volts

(See Page 2 for all notes.)

TYPE 5897

CHARACTERISTICS

Conditions:		
Heater Voltage (ac or dc)	6.3	volts
Plate Voltage (dc)	100	volts
Cathode Resistor	150	ohms
Plate Current	8.5	milliamps
Transconductance	5,800	micromhos
Amplification Factor	27	
Grid Voltage for 10 μamps Plate Current	-7.0	volts
Noise Output Voltage, maximum(7)	100	millivolts
Life Expectancy, at 180 °C Maximum Bulb Temperature	5,000	hours
Life Expectancy, at 250 °C Maximum Bulb Temperature	1,500	hours

TYPICAL OPERATION -- *RF Oscillator*

Heater Voltage (ac or dc)	6.3	volts
Plate Voltage (dc)	150	volts
Plate Current	20	milliamps
Frequency	500	megacycles
Power Output	0.9	watts

(1) With 1.500 inches Minimum Lead Length as specified above.

(2) Limitations beyond which normal tube performance and tube life may be impaired.

(3) Forces in any direction as applied by the NRL Impact Machine for Electronic Devices, or equivalent.

(4) Forces in any direction applied gradually, as in centrifuge.

(5) Vibrational forces in any direction at 60 cycles per second for a period exceeding 100 hours.

(6) Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts.

(7) Across plate resistor of 10,000 ohms, with applied vibrational acceleration of 15 G.

from RMA release #842A
Sept. 15, 1950

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 5898

TRIODE

The Type 5898 is a subminiature high-mu triode capable of operation in the uhf region. This type is characterized by long life and stable performance. It is designed for service where severe conditions of mechanical shock and vibration are encountered, and it is suitable for high operating temperatures.

MECHANICAL DATA

GENERAL

Style	subminiature
Cathode	coated, unipotential
Bulb	T-3
Base	K8-1(1) Subminiature Button--Flexible Leads
Outline	3-1
Maximum Bulb Diameter	0.400 inch
Maximum Overall Bulb Length	1.375 inches
Minimum Lead Length	1.500 inches
Mounting Position	any
Basing	8DK

Lead Connections:

Lead 1 .. grid	Lead 5 .. cathode
Lead 2 .. no connection	Lead 6 .. heater
Lead 3 .. heater	Lead 7 .. no connection
Lead 4 .. no connection	Lead 8 .. plate

RATINGS(2)

Maximum Impact Acceleration (3)	450	G
Maximum Uniform Acceleration (4)	1,000	G
Maximum Vibrational Acceleration for Extended Periods (5)	2.5	G

ELECTRICAL DATA

GENERAL

Direct Interelectrode Capacitances:		
Grid to Plate	0.70	μμf
Input	2.40	μμf
Output	0.60	μμf
Heater Voltage (ac or dc)	6.3	volts
Heater Current	150	milliamps

RATINGS(2) -- *Absolute System*

Heater Voltage (ac or dc)(6)	6.3 (±10%)	volts
Maximum Plate Voltage (dc)	165	volts
Maximum Plate Dissipation	0.55	watts
Maximum Heater-Cathode Voltage	±200	volts

(See Page 2 for all notes.)

TYPE 5898

CHARACTERISTICS

Conditions:		
Heater Voltage (ac or dc)	6.3	volts
Plate Voltage (dc)	150	volts
Cathode Resistor	680	ohms
Plate Current	1.7	milliamps
Transconductance	2,700	micromhos
Amplification Factor	70	
Grid Voltage for 10 μamps Plate Current	-6.0	volts
Noise Output Voltage, maximum (7)	50	millivolts
Life Expectancy, at 180 °C Maximum Bulb Temperature	5,000	hours
Life Expectancy, at 250 °C Maximum Bulb Temperature	1,500	hours

(1) With 1.500 inches Minimum Lead Length as specified above.

(2) Limitations beyond which normal tube performance and tube life may be impaired.

(3) Forces in any direction as applied by the NRL Impact Machine for Electronic Devices, or equivalent.

(4) Forces in any direction applied gradually, as in centrifuge.

(5) Vibrational forces in any direction at 60 cycles per second for a period exceeding 100 hours.

(6) Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts.

(7) Across plate resistor of 10,000 ohms, with applied vibrational acceleration of 15 G.

SYLVANIA engineering data service 5899

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DL
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		150	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid No. 1 to Plate	0.015	0.03 μμf Max.
Input	4.20	4.00 μμf
Output	3.40	1.90 μμf

RATINGS[1 & 5] (Absolute Maximum)

Plate Voltage	165 Vdc
Peak Plate Forward Voltage[6]	330 v
Grid No. 2 Voltage	155 Vdc
Plate Dissipation	1.1 W
Grid No. 2 Dissipation	0.55 W
Cathode Current	16.5 mAdc
Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid No. 1 Circuit Resistance	1.1 Meg

CHARACTERISTICS

Plate Voltage	100 Vdc
Grid No. 2 Voltage	100 Vdc
Cathode Resistor	120 Ohms
Plate Current	7.2 mAdc
Grid No. 2 Current	2.0 mAdc
Transconductance	4500 μmhos
Plate Resistance	260000 Ohms
Grid No. 1 Voltage for Transconductance = Approx. 25 μmhos (75 μmhos Max.)	−14 Vdc

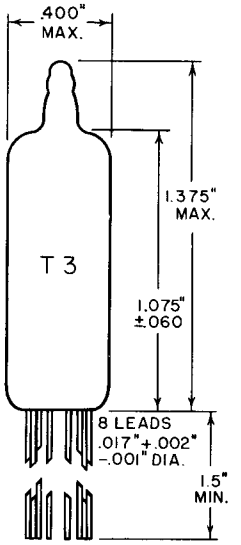
NOTES:

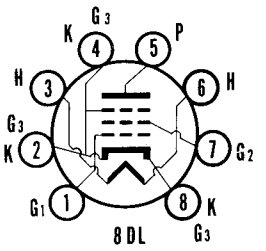
1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Per MIL-E-1C Par. 6.5 and General Section of this Sylvania Subminiature Tube Manual titled Specifications and Ratings.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5899 is a semi-remote cut-off pentode intended primarily for use as an agc controlled RF or IF amplifier at frequencies up to 400 mc.

The 5899 is designed for dependable operation under conditions of severe shock, vibration, high temperature and high altitude, and is manufactured and inspected to meet the applicable MIL-E-1 specification.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Grid No. 2 Voltage	100 Vdc
Plate Voltage	100 Vdc	Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1	0 V
Grid No. 1 Voltage	0 V	Cathode Resistor	120 Ohms

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7 4.10.8	(Method A) Heater Current: ALD = 12	—	—	144	150	156	—	mA
4.10.8	Heater Current:	0.65	140	—	—	—	160	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = -100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid Current: Ic1 Rg1 = 1.0 Meg	0.65	0	—	—	—	-0.3	μAdc
4.1.1.7 4.10.4.1	(Method A) Plate Current (1): ALD = 2.3	—	—	6.4	7.2	8.0	—	mAdc
4.10.4.1	Plate Current (1):	0.65	5.2	—	—	—	9.2	mAdc
4.10.4.3	Screen Grid Current: Ic2	0.65	1.0	—	—	—	3.0	mAdc
4.1.1.7 4.10.9	(Method A) Transconductance (1): ALD = 800 Sm	—	—	4200	4500	4800	—	μmhos
4.10.9	Transconductance (1): Sm	0.65	3800	—	—	—	5200	μmhos
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes:	2.5	—	—	—	—	—	
	g1-all	—	100	—	—	—	—	Meg
	p-all	—	100	—	—	—	—	Meg
4.10.9	Transconductance (2): $\triangle$ Sm Ef = 5.7 V $\triangle$ Ef	2.5	—	—	—	—	10	%
4.10.9	Transconductance (3): Sm Ec1 = -14 Vdc; Rk = 0 Ohms	2.5	1.0	—	25	—	75	μmhos
4.10.6.2	Grid Emission: Note 4 Ef = 7.5 V; Ec1 = -14 Vdc; Rg1 = 1.0 Meg; Rk = 0 Ohms	2.5	0	—	—	—	-0.5	μAdc
4.10.3.2	AF Noise: Esig = 70 mVac; Ec2 = 19 Vdc; Rg1 = 0.1 Meg; Rg2 = 1000 Ohms; Rp = 0.2 Meg; Ck = 1000 μf	2.5	—	—	—	—	17	VU
4.10.10	Plate Resistance:	6.5	0.175	—	—	—	—	Meg
4.10.14	Capacitance:	6.5	—	—	—	—	—	
	0.405 In. Dia. Shield Cg1p	—	—	—	—	—	0.015	μμf
	0.405 In. Dia. Shield Cin	—	3.8	—	—	—	4.8	μμf
	0.405 In. Dia. Shield Cout	—	2.9	—	—	—	3.9	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 20 ±5 mm Hg.; Voltage = 300 Vac	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 2 (Continued)								
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
4.9.19.1	Vibration (2): F = 40 cps; G = 15; Rp = 10,000 Ohms; Ck = 1000 μf	2.5	—	—	—	—	60	mVac
4.9.19.1	White Noise: Note 5; Rp = 10,000 Ohms; Ck = 1000 μf;	2.5	—	—	—	—	1000	mv pk-pk
	Peak Acceleration = 15 G	2.5	—	—	—	—	150	mVac
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc; Rg1 = 0.1 Meg	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
- - - -	Post Shock and Fatigue Test End Points:							
	Vibration (2)	—	—	—	—	—	200	mVac
	Heater-Cathode Leakage							
	Ehk = +100 Vdc	—	—	—	—	—	20	μAdc
	Ehk = -100 Vdc	—	—	—	—	—	20	μAdc
	Change in Transconductance (1) of Individual Tubes Δ_t Sm	—	—	—	—	—	20	%
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec1 = Ec2 = Eb = O V	2.5	—	—	—	—	
4.11.3.1	Stability Life Test (1 Hour) Ehk = 200 Vdc; Rg1 = 1.0 Meg; TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes Δ_t Sm	—	—	—	—	10	%
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	
	Transconductance (1) Sm	1.0	—	—	3350	—	μmhos
4.11.5 4.11.3.1	Intermittent Life Test: Note 3 Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2 (Continued)							
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Grid Current Ic1	—	1	3	0	-0.8	μAdc
	Heater Current	—	2	5	138	164	mA
	Change in Transconductance (1) of						
	Individual Tubes Δ Sm $_t$	—	1	3	—	20	%
	Transconductance (2) Δ Sm $_{Ef}$	—	2	5	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	10	μAdc
	Ehk = -100 Vdc	—	—	—	—	10	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	g1-all	—	—	—	50	—	Meg
	p-all	—	—	—	50	—	Meg
	Transconductance (1) Average Change Avg Δ Sm $_t$	—	—	—	—	15	%
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests. Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature lead fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater cycling life test
4.11.5	Intermittent life test

3: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any postion on the life test rack.

4: Prior to this test tubes shall be preheated five (5) minutes at conditions indicated below. Test within three (3) seconds after preheating. Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission Test.

Ef	Ec1	Ec2	Eb	Rk	Rg1
V	Vdc	Vdc	Vdc	Ohms	Meg
7.5	0	100	100	120	1.0

5: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "White Noise" spectrum which is free from discontinuities from 100 cps to 5000 cps. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 G's rms acceleration. With this the case, the rms value of acceleration for any bandwidth within the specified spectrum is equal to

$$G\ rms = 2.3\ G \sqrt{3.32 \log_{10} (f2/f1)}$$

f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (0.25 megohm or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 40 db at 13,000 cps. For reading the peak to peak value of output voltage the filter output shall be fed directly to the input of a Ballantine Model 305 peak to peak electronic voltmeter or equal, while the rms value shall be measured with a Hewlett-Packard Model 400C or equal.

APPLICATION DATA

The 5899 is a Premium Subminiature, semi-remote cutoff pentode characterized by long life and stable performance under conditions of severe shock, vibration, high altitude and high temperature.

The 5899 is intended for use as an agc controlled rf and/or if amplifier at frequencies up to 400 mc, as well as many low frequency applications. As the frequency of operation is increased, consideration should be given to the resultant decrease in input and output resistance, Figure 1. Assuming matched input and output impedance, approximate tube gain can be obtained from the formula:

$$\text{Voltage Gain} = \frac{gm\sqrt{\text{Rinput x Routput}}}{2}$$

where the values of Rinput and Routput are obtained from the curves of Figure 1. The use of this formula assumes matched impedances into and out of the amplifier stage under consideration. If the source impedance is lower than the input resistance or if the load resistance is higher than the output resistance greater voltage gain per stage can be obtained than that indicated by the above formula. The voltage gain of a matching circuit is equal to the square root of the impedance ratio.

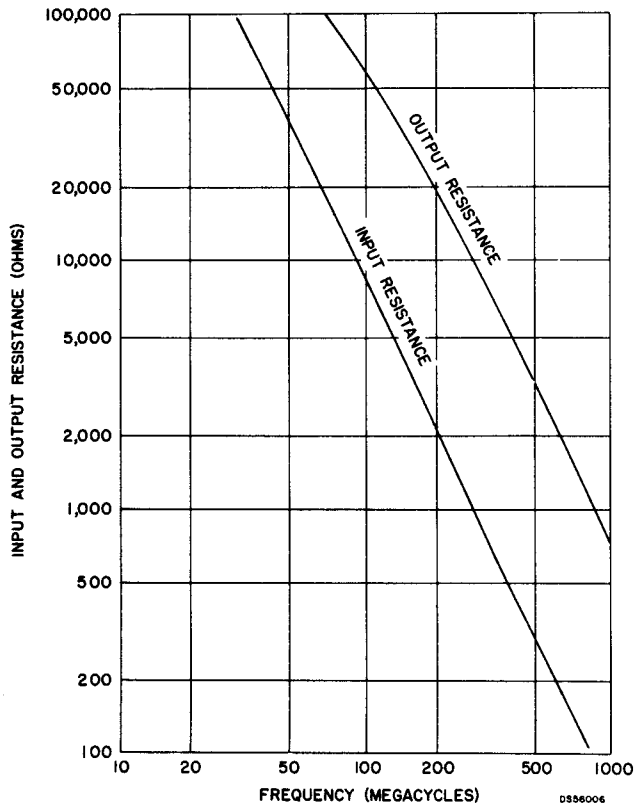


Figure 1—Input and Output resistance vs frequency

In the use of agc at high frequencies it may be advantageous to place an unbypassed resistance in the cathode circuit to compensate for the change in input capacitance with bias. This unbypassed resistance reduces the effective gm of the tube by the factor

$$\frac{1}{1 + gm\ Rk\left(\frac{Ib + Ic2}{Ib}\right)}$$

However, it also has the effect of raising the input resistance of the tube under certain operating conditions so that both a net increase in gain and a net decrease in input capacitance change may result.

The self neutralization frequency of the 5899 is approximately 200 mc. At this point the inductance of the tube leads resonate with the grid plate capacitance to effect neutralization. At higher frequencies the feedback is inductive and takes place through the tube leads. Three cathode leads are provided to minimize this effect and permit isolation of the input and output circuits.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

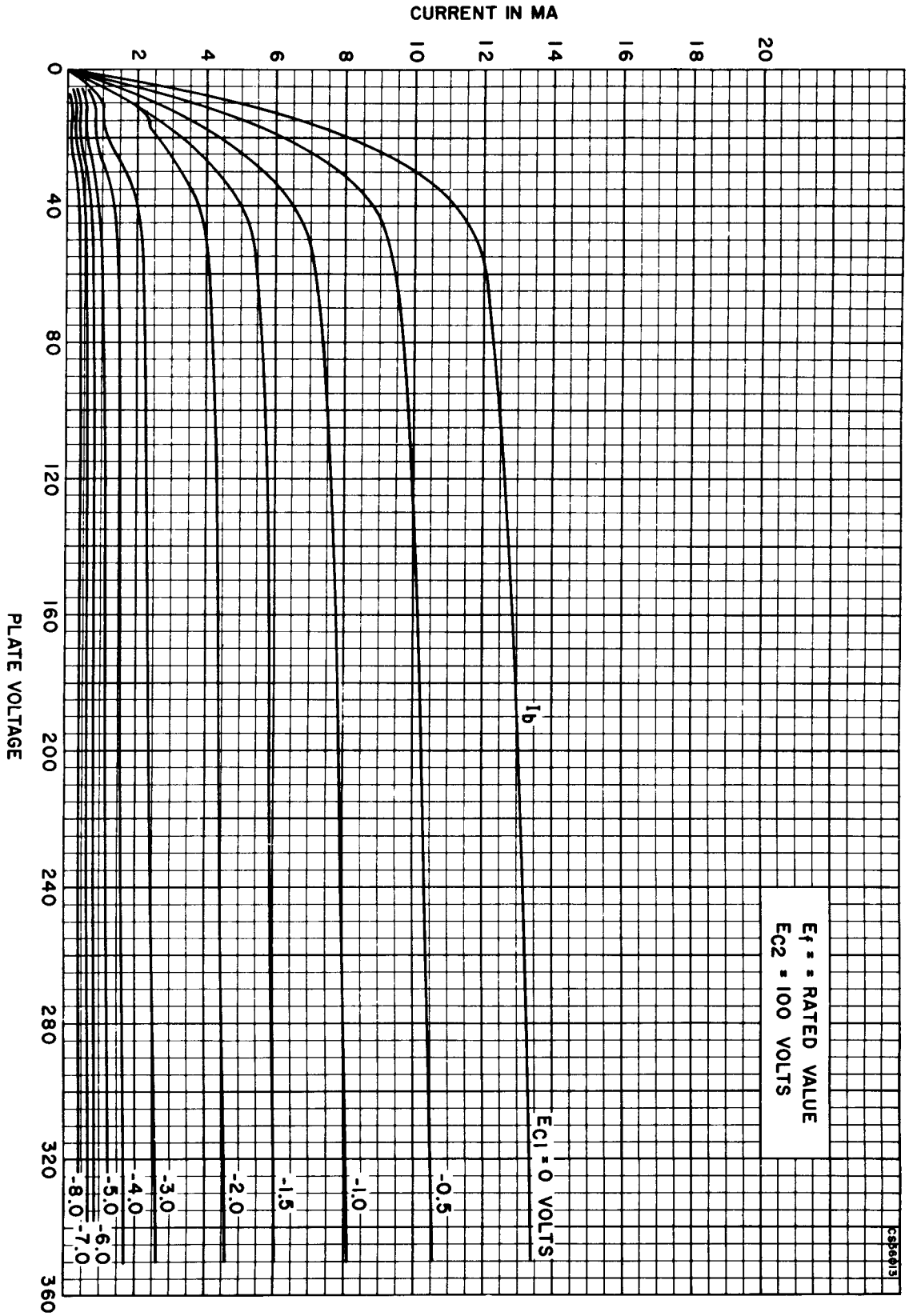
The 5899 is manufactured and inspected to meet the applicable MIL-E-1 specifications for reliability.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

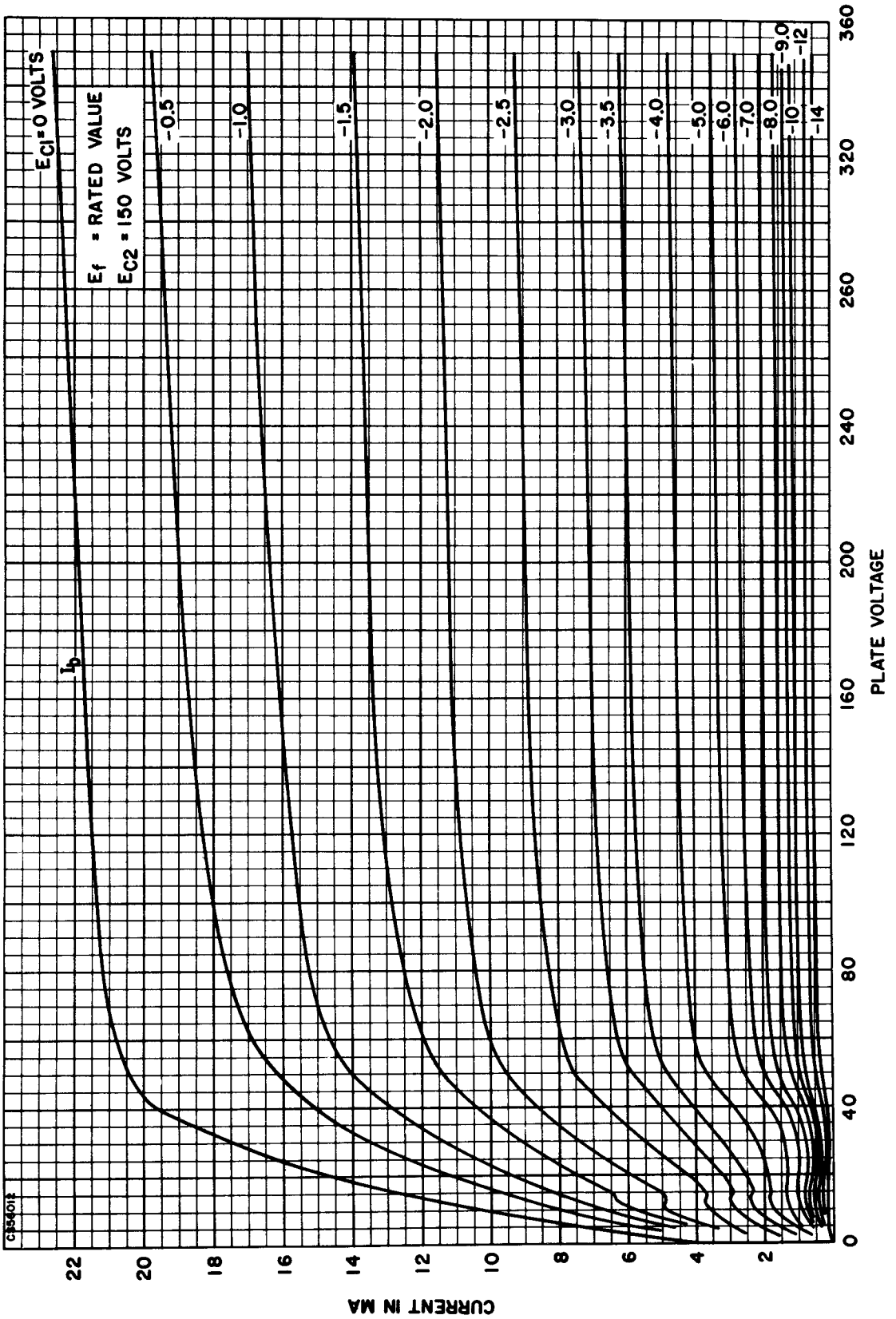
When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

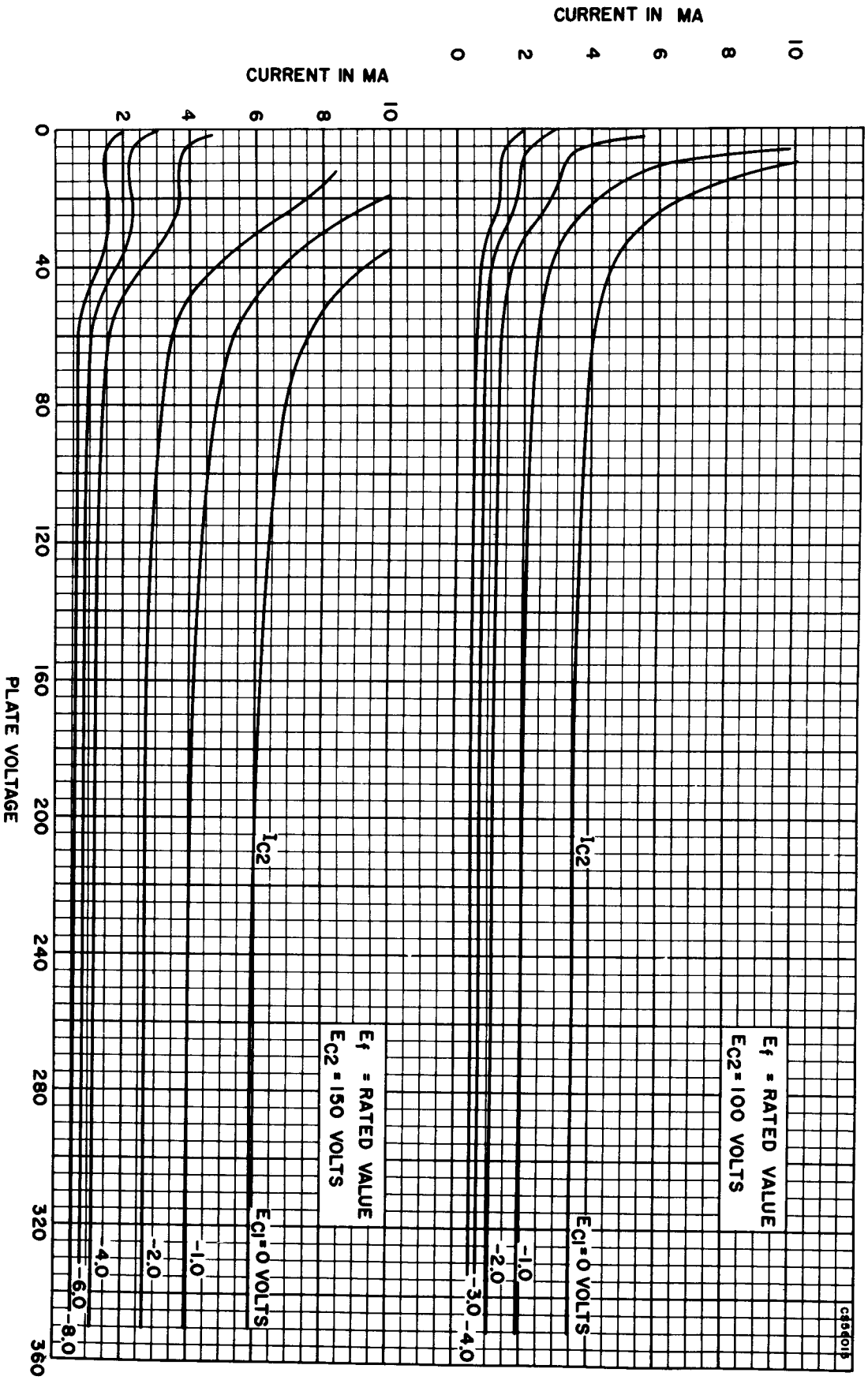
AVERAGE PLATE CHARACTERISTICS
(PENTODE CONNECTED)



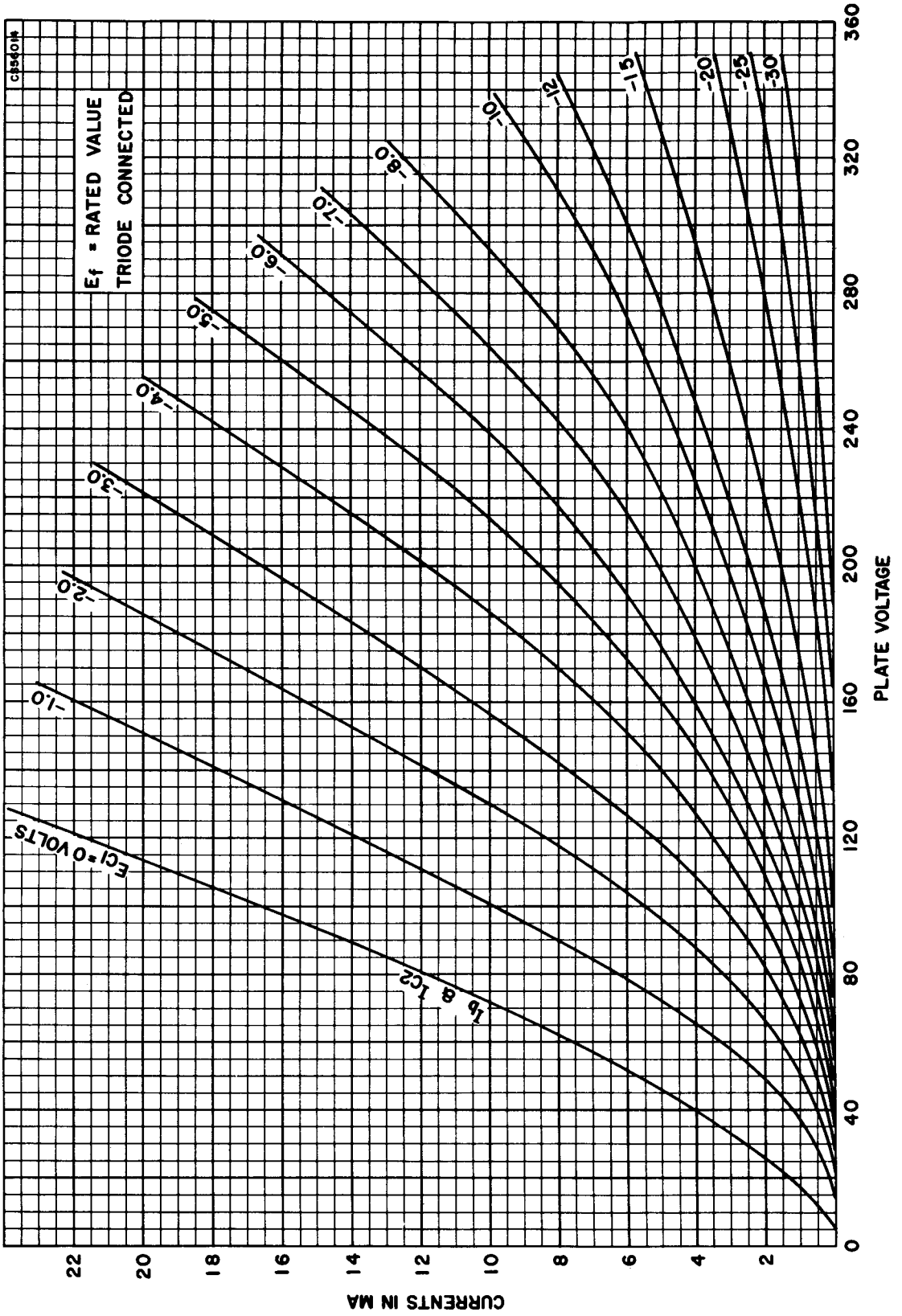
AVERAGE PLATE CHARACTERISTICS
(PENTODE CONNECTED)



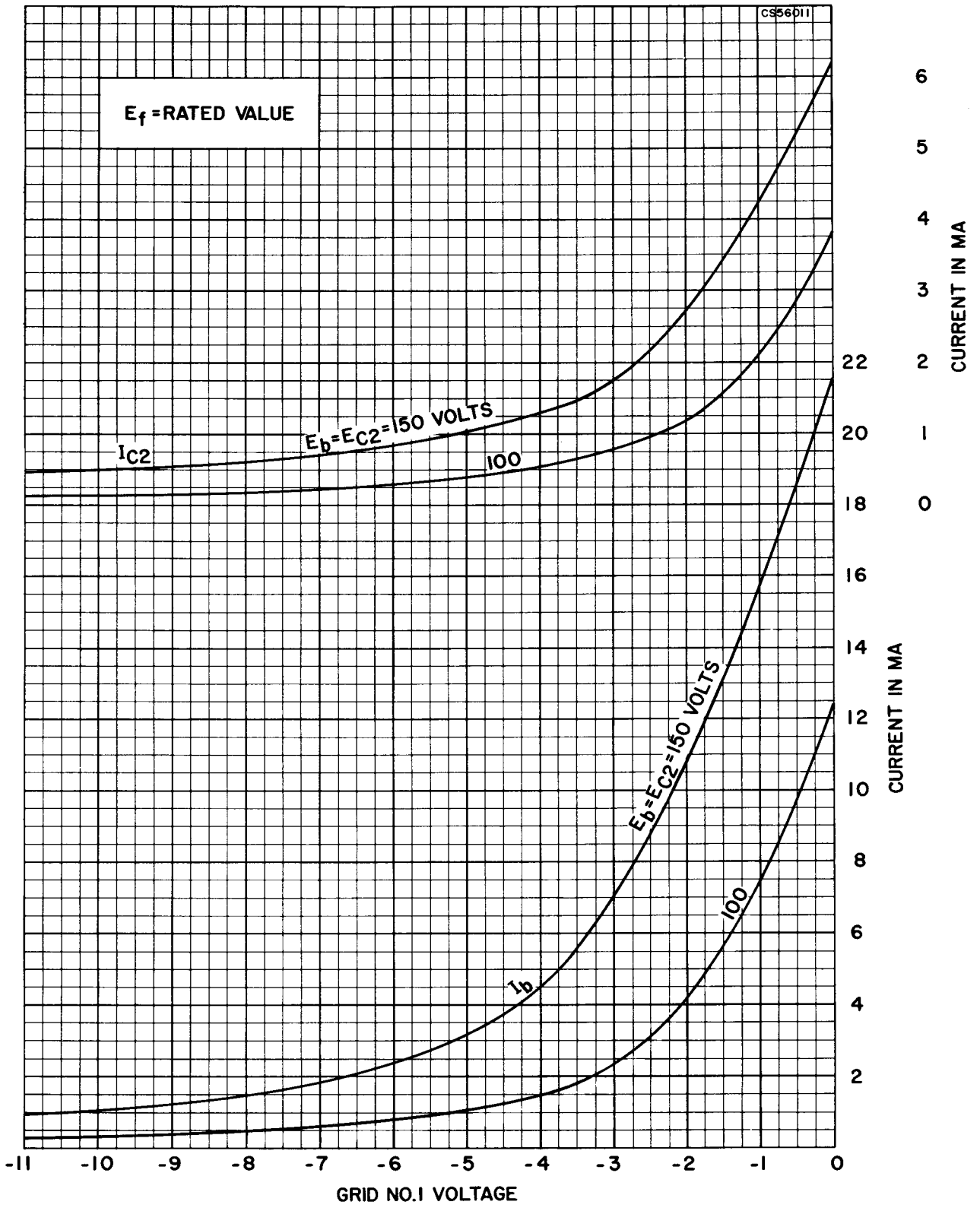
AVERAGE GRID No. 2 CHARACTERISTICS
(PENTODE CONNECTED)



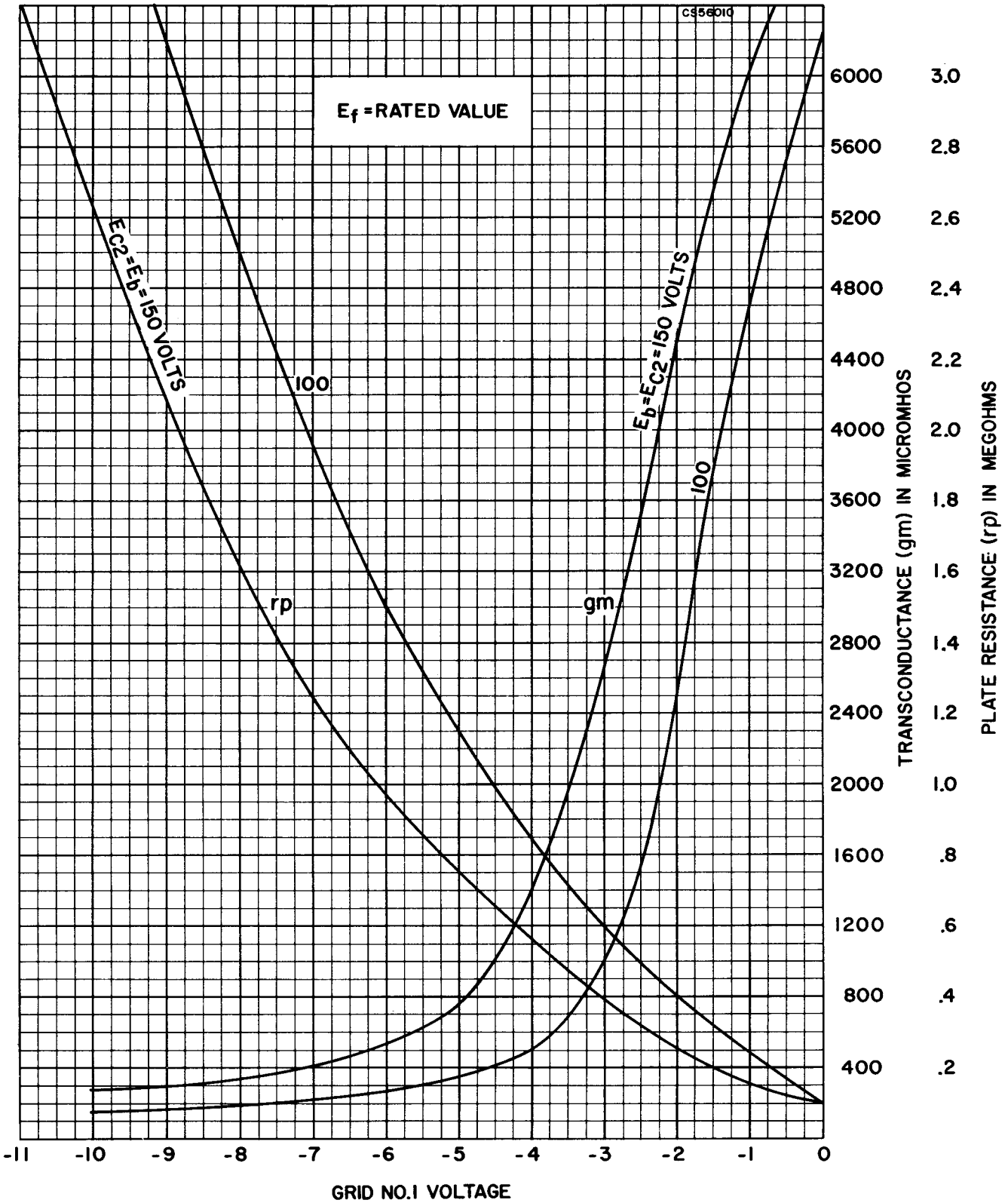
AVERAGE PLATE CHARACTERISTICS
(TRIODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE CONNECTED)



from RMA release #842
March 16, 1950

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 5900

PENTODE

The Type 5900 is a subminiature semi-remote-cutoff rf pentode capable of operation in the uhf region. This type is characterized by long life and stable performance. It is designed for service where severe conditions of mechanical shock and vibration are encountered, and it is suitable for high operating temperatures.

MECHANICAL DATA

GENERAL

Style	subminiature
Cathode	coated, unipotential
Bulb	T-3
Base	K8-1,(1) Subminiature Button--Flexible Leads
Outline	3-1
Maximum Bulb Diameter	0.400 inch
Maximum Overall Bulb Length	1.375 inches
Minimum Lead Length	1.500 inches
Mounting Position	any
Basing	8DL

Lead Connections:

Lead 1 .. grid #1	Lead 5 .. plate
Lead 2 .. cathode and grid #3	Lead 6 .. heater
Lead 3 .. heater	Lead 7 .. grid #2
Lead 4 .. cathode and grid #3	Lead 8 .. cathode and grid #3

RATINGS(2)

Maximum Impact Acceleration(3)	450	G
Maximum Uniform Acceleration(4)	1,000	G
Maximum Vibrational Acceleration for Extended Periods(5)	2.5	G

ELECTRICAL DATA

GENERAL

Direct Interelectrode Capacitances:(6)		
Grid to Plate, maximum	0.015	μμf
Input	4.40	μμf
Output	4.00	μμf
Heater Voltage (ac or dc)	6.3	volts
Heater Current	150	milliamps

RATINGS(2) -- *Absolute System*

Heater Voltage (ac or dc)(7)	6.3 (±10%)	volts
Maximum Plate Voltage (dc)	165	volts
Maximum Grid #2 Voltage (dc)	155	volts
Maximum Plate Dissipation	1.10	watts
Maximum Grid #2 Dissipation	0.55	watts
Maximum Heater-Cathode Voltage	±200	volts

(See Page 2 for all notes.)

TYPE 5900

CHARACTERISTICS

Conditions:		
Heater Voltage (ac or dc)	6.3	volts
Plate Voltage (dc)	100	volts
Grid #2 Voltage (dc)	100	volts
Cathode Resistor	120	ohms
Plate Current	7.2	milliamps
Grid #2 Current	2.2	milliamps
Transconductance	4,500	micromhos
Plate Resistance	260,000	ohms
Grid #1 Voltage for 25 μmhos Transconductance	-14.0	volts
Noise Output Voltage, maximum(8)	100	millivolts
Life Expectancy, at 180 °C Maximum Bulb Temperature	5,000	hours
Life Expectancy, at 250 °C Maximum Bulb Temperature	1,500	hours

(1) With 1.500 inches Minimum Lead Length as specified above.

(2) Limitations beyond which normal tube performance and tube life may be impaired.

(3) Forces in any direction as applied by the NRL Impact Machine for Electronic Devices, or equivalent.

(4) Forces in any direction applied gradually, as in centrifuge.

(5) Vibrational forces in any direction at 60 cycles per second for a period exceeding 100 hours.

(6) External shield of 0.405 inch diameter connected to cathode.

(7) Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts.

(8) Across plate resistor of 10,000 ohms, with applied vibrational acceleration of 15 G.

from RMA release #842
March 16, 1950

SYLVANIA ELECTRIC

RMA Registration Data

TYPE 5901

PENTODE

The Type 5901 is a subminiature semi-remote cutoff rf pentode capable of operation in the uhf region. This type is characterized by long life and stable performance. It is designed for service where severe conditions of mechanical shock and vibration are encountered, and it is suitable for high operating temperatures.

MECHANICAL DATA

GENERAL

Style	subminiature
Cathode	coated, unipotential
Bulb	T-3
Base	K8-1,(1) Subminiature Button--Flexible Leads
Outline	3-1
Maximum Bulb Diameter	0.400 inch
Maximum Overall Bulb Length	1.375 inches
Minimum Lead Length	1.500 inches
Mounting Position	any
Basing	8DL

Lead Connections:

Lead 1 .. grid #1	Lead 5 .. plate
Lead 2 .. cathode and grid #3	Lead 6 .. heater
Lead 3 .. heater	Lead 7 .. grid #2
Lead 4 .. cathode and grid #3	Lead 8 .. cathode and grid #3

RATINGS(2)

Maximum Impact Acceleration(3)	450	G
Maximum Uniform Acceleration (4)	1,000	G
Maximum Vibrational Acceleration for Extended Periods(5)	2.5	G

ELECTRICAL DATA

GENERAL

Direct Interelectrode Capacitances: (6)		
Grid to Plate, maximum	0.015	μμf
Input	4.20	μμf
Output	4.00	μμf
Heater Voltage (ac or dc)	6.3	volts
Heater Current	150	milliamps

RATINGS(5) -- *Absolute System*

Heater Voltage (ac or dc)(7)	6.3 (±10%)	volts
Maximum Plate Voltage (dc)	165	volts
Maximum Grid #2 Voltage (dc)	155	volts
Maximum Plate Dissipation	1.10	watts
Maximum Grid #2 Dissipation	0.55	watts
Maximum Heater-Cathode Voltage	±200	volts

(See Page 2 for all notes.)

TYPE 5901

CHARACTERISTICS

Conditions:		
Heater Voltage (ac or dc)	6.3	volts
Plate Voltage (dc)	100	volts
Grid #2 Voltage (dc)	100	volts
Cathode Resistor	150	ohms
Plate Current	7.5	milliamps
Grid #2 Current	2.4	milliamps
Transconductance	5,000	micromhos
Plate Resistance	230,000	ohms
Grid #1 Voltage for 10 μamps Plate Current	-9.0	volts
Noise Output Voltage, maximum(8)	100	millivolts
Life Expectancy, at 180 °C Maximum Bulb Temperature	5,000	hours
Life Expectancy, at 250 °C Maximum Bulb Temperature	1,500	hours

(1) With 1.500 inches Minimum Lead Length as specified above.

(2) Limitations beyond which normal tube performance and tube life may be impaired.

(3) Forces in any direction as applied by the NRL Impact Machine for Electronic Devices, or equivalent.

(4) Forces in any direction applied gradually, as in centrifuge.

(5) Vibrational forces in any direction at 60 cycles per second for a period exceeding 100 hours.

(6) External shield of 0.405 inch diameter connected to cathode.

(7) Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts.

(8) Across plate resistor of 10,000 ohms, with applied vibrational acceleration of 15 G.

SYLVANIA

engineering data service 5902

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-3
Basing	8DL
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		450	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid No. 1 to Plate	0.11	0.15 μμf
Input	6.5	6.5 μμf
Output	7.5	4.5 μμf

RATINGS[1 & 5] (Absolute Maximum)

Plate Voltage	165 Vdc
Peak Plate Forward Voltage[6]	330 v
Grid No. 2 Voltage	155 Vdc
Plate Dissipation	4.0 W
Grid No. 2 Dissipation	1.0 W
Cathode Current	50 mAdc
DC Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid No. 1 Circuit Resistance	
Self Bias	0.55 Meg
Fixed Bias	0.1 Meg

CHARACTERISTICS

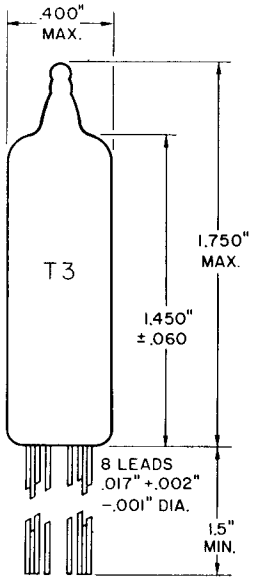
Plate Voltage	110 Vdc
Grid No. 2 Voltage	110 Vdc
Cathode Resistor	270 Ohms
Plate Current	30 mAdc
Grid No. 2 Current	2.2 mAdc
Transconductance	4200 μmhos
Plate Resistance	150000 Ohms
Grid Voltage for Ib = 100 μAdc Max.	−40 Vdc

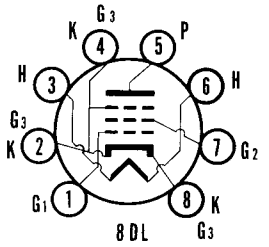
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Per MIL-E-1C Par. 6.5 and General Section of this Sylvania Subminiature Tube Manual titled Specifications and Ratings.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5902 is a beam power pentode designed for use as an audio amplifier. It is intended for operation under conditions of severe shock, vibration, high temperature and high altitude. The Sylvania Type 5902 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Grid No. 2 Voltage	110 Vdc
Plate Voltage	110 Vdc	Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1	0 V
Grid No. 1 Voltage	0 V	Cathode Resistor MIL-E-1 Par. 3.2.2.1	270 Ohms

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7 4.10.8	(Method A) Heater Current: ALD = 36	—	—	432	450	468	—	mA
4.10.8	Heater Current:	0.65	420	—	—	—	480	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	15	μAdc
	Ehk = -100 Vdc	—	—	—	—	—	15	μAdc
4.10.6.1	Grid Current: Rg1 = 1.0 Meg	0.65	0	—	—	—	-1.0	μAdc
4.1.1.7 4.10.4.1	(Method A) Plate Current (1): ALD = 8.0	—	—	27.0	30.0	33.0	—	mAdc
4.10.4.1	Plate Current (1):	0.65	23.0	—	—	—	37.0	mAdc
4.10.4.1	Plate Current (2): Ec1 = -40 Vdc; Rk = 0 Ohms	0.65	—	—	—	—	100	μAdc
4.10.16.1	Power Output (1): Po Esig = 6.4 Vac; Rp = 3000 Ohms	0.65	0.75	—	—	—	—	W
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-4)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes:	2.5	—	—	—	—	—	
	g1-all	—	50	—	—	—	—	Meg
	p-all	—	50	—	—	—	—	Meg
4.10.4.3	Screen Grid Current: Ic2	2.5	0	—	—	—	4.0	mAdc
4.1.1.7 4.10.9	(Method A) Transconductance: ALD = 950	—	—	3850	4200	4550	—	μmhos
4.10.9	Transconductance:	2.5	3500	—	—	—	4900	μmhos
4.10.6.2	Grid Emission: Note 4 Ef = 7.5 V; Ec1 = -40 Vdc; Rg1 = 1.0 Meg; Rk = 0 Ohms	2.5	0	—	—	—	-2.0	μAdc
4.10.16.1	Power Output (2): $\triangle \frac{Po}{Ef}$ Ef = 5.7 V; Esig = 6.4 Vac; Rp = 3000 Ohms	2.5	—	—	—	—	15	%
4.10.3.2	AF Noise: Esig = 150 Vac; Ecc2 = 110 Vdc; Ec1 = -8.7 Vdc; Rk = 0 Ohms; Rp = 2000 Ohms; Rg1 = 0.5 Meg; Rg2 = 10,000 Ohms; Cg2 = 4.0 μf	2.5	—	—	—	—	17	VU
4.10.14	Capacitance:	6.5	—	—	—	—	—	
	0.405 In. Dia. Shield Cg1p	—	—	—	—	—	0.20	μμf
	0.405 In. Dia. Shield Cin	—	5.5	—	—	—	7.5	μμf
	0.405 In. Dia. Shield Cout	—	6.5	—	—	—	8.5	μμf
4.10.10	Plate Resistance:	6.5	0.01	—	—	—	—	Meg

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 2 (Continued)								
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 20 ±5 mm Hg.; Voltage = 300 Vac	6.5	—	—	—	—	—	
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
4.9.19.1	Vibration (2): Rp = 2000 Ohms; Ck = 1000 μf; F = 40 cps; G = 15	2.5	—	—	—	—	75	mVac
4.9.19.1	White Noise: Note 5; Rp = 10,000 Ohms; Ck = 1000 μf; Peak Acceleration = 15 G	2.5 2.5	— —	— —	— —	— —	1500 200	mv pk-pk mVac
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc; Rg1 = 0.1 Meg	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max	6.5	—	—	—	—	—	
- - - -	Post Shock and Fatigue Test End Points: Vibration (2) Heater-Cathode Leakage Ehk = +100 Vdc Ehk = -100 Vdc Change in Power Output (1) of Individual Tubes Δ Po$_t$	— — — —	— — — —	— — — —	— — — —	— — — —	300 40 40 20	mVac μAdc μAdc %
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2							
4.11.3.1	Stability Life Test: (1 Hour) Eb = Ec2 = 100 Vdc; Ehk = +200 Vdc; Rg1 = 0.47 Meg; Rk = 220 Ohms; TA = Room.	1.0	—	—	—	—	
- - - - -	Stability Life Test End Points: Change in Power Output (1) of Individual Tubes Δ Po$_t$	—	—	—	—	10.0	%
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
- - - - -	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives) Power Output (1) Po	0.65 1.0	— —	— —	— 0.65	— —	 W
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec1 = Ec2 = Eb = O V	2.5	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic: 1st Sample	Allowable Defectives per Characteristic: Combined Samples	Limits: Min.	Limits: Max.	Units
Acceptance Life Tests, Note 2 (Continued)							
4.11.5 4.11.3.1	Intermittent Life Test: Note 3 Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Heater Current	—	2	5	414	492	mA
	Grid Current	—	1	3	0	-2.0	μAdc
	Change in Power Output (1) of Individual Tubes From Initial $\Delta \frac{Po}{t}$	—	1	3	—	20	%
	Power Output (2) $\Delta \frac{Po}{Ef}$	—	2	5	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	60	μAdc
	Ehk = -100 Vdc	—	—	—	—	60	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	g1-all	—	—	—	25	—	Meg
	p-all	—	—	—	25	—	Meg
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests. Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature lead fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater cycling life test
4.11.5	Intermittent life test

3: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

4: Prior to this test tubes shall be preheated five (5) minutes at conditions indicated below. Test within three (3) seconds after preheating. Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission Test.

Ef	Ec1	Ec2	Ec3	Eb	Rk	Rg1
V	Vdc	Vdc	Vdc	Vdc	Ohms	Meg
7.5	0	100	0	100	220	0.47

5: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "White Noise" spectrum which is free from discontinuities from 100 cps to 5000 cps. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 G's rms acceleration. With this the case, the rms value of acceleration for any bandwidth within the specified spectrum is equal to

$$G\ rms = 2.3\ G \sqrt{3.32 \log_{10} (f2/f1)}$$

f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (0.25 megohm or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 40 db at 13,000 cps. For reading the peak to peak value of output voltage the filter output shall be fed directly to the input of a Ballantine Model 305 peak to peak electronic voltmeter or equal, while the rms value shall be measured with a Hewlett-Packard Model 400C or equal.

APPLICATION DATA

The 5902 is a Premium Subminiature beam power audio pentode having a relatively high power sensitivity. It is capable of efficient operation at low supply voltages. In Class A audio service a single tube will deliver one watt under normal operating conditions.

This type is well suited to application as a series regulator in electronically regulated power supplies. A typical circuit employing two 5902's in parallel and subminiature types 5718 and 6308 is shown in Figure 1.

The 5902 is also useful in many pulse applications including Class C service at low radio frequencies.

Triode connected the 5902 displays the low mu, high perveance qualities desirable in servo control circuits. In this application, when utilizing an ac plate supply, precautions should be taken to insure against poor tube and circuit reliability.

Since conduction occurs for only one-half cycle high plate supply voltage is often deemed necessary in order

APPLICATION DATA (Continued)

to realize sufficient output. Excessive positive plate voltage, however, causes an appreciable increase in secondary emission. In addition, presence of the negative half-cycle of plate encourages primary emission by the plate and grids.

The effects of back emission can be minimized by (1) employing a low value grid resistor, (2) inserting series diodes, such as the Sylvania 5641, in the plate circuits, (3) operate the tubes conservatively with respect to supply voltage, peak currents, element dissipation and bulb temperature. Back emission approximates an exponential curve with increasing plate voltage swing and plate disc dissipation. For further discussion the reader is referred to the frontal section of this manual or "Effects of AC Plate Voltages on Tube Performance", Sylvania Engineering Information Service, Vol. 1, No. 10, May 1954.

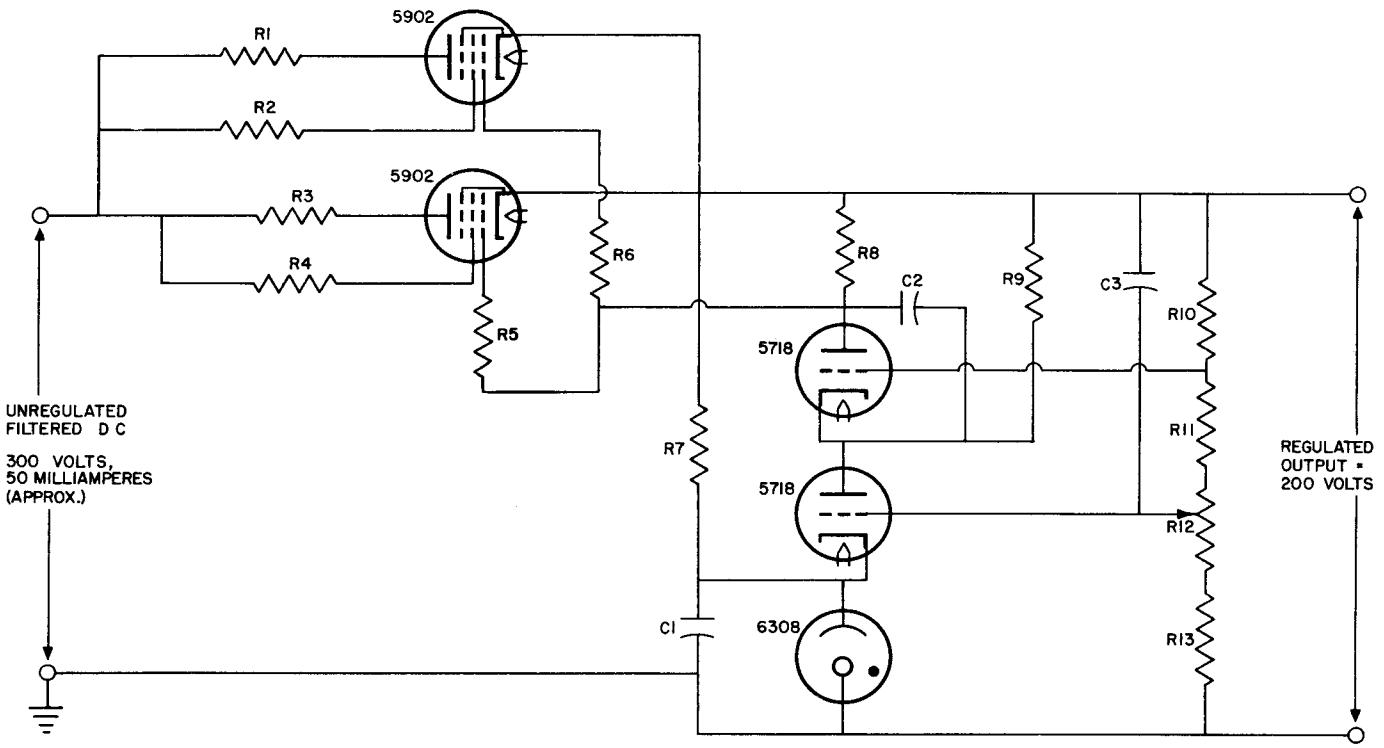
To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave. Lmits are specified for peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

The 5902 is characterized by long life and stable performance under conditions of severe vibration, shock, high temperature and high altitude and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

FIGURE 1. ELECTRONIC VOLTAGE REGULATOR CIRCUIT



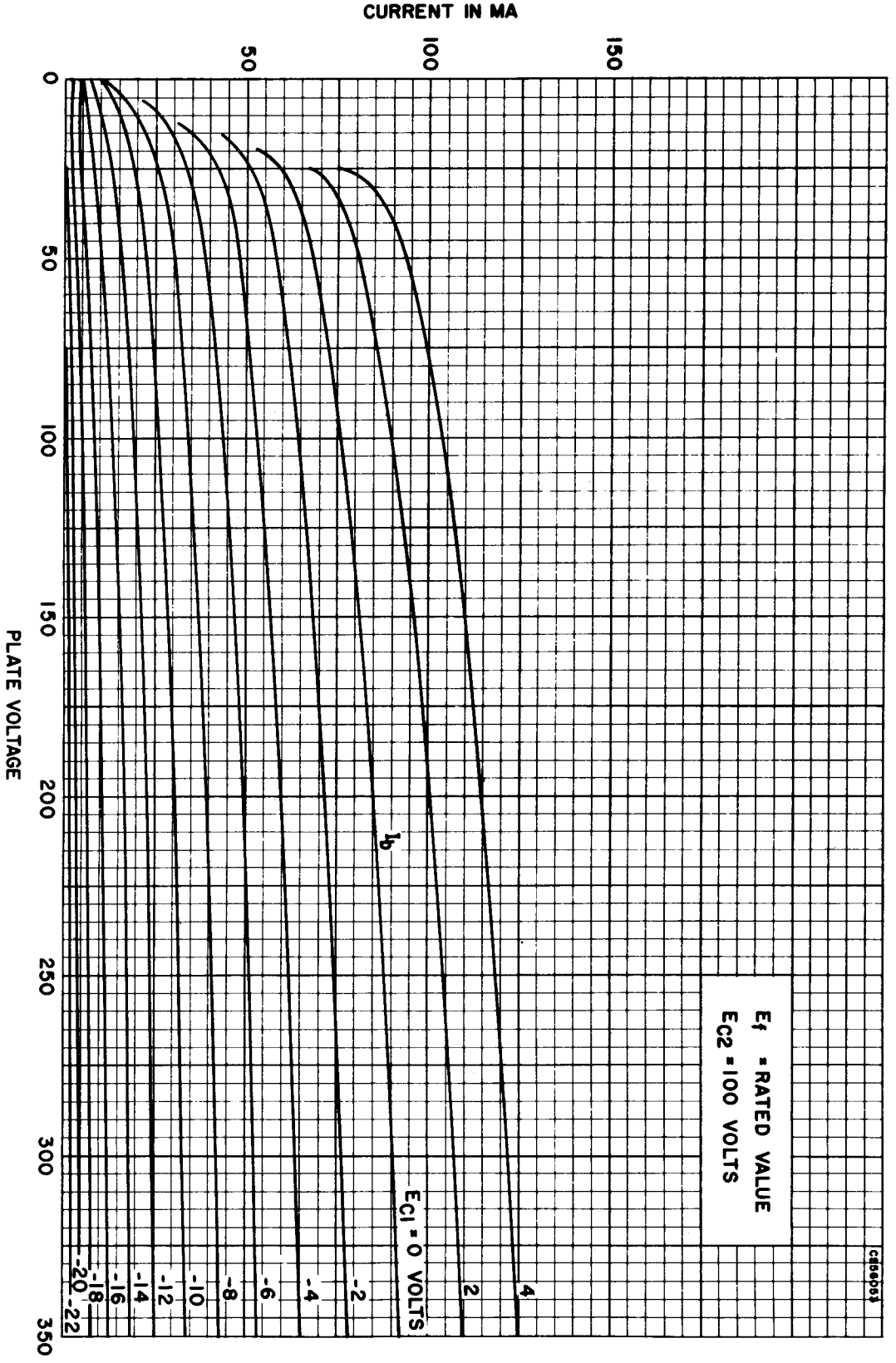
R_1 = 200 Ohms
R_2 = 500 Ohms
R_3 = 200 Ohms
R_4 = 500 Ohms
R_5 = 200 Ohms
R_6 = 200 Ohms
R_7 = 50,000 Ohms
R_8 = 490,000 Ohms
R_9 = 200,000 Ohms
R_{10} = 200,000 Ohms
R_{11} = 150,000 Ohms
R_{12} = 50,000 Ohm, 1 Watt, Pot.
R_{13} = 250,000 Ohms
C_1 = 0.01 μf, 200 V
C_2 = 510 μμf, 500 V
C_3 = 0.05 μf, 200 V

All resistors are 0.5 watt, except the potentiometer.

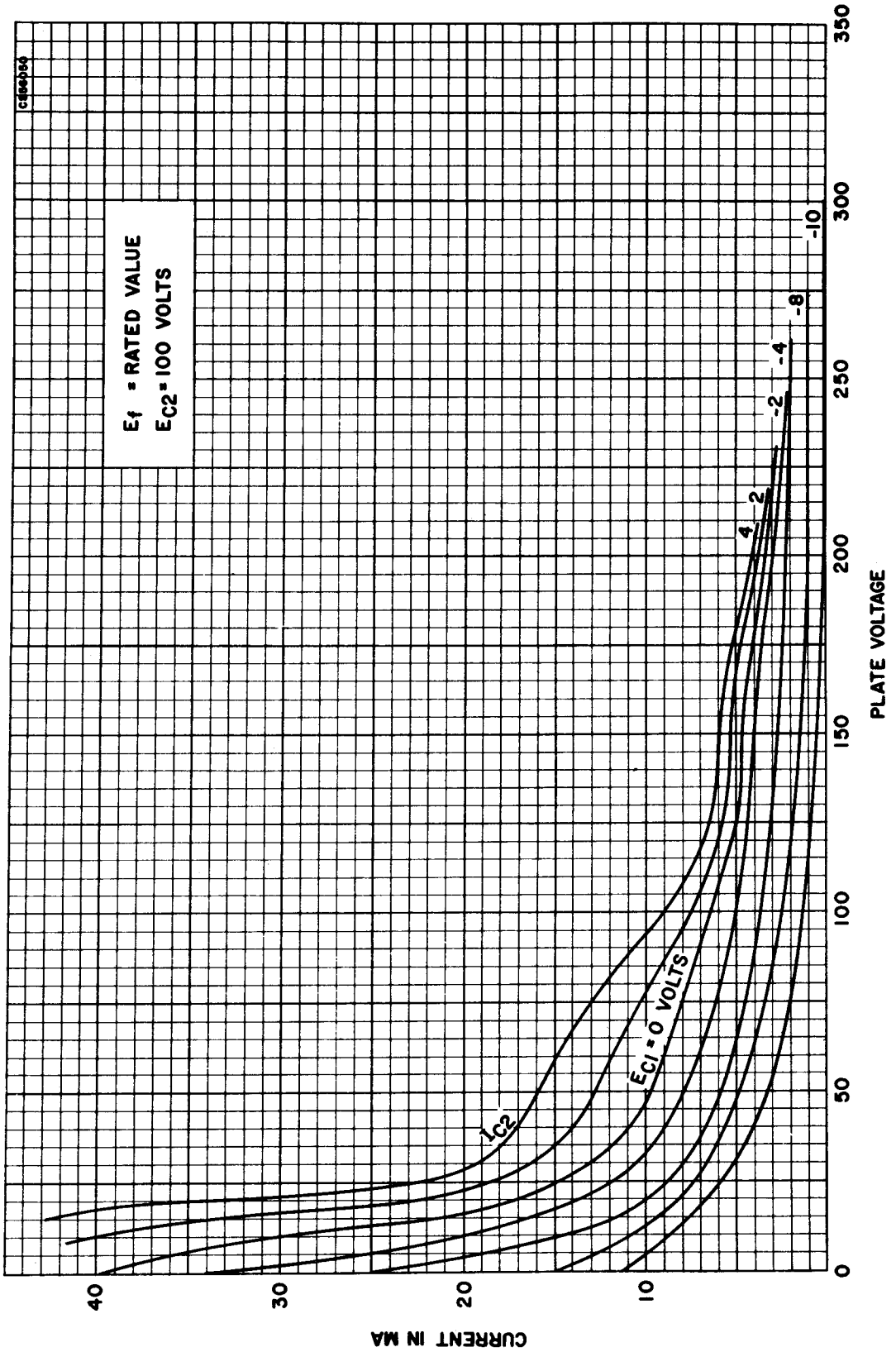
The information presented on this data sheet is furnished without assuming any obligation.

AVERAGE PLATE CHARACTERISTICS

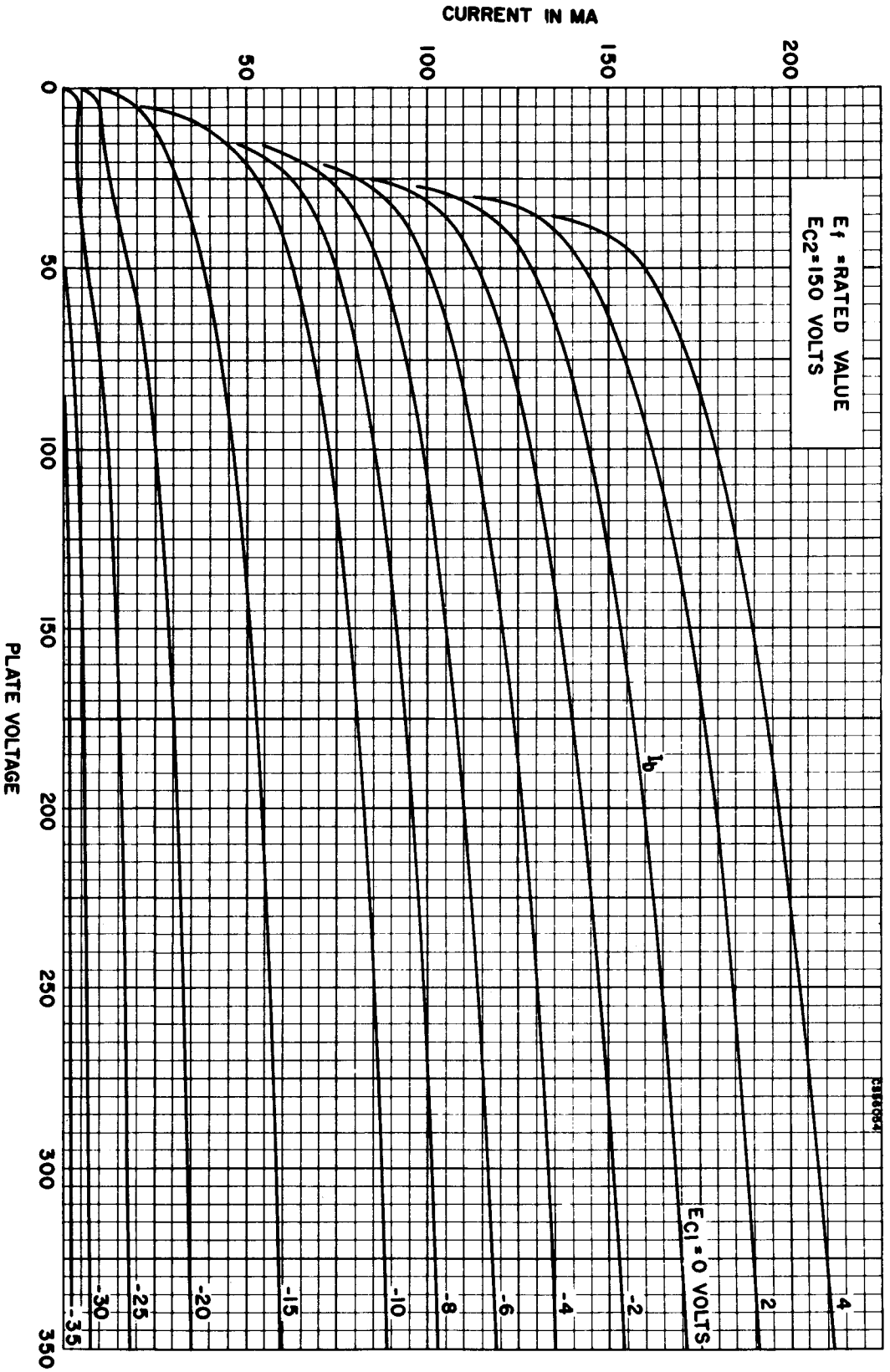
(PENTODE CONNECTED)



AVERAGE GRID No. 2 CHARACTERISTICS
(PENTODE CONNECTED)

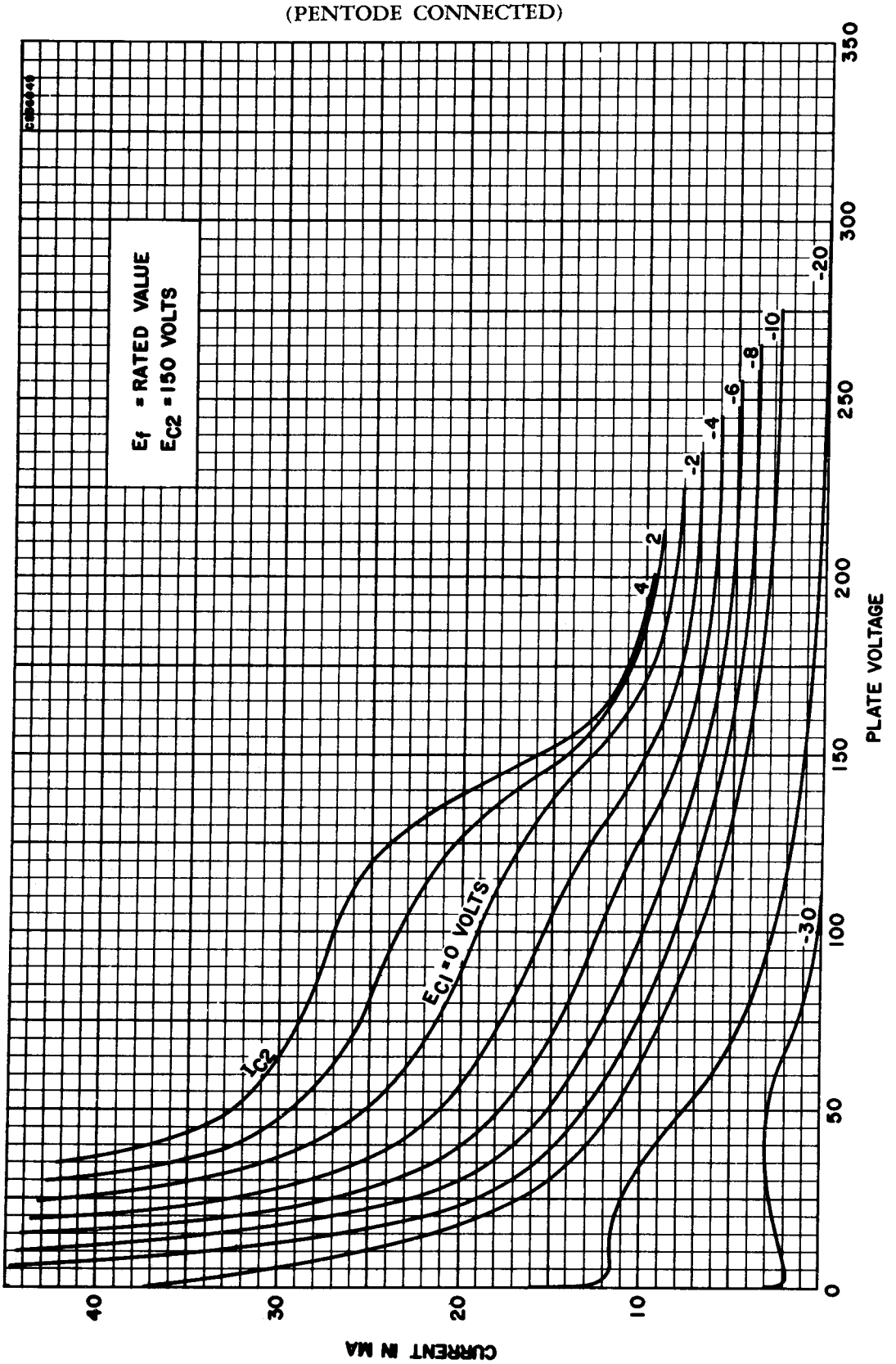


AVERAGE PLATE CHARACTERISTICS
(PENTODE CONNECTED)

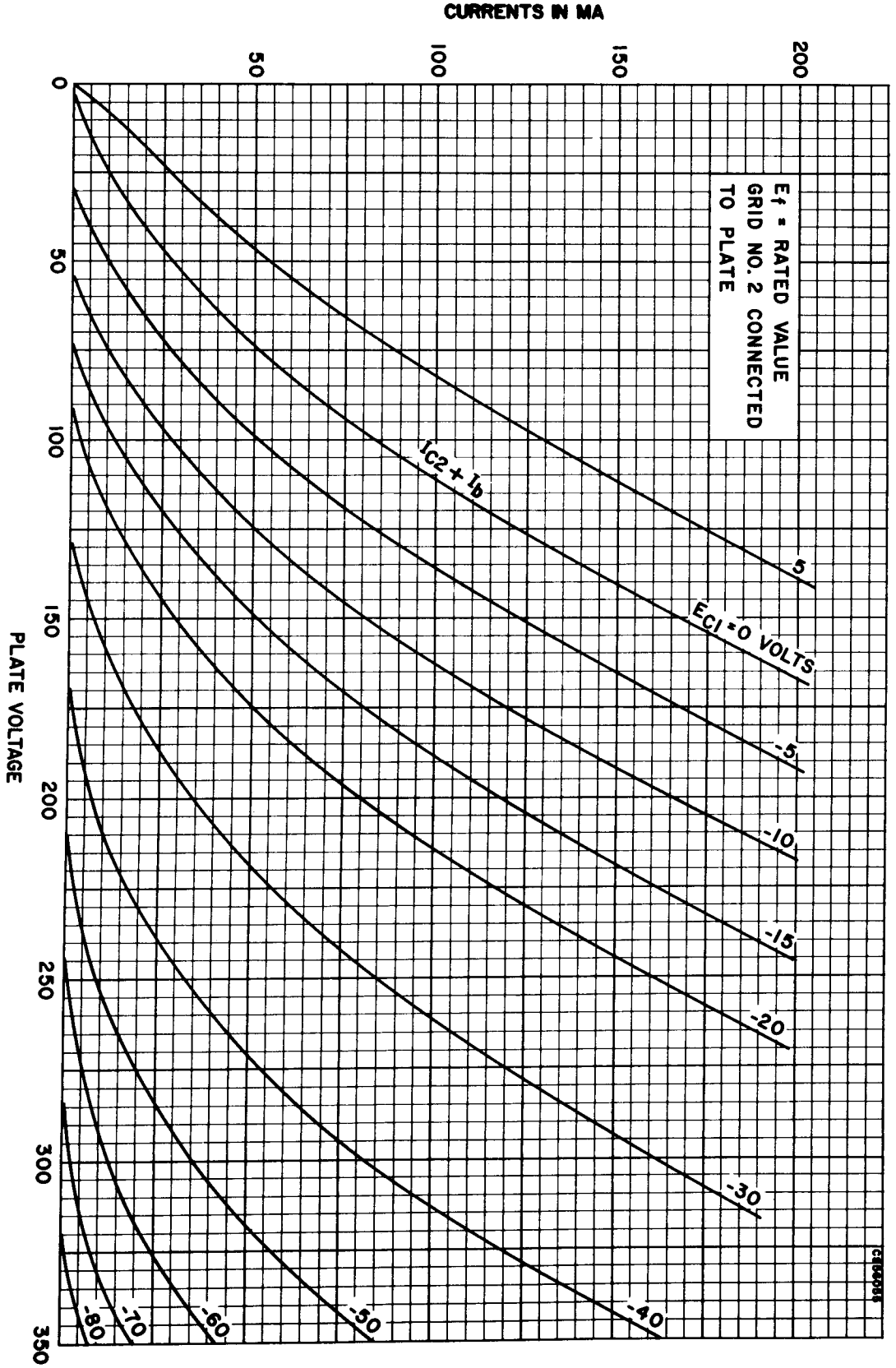


AVERAGE GRID No. 2 CHARACTERISTICS

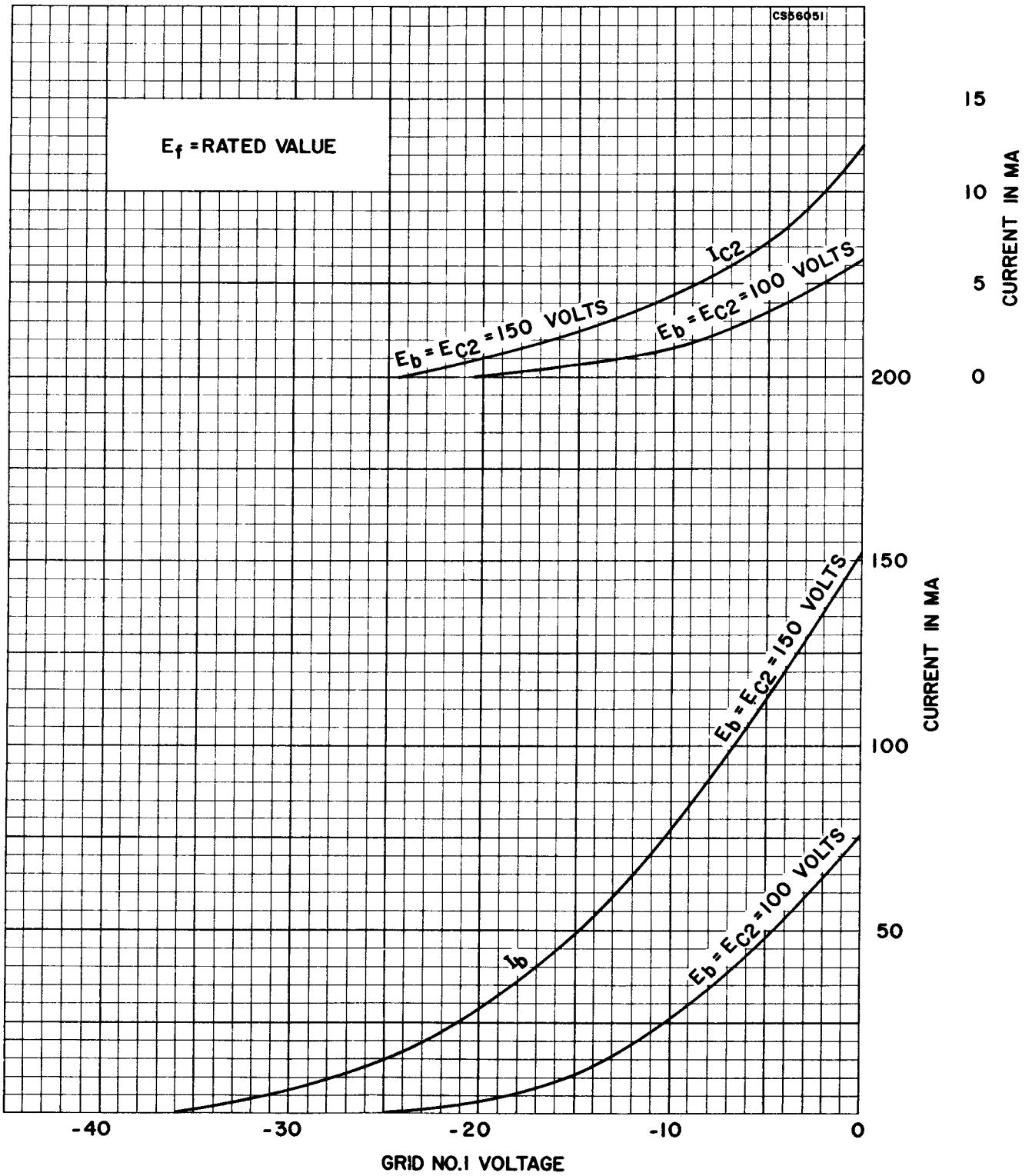
(PENTODE CONNECTED)



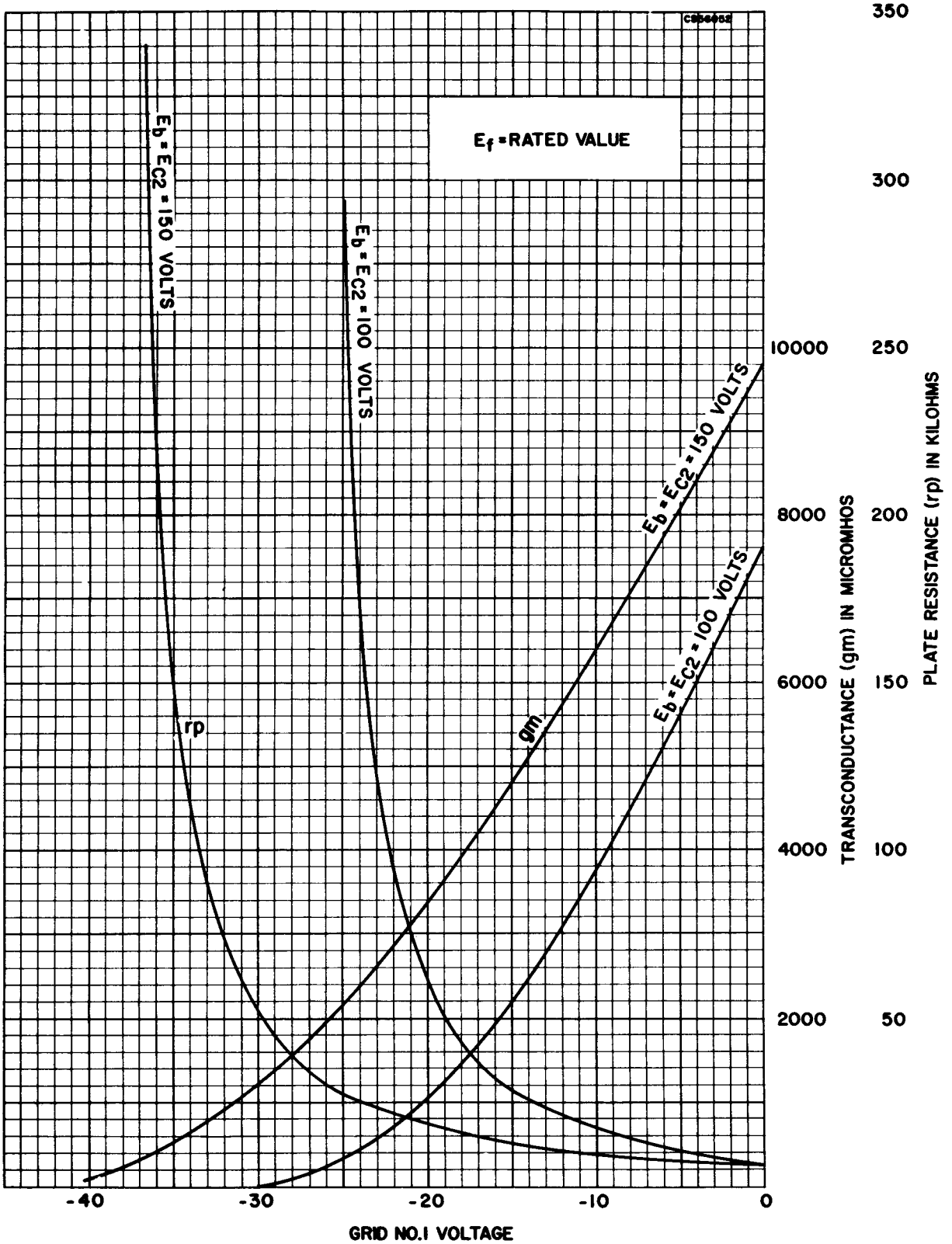
AVERAGE PLATE CHARACTERISTICS
(TRIODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE CONNECTED)



SYLVANIA engineering data service 5903

MECHANICAL DATA

Bulb	T-3
Base	E8-1, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DJ
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	60000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.	
Heater Voltage[3]	25.2	26.5	27.8	V
Heater Current		75		mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[4]

Plate to Plate: (1p to 2p)	0.026 μμf	Max.
Plate to Section No. 1: 1p to (h+1k+i.s.+e.s.)	3.0 μμf	
Plate to Section No. 2: 2p to (h+2k+i.s.+e.s.)	3.0 μμf	
Cathode to Section No. 1: 1k to (h+1p+i.s.+e.s.)	4.2 μμf	
Cathode to Section No. 2: 2k to (h+2p+i.s.+e.s.)	4.2 μμf	

RATINGS[1&5] (Absolute Maximum)

Plate Supply Voltage (Each Plate)	165 Vac
Peak Inverse Plate Voltage[6]	460 v
Steady State Peak Plate Current (Each Plate)	60 ma
Transient Peak Plate Current	350 ma
Output Current (Each Plate)	10 mAdc
Heater-Cathode Voltage[6]	
Heater Positive with Respect to Cathode	360 V
Heater Negative with Respect to Cathode	360 V

CHARACTERISTICS

Tube Voltage Drop for Ib=18 mAdc (Each Plate)	4.5 Vdc

TYPICAL OPERATION

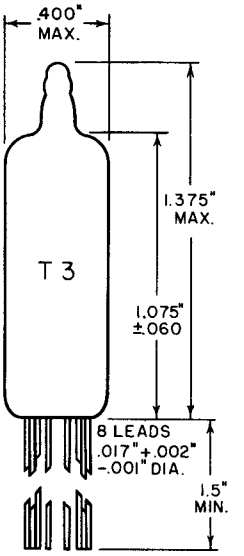
Full-Wave Rectifier—Capacitor Input	
Plate Supply Voltage (rms per plate)	165 Vac
Total Plate Supply Impedance (per plate)	300 Ohms
Load Resistance	11000 Ohms
Output Current (full-wave)	18 mAdc
Filter Input Capacitor	8 μf

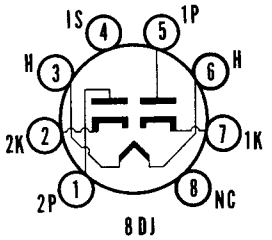
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltage (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 26.5 volts.*
4. *External shield of 0.405 inch diameter connected to heater.*
5. *Values shown are as registered with RETMA.*
6. *The maximum voltage appearing between any pair of leads shall be no greater than the maximum peak inverse plate voltage.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5903 is a high perveance double diode having separate cathode connections for each section and a 26.5 volt, 75 ma heater. Electrically this type is otherwise identical to the Type 5896. It is designed for use in detector applications at UHF as well as low frequencies. This type is intended for operation under conditions of severe shock, vibration, high temperature and high altitude. The Sylvania Type 5903 is manufactured and inspected to meet the applicable specifications for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
AUGUST, 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	26.5 V	Load Resistance	11000 Ohms
Plate Supply Voltage Per Plate	165 Vac	Load Capacitance	8 μf

For the purpose of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Tests	Limits Min.	Bogey	Max.	Units
Production Tests					
4.10.8	Heater Current:	70	75	80	mA
4.10.1.1	Emission; Diode No. 1: E1b = 10 Vdc	30	—	—	mAdc
4.10.1.1	Emission; Diode No. 2: E2b = 10 Vdc	30	—	—	mAdc
4.10.4.1	Plate Current; Diode No. 1: Ebb = O V; Rp = 40,000 Ohms	5	—	25	μAdc
4.10.4.1	Plate Current; Diode No. 2: Ebb = O V; Rp = 40,000 Ohms	5	—	25	μAdc
- - - -	Plate Current Difference Between Diodes:	0	—	5	μAdc
4.10.13	Operation: Note 2 Ehk = Eo + 117 Vac; So phased that Ef and 117 Vac Subtract	16	—	—	mAdc
Special Design Tests					
4.9.5.3	Subminiature Lead Fatigue:	4	—	—	Arcs
4.10.15	Heater-Cathode Leakage; Diode No. 1: Ehk = +360 Vdc	0	—	40	μAdc
	Ehk = — 360 Vdc	0	—	40	μAdc
4.10.15	Heater-Cathode Leakage: Diode No. 2: Ehk = +360 Vdc	0	—	40	μAdc
	Ehk = -360 Vdc	0	—	40	μAdc
4.8	Insulation of Electrodes: Ef = 26.5 V	100	—	—	Meg
Design Tests					
4.10.14	Capacitance: Tests made with 0.405 in. dia. shield tied to heater.				
	1p to 2p	—	—	0.026	μμf
	1p to h + 1k + sd	2.5	—	3.5	μμf
	2p to h + 2k + sd	2.5	—	3.5	μμf
	1k to h + 1p + sd	3.5	—	4.9	μμf
	2k to h + 2p + sd	3.5	—	4.9	μμf
Degradation Tests					
4.9.20.5	Shock: Note 1 Hammer Angle = 30°				
4.9.20.6	Fatigue: Note 1				
- - - -	Post Shock and Fatigue Test End Points				
	Heater-Cathode Leakage	0	—	80	μAdc
	Operation	14	—	—	mAdc

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Tests	Limits			Units
		Min.	Bogey	Max.	
Acceptance Life Tests					
4.11.7	Heater Cycling Life Test: Ef = 29.0 V, E1b = E2b = O V; Ehk = 140 Vac; One min. On, four min. Off	2500	—	—	Cycles
4.11.5	Intermittent Life Test (1); Notes 3 & 4 TA = 175° C; Ehk = Eo + 117 Vac	500	—	—	Hours
4.11.4	Intermittent Life Test End Points (1):				
	Operation	14	—	—	mAdc
	Heater-Cathode Leakage; Diode No. 1	0	—	120	μAdc
	Heater-Cathode Leakage; Diode No. 2	0	—	120	μAdc
Qualification Test					
4.10.7.4	Resonant Frequency: Length	14.65	—	—	cm

ACCEPTANCE CRITERIA NOTES

1: Acceptance sampling procedure shall be in accordance with the shock test sampling procedure of the Inspection Instructions for Electron Tubes.

2: In a full-wave circuit, adjust Zp such that a tube having Etd = 10 Vdc at 50 mAdc per plate gives Io equal to 18 mAdc.

3: At the conclusion of the five hundred hour life test, the average life of the life test group shall be not less than four hundred fifty hours. Life test sample size shall be five tubes. Provision for release of tubes prior to completion of life test on a reduced basis as specified in Par. 4.3.1.3 of the Inspection Instructions for Electron Tubes shall not apply.

4: Full-wave circuit. In life test operation, the values of RL and CL given in the test conditions shall be considered as approximate and shall be adjusted initially to give Io equal to or greater than 18 mAdc with ib equal to or greater than 50 milliamperes.

APPLICATION DATA

The Premium Subminiature Type 5903 is a high perveance subminiature double diode employing a 26.5 volt, 75 ma heater. The 5903 is otherwise identical to the Type 5896. Separate cathode connections permit independent operation of each section. It is particularly useful in a variety of detector applications including discriminators or ratio detectors at uhf as well as low frequencies.

The resonant frequency of each diode section is greater than 900 megacycles, making the type applicable to use in automatic frequency control discriminator circuits in the uhf region. The line length in push-pull applications of this nature is plotted against frequency in Figure 1.

In critical detector applications, a reduction in hum output and contact potential voltage may be realized by lowering the operating heater voltage. Such a reduction will, however, result in a plate characteristic curve which departs from that obtained with rated heater voltage, Figure 2. With practical values of reduced heater voltage, hum output may be lowered by as much as 60% and contact potential by 20 to 30%. Operation under these conditions is satisfactory, providing the current requirements are consistent with values normally encountered in low level detection. An alternative method of lowering hum output and contact potential is to bias the heater with respect to the cathode.

The 5903 is also useful in clamping and gating applications.

The 5903 is intended for operation under conditions of severe shock, vibration, high altitude and high temperature and is manufactured and inspected to meet the aplicable MIL-E-1 specification for reliability.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy.

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

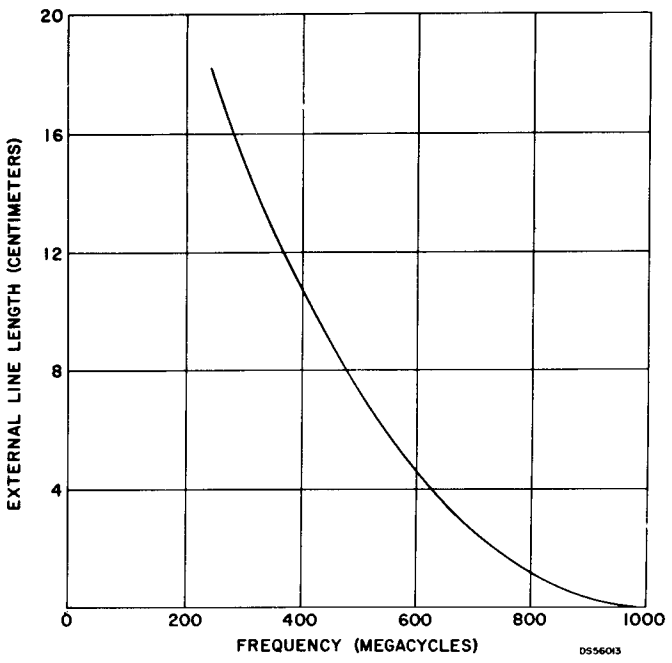


Figure 1—Approximate resonant-line length vs frequency

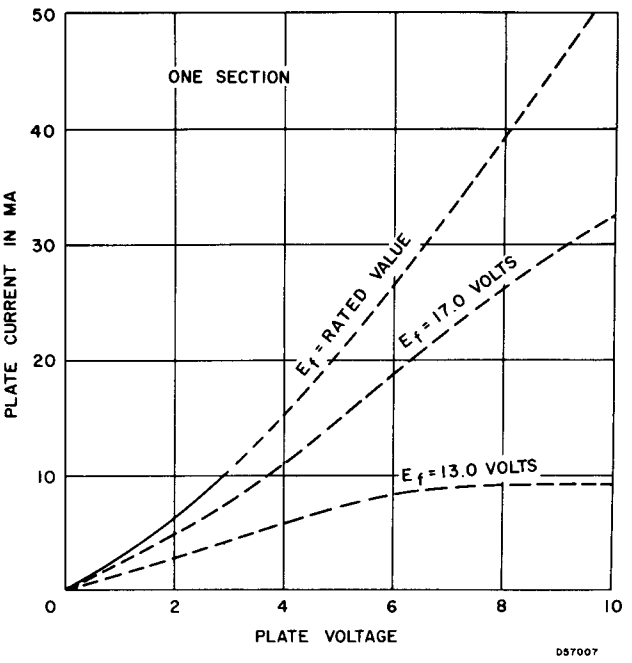
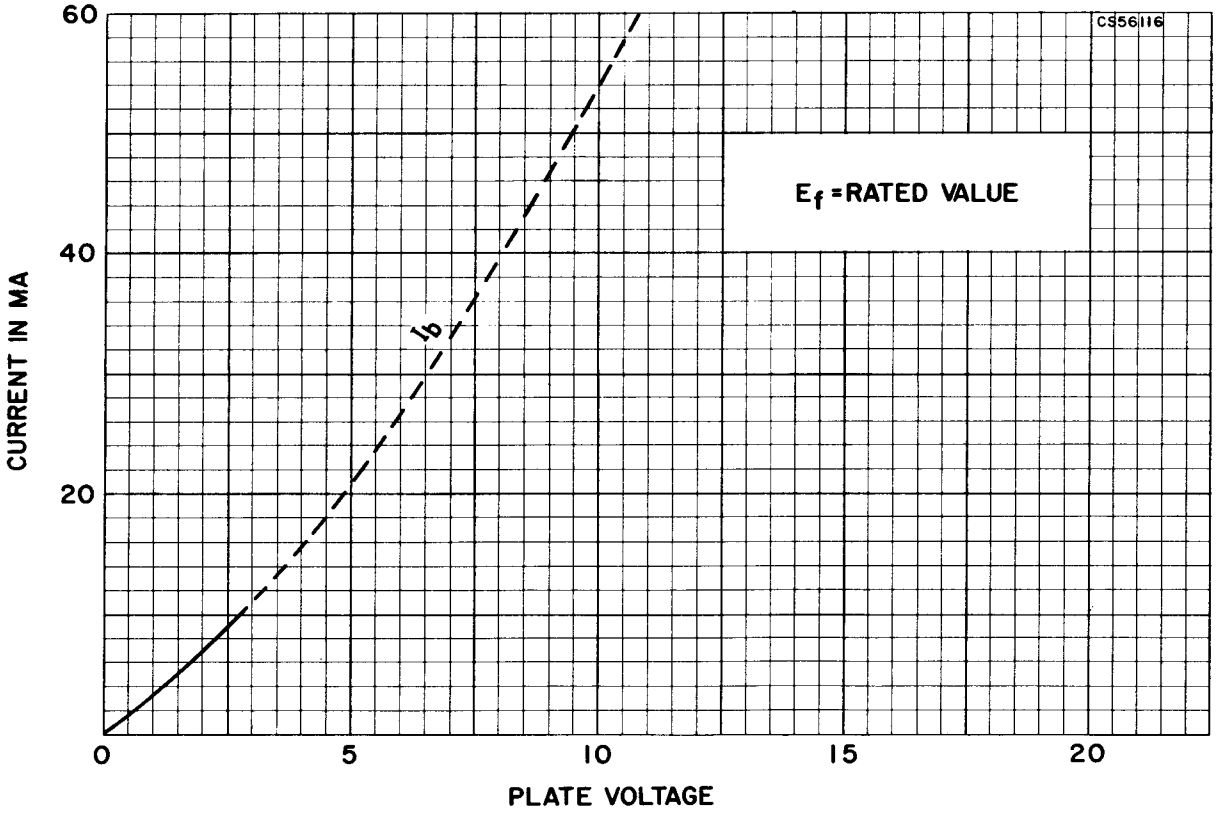


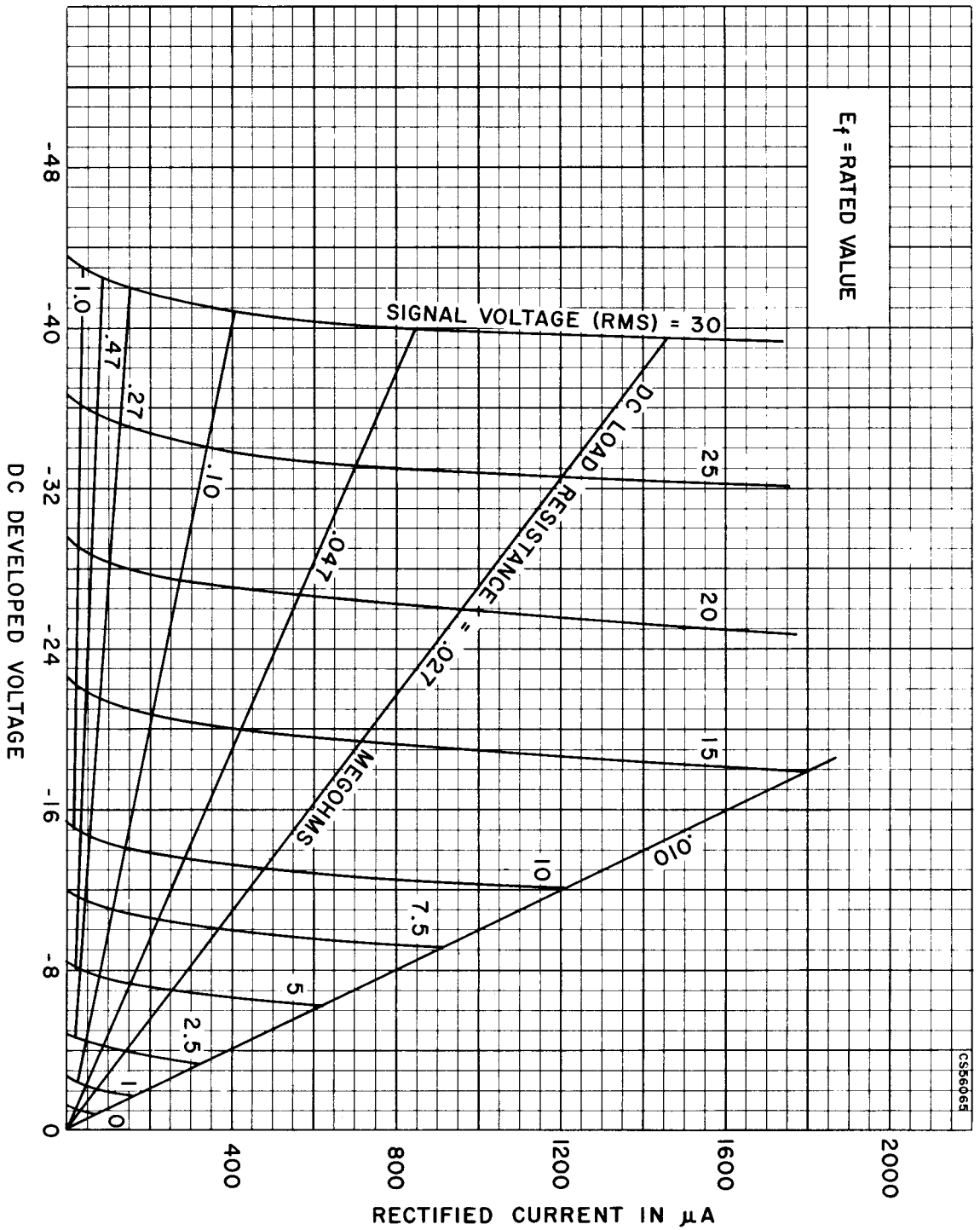
Figure 2—Approximate plate characteristics at reduced heater voltage

The information presented on this data sheet is furnished without assuming any obligation.

AVERAGE PLATE CHARACTERISTICS
(EACH SECTION)



AVERAGE CHARACTERISTICS
(EACH SECTION)



SYLVANIA

engineering data service

5904

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DK
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.	
Heater Voltage[2]	25.2	26.5	27.8	V
Heater Current		45		mA

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	1.8 μμf
Input	2.2 μμf
Output	0.8 μμf

RATINGS[1 & 3] (Absolute Maximum)

Plate Voltage	55 Vdc
Grid Current	8.5 mAdc
Plate Current	22 mAdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	100 v
Heater Negative with Respect to Cathode	100 v

CHARACTERISTICS

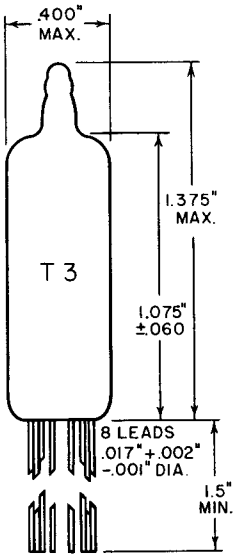
Plate Voltage	26.5 Vdc
Grid Resistor	2.2 Meg
Plate Current	3.0 mAdc
Amplification Factor	20
Transconductance	5000 μmhos
Grid Voltage for Ib = 50 μAdc Max.	-3.5 Vdc

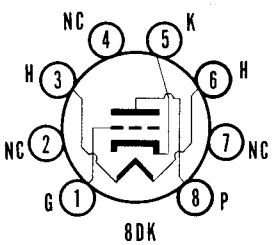
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 26.5 volts.*
3. *Values shown are as registered with RETMA.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5904 is a medium-mu, high perveance triode designed for use as an amplifier or oscillator, with 26.5 volts on both the plate and the heater. It is intended for operation under conditions of severe shock, vibration, high temperature and high altitude. The Sylvania Type 5904 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

AUGUST, 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage . . . . . 26.5 V
Plate Voltage . . . . . 26.5 Vdc
Grid Resistor . . . . . 2.2 Meg

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Tests	Limits Min.	Limits Bogey	Limits Max.	Units
Production Tests					
4.10.8	Heater Current:	40	45	50	mA
4.10.6.1	Grid Current: Eb = 50 Vdc; Ec = −1.5 Vdc; Rg = 0.1 Meg	0	—	−0.5	μAdc
4.10.4.1	Plate Current (1):	1.5	3.0	4.5	mAdc
4.10.9	Transconductance (1): Cg = 1 μf	3500	5000	6500	μmhos
Special Design Tests					
4.9.5.3	Subminiature Lead Fatigue:	4	—	—	arcs
4.9.19.2	Vibration: Ep F = 40 cps; G = 15; Rp = 10,000 Ohms; Cg = 1 μf	—	—	50	mVac
4.10.15	Heater-Cathode Leakage: Ehk = +100 Vdc	0		10	μAdc
	Ehk = −100 Vdc	0		10	μAdc
4.8	Insulation of Electrodes: Eg to All = −100 Vdc; Ef = 26.5 V	100	—	—	Meg
4.10.3.2	AF Noise: Ebb = 50 Vdc; Rg = 2.2 Meg; Rp = 10,000 Ohms; Esig = 50 mVac	—	—	16	VU
Design Tests					
4.10.4.1	Plate Current (2): Ec = −3.5 Vdc; Rg = 0 Ohms	—	—	50	μAdc
4.10.11.1	Amplification Factor: Cg = 1 μf	16	20	24	
4.10.9	Transconductance (2): Ef = 24.0 V; Cg = 1 μf	3250	—	—	μmhos
4.10.14	Capacitance: No Shield Cgp	1.2	—	2.4	μμf
	No Shield Cin	1.6	—	2.8	μμf
	No Shield Cout	0.6	—	1.0	μμf
4.10.2.2	Power Oscillation: Po F = 400 Mc; Eb = 26.5 Vdc; Rg/Ib = 20 mAdc	50	—	—	mW
Degradation Tests					
4.9.20.5	Shock: Note 1 Hammer Angle = 30°	—	—	—	
4.9.20.6	Fatigue: Note 1	—	—	—	
-----	Post Shock Test End Points: Vibration	—	—	200	mVac
-----	Post Fatigue Test End Points: Vibration	—	—	100	mVac
-----	Post Shock and Fatigue Test End Points Heater-Cathode Leakage	0	—	20	μAdc
	Transconductance	3300	—	—	μmhos

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Tests	Limits			Units
		Min.	Bogey	Max.	
Acceptance Life Tests					
4.11.7	Heater Cycling Life Test: Ef = 29.0 V; Eb = Ec = 0 V; Rg = 0 Ohms; Ehk = 140 Vac One min. On, four min. Off	2500	—	—	Cycles
4.11.5	Intermittent Life Test: Note 2 Rg = 2.2 Meg; Ehk = +200 Vdc; TA = 175°C	500	—	—	Hours
4.11.4	Intermittent Life Test End Points:				
	Transconductance (1)	2600	—	—	μmhos
	Heater-Cathode Leakage	0	—	30	μAdc
	Grid Current	—	—	-1.5	μAdc

ACCEPTANCE CRITERIA NOTES:

1: Acceptance sampling procedure shall be in accordance with the shock test sampling procedure of the Inspection Instructions for Electron Tubes.

2: At the conclusion of the five hundred hour life test, the average life of the life test group shall be not less than four hundred fifty hours. Life test sample size shall be ten tubes. Provision for release of tubes prior to completion of life test on a reduced basis as specified in Par. 4.3.1.3 of the Inspection Instructions for Electron Tubes shall not apply.

APPLICATION DATA

The Premium Subminiature Type 5904 is a high gm, medium mu triode manufactured and inspected to meet the applicable MIL-E-1 specification and provide reliable operation under conditions of severe shock, vibration, high temperature, and high altitude.

The Type 5904 is particularly well suited to application as an oscillator at frequencies through 400 megacycles and is designed to operate with 26.5 volts applied to the heater and plate. The 5904 is also suited to many low frequency applications. Resistance coupled amplifier data is shown in the accompanying table and circuit.

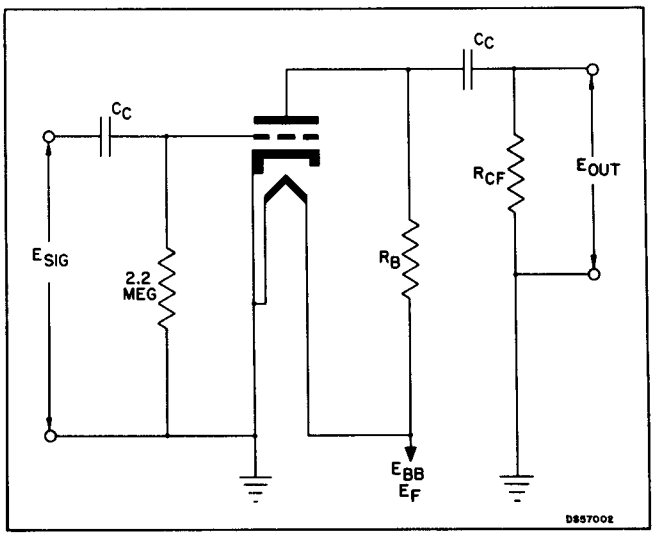
Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poor life expectancy.

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

RESISTANCE COUPLED AMPLIFIER DATA
ZERO-BIAS OPERATION

Ef = Ebb (volts)	21.0		26.5		30.0	
Rb (megohms)	0.022	0.1	0.022	0.1	0.022	0.1
Ib (ma)	0.380	0.124	0.580	0.174	0.700	0.206
Eb (volts	12.6	8.6	13.7	9.1	14.6	9.4
Rcf (megohms)	2.0	2.0	2.0	2.0	2.0	2.0
Esig (volts, rms)	0.1	0.1	0.1	0.1	0.1	0.1
Eout (volts, rms)	1.05	1.15	1.1	1.2	1.21	1.25
Gain	10.5	11.5	11.0	12.0	12.1	12.5
% Distortion	2.5	1.5	1.9	1.0	1.6	0.8
Esig* (volts, rms)	0.18	0.30	0.25	0.41	0.30	0.49
Eout (volts, rms)	1.75	3.15	2.6	4.5	3.32	5.5
Gain	9.7	10.5	10.4	11.0	11.1	11.2
% Distortion	4.8	4.8	4.8	4.8	4.9	5.0

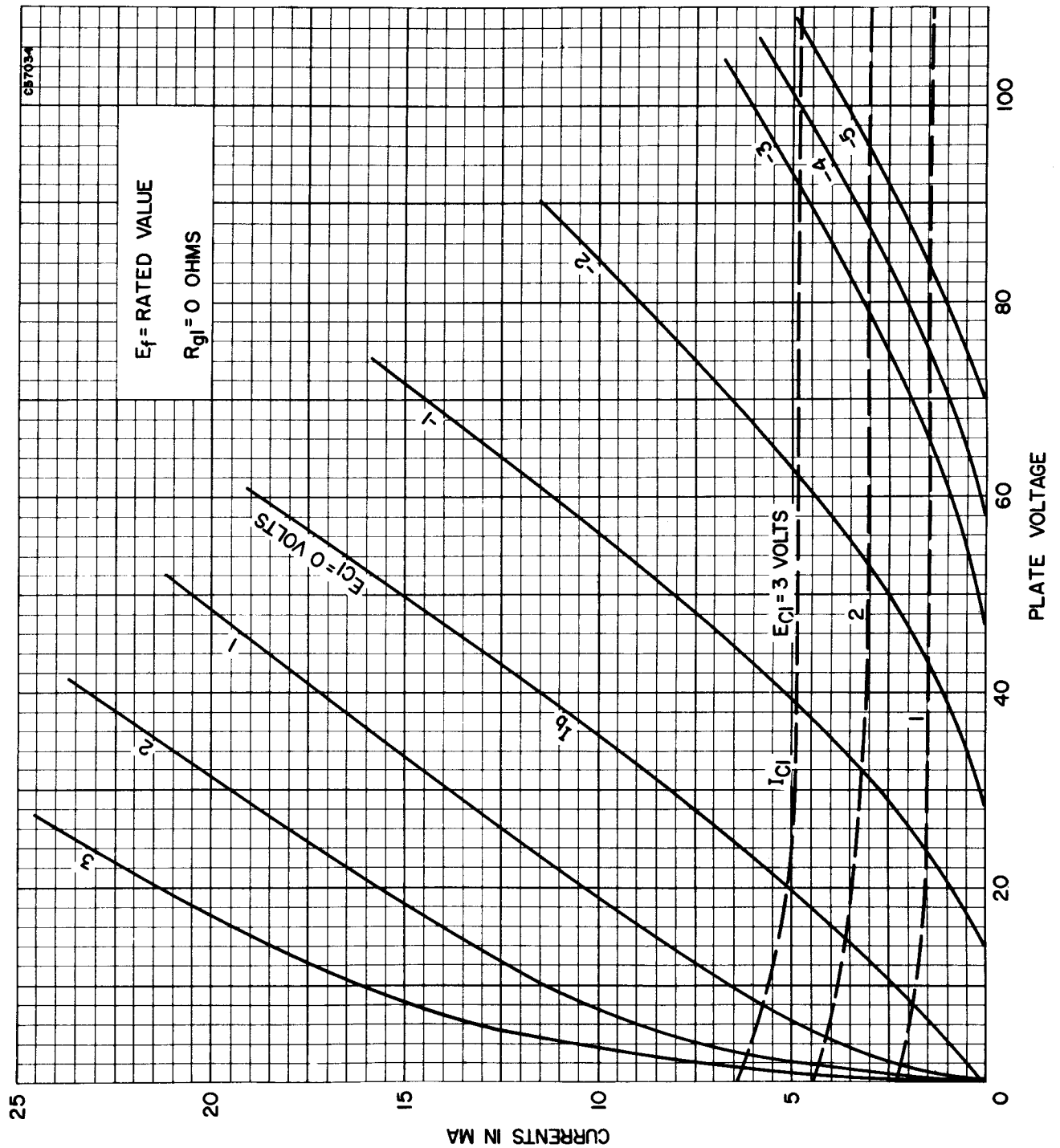
*Maximum Signal for 5% Distortion.



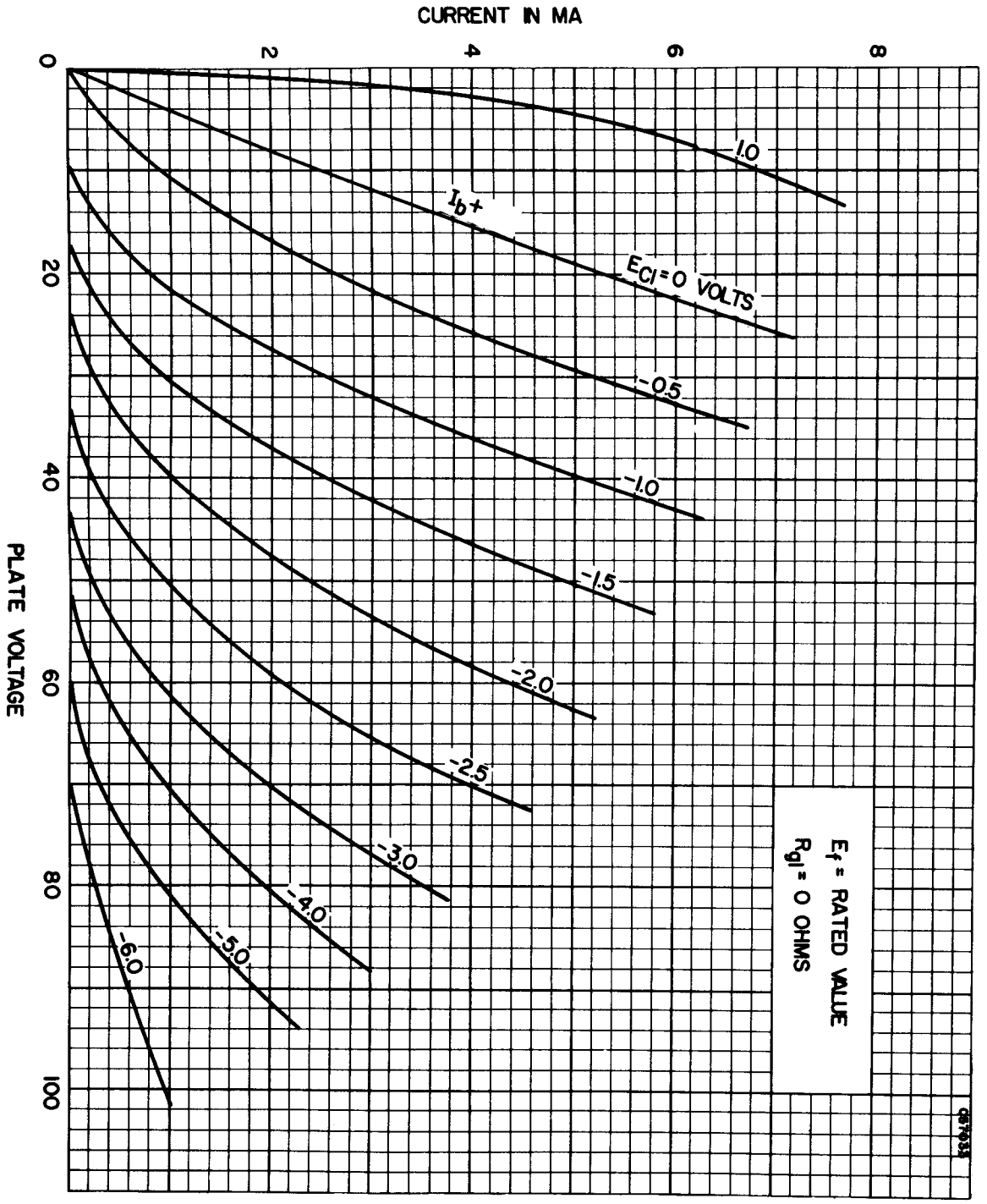
Resistance coupled amplifier circuit

The information presented on this data sheet is furnished without assuming any obligation.

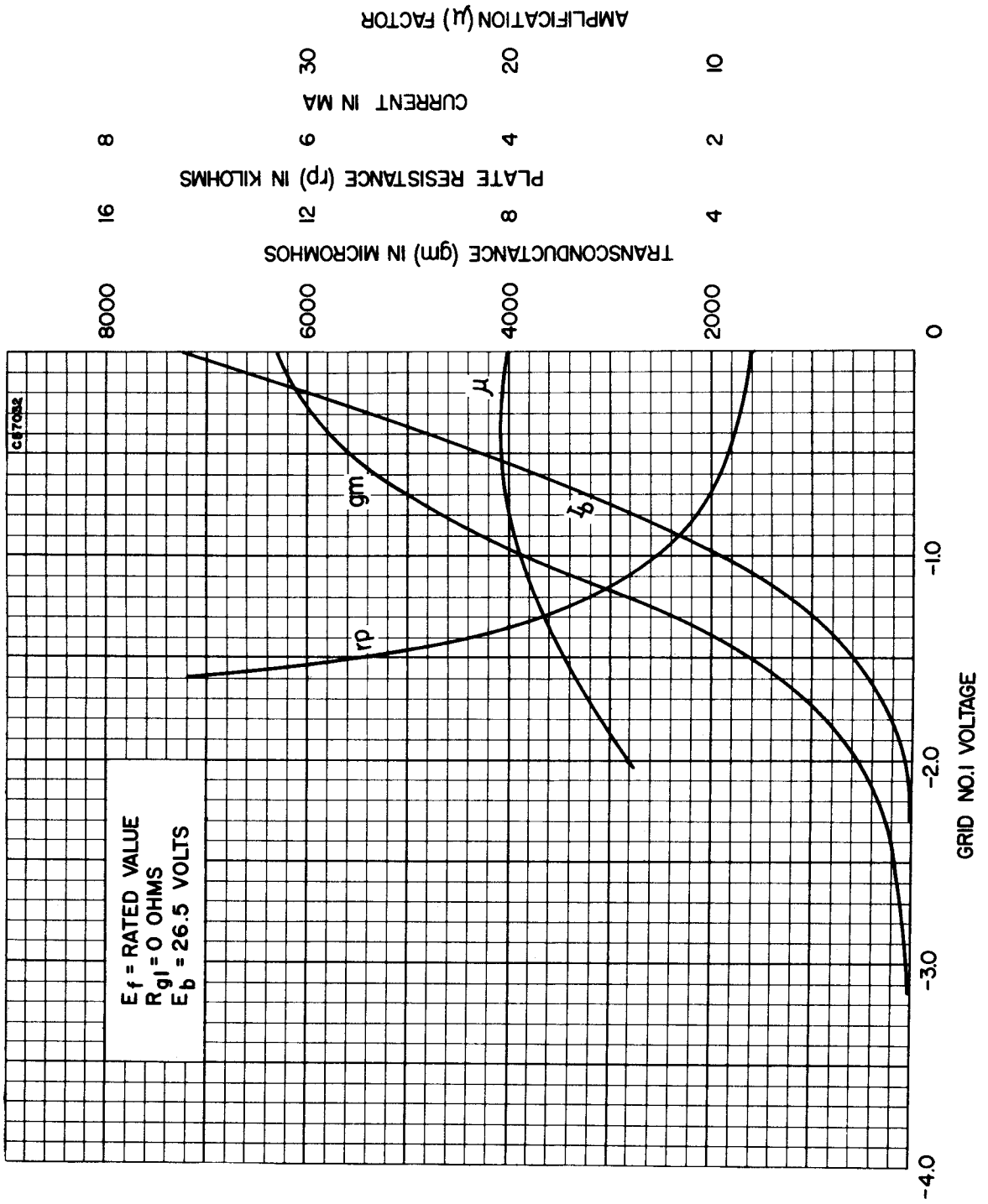
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA

engineering data service

5905

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DL
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.	
Heater Voltage[2]	25.2	26.5	27.8	V
Heater Current		45		mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[3]

Grid No. 1 to Plate	0.015 μμf	Max.
Input	4.0 μμf	
Output	3.4 μμf	

RATINGS[1 & 4] (Absolute Maximum)

Plate Voltage	55 Vdc
Grid No. 2 Voltage	55 Vdc
Cathode Current	10 mAdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	100 v
Heater Negative with Respect to Cathode	100 v

CHARACTERISTICS

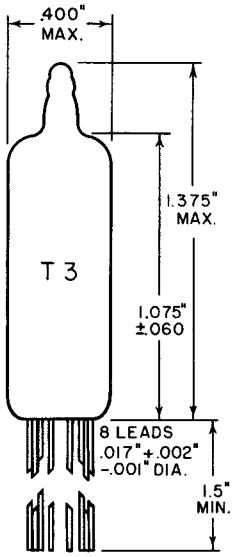
Plate Voltage	26.5 Vdc
Grid No. 2 Voltage	26.5 Vdc
Grid No. 1 Resistor	2.2 Meg
Plate Current	2.1 mAdc
Grid No. 2 Current	0.75 mAdc
Transconductance	2850 μmhos
Plate Resistance	150 K Ohms
Grid Bias for Ib = 10 μa	−3 Vdc

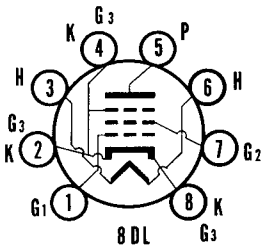
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 26.5 volts.*
3. *External shield of 0.405 inch internal diameter connected to cathode.*
4. *Values shown are as registered with RETMA.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5905 is a sharp cutoff, UHF pentode designed for use as an amplifier with 26.5 volts on the heater, plate and grid No. 2. The Sylvania Type 5905 is intended for operation under conditions of severe shock, vibration, high temperature and high altitude. It is manufactured and inspected to meet the applicable specifications for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
AUGUST, 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	26.5 V	Grid No. 2 Voltage	26.5 Vdc
Plate Voltage	26.5 Vdc	Grid No. 1 Resistor	2.2 Meg

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Tests	Limits Min.	Limits Bogey	Limits Max.	Units
Production Tests					
4.10.8	Heater Current:	40	45	50	mA
4.10.6.1	Grid No. 1 Current: Ec2 = Eb = 50 Vdc; Rg1 = 0.1 Meg Ec1 = −1.5 Vdc	0	—	−0.3	μAdc
4.10.4.1	Plate Current (1):	1.4	2.1	2.8	mAdc
4.10.4.3	Grid No. 2 Current:	0	0.75	1.5	mAdc
4.10.9	Transconductance (1): Cg1 = 1 μf	2350	2850	3350	μmhos
Special Design Tests					
4.9.5.3	Subminiature Lead Fatigue:	4	—	—	arcs
4.9.19.2	Vibration: F = 40 cps; G = 15; Rp = 10,000 Ohms; Cg1 = 1 μf	—	—	30	mVac
4.10.15	Heater-Cathode Leakage: Ehk = +100 Vdc Ehk = −100 Vdc	0 0	— —	10 10	μAdc μAdc
4.8	Insulation of Electrodes: Eg1 — all = −100 Vdc; Ef = 26.5 V	100	—	—	Meg
4.10.3.2	AF Noise: Esig = 70 mVac; Rg2 = 1000 Ohms; Rp = 0.2 Meg; Ebb = 100 Vdc; Ecc2 = 19 Vdc	—	—	17	VU
Design Tests					
4.10.10	Plate Resistance: Cg1 = 1 μf	0.090	—	—	Meg
4.10.4.1	Plate Current (2): Ec1 = −3.0 Vdc; Rg1 = 0	0	—	100	μAdc
4.10.9	Transconductance (2): Ef = 24.0 V; Cg1 = 1 μf	2150	—	—	μmhos
4.10.14	Capacitance: Tests made with a 0.405 in. dia. shield tied to cathode Cgp Cin Cout	— 3.5 2.9	— 4.0 3.4	0.015 4.5 3.9	μμf μμf μμf
Degradation Tests					
4.9.20.5	Shock: Note 1 Hammer Angle = 30°				
4.9.20.6	Fatigue: No. 1				
-----	Post Shock Test End Points: Vibration	—	—	100	mVac
-----	Post Fatigue Test End Points: Vibration	—	—	75	mVac
-----	Post Shock and Fatigue Test End Points: Heater-Cathode Leakage Transconductance (1)	0 2100	— —	20 —	μAdc μmhos

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Tests	Limits			Units
		Min.	Bogey	Max.	
Acceptance Life Tests					
4.11.7	Heater Cycling Life Test: Ef = 29.0 V; Eb = Ec2 = Ec1 = 0 V; Rg1 = 0 Ohms; Ehk = 140 Vac One min. On, four min. Off	2500	—	—	Cycles
4.11.5	Intermittent Life Test: Note 2 Rg1 = 2.2 Meg; Ehk = +200 Vdc; TA = 175°C	500	—	—	Hours
4.11.4	Intermittent Life Test End Points:				
	Transconductance	1700	—	—	μmhos
	Heater-Cathode Leakage	0	—	30	μAdc
	Grid No. 1 Current	—	—	-0.9	μAdc

ACCEPTANCE CRITERIA NOTES:

1: Acceptance sampling procedure shall be in accordance with the shock test sampling procedure of the Inspection Instructions for Electron Tubes.

2: At the conclusion of the five hundred hour life test, the average life of the life test group shall be not less than four hundred fifty hours. Life test sample size shall be ten tubes. Provision for release of tubes prior to completion of life test on a reduced basis as specified in Par. 4.3.1.3 of the Inspection Instructions for Electron Tubes shall not apply.

APPLICATION DATA

The Premium Subminiature Type 5905 is an ultra high frequency pentode designed for operation with 26.5 volts on heater, plate and No. 2 grid. For optimum performance this type should be used with grid-resistor bias to avoid the loss of plate voltage associated with cathode-biasing systems. The tube impedances are lower than those encountered in higher voltage tubes, but this is a natural result of the very low voltages employed. Input and output resistance are plotted as a function of frequency in Figure 1.

These input and output loading effects must be considered in uhf circuit design. As in any uhf pentode, the grid-plate feedback is not primarily dependent on grid-plate capacitance. At uhf the inductances of tube leads will go into resonance with the grid-plate capacitance, thereby effecting complete neutralization within the tube at some frequency. This self-neutralization point in the 5905 is approximately 200 megacycles. At higher frequencies the feedback is inductive, and takes place primarily through the tube leads.

The importance of short leads cannot be over-emphasized in the application of the Type 5905 to uhf. The careful reduction of coupling effects within the tube may be nullified if sufficient capacitance and mutual inductance exist in wiring external to the tube.

The three cathode leads provided in the 5905 allow isolation of the input and output circuit returns. Two of the three leads can be used to best advantage in the

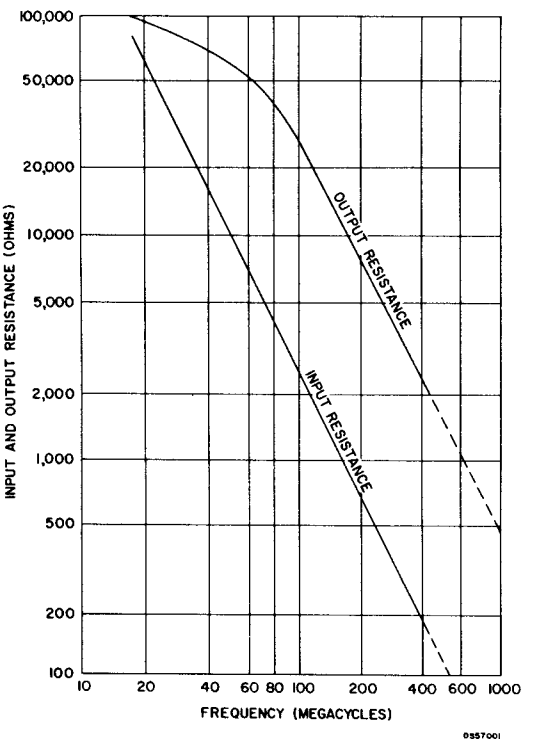


Figure 1—Input and output resistance vs frequency

APPLICATION DATA (Continued)

input circuit return, to provide the high input impedance shown in Figure 1.

A power gain of approximately 2 has been obtained from a Type 5905 at 400 megacycles using a single stage with matched input and output. At those frequencies where circuit impedances are relatively high in comparison with tube impedances and can be neglected, the power gain may be approximated as:

$$\text{Power Gain} = \left[\frac{gm\sqrt{\text{Rinput x Routput}}}{2}\right]^2$$

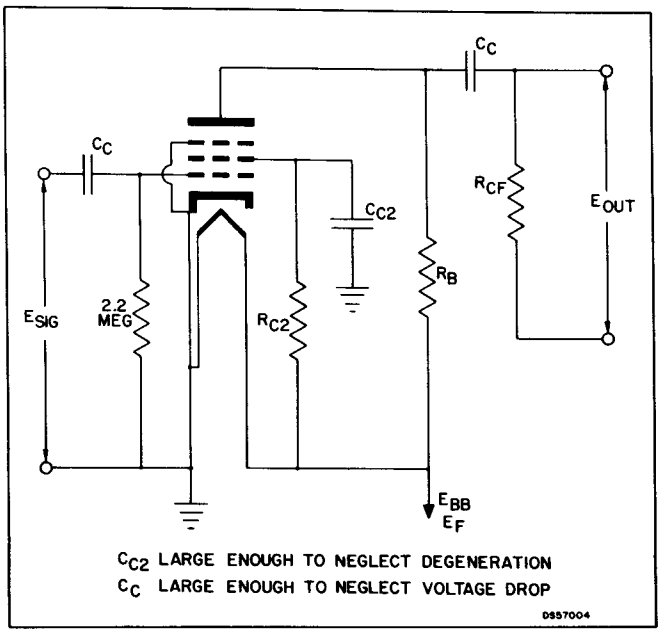
Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tube in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy.

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

RESISTANCE COUPLED AMPLIFIER DATA
ZERO-BIAS OPERATION

Ef = Ebb (volts)	21.0		26.5		30.0	
Rb (megohms)	0.27	0.47	0.27	0.47	0.27	0.47
R_{c_2} (megohms)	0.68	1.20	0.68	1.20	0.68	1.20
Rcf (megohms)	2.0	2.0	2.0	2.0	2.0	2.0
Esig (volts, rms)	0	0	0	0	0	0
Ib (ma)	0.050	0.031	0.068	0.082	0.082	0.050
I_{c_2} (ma)	0.021	0.013	0.029	0.017	0.034	0.020
Eb (volts)	7.5	6.4	8.1	6.8	7.8	6.5
E_{c_2} (volts)	6.7	5.4	6.8	6.1	6.9	6.0
Esig (volts, rms)	0.05	0.05	0.05	0.05	0.05	0.05
Eout (volts, rms)	3.0	3.1	3.4	3.8	3.8	4.1
Gain	60	62	68	76	76	82
% Distortion	4.2	4.4	3.1	3.8	2.4	4.3
Esig* (volts, rms)	0.07	0.06	0.07	0.06	0.07	0.06
Eout (volts, rms)	3.6	3.6	4.1	4.2	5.0	4.7
Gain	51	60	59	70	71	78
% Distortion	6.2	5.3	4.9	4.9	4.8	5.5

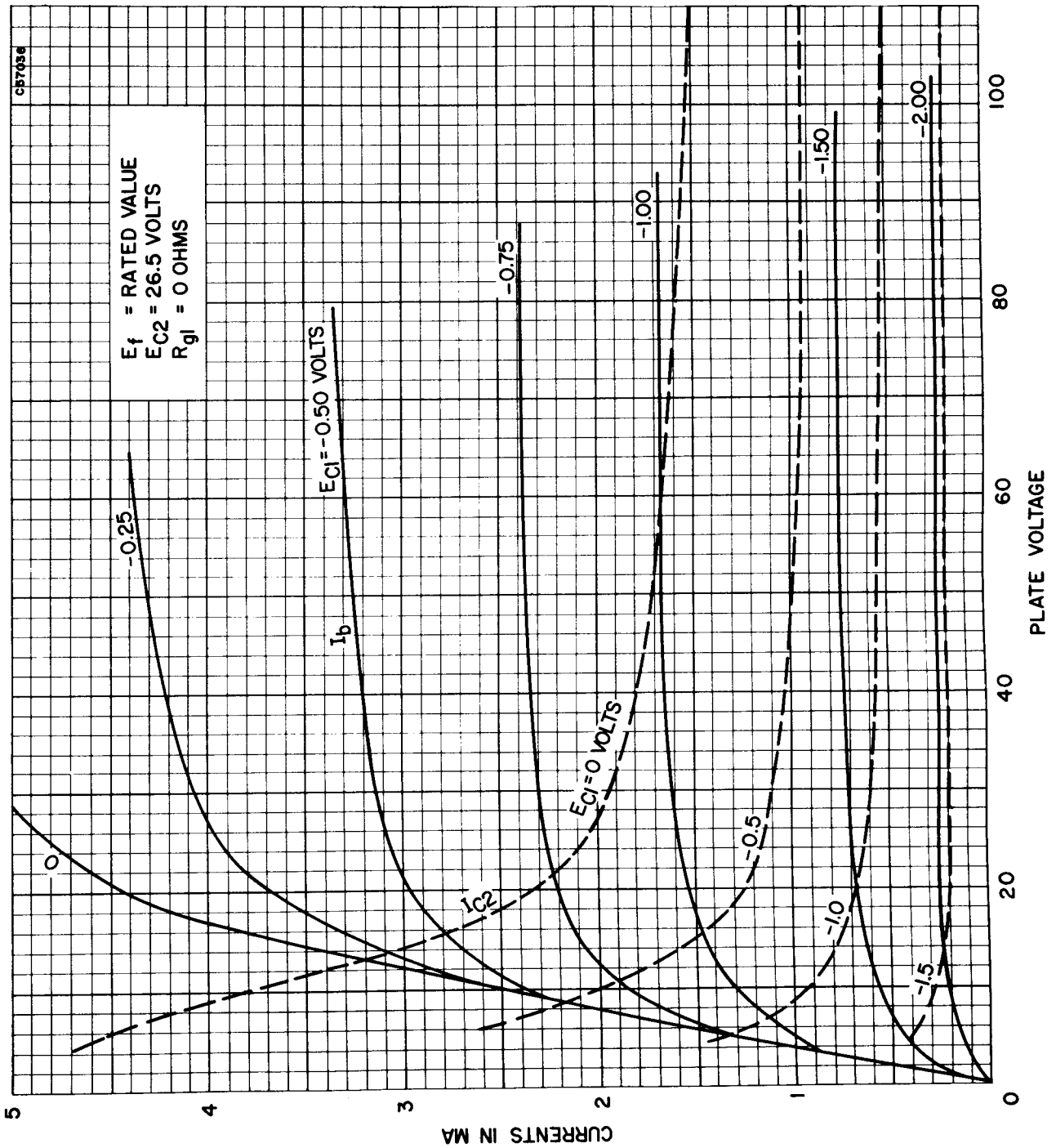
*Maximum Signal for 5% Distortion



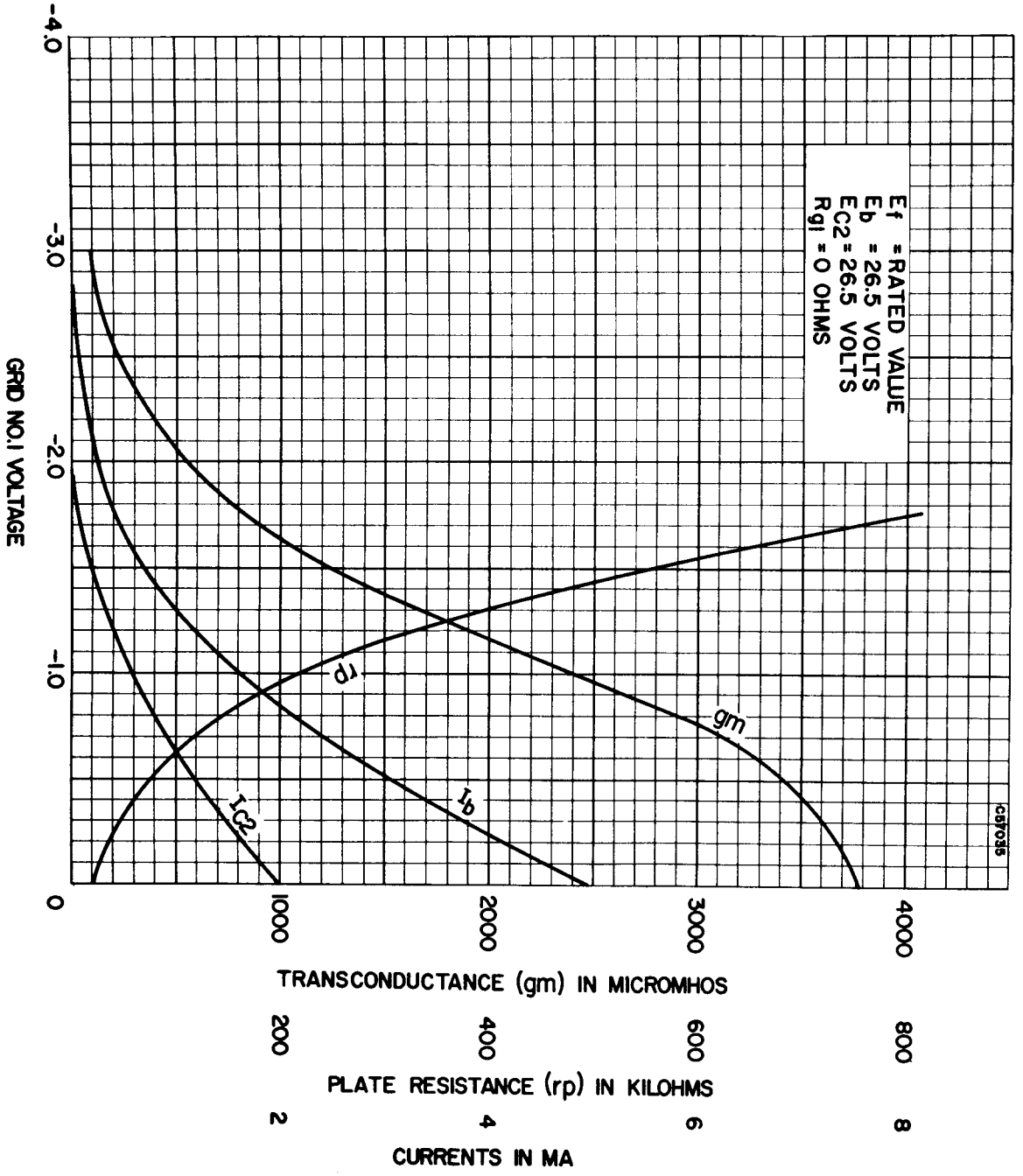
Resistance coupled amplifier circuit

The information presented on this data sheet is furnished without assuming any obligation.

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DL
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.	
Heater Voltage[3]	25.2	26.5	27.8	V
Heater Current		45		mA

DIRECT INTERLODE CAPACITANCES

	Shielded[4]	Unshielded	
Grid No. 1 to Plate	0.015	0.03 μμf	Max.
Input	4.2	4.0 μμf	
Output	3.4	1.9 μμf	

RATINGS[1 & 5] (Absolute Maximum)

Plate Voltage	165 Vdc
Peak Plate Forward Voltage[6]	330 v
Grid No. 2 Voltage	155 Vdc
Plate Dissipation	1.1 W
Grid No. 2 Dissipation	0.55 W
Cathode Current	16.5 mAdc
Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid No. 1 Circuit Resistance	1.1 Meg

CHARACTERISTICS

Plate Voltage	100 Vdc
Grid No. 2 Voltage	100 Vdc
Cathode Resistor	150 Ohms
Plate Current	7.5 mAdc
Grid No. 2 Current	2.4 mAdc
Transconductance	5000 μmhos
Plate Resistance	260000 Ohms
Grid No. 1 Voltage for Ib = 50 μAdc Max.	-9.0 Vdc

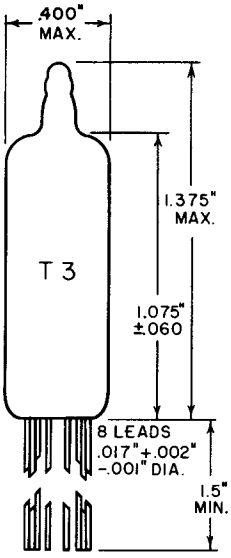
NOTES:

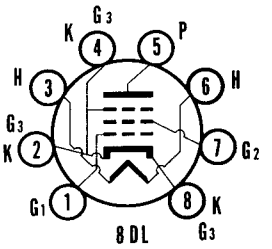
1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltage (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 26.5 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Per MIL-E-1C Par. 6.5 and General Section of this Sylvania Subminiature Tube Manual titled Specifications and Ratings.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5906 is a sharp cutoff pentode characterized by long life and stable performance under conditions of severe shock, vibration, high temperature and high altitude. Except for heater characteristics, the Type 5906 is identical to the Type 5840. The 5906 employs a 26.5 volt, 45 ma heater.

The 5906 is suited to a variety of low frequency applications as well as rf amplifier service at frequencies up to 400 mc.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
AUGUST, 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	26.5 V	Grid No. 2 Voltage	100 Vdc
Plate Voltage	100 Vdc	Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1	0 V
Grid No. 1 Voltage	0 V	Cathode Resistor	150 Ohms

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Tests	Limits Min.	Limits Bogey	Limits Max.	Units
Production Tests					
4.10.8	Heater Current:	40	45	50	mA
4.10.6.1	Grid No. 1 Current:	0	—	-0.3	μAdc
4.10.4.1	Plate Current: (1)	5.5	7.5	9.5	mAdc
4.10.4.1	Plate Current (2) Ec1 = -9 Vdc	0	—	50	μAdc
4.10.4.3	Grid No. 2 Current:	0.5	2.4	3.5	mAdc
4.10.9	Transconductance (1):	4100	5000	5900	μmhos
Special Design Tests					
4.9.5.3	Subminiature Lead Fatigue:	4	—	—	Arcs
4.9.19.2	Vibration: F = 40 cps; G = 15; Rp = 10K Ohms; Ck = 1000 μf	—	—	60	mVac
4.10.15	Heater-Cathode Leakage:				
	Ehk = +100 Vdc	0	—	7	μAdc
	Ehk = -100 Vdc	0	—	7	μAdc
4.8	Insulation of Electrodes: Eg1-all = -100 Vdc; Ef = 26.5 V	100	—	—	Megs
4.10.3.2	AF Noise: Esig = 70 mVac; Rg1 = 0.1 Meg; Rg2 = 1000 Ohms; Rp = 0.2 Meg; Ecc2 = 19 Vdc; Ebb = 100 Vdc	—	—	17	VU
Design Tests					
4.10.9	Transconductance (2): Ef = 24.0 V;	3750	—	—	μmhos
4.10.10	Plate Resistance:	0.150	—	—	Meg
4.10.14	Capacitance: 0.405" Dia. Shield Tied to Cathode				
	Cg1p	—	—	0.015	μμf
	Cin	3.5	4.2	4.9	μμf
	Cout	2.9	3.4	3.9	μμf
Degradation Tests					
4.9.20.5	Shock: Note 1 Hammer Angle = 30°	—	—	—	
4.9.20.6	Fatigue: Note 1 F = 60 cps; G = 2.5; Ef = 26.5 V	—	—	—	
- - - - -	Post Shock Test End Points: Vibration	—	—	200	mVac
- - - -	Post Fatigue Test End Points: Vibration	—	—	100	mVac
- - - - -	Post Shock and Fatigue Test End Points:				
	Heater-Cathode Leakage	—	—	20	μAdc
	Transconductance (1)	3750	—	—	μmhos

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Tests	Limits Min.	Limits Bogey	Limits Max.	Units
Acceptance Life Tests					
4.11.7	Heater Cycling Life Test Ef = 29.0 V; 1 min. On, 4 min. Off; Eb = Ec2 = Ec1 = 0 V; Ehk = 140 Vac	2500	—	—	Cycles
4.11.5	Intermittent Life Test: Note 2 Rg1 = 1.0 Meg; Ehk = +200 Vdc; TA = 175°C	500	—	—	Hours
4.11.4	Intermittent Life Test End Points Transconductance (1)	3250	—	—	μmhos
	Heater-Cathode Leakage	0	—	20	μAdc
	Grid Current	—	—	-0.9	μAdc

ACCEPTANCE CRITERIA NOTES

1: Acceptance sampling procedure shall be in accordance with the shock test sampling procedure of the Inspection Instructions for Electron Tubes.

2: At the conclusion of the five hundred hour life test, the average life of the life test sample shall be not less than four hundred fifty hours. Life test sample size shall be ten tubes. Provision for release of tubes prior to completion of life test on a reduced basis as specified in 4.3.1.3 Inspection Instructions for Electron Tubes shall not apply.

APPLICATION DATA

The 5906 is a subminiature sharp cutoff pentode characterized by long life and stable performance under conditions of severe shock, vibration, high altitude and high temperature. Except for heater characteristics, the 5906 is identical to the Type 5840. The 5906 employs a 26.5 volt, 45 ma heater. The 5906 is suited to a variety of low frequency applications as well as rf amplifier service at frequencies up to 400 mc.

As the frequency of operation is increased, consideration should be given to the resultant decrease in input and output resistance, Figure 1. Assuming matched input and output impedances, approximate tube gain can be obtained from the formula:

$$\text{Voltage Gain} = Gm \sqrt{\frac{R_{input} \times R_{output}}{2}}$$

where the values of Rinput and Routput are obtain from the curves of Figure 1. The use of this formula assumes matched impedances into and out of the amplifier stage under consideration. If the source impedance is lower than the input resistance or if the load resistance is higher than the output resistance, much greater voltage gain per stage can be obtained than that indicated by the above formula. The voltage gain of a matching circuit is equal to the square root of the impedance ratio.

In some applications it may be advantageous to employ an unbypassed resistance in the cathode circuit to compensate for the change in input capacitance with bias. This unbypassed resistance reduces the effective Gm of the tube by the factor

$$\frac{1}{1 + Gm\ Rk\left(\frac{Ib + Ic2}{Ib}\right)}$$

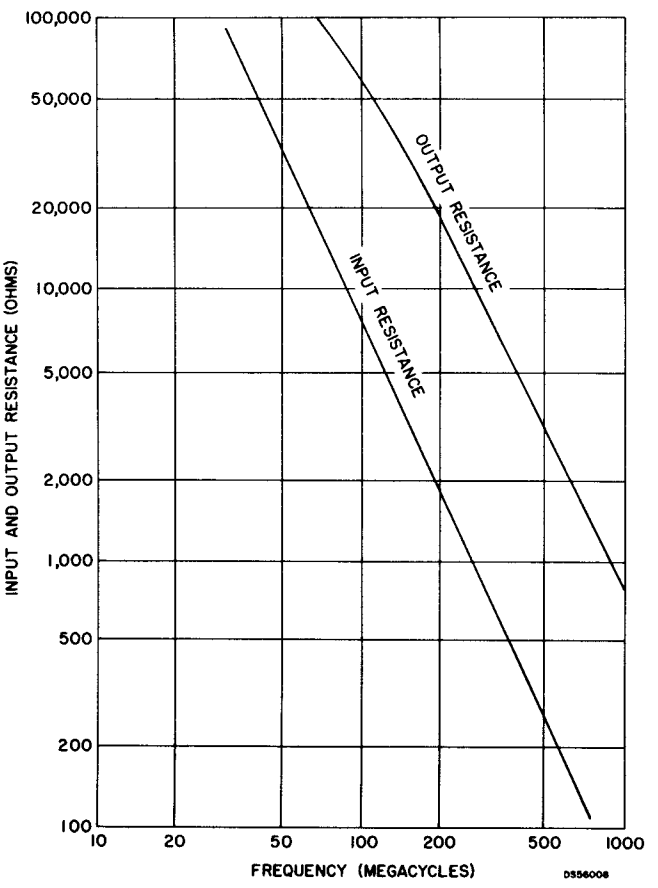


Figure 1—Input and output resistance vs frequency

APPLICATION DATA (Continued)

However, this unbypassed resistance also has the effect of raising the input resistance of the tube under certain operating conditions so that both a net increase in gain and a net decrease in input capacitance change may result. Some increase in effective grid-plate coupling may accompany these advantages.

The self neutralization frequency of the 5906 is approximately 200 mc. At this point the inductance of tube leads resonate with the grid plate capacitance to effect neutralization. At higher frequencies the feedback is inductive and takes place through the tube leads. Three cathode leads are provided to permit isolation of the input and output circuits.

Resistance coupled amplifier data is presented in the accompanying table.

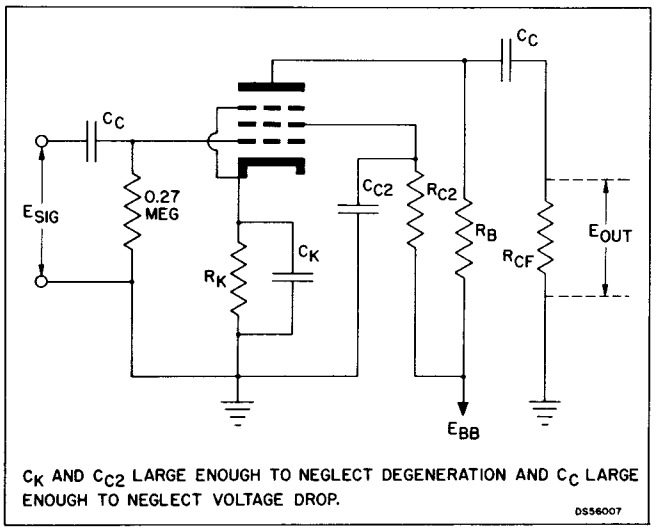
Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tube in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy.

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

RESISTANCE COUPLED AMPLIFIER DATA
SELF-BIAS OPERATION

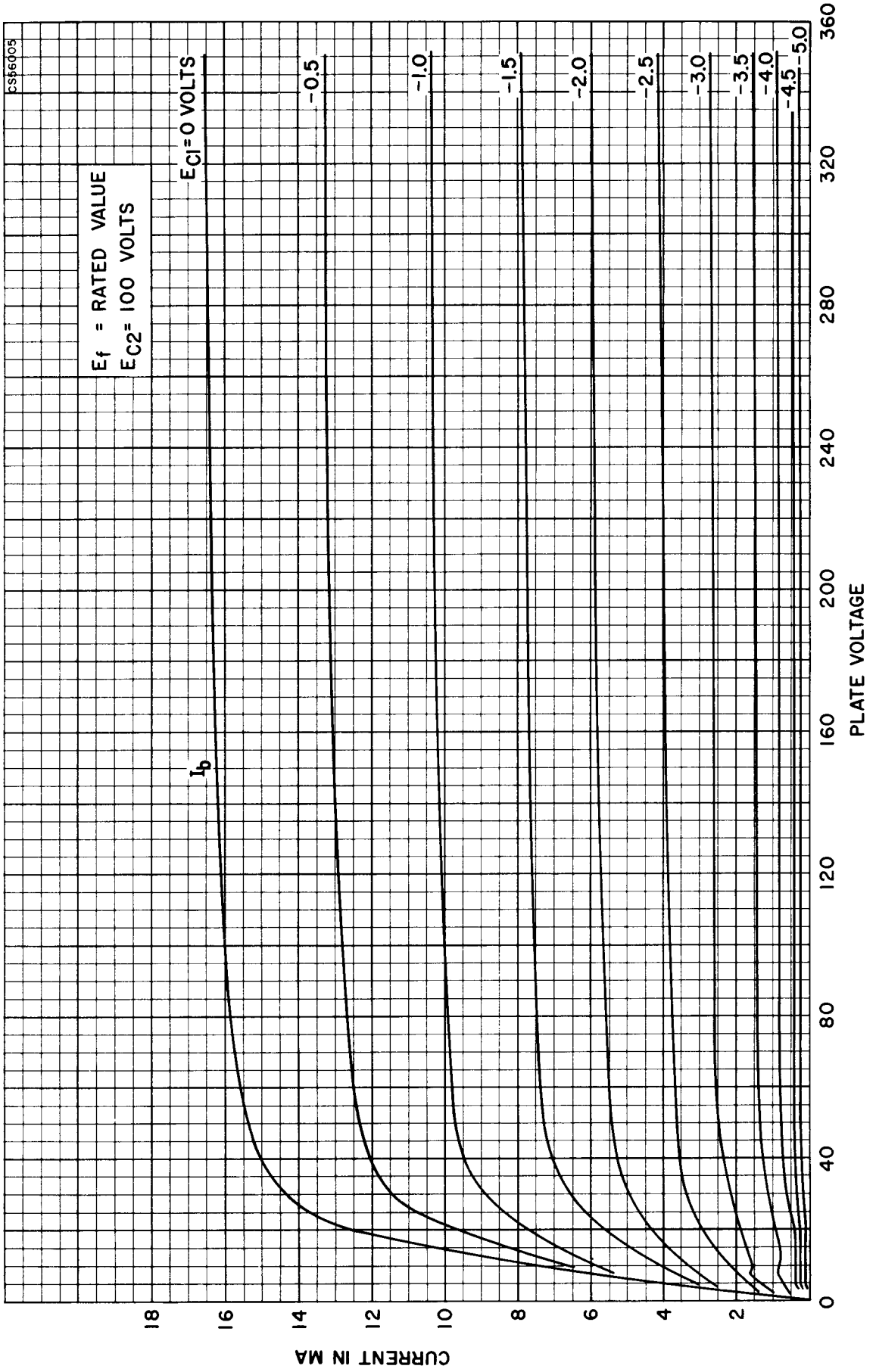
	Ebb = 100 Volts						Ebb = 150 Volts					
Rb (megohms)	0.100		0.270		0.470		0.100		0.270		0.470	
Rc2 (megohms)	0.220		0.680		1.20		0.270		0.820		1.50	
Rcf (megohms)	0.27	0.47	0.47	1.0	0.47	1.0	0.27	0.47	0.47	1.0	0.47	1.0
Rk (ohms)	820	820	2200	2200	3300	3300	560	560	1500	1500	2200	2200
Ib (ma)	0.75	0.75	0.273	0.273	0.164	0.164	1.13	1.13	0.42	0.42	0.247	0.247
Ic2 (ma)	0.292	0.292	0.102	0.102	0.062	0.062	0.41	0.41	0.143	0.143	0.083	0.083
Ec1 (volts)	−0.855	−0.855	−0.825	−0.825	−0.746	−0.746	−0.862	−0.862	−0.845	−0.845	−0.726	−0.726
Ec2 (volts)	35.8	35.8	31.4	31.4	25.5	25.5	39.3	39.3	32.8	32.8	25.6	25.6
Eb (volts)	25.0	25.0	26.3	26.3	22.9	22.9	37.0	37.0	36.7	36.7	34.0	34.0
Esig (volts, rms)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Eout (volts, rms)	8.2	9.0	9.5	11.8	9.2	11.7	11.5	12.5	13.2	15.5	13.0	16.7
Gain	82	90	95	118	92	117	115	125	132	155	130	167
% Distortion	2.8	3.8	2.5	3.0	3.1	2.3	1.5	2.2	2.4	2.4	3.7	3.0
Esig* (volts, rms)	0.23	0.22	0.15	0.16	0.12	0.14	0.20	0.18	0.16	0.16	0.11	0.14
Eout (volts, rms)	17.7	18.6	13.6	17.0	11.0	16.0	21.7	21.7	20.5	24.0	14.0	22.2
Gain	77	85	91	106	92	114	109	120	128	150	127	159
% Distortion	4.9	4.8	4.7	4.4	4.8	5.0	4.8	5.0	4.9	4.8	4.2	4.8

* Maximum signal for 5% distortion or ⅛ microampere grid current.



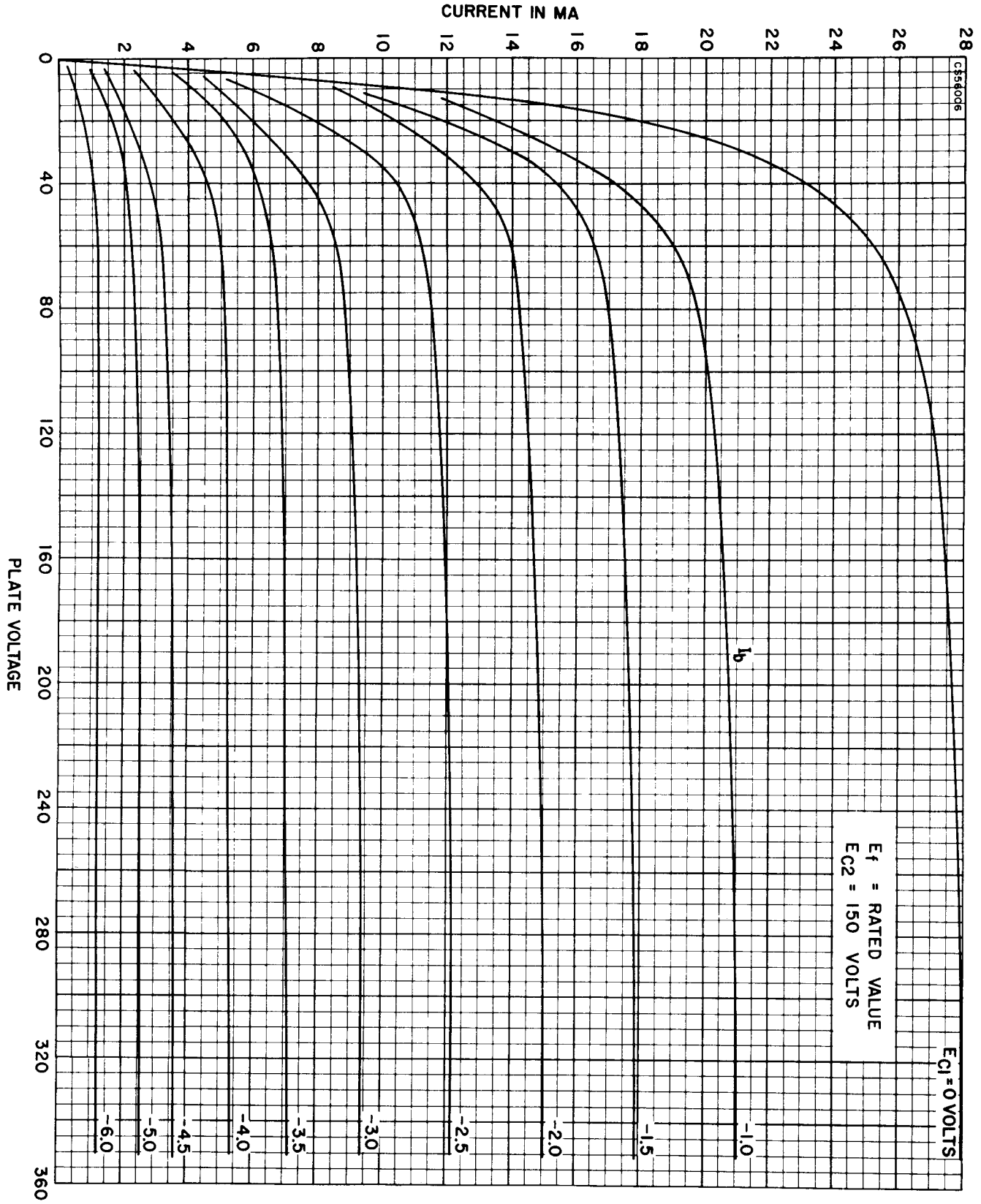
Resistance coupled amplifier circuit.

AVERAGE PLATE CHARACTERISTICS
(PENTODE CONNECTED)

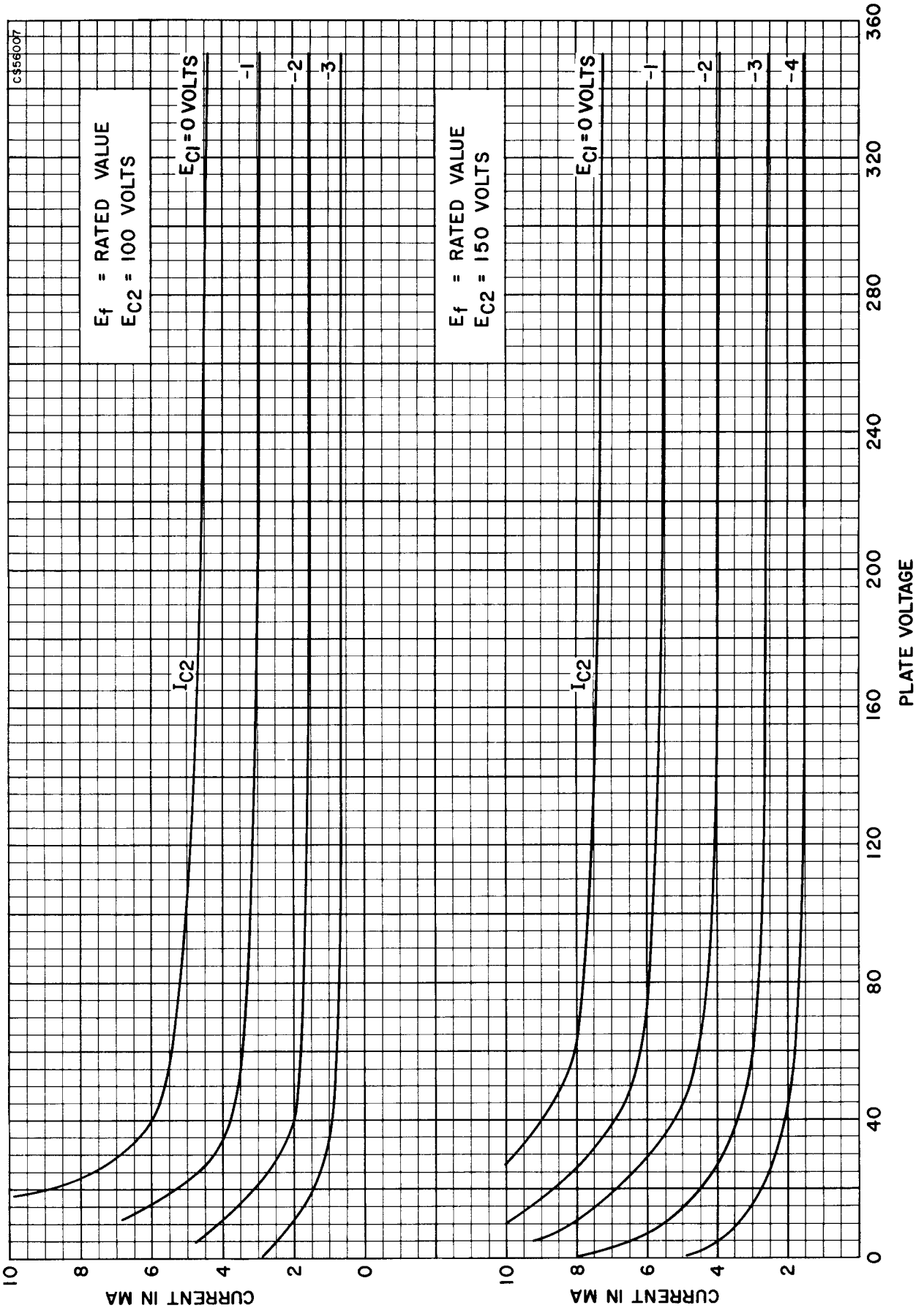


AVERAGE PLATE CHARACTERISTICS

(PENTODE CONNECTED)

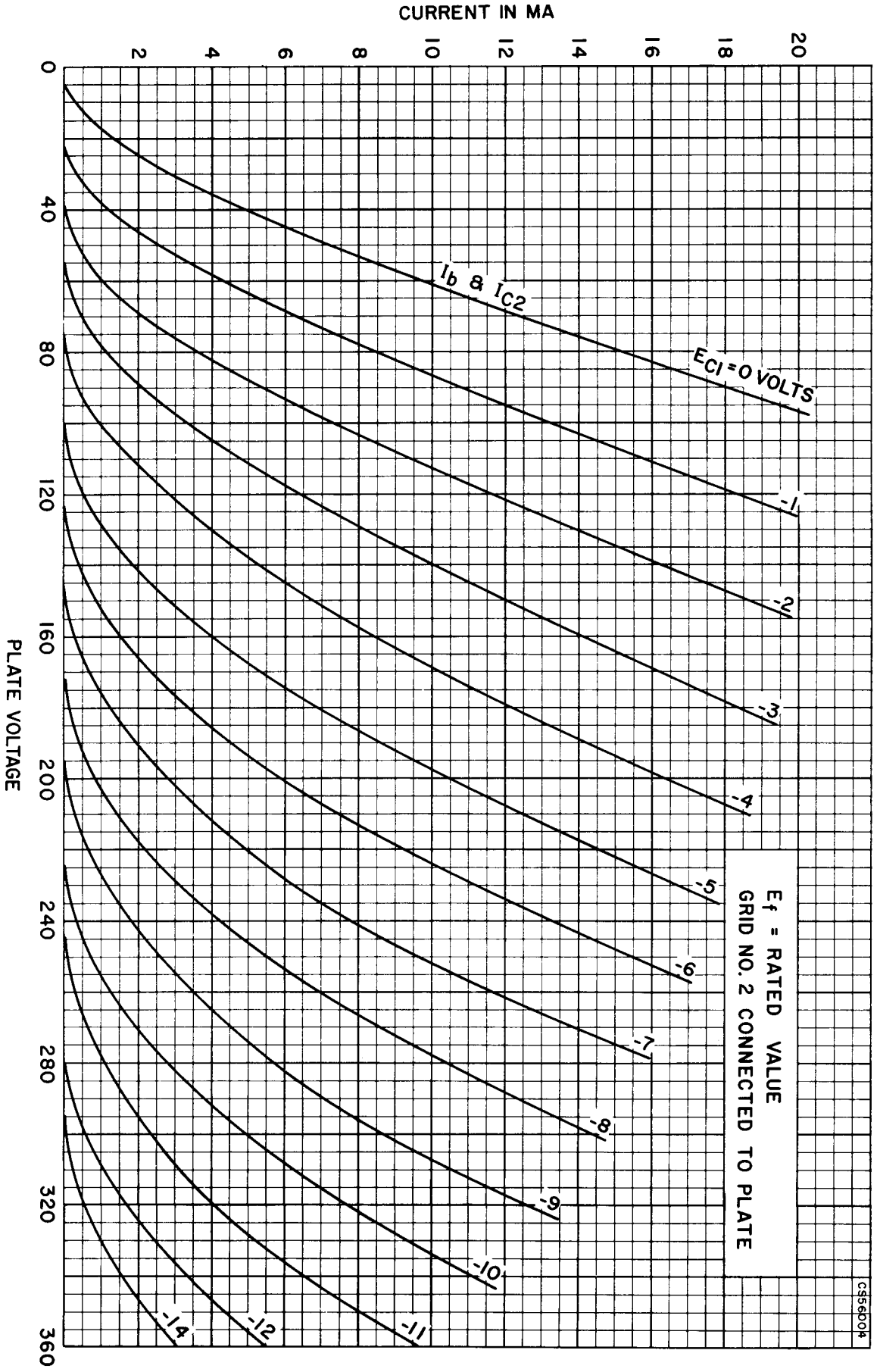


AVERAGE GRID No. 2 CHARACTERISTICS
(PENTODE CONNECTED)

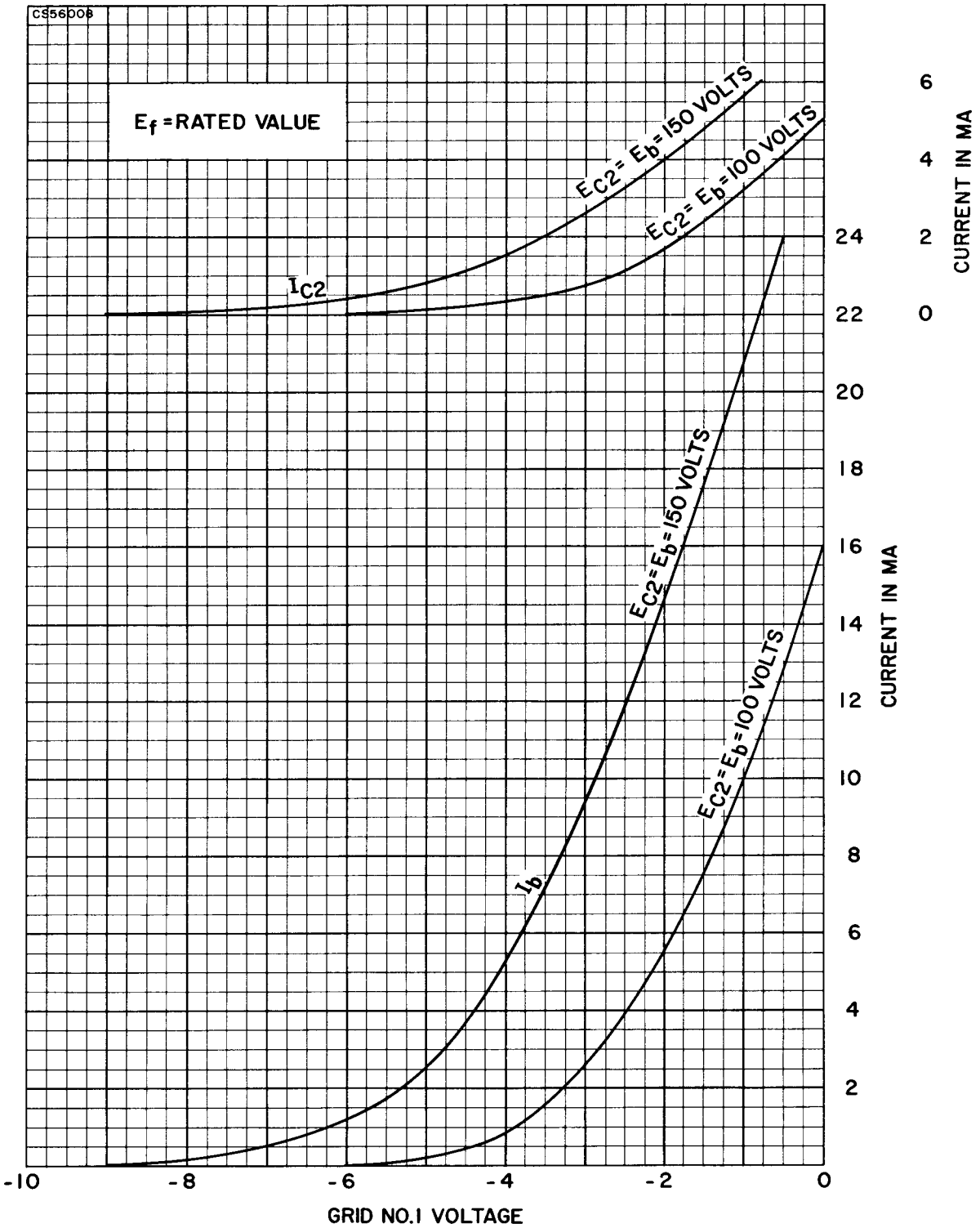


AVERAGE PLATE CHARACTERISTICS

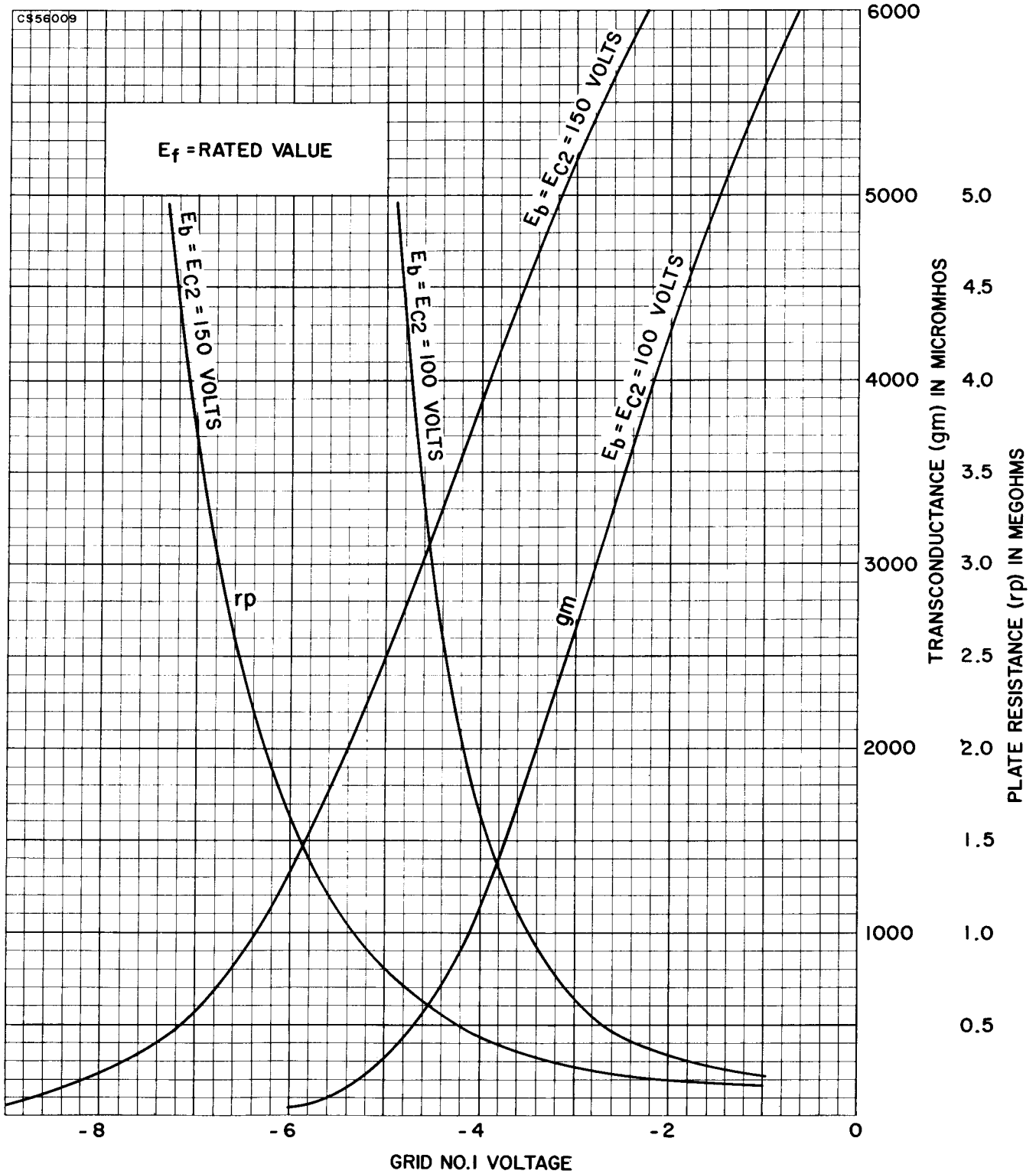
(TRIODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE CONNECTED)



SYLVANIA

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5907

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DL
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[2]	25.2	26.5	27.8 V
Heater Current		45	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[3]	Unshielded
Grid No. 1 to Plate	0.015 Max.	0.03 μμf
Input	4.0	4.0 μμf
Output	3.4	1.9 μμf

RATINGS[1 & 4] (Absolute Maximum)

Plate Voltage	55 Vdc
Grid No. 2 Voltage	55 Vdc
Cathode Current	10.0 mAdc
Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	100 v
Heater Negative with Respect to Cathode	100 v
Grid No. 1 Circuit Resistance	2.4 Meg

CHARACTERISTICS

Plate Voltage	26.5 Vdc
Grid No. 2 Voltage	26.5 Vdc
Grid No. 1 Resistor	2.2 Meg
Plate Current	2.7 mAdc
Grid No. 2 Current	1.1 mAdc
Transconductance	3000 μmhos
Plate Resistance	100,000 Ohms
Grid No. 1 Voltage for Transconductance = 50 μmhos Max.	-4.5 Vdc

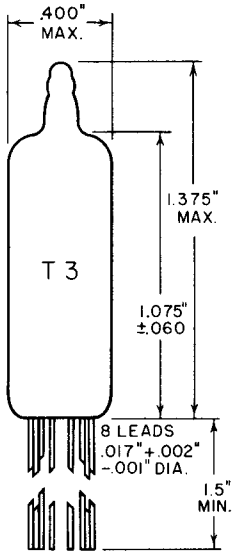
NOTES:

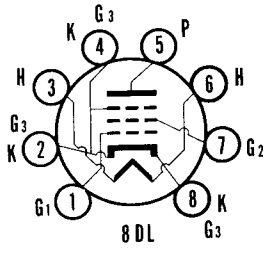
1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 26.5 volts.*
3. *External shield of 0.405 inch diameter connected to cathode.*
4. *Values shown are as registered with RETMA.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5907 is a remote cutoff pentode designed to operate at a heater, plate and Grid No. 2 voltage of 26.5 volts. It is intended for use as an rf amplifier at frequencies up to 400 mc, as well as many low frequency applications.

The 5907 is designed for dependable operation under conditions of severe shock, vibration, high temperature and high altitude, and is manufactured and inspected to meet the applicable MIL-E-1 specification.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

AUGUST, 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	26.5 V	Grid No. 2 Voltage	26.5 Vdc
Plate Voltage	26.5 Vdc	Grid No. 1 Resistor	2.2 Meg

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Tests	Limits Min.	Limits Bogey	Limits Max.	Units
Production Tests					
4.10.8	Heater Current:	40	45	50	mA
4.10.6.1	Grid Current: Eb = Ec2 = 50 Vdc; Ec1 = −1.5 Vdc; Rg = 0.1 Meg	0	—	−0.3	μAdc
4.10.4.1	Plate Current:	1.7	2.7	3.7	mAdc
4.10.4.3	Grid No. 2 Current:	0	1.1	1.9	mAdc
4.10.9	Transconductance (1): Cg1 = 1 μf	2400	3000	3600	μmhos
Special Design Tests					
4.9.5.3	Subminiature Lead Fatigue:	4	—	—	Arcs
4.9.19.2	Vibration: F = 40 cps; G = 15; Rp = 10,000 Ohms; Cg1 = 1 μf	—	—	30	mVac
4.10.15	Heater-Cathode Leakage: Ehk = +100 Vdc Ehk = −100 Vdc	— —	— —	10 10	μAdc μAdc
4.8	Insulation of Electrodes: Eg1 — All; Ef = 26.5 V	100	—	—	Meg
4.10.3.2	AF Noise: Ebb = 100 Vdc; Ecc2 = 19 Vdc; Rg1 = 2.2 Meg; Rg2 = 1000 Ohms; Rp = 0.2 Meg; Esig = 70 mVac	—	—	17	VU
Design Tests					
4.10.9	Transconductance (2): Ef = 24.0 V; Cg1 = 1 μf	2200	—	—	μmhos
4.10.9	Transconductance (3): Ec1 = −4.5 Vdc; Cg1 = 1 μf	0.1	—	50	μmhos
4.10.10	Plate Resistance: Cg1 = 1 μf	0.065	0.1	—	Meg
4.10.14	Capacitance: 0.405 In. Dia. Shield Tied to Cathode Cg1p Cin Cout	— 3.5 2.9	— 4.0 3.4	0.015 4.5 3.9	μμf μμf μμf

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Tests	Limits Min.	Limits Bogey	Limits Max.	Units
Acceptance Life Tests					
4.9.20.5	Shock: Note 1 Hammer Angle = 30°	—	—	—	
4.9.20.6	Fatigue: Note 1	—	—	—	
- - - - -	Post Shock Test End Points: Vibration	—	—	100	mVac
- - - - -	Post Fatigue Test End Points: Vibration	—	—	75	mVac
- - - - -	Post Shock and Post Fatigue Test End Points: Heater-Cathode Leakage	0	—	20	μAdc
	Transconductance (1)	2100	—	—	μmhos
Degradation Tests					
4.11.7	Heater Cycling Life Test: Ef = 29.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Eb = Ec2 = Ec1 = 0; Rg1 = 0	2500	—	—	Cycles
4.11.5	Intermittent Life Test: Note 2 Rg1 = 2.2 Meg; Ehk = +200 Vdc; TA = 175°C	500	—	—	Hours
	Intermittent Life Test End Points: Note 2				
	Transconductance (1)	1500	—	—	μmhos
	Heater-Cathode Leakage	0	—	30	μAdc
	Grid Current	—	—	-0.9	μAdc

ACCEPTANCE CRITERIA NOTES:

1: Acceptance sampling procedure shall be in accordance with the shock test sampling procedure of the Inspection Instructions for Electron Tubes.

2: At the conclusion of the five hundred hour life test, the average life of the life test sample shall be not less than four hundred fifty hours. Life test sample size shall be ten tubes. Provision for release of tubes prior to completion of life test on a reduced basis as specified in 4.3.1.3 Inspection Instructions for Electron Tubes shall not apply.

APPLICATION DATA

The Premium Subminiature Type 5907 is an ultra high frequency pentode designed for operation with 26.5 volts on heater, plate and Grid No. 2. This type may be used with grid-resistor bias to avoid the loss of plate voltage associated with cathode-biasing systems. The tube impedances are lower than those encountered in higher voltage tubes, but this is a natural result of the very low voltages employed. Input and output resistance are plotted as a function of frequency in Figure 1.

These input and output loading effects must be considered in uhf circuit design. As in any uhf pentode, the grid-plate feedback is not primarily dependent on grid-plate capacitance. At uhf the inductances of tube leads will go into resonance with the grid-plate capacitance, thereby effecting complete neutralization within the tube at some frequency. This self-neutralization point in the 5907 is approximately 200 megacycles. At higher frequencies the feedback is inductive, and takes place primarily through the tube leads.

The importance of short leads cannot be overemphasized in the application of the Type 5907 to uhf. The careful reduction of coupling effects within the tube may be nullified if sufficient capacitance and mutual inductance exist in wiring external to the tube.

The three cathode leads provided in the 5907 allow isolation of the input and output circuit returns. Two of the three leads can be used to best advantage in the input circuit return, to provide the high input impedance shown in Figure 1.

A power gain of approximately 2 can be obtained in a proper circuit at 400 megacycles. Progressively better performance can be obtained at lower frequencies. In a single stage with matched input and output, the power gain can be expressed as

$$\text{Power Gain} = \left[\frac{gm\sqrt{Rinput \times Routput}}{2}\right]^2$$

This applies only to the higher frequency ranges, where circuit impedances are relatively high in comparison with tube impedances and can be neglected.

APPLICATION DATA (Continued)

The 5907 is manufactured and inspected to meet the applicable MIL-E-1 specifications for reliability.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy.

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

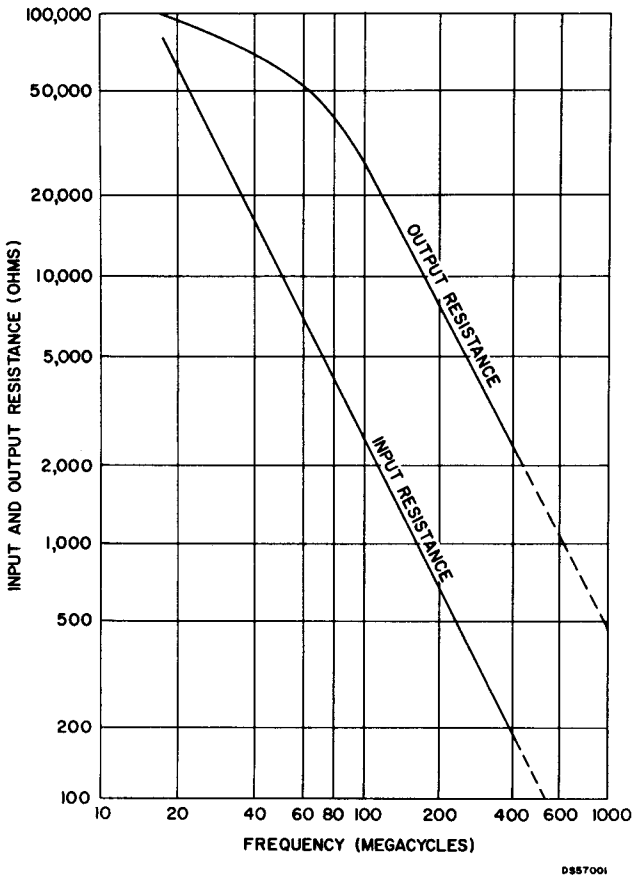
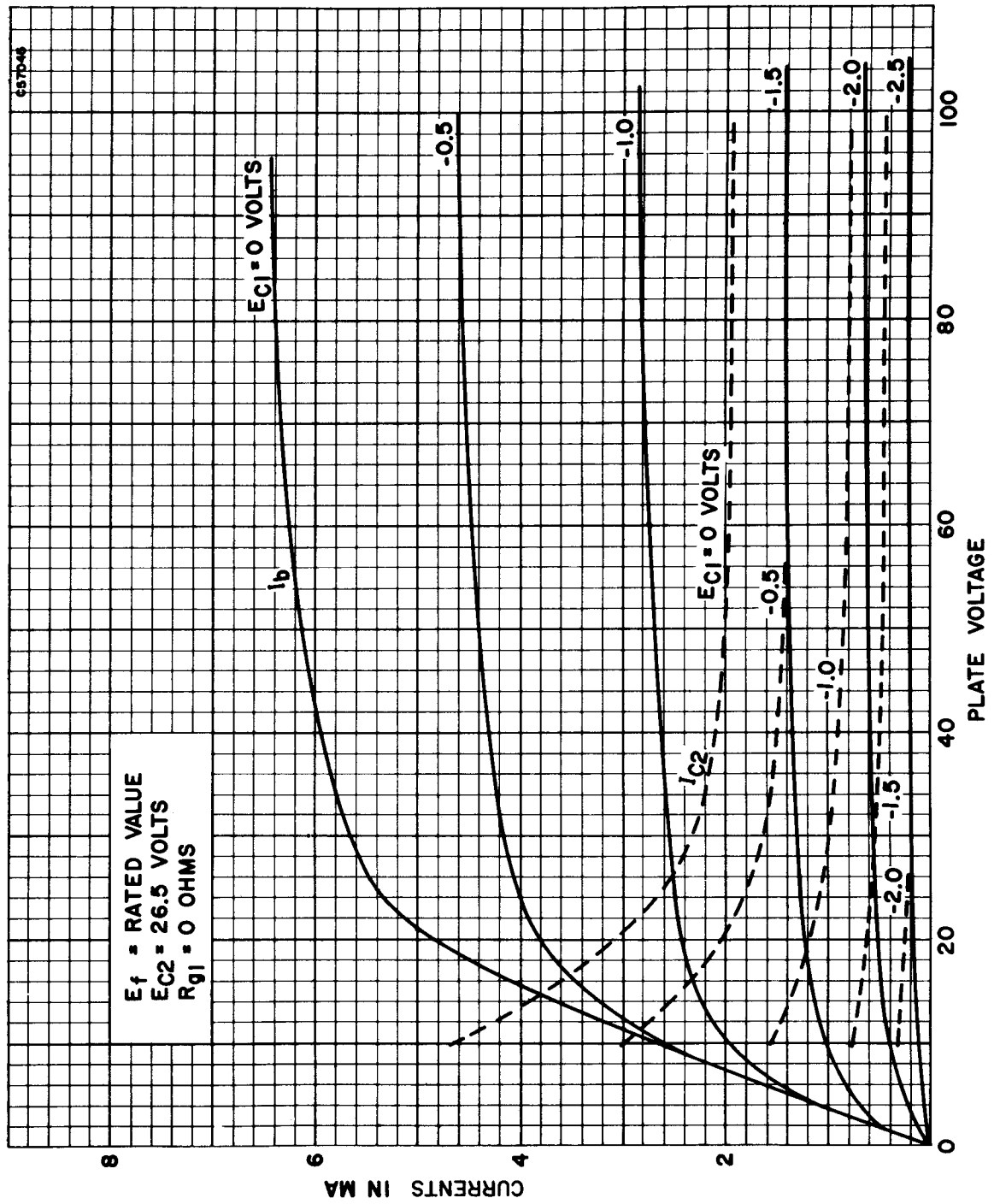


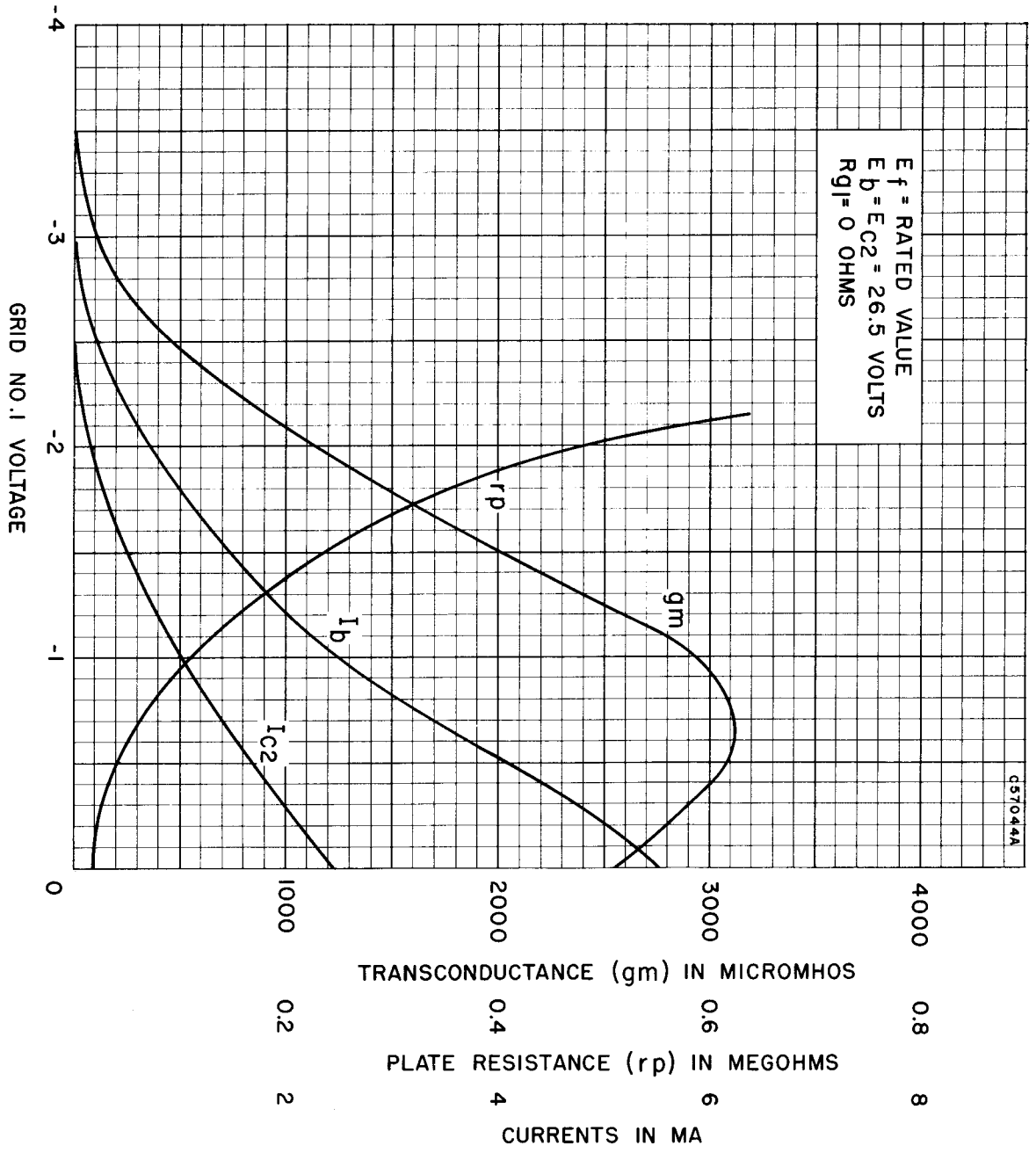
Figure 1—Input and output resistance vs frequency

The information presented on this data sheet is furnished without assuming any obligation.

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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5908

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DC
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.	
Heater Voltage[2]	25.2	26.5	27.8	V
Heater Current		150		mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[3]	Unshielded	
Grid No. 1 to Plate	0.06	0.08 μμf	Max.
Grid No. 1 to All Other Elements	4.0	4.0 μμf	
Grid No. 1 to Grid No. 3	0.26	0.26 μμf	Max.
Grid No. 3 to All Other Elements	4.6	4.6 μμf	
Grid No. 3 to Plate	1.9	2.0 μμf	Max.
Plate to All Other Elements	4.6	3.2 μμf	

RATINGS[1 & 4] (Absolute Maximum)

Plate Voltage	55 Vdc
Grid No. 2 Voltage	55 Vdc
DC Grid No. 3 Voltage	
Negative Value	55 Vdc
DC Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Grid No. 3 Current	1.5 mAdc
Grid No. 1 Current	1.5 mAdc
Cathode Current	10.0 mAdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	100 v
Heater Negative with Respect to Cathode	100 v
Grid No. 1 Circuit Resistance	2.4 Meg

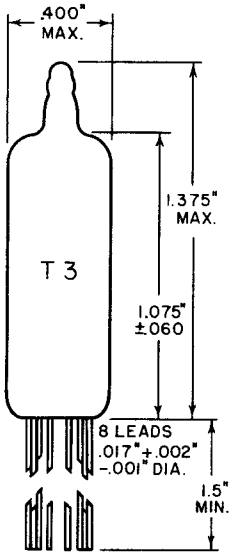
CHARACTERISTICS[5]

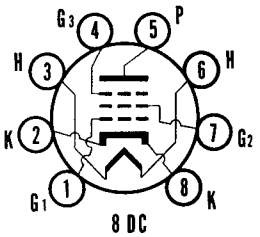
	Amplifier	Mixer	
Plate Voltage	26.5	26.5	Vdc
Grid No. 2 Voltage	26.5	26.5	Vdc
Grid No. 3 Voltage	0	0	Vdc
Grid No. 3 Voltage	0	10	Vac
Grid No. 1 Resistor	2.2	2.2	Meg
Plate Current	3.3	2.1	mAdc
Grid No. 2 Current	2.0	2.4	mAdc
Transconductance, Grid No. 1 to Plate	2200	—	μmhos
Transconductance, Grid No. 3 to Plate	550	—	μmhos

QUICK REFERENCE DATA

The Premium Subminiature Type 5908 is a sharp cutoff, dual control pentode designed to operate from a 26.5 volt heater and B supply. This type is particularly useful as a mixer at frequencies up to 400 mc, but may also be used in gating and other applications at low frequencies.

The type 5908 is designed for operation under conditions of severe shock, vibration, high temperature and high altitude, and is manufactured and inspected to meet the applicable MIL-E-I specification for reliable operation.





8 DC

SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

AUGUST, 1957

CHARACTERISTICS[5] (Continued)

	Amplifier	Mixer
Plate Resistance	31000	65000 Ohms
Conversion Transconductance Direct Transformer Input	—	1000 μmhos
Grid No. 1 Voltage for Ib = 10 μa (approx.)	-5	— Vdc
Grid No. 3 Voltage for Ib = 10 μa (approx.)	-7	— Vdc

NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 26.5 volts.*
3. *External shield of 0.405 inch diameter connected to cathode.*
4. *Values shown are as registered with RETMA.*
5. *All voltages referred to ground.*

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	26.5 V	Grid No. 3 Voltage (Tie to Cathode)	0 Vdc
Plate Voltage	26.5 Vdc	Grid No. 1 Resistor	2.2 Meg
Grid No. 2 Voltage	26.5 Vdc		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Tests	Limits Min.	Limits Bogey	Limits Max.	Units
Production Tests					
4.10.8	Heater Current	40	45	50	mA
4.10.6.1	Grid Current: Ec2 = Eb = 50 Vdc; Ec1 = -1.5 Vdc; Rg1 = 0.1 Meg	0	—	-0.3	μAdc
4.10.4.1	Plate Current (1):	2.4	3.3	4.6	mAdc
4.10.4.1	Plate Current (2): Ec1 = -5 Vdc; Rg1 = 0	0	—	100	μAdc
4.10.4.3	Grid No. 2 Current	0.8	2.0	3.4	mAdc
4.10.9	Transconductance (1): Smg1p Cg1 = 1 μf	1800	2200	2600	μmhos
Special Design Tests					
4.9.5.3	Subminiature Lead Fatigue:	4	—	—	Arcs
4.9.19.2	Vibration : F = 40 cps; G = 15; Cg1 = 1 μf; Rp = 10,000 Ohms	—	—	100	mVac
4.10.15	Heater-Cathode Leakage Ehk = +100 Vdc	0	—	10	μAdc
	Ehk = -100 Vdc	0	—	10	μAdc

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Tests	Limits Min.	Limits Bogey	Limits Max.	Units
Special Design Test (Continued)					
4.8	Insulation of Electrode Eg1 — All = -100 Vdc; Ef = 26.5 V	100	—	—	Meg.
4.10.4.1	Plate Current (3): Ec3 = -7.0 Vdc; Ec1 = 0; Rg1 = 0	0	—	50	μAdc
4.10.3.2	AF Noise: Esig = 70 mVac; Rg2 = 1000 Ohms; Rp = 0.2 Meg; Ebb = 100 Vdc; Ecc2 = 19 Vdc	—	—	17	VU
Design Tests					
4.10.9	Transconductance (2): Smg1p Ef = 24.0 V; Cg1 = 1 μf	1600	—	—	μmhos
4.10.9	Transconductance (3): Smg3p Cg1 = 1 μf	300	550	1000	μmhos
4.10.14	Capacitance: With 0.405 In. Dia. Shield Tied to Cathode				
	Cg1p	—	—	0.06	μμf
	Cg3p	—	—	1.90	μμf
	Cg1g3	—	—	0.26	μμf
	Cg1-all	3.5	—	4.5	μμf
	Cg3-all	4.1	—	5.1	μμf
	Cp-all	4.1	—	5.1	μμf
Degradation Tests					
4.9.20.5	Shock: Note 1 Hammer Angle = 30°	—	—	—	
4.9.20.6	Fatigue: Note 1				
- - - - -	Post Shock and Fatigue Test End Points:				
	Vibration	—	—	200	mVac
	Heater-Cathode Leakage	0	—	20	μAdc
	Transconductance (1)	1500	—	—	μmhos
Acceptance Life Tests					
4.11.7	Heater Cycling Life Test: Ef = 29.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Eb = Ec1 = Ec2 = Rg1 = 0	2500	—	—	Cycles
4.11.5	Intermittent Life Test: Note 2 Rg1 = 2.2 Meg; Ehk = +200 Vdc; TA = 175°C	500	—	—	Hours
4.11.4	Intermittent Life Test End Points				
	Transconductance (1)	1300	—	—	μmhos
	Heater-Cathode Leakage	0	—	30	μAdc
	Grid Current	—	—	-0.9	μAdc

ACCEPTANCE CRITERIA NOTES:

1: Acceptance sampling procedure shall be in accordance with Section 5, Item 5.2 of the Inspection Instructions for Electron Tubes.

2: At the conclusion of the five hundred hour life test, the average life of the life test group shall be not less than four hundred fifty hours. Life test sample size shall be ten tubes. Provision for release of tubes prior to completion of life test on a reduced basis as specified in Par. 4.3.1.3 of the Inspection Instructions for Electron Tubes shall not apply.

APPLICATION DATA

The Premium Subminiature Type 5908 is a sharp cutoff dual control pentode designed to operate directly from a 26.5 volt supply.

Both No. 1 and No. 3 grids have sharp cutoff characteristics and are intended for control purposes thus making the 5908 particularly useful in a variety of gated amplifier applications, as well as mixer service at frequencies up to 400 mc.

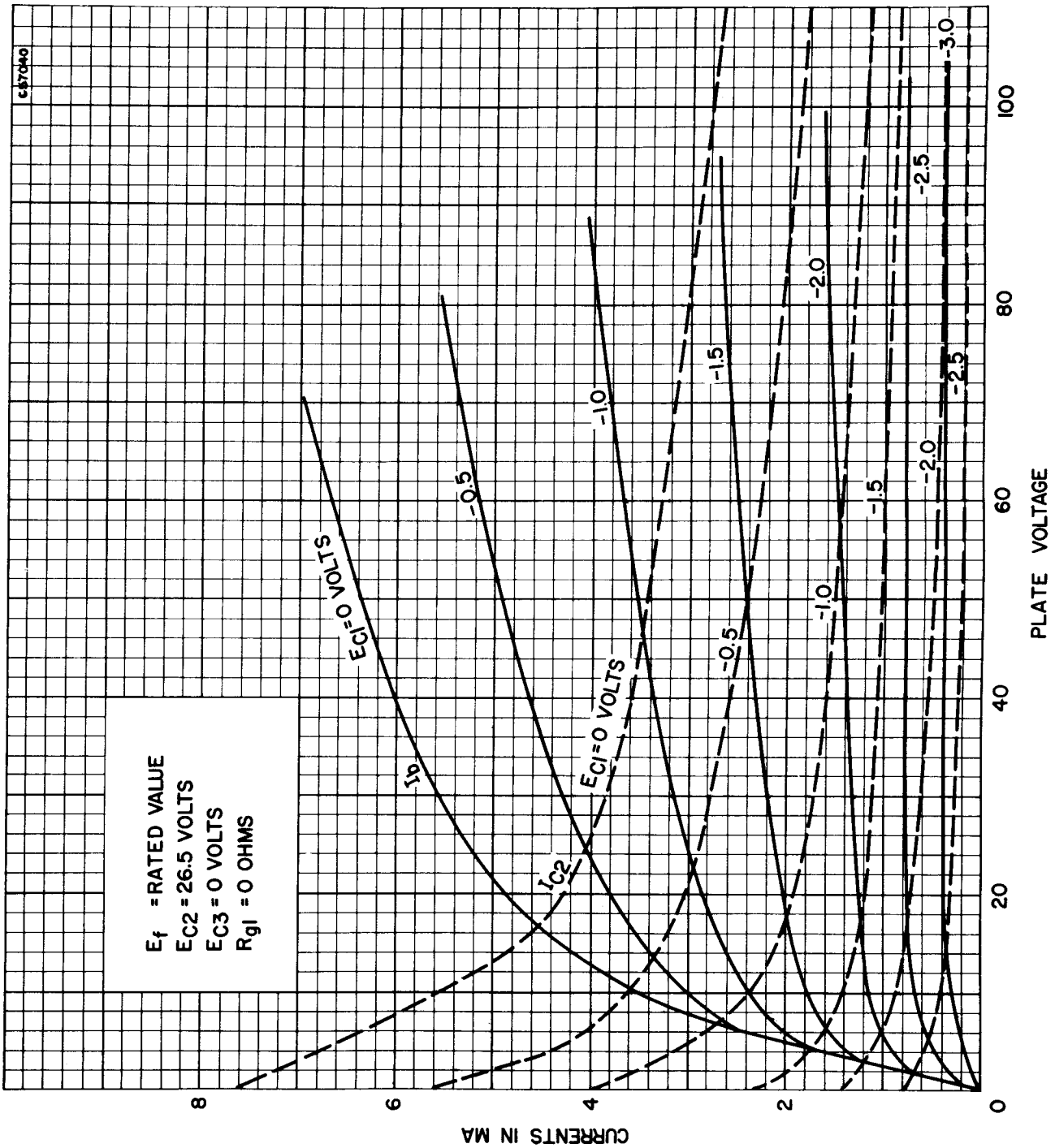
When used as a uhf mixer, with the oscillator voltage applied to the No. 3 grid, it is recommended that cathode bias be used rather than grid-leak bias since a positive grid current may be encountered at high frequencies. At low frequencies it is preferable to use a 2.2 megohm grid resistor to obtain bias.

The 5908 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability. Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy.

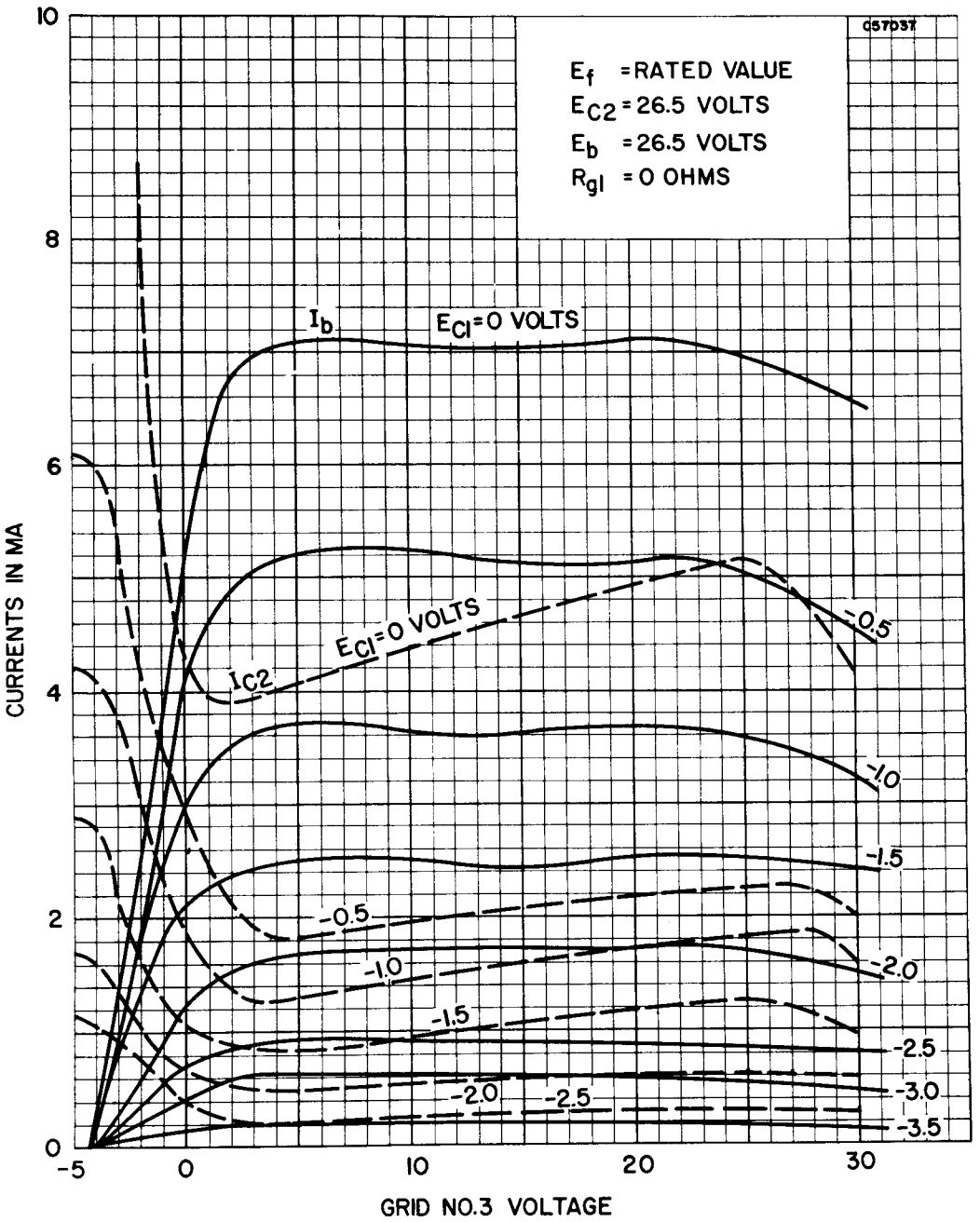
When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

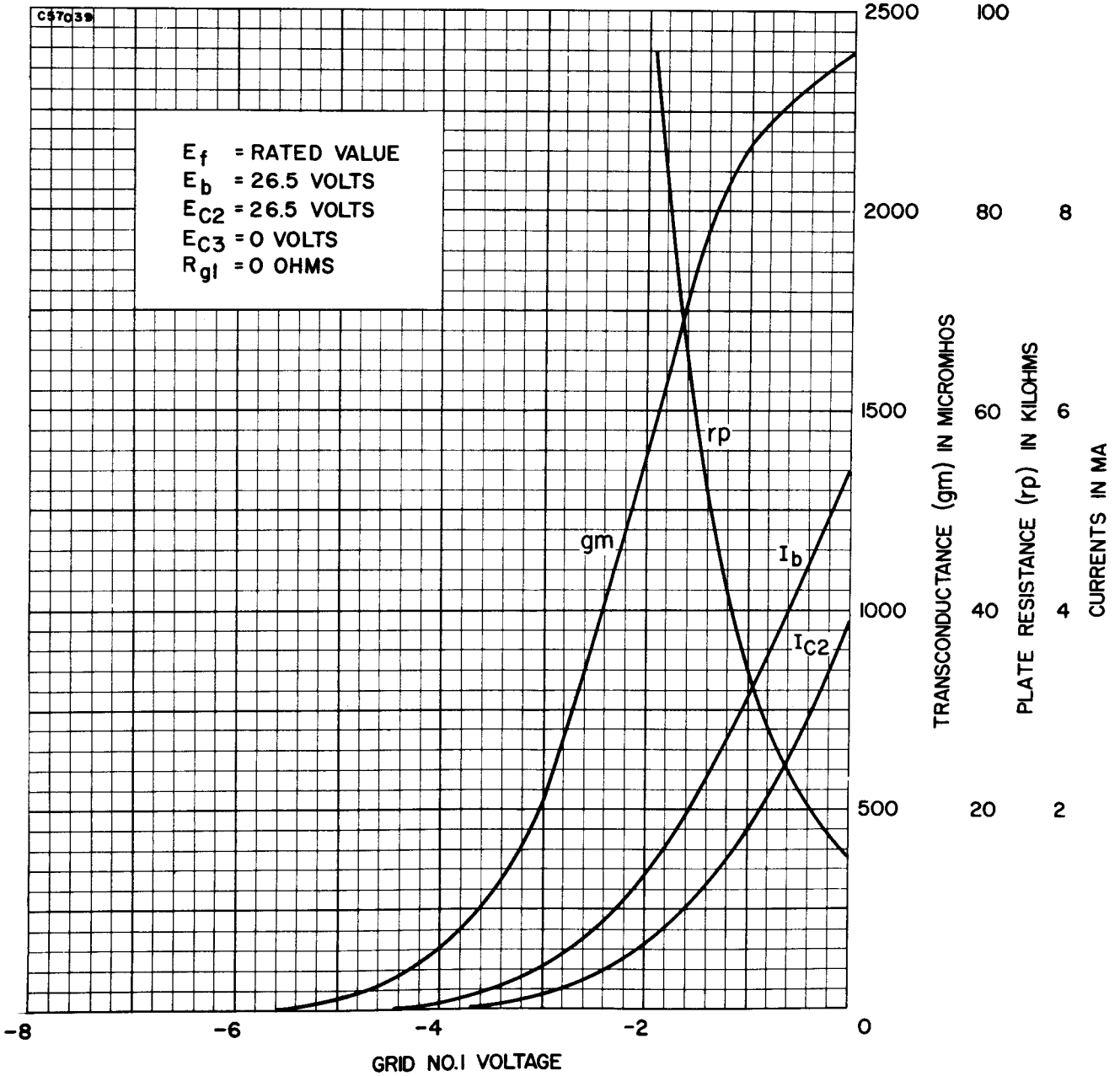
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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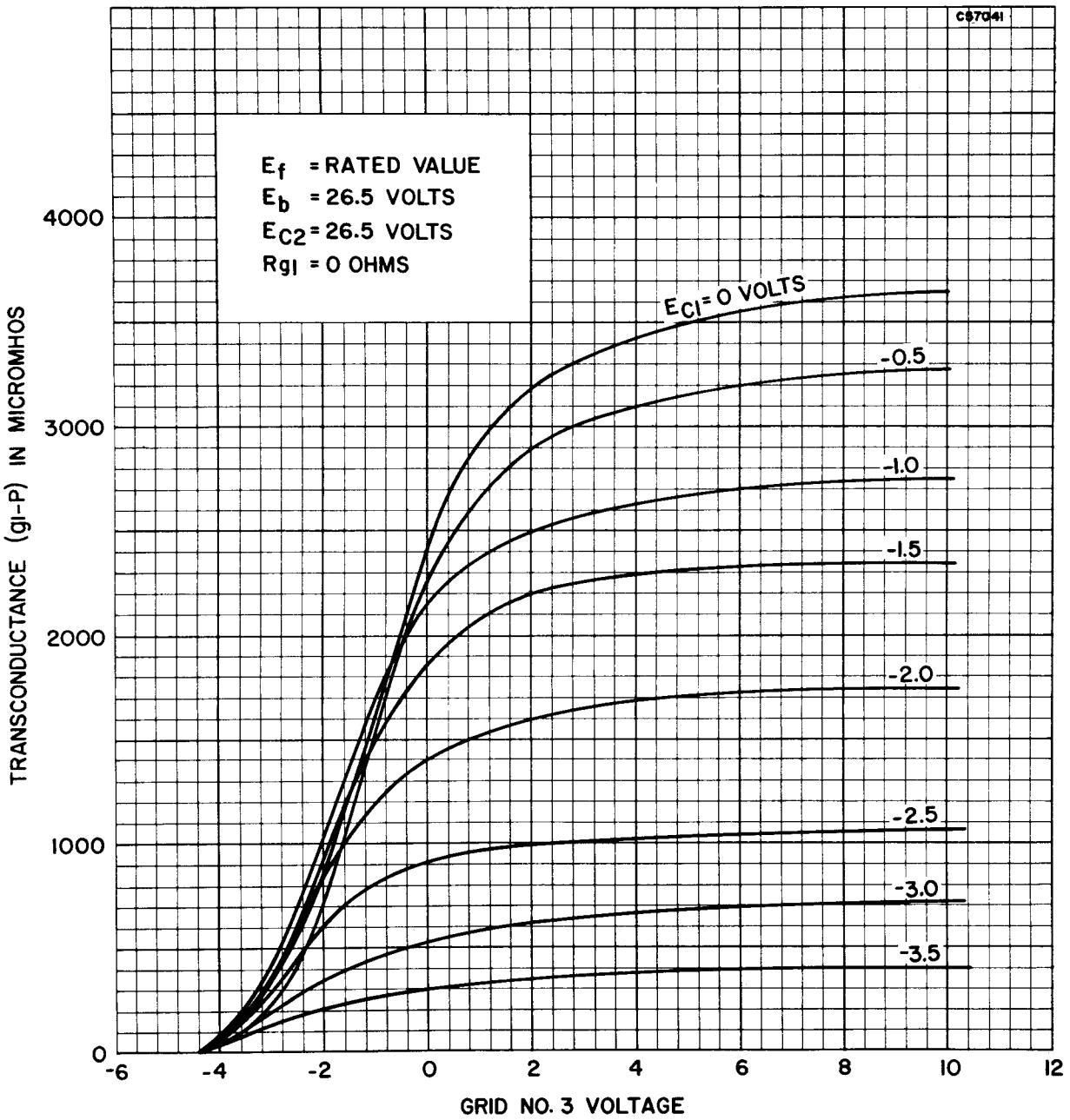

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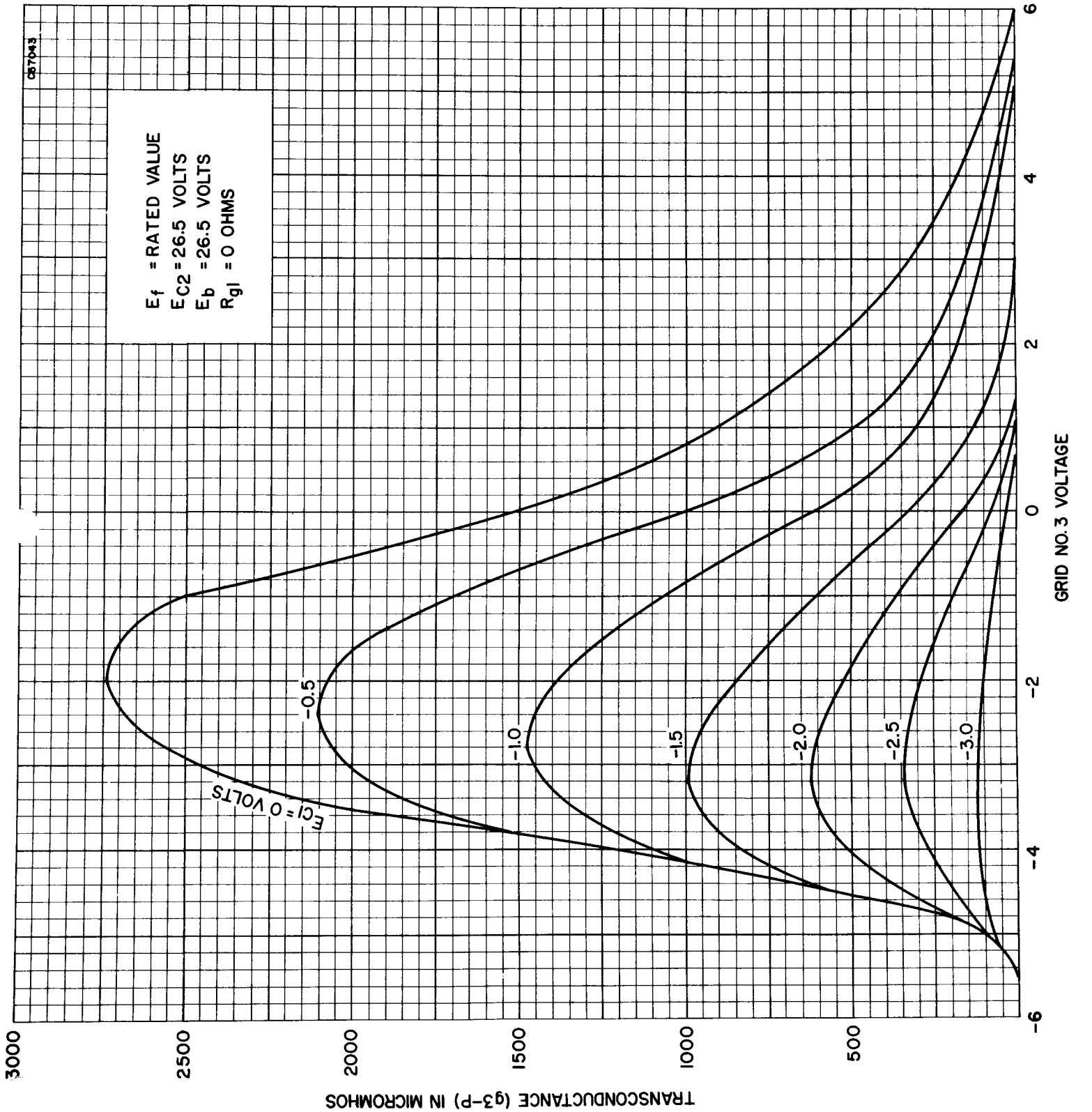
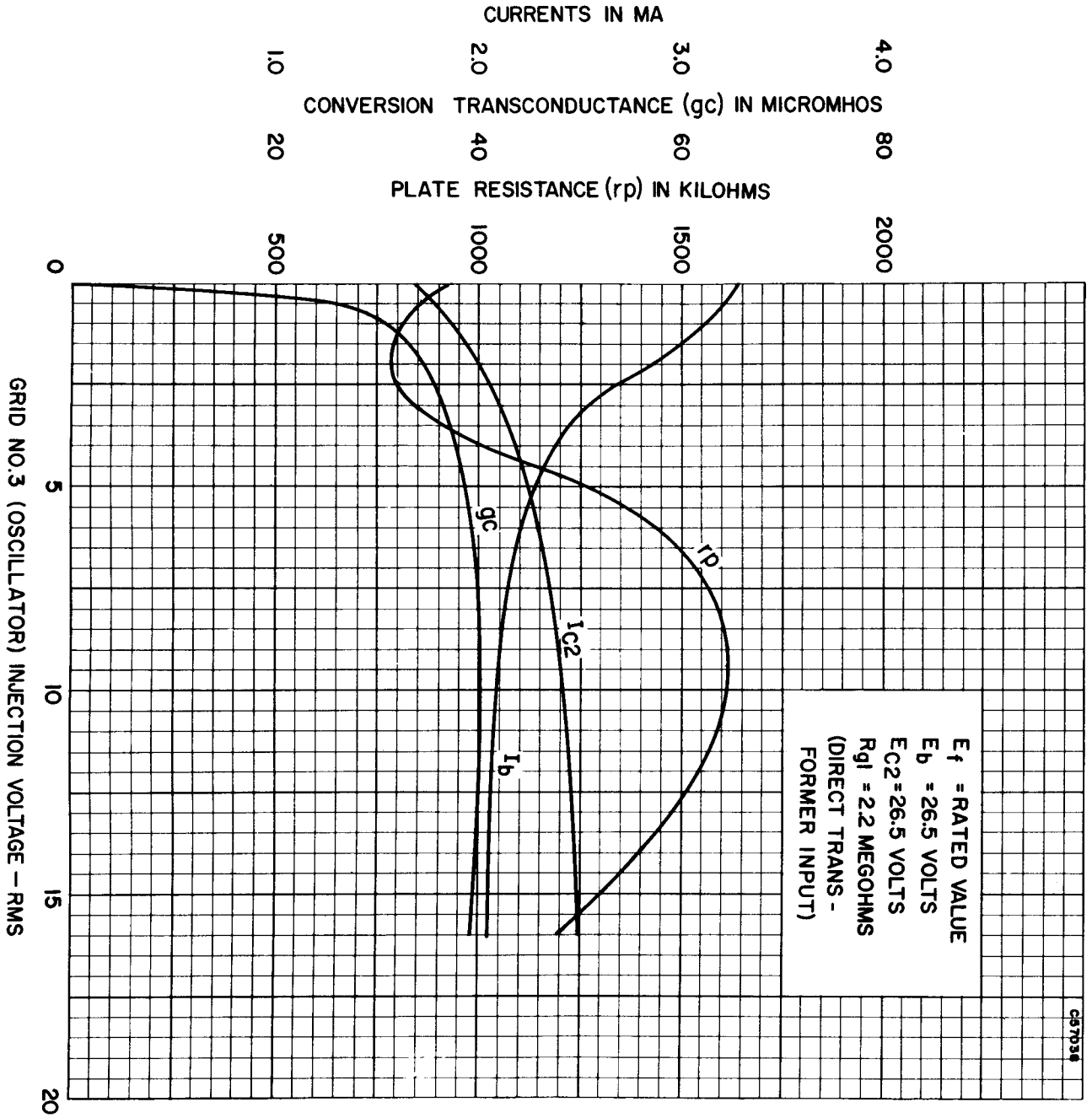


AVERAGE CONVERSION CHARACTERISTICS



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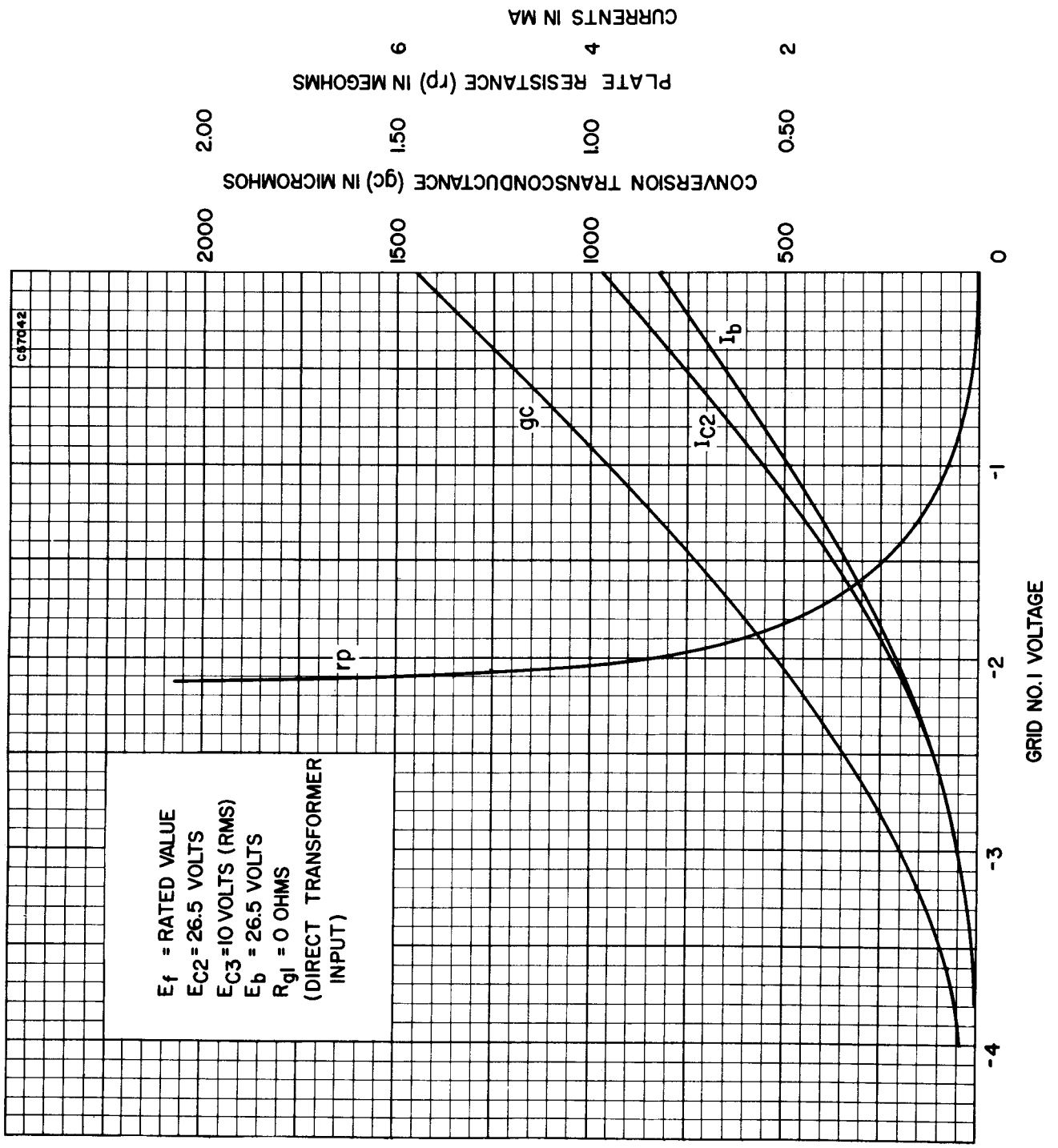


MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button, 7-Pin
Outline	5-2
Basing	7CH
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	300 Ma
Peak Heater Cathode Voltage	
Heater Positive	90 Volts Max.
Heater Negative	90 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.08 μμf Max.
Grid No. 3 to Plate	0.35 μμf Max.
Grid No. 1 to Grid No. 3	0.15 μμf Max.
Grid No. 1 to All Other Electrodes and Heater	5.4 μμf
Grid No. 3 to All Other Electrodes and Heater	6.9 μμf
Plate to All Other Electrodes and Heater	7.6 μμf

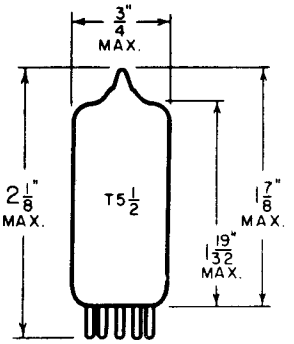
RATINGS (Absolute Values)

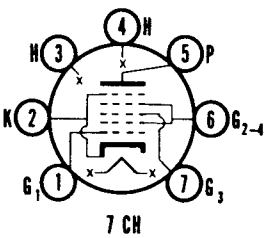
Gated Amplifier in Computer Service and "On-Off" Control Service

Plate Voltage	250 Volts Max.
Grids No. 2 and No. 4 Voltage	See Rating Chart
Grids No. 2 and No. 4 Supply Voltage	250 Volts Max.
Grid No. 3 Supply Voltage	
Negative Bias Value	100 Volts Max.
Positive Bias Value	0 Volts Max.
Peak Negative Value	200 Volts Max.
Peak Positive Value	90 Volts Max.
Grid No. 1 Supply Voltage	
Negative Bias Value	100 Volts Max.
Positive Bias Value	0 Volts Max.
Peak Negative Value	200 Volts Max.
Peak Positive Value	Limited in Any Application by the Peak Cathode Current and the Grid No. 1 Input
Plate Dissipation	1 Watt Max.
Grid No. 3 Input	0.5 Watt Max.
Grids No. 2 and No. 4 Input	1 Watt Max.
Grid No. 1 Input	0.5 Watt Max.
DC Cathode Current	20 Ma Max.
Peak Cathode Current	70 Ma Max.
Bulb Temperature (at Hottest Point)	120°C Max.
Grid No. 1 or Grid No. 3 Circuit Resistance	
Fixed Bias	0.5 Megohm Max.
Cathode Bias	1.0 Megohm Max.

QUICK REFERENCE DATA

The Sylvania Type 5915 is a miniature, dual control heptode designed for service in electronic computors and other control applications envolving long periods of operation under cut-off conditions.





7 CH

SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

FEBRUARY, 1955

CHARACTERISTICS

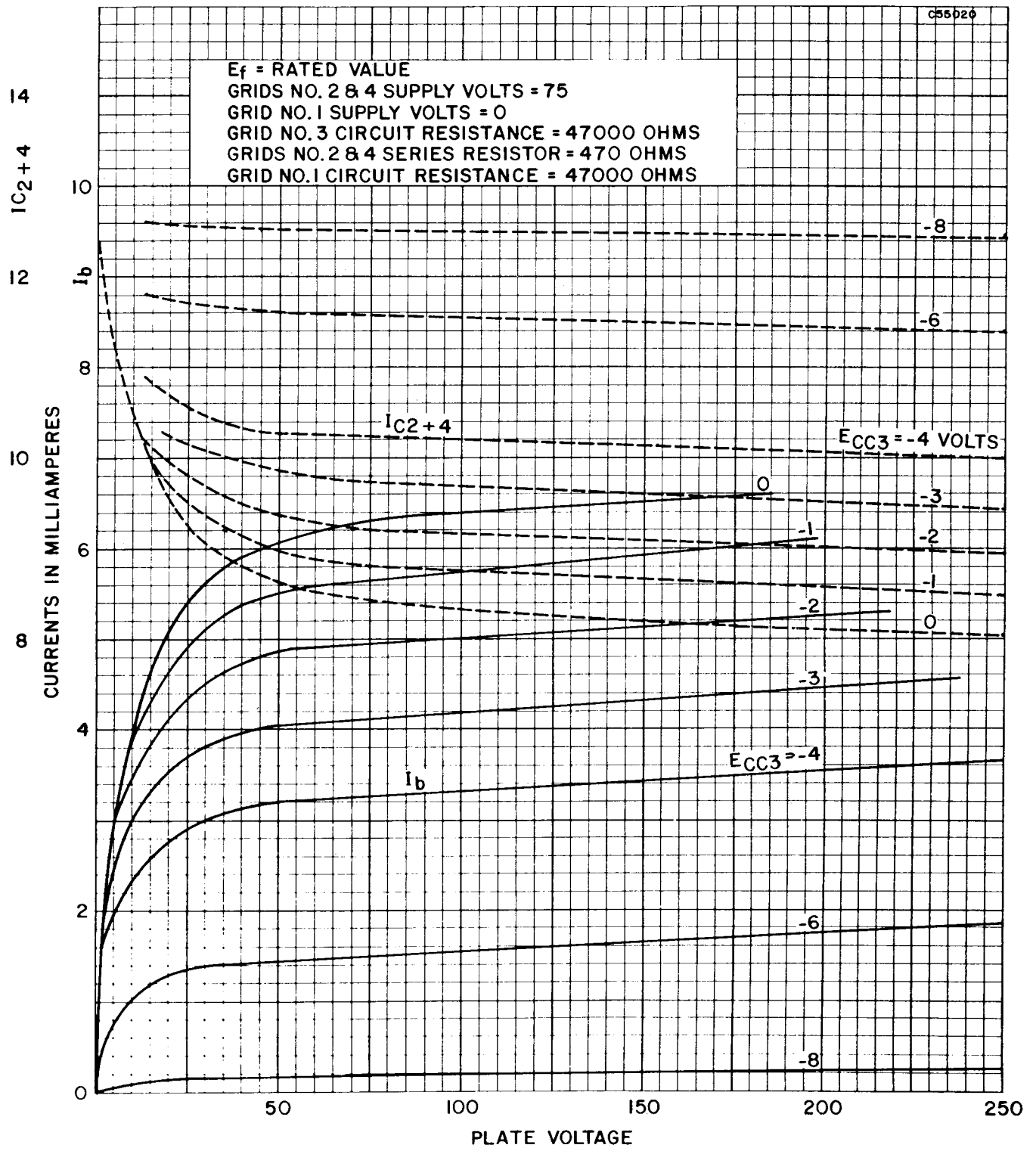
Class A Amplifier

Plate Voltage	67.5	67.5	Volts
Grids No. 2 and No. 4 Voltage	67.5	67.5	Volts
Grid No. 3 Voltage	0	−4	Volts
Grid No. 1 Voltage	0	0	Volts
Grid No. 1 Transconductance	2000		μmhos
Grid No. 3 Transconductance		1100	μmhos

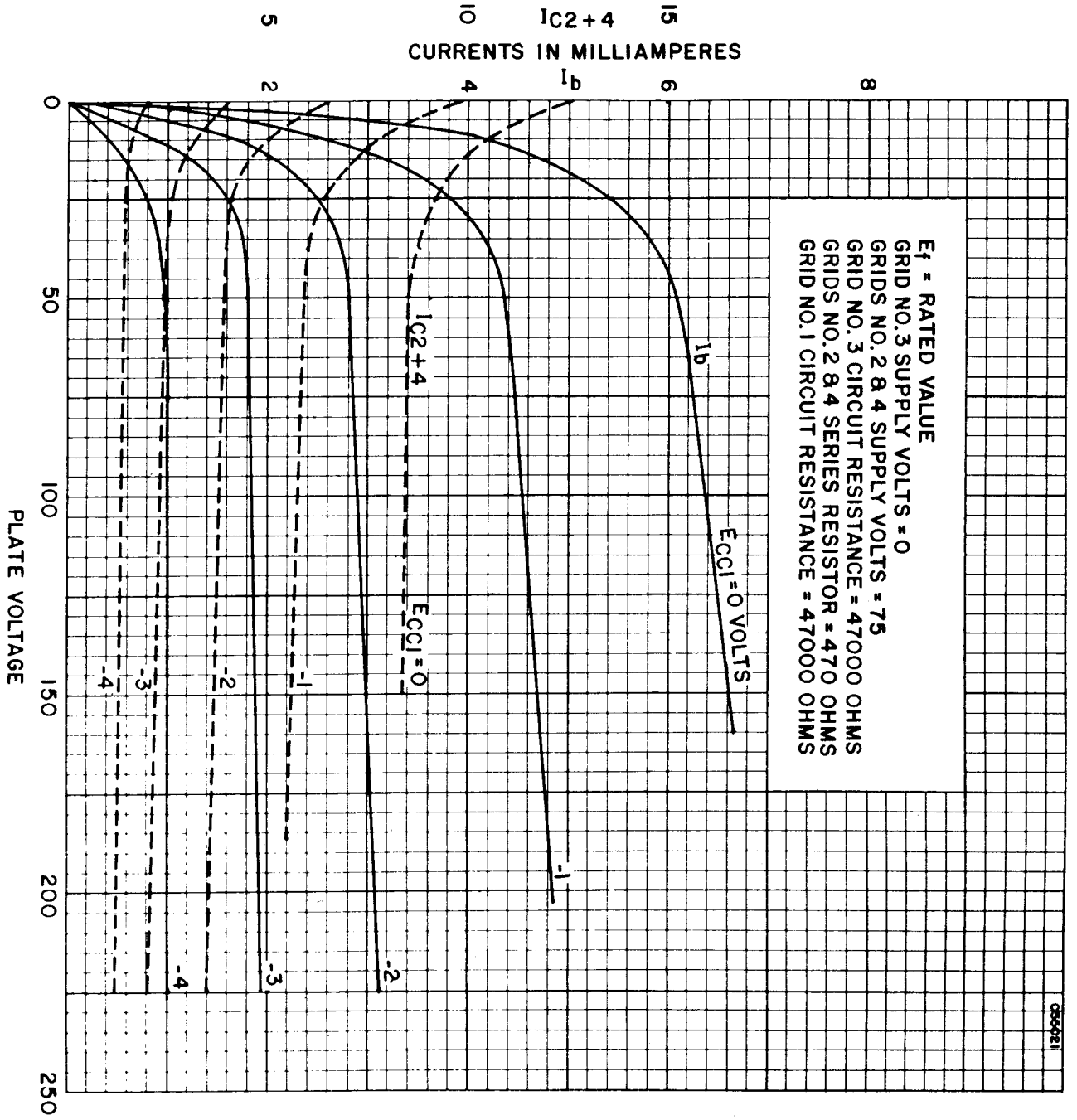
TYPICAL OPERATION

	Cutoff Condition		Zero Bias Condition	
	Grid No. 1 Control	Grid No. 3 Control		
Plate Supply Voltage	150	150	150	Volts
Grid No. 3 Supply Voltage	0	−10	0	Volts
Grids No. 2 and No. 4 Supply Voltage	75	75	75	Volts
Grid No. 1 Supply Voltage	−10	0	0	Volts
Plate Circuit Resistance	20,000	20,000	20,000	Ohms
Grid No. 3 Circuit Resistance	47,000	47,000	47,000	Ohms
Grids No. 2 and No. 4 Series Resistor	470	470	470	Ohms
Grid No. 1 Circuit Resistance	47,000	47,000	47,000	Ohms
Plate Current	0	0	5.8	Ma
Grids No. 2 and No. 4 Current	0	14	9	Ma

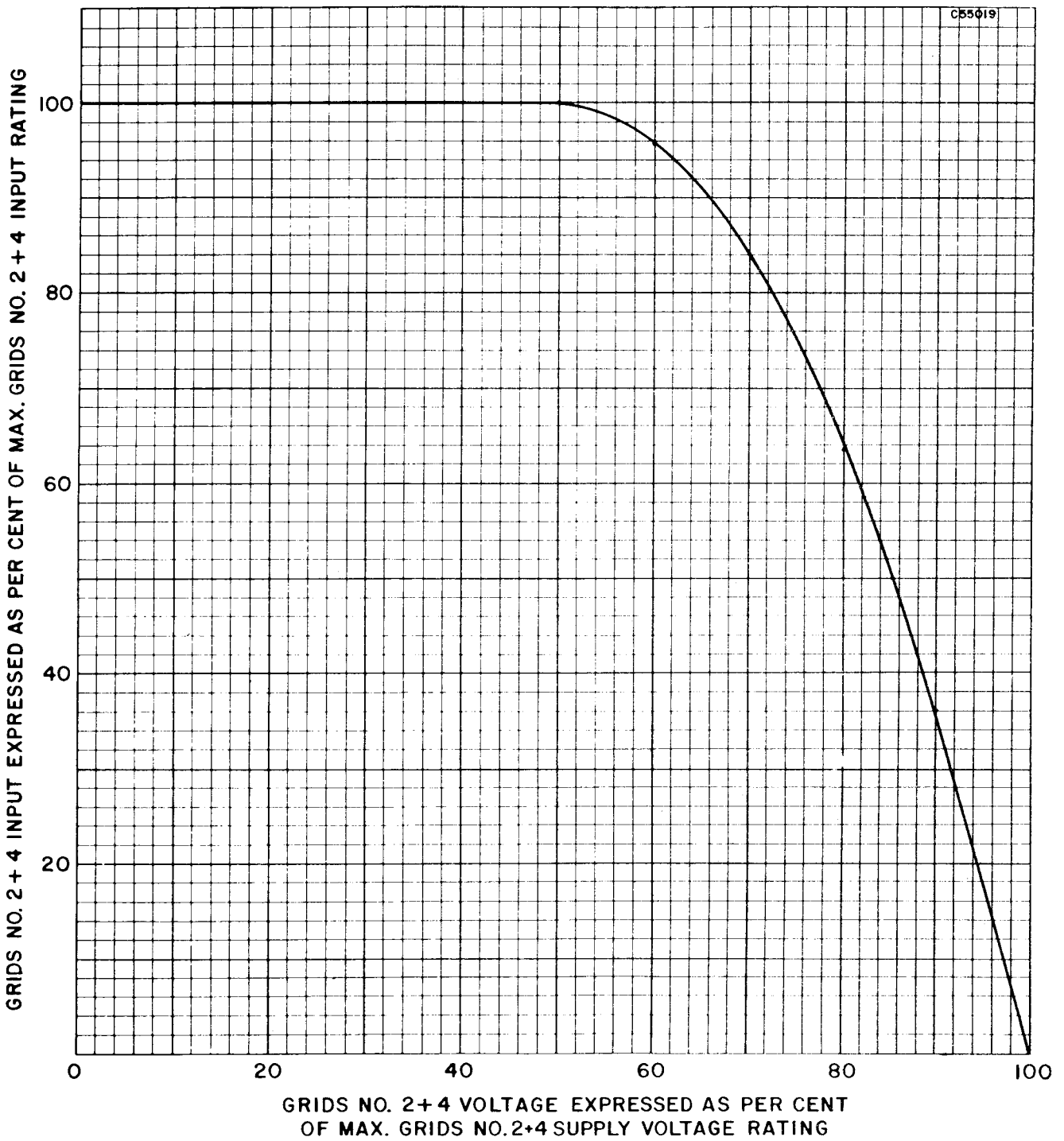
AVERAGE CHARACTERISTICS



AVERAGE CHARACTERISTICS



RATING CHART



MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button, 7-Pin
Outline	5-2
Basing	7CH
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	300 Ma
Peak Heater Cathode Voltage	
Heater Positive	90 Volts Max.
Heater Negative	90 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.08 μμf Max.
Grid No. 3 to Plate	0.35 μμf Max.
Grid No. 1 to Grid No. 3	0.2 μμf Max.
Grid No. 1 to All Other Electrodes and Heater	5.4 μμf
Grid No. 3 to All Other Electrodes and Heater	6.9 μμf
Plate to All Other Electrodes and Heater	7.6 μμf

RATINGS (Absolute Values)

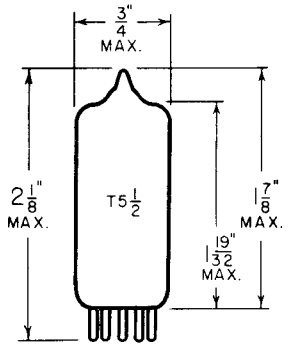
Gated Amplifier in Computer Service and "On-Off" Control Service

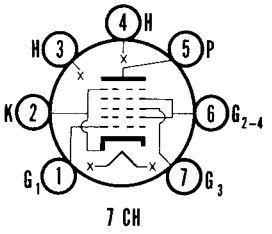
Plate Voltage	250 Volts Max.
Grids No. 2 and No. 4 Voltage	See Rating Chart
Grids No. 2 and No. 4 Supply Voltage	250 Volts Max.
Grid No. 3 Supply Voltage	
Negative Bias Value	100 Volts Max.
Positive Bias Value	0 Volts Max.
Peak Negative Value	200 Volts Max.
Peak Positive Value	90 Volts Max.
Grid No. 1 Supply Voltage	
Negative Bias Value	100 Volts Max.
Positive Bias Value	0 Volts Max.
Peak Negative Value	200 Volts Max.
Peak Positive Value	Limited in Any Application by the Peak Cathode Current and the Grid No. 1 Input

Plate Dissipation	1 Watt	Max.
Grid No. 3 Input	0.5 Watt	Max.
Grids No. 2 and No. 4 Input	1 Watt	Max.
Grid No. 1 Input	0.5 Watt	Max.
DC Cathode Current	20 Ma	Max.
Peak Cathode Current	70 Ma	Max.
Grid No. 1 or Grid No. 3 Circuit Resistance		
Fixed Bias	0.5 Megohm	Max.
Cathode Bias	1.0 Megohm	Max.
Bulb Temperature (At Hottest Point)	120° C	Max.

QUICK REFERENCE DATA

The Sylvania Type 5915A is a miniature, dual control heptode designed for service in electronic computers and other control applications involving long periods of operation under cutoff conditions.





7 CH

SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

APRIL, 1957

CHARACTERISTICS

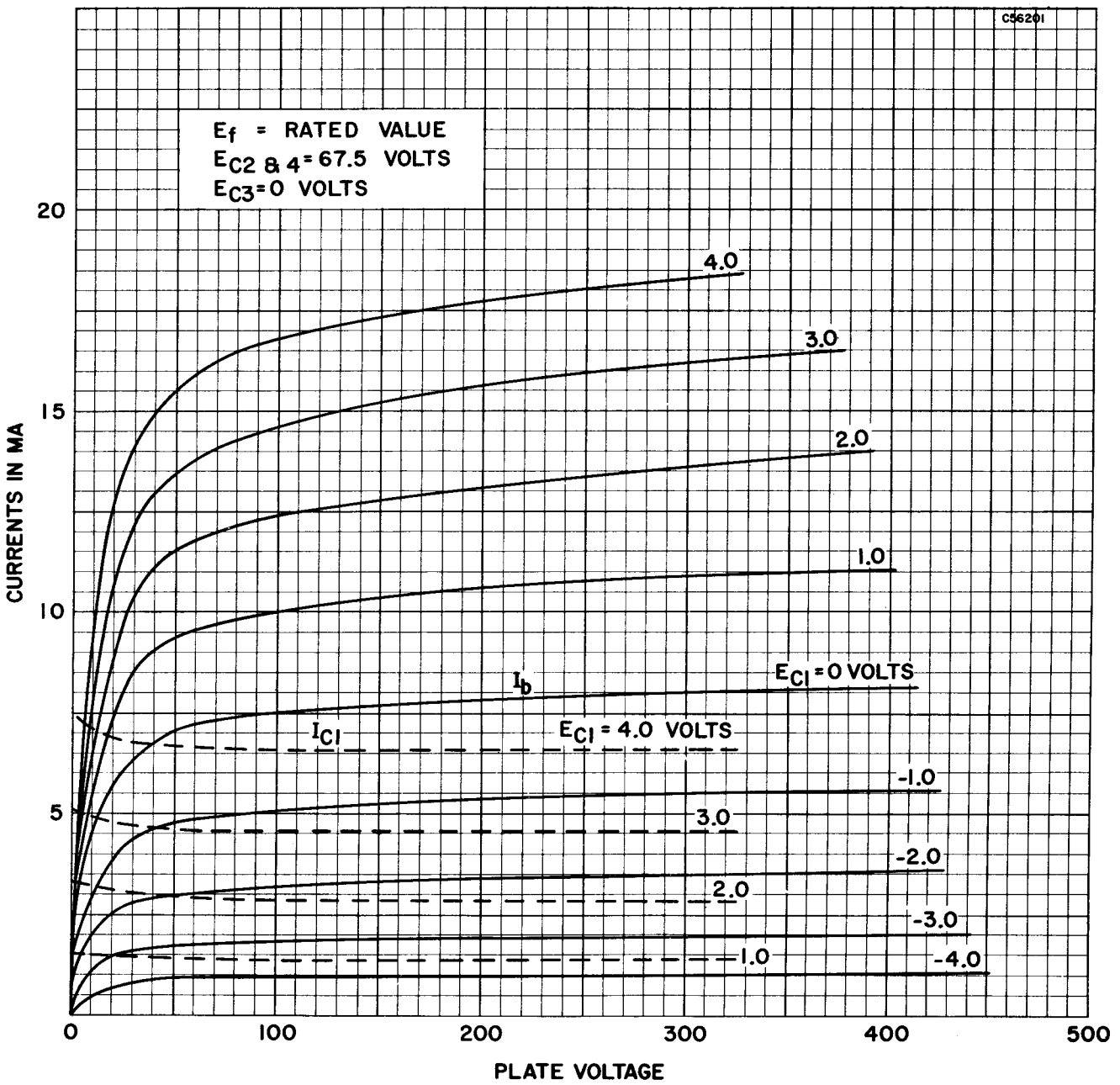
Class A Amplifier

Plate Voltage	67.5	67.5 Volts
Grids No. 2 and No. 4 Voltage	67.5	67.5 Volts
Grid No. 3 Voltage	0	−4 Volts
Grid No. 1 Voltage	0	0 Volts
Grid No. 1 Transconductance	2400	μmhos
Grid No. 3 Transconductance		1700 μmhos

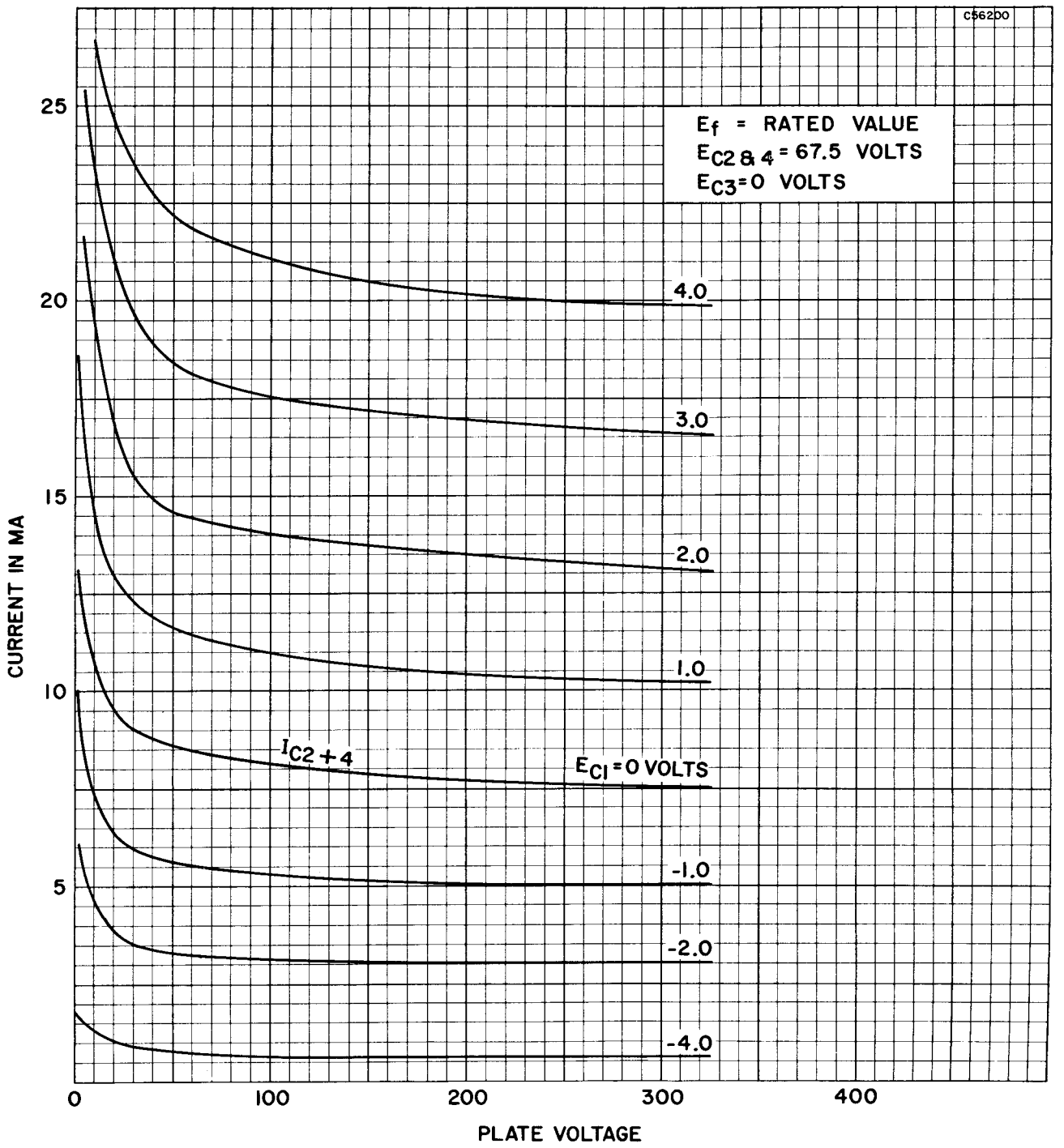
TYPICAL OPERATION

	Cutoff Condition		Zero Bias Condition
	Grid No. 1 Control	Grid No. 3 Control	
Plate Supply Voltage	150	150	150 Volts
Grid No. 3 Supply Voltage	0	−10	0 Volts
Grids No. 2 and No. 4 Supply Voltage	75	75	75 Volts
Grid No. 1 Supply Voltage	−10	0	0 Volts
Plate Circuit Resistance	20,000	20,000	20,000 Ohms
Grid No. 3 Circuit Resistance	47,000	47,000	47,000 Ohms
Grids No. 2 and No. 4 Series Resistor	470	470	470 Ohms
Grid No. 1 Circuit Resistance	47,000	47,000	47,000 Ohms
Plate Current	0	0	5.8 Ma
Grids No. 2 and No. 4 Current	0	14	9 Ma

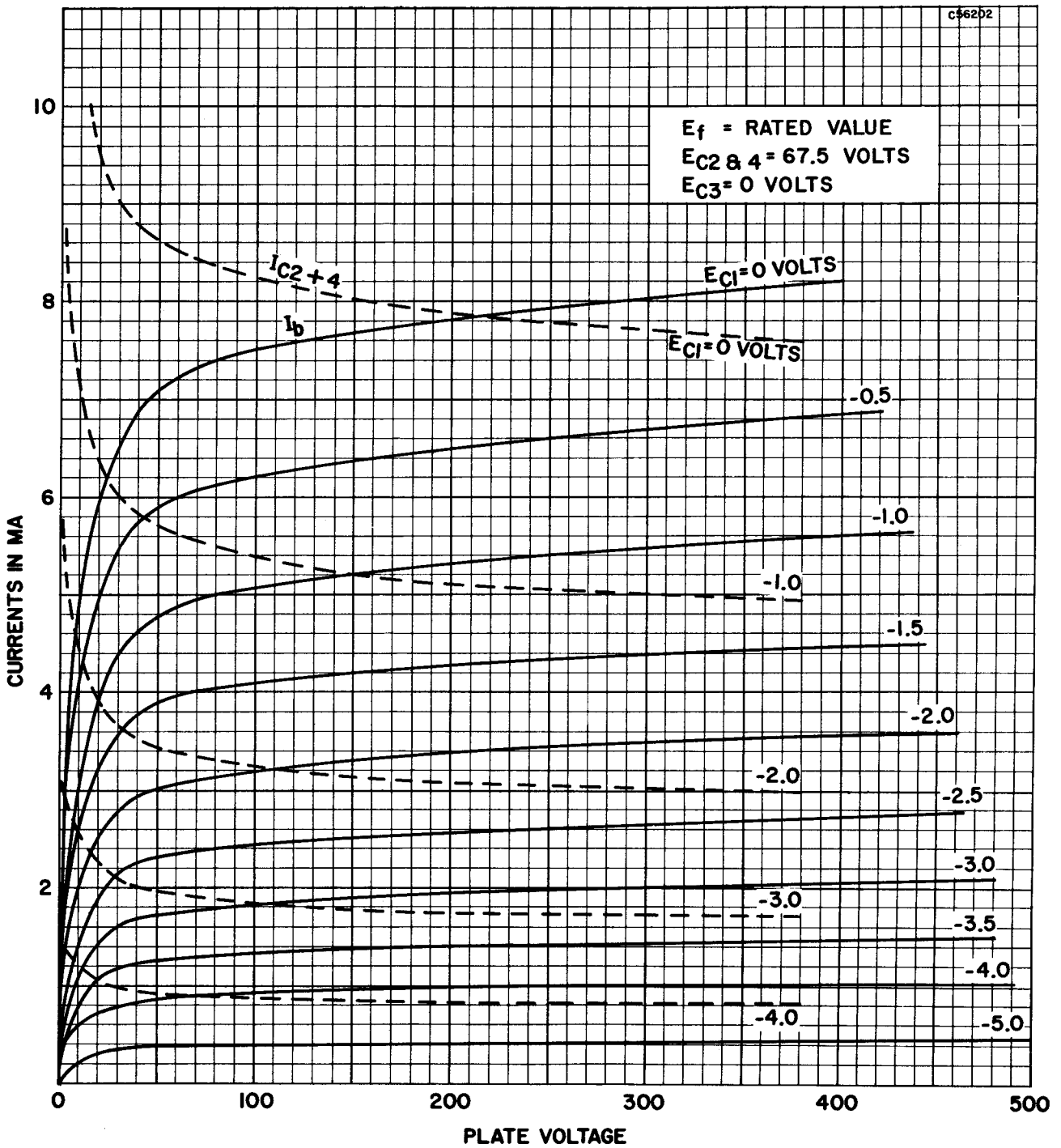
AVERAGE PLATE CHARACTERISTICS



AVERAGE SCREEN CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



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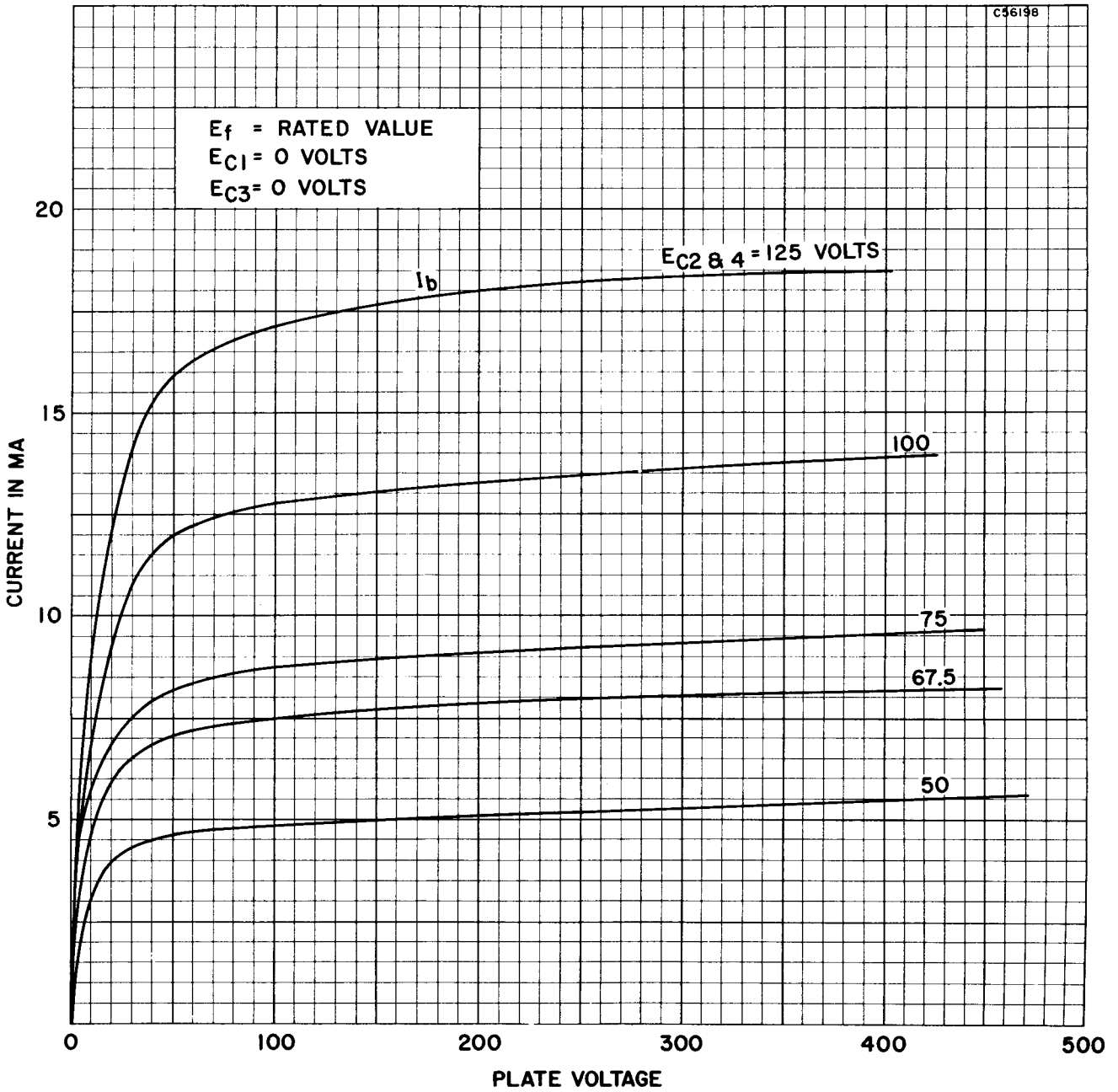

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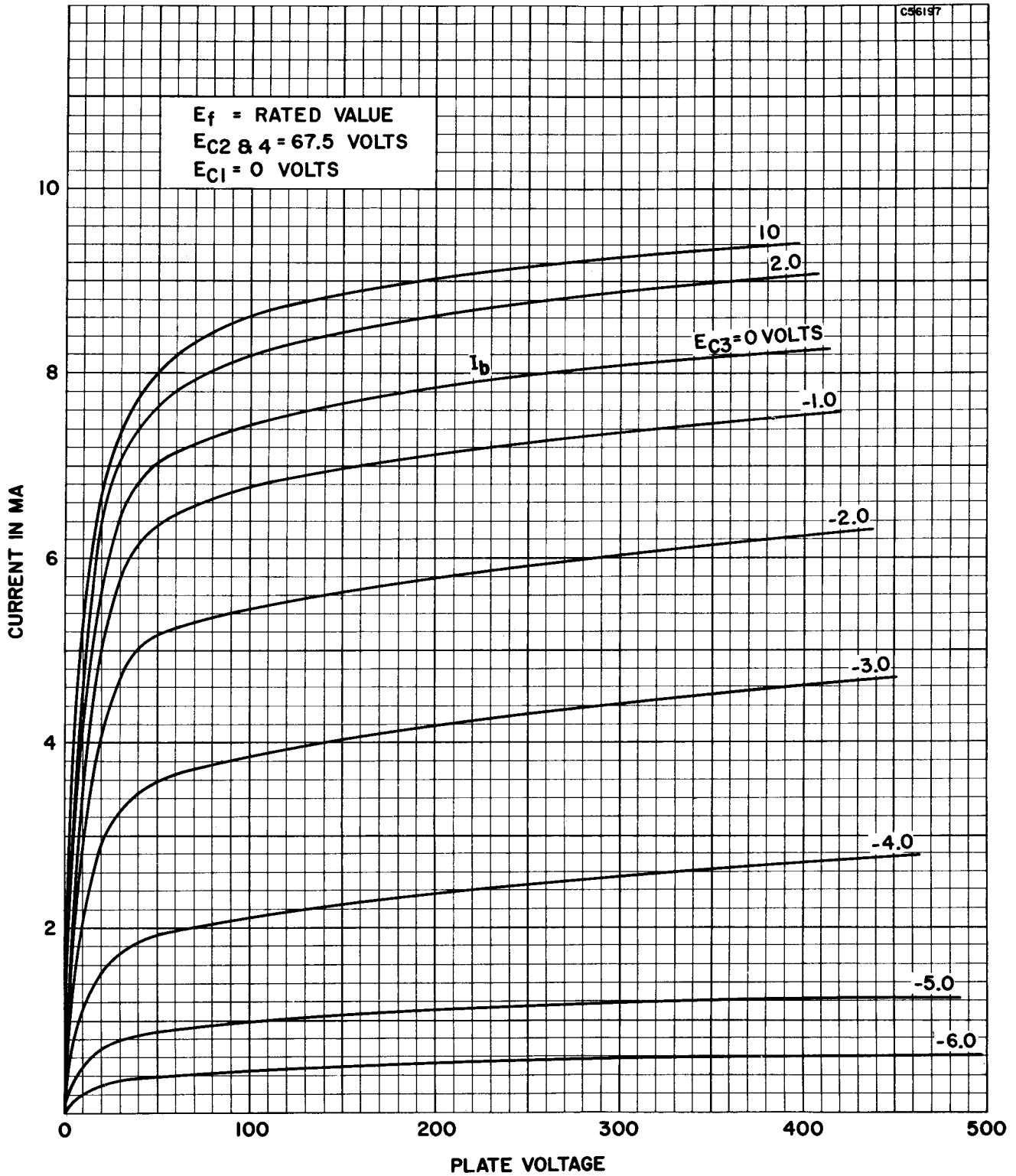
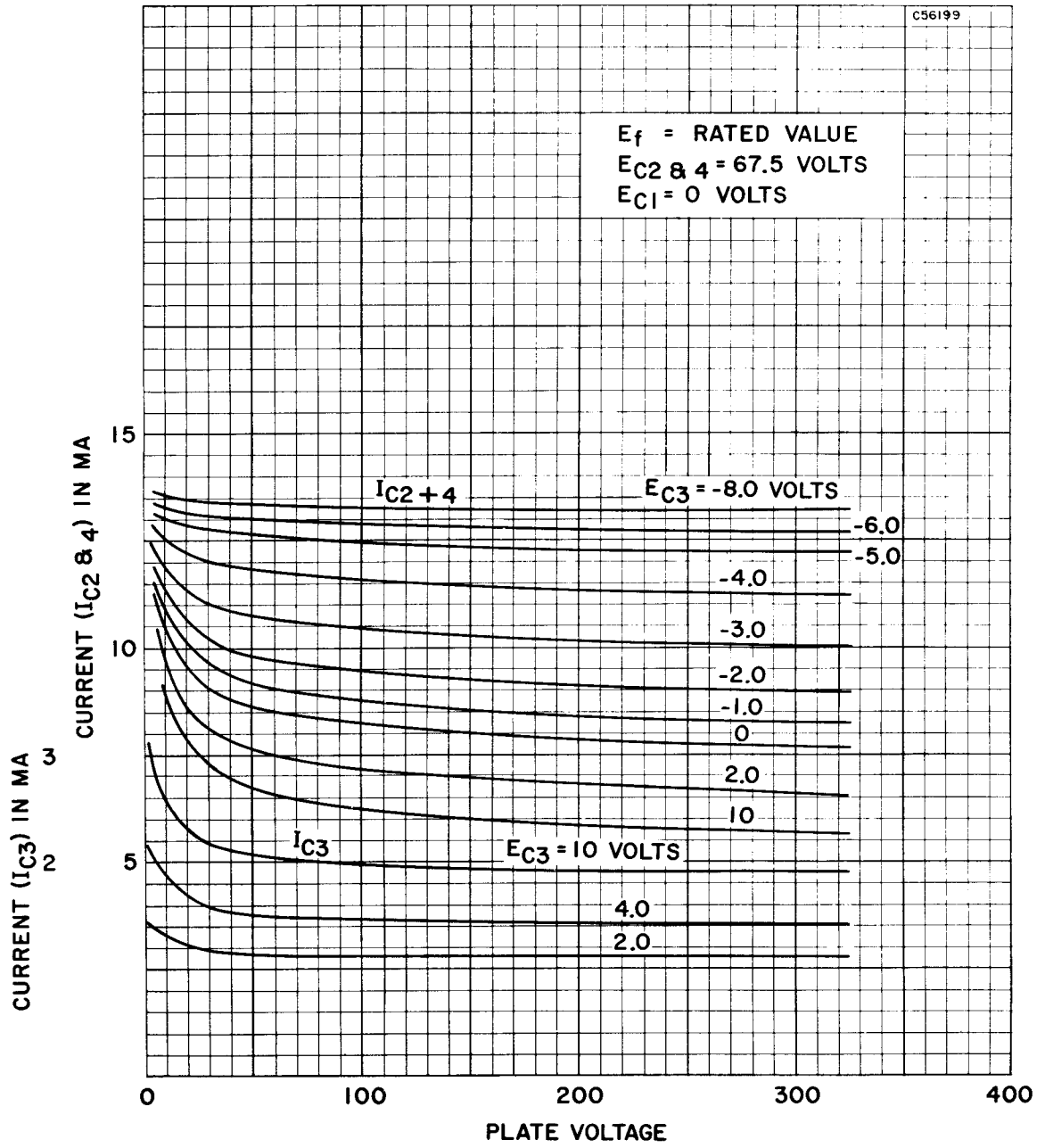
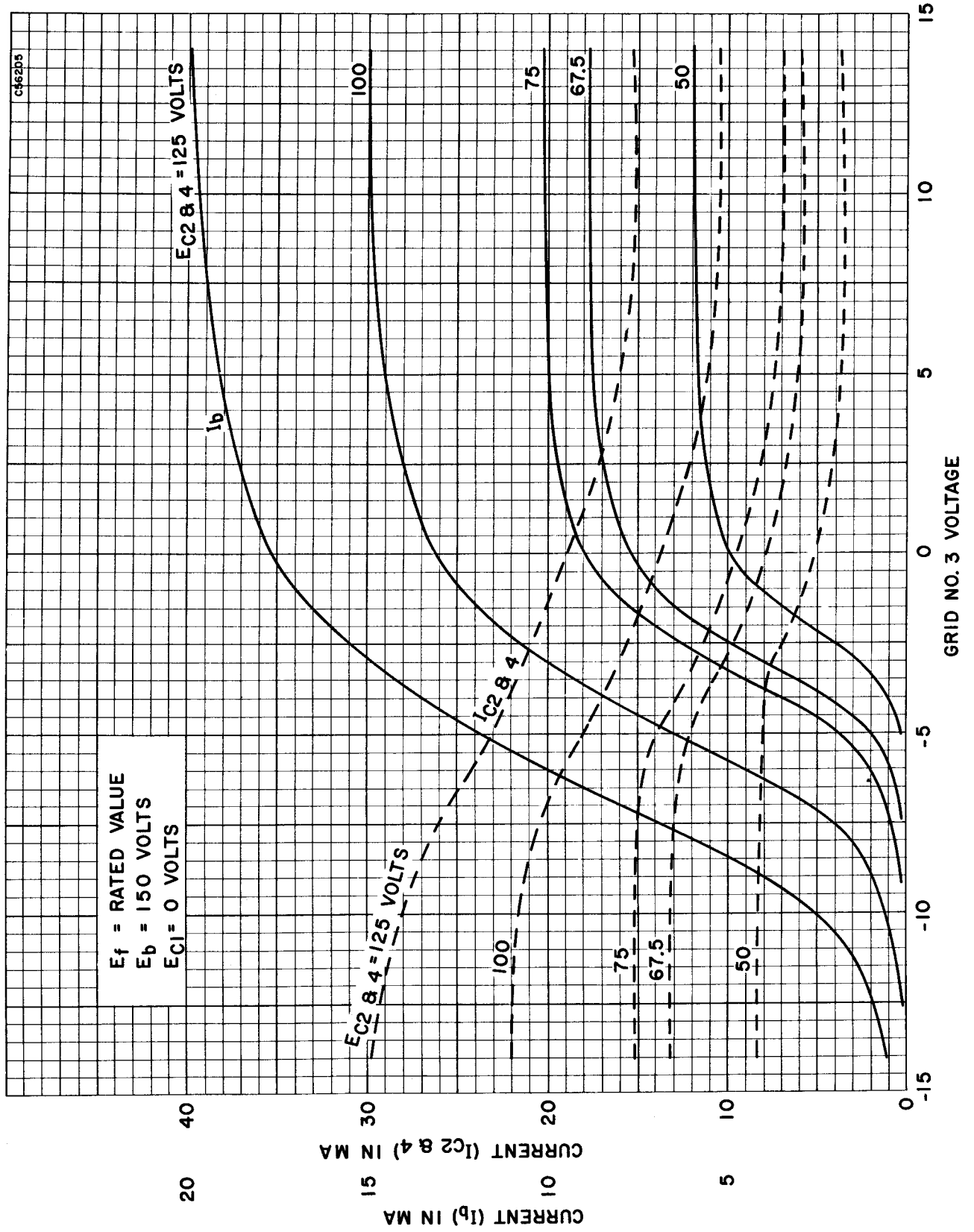


AVERAGE SCREEN CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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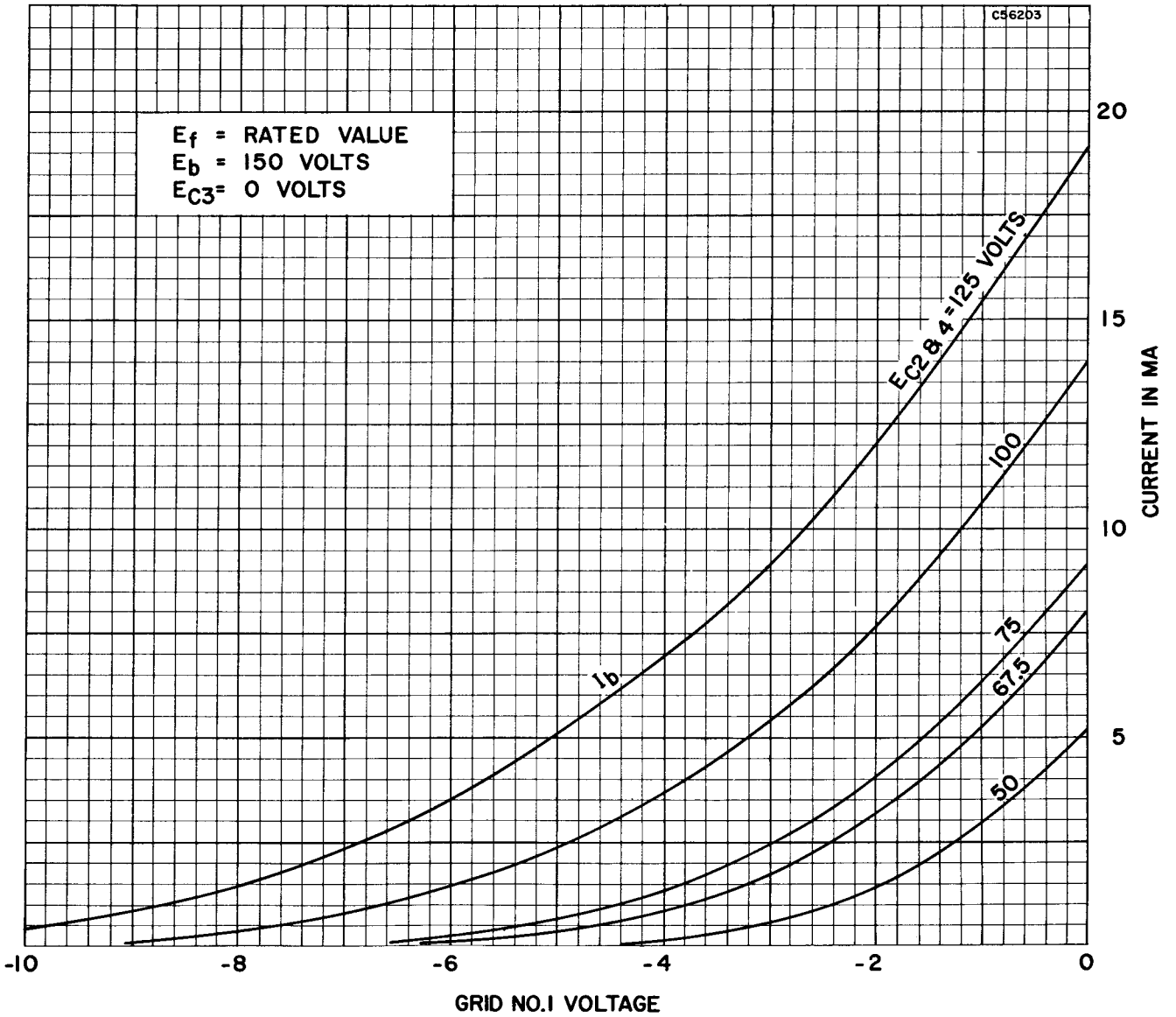

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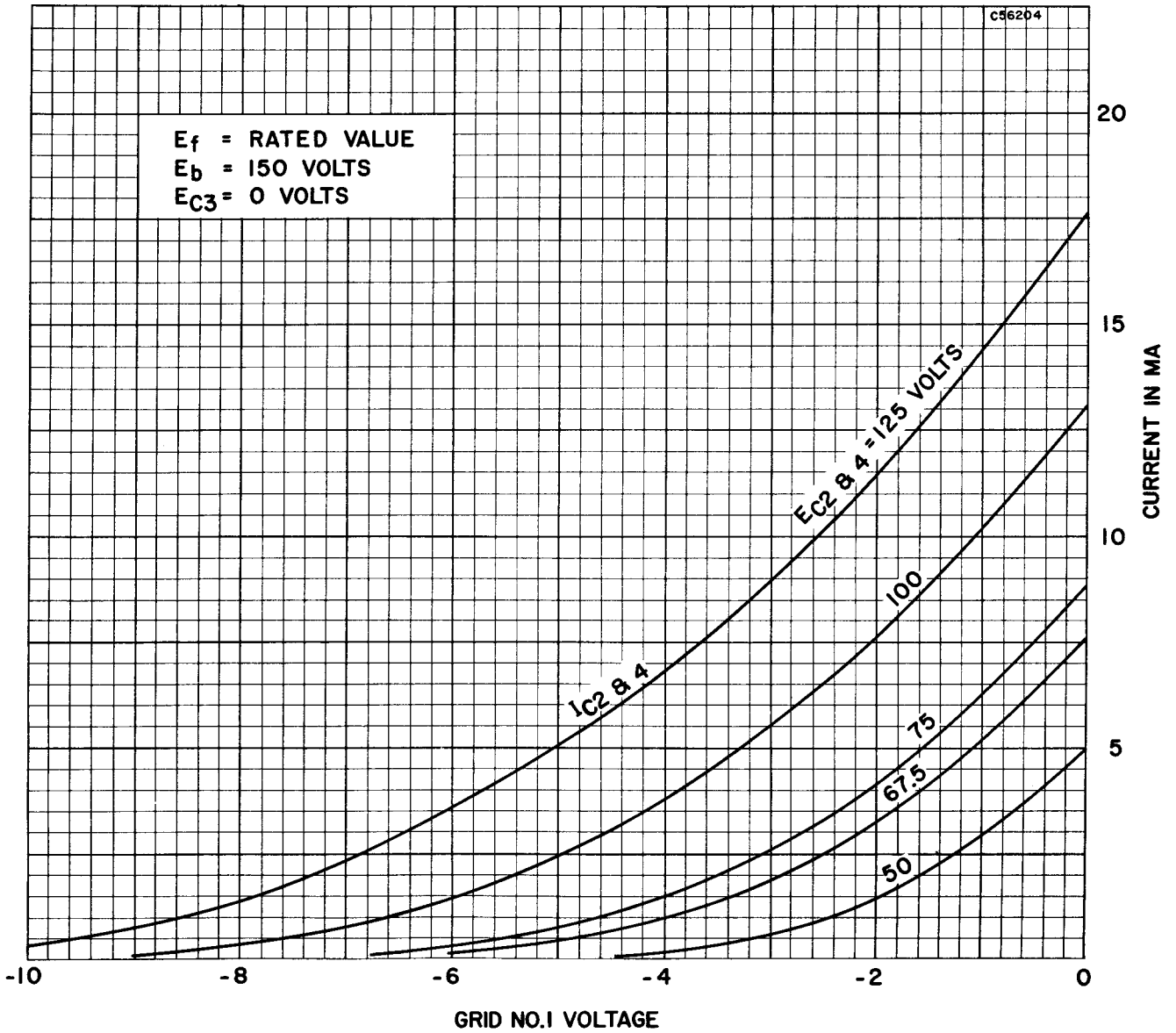
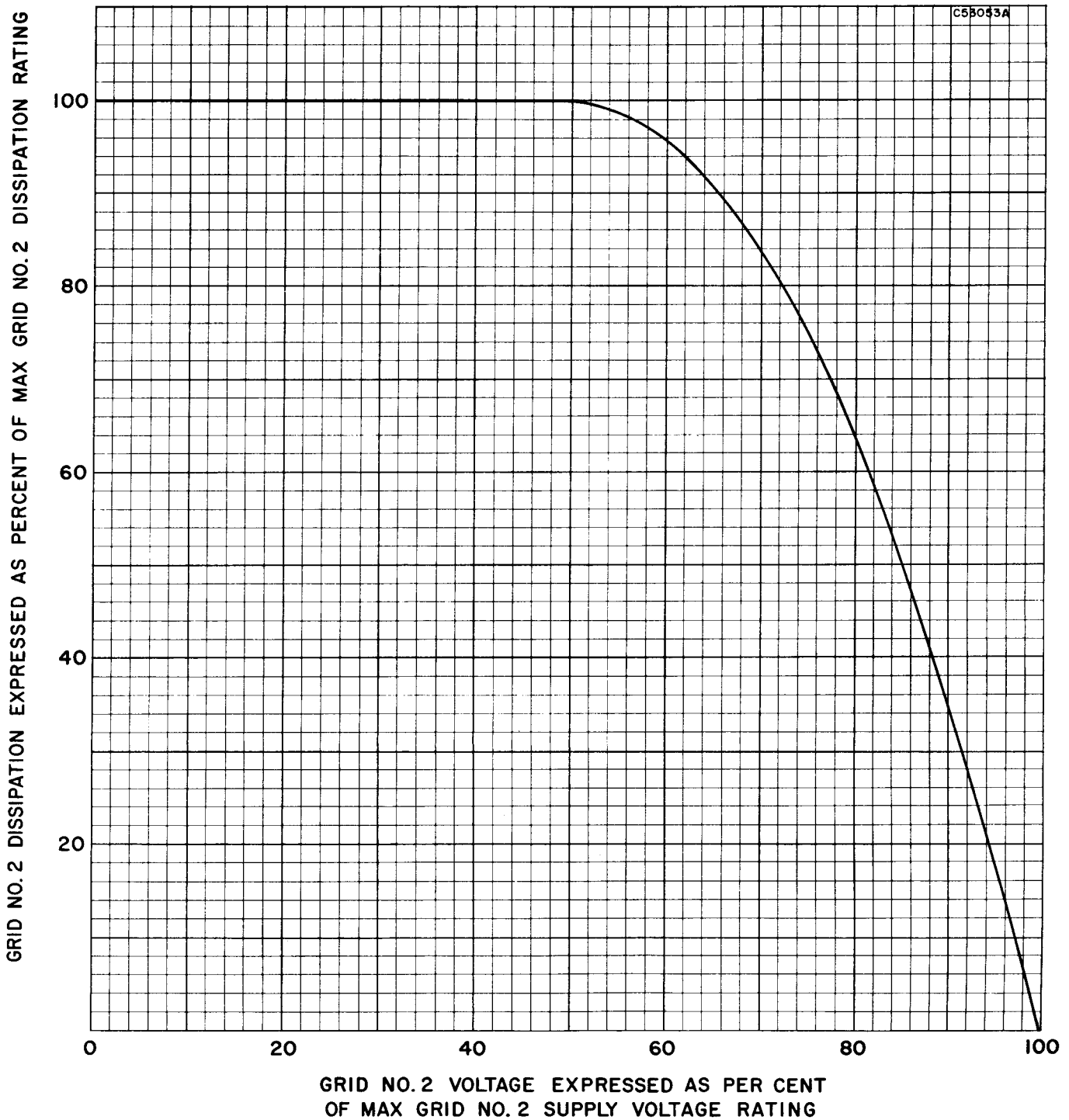


RATING CHART



SYLVANIA

engineering data service

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DC
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.	
Heater Voltage[3]	25.2	26.5	27.8	V
Heater Current		45		mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded[4])

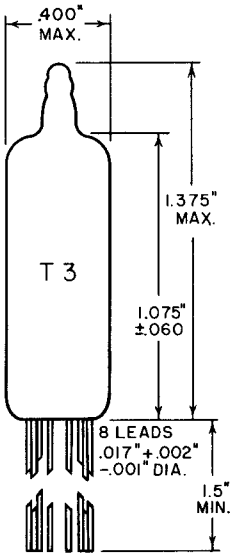
Grid No. 1 to Plate	0.020 μμf	Max.
Grid No. 3 to Plate	1.10 μμf	Max.
Grid No. 1 to All Other Electrodes	4.00 μμf	
Grid No. 3 to All Other Electrodes	4.00 μμf	
Plate to All Other Electrodes	3.40 μμf	
Grid No. 1 to Grid No. 3	0.15 μμf	Max.

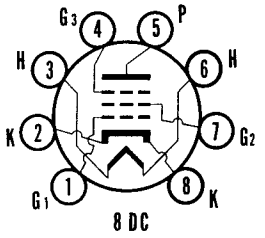
RATINGS[1 & 5] (Absolute Maximum)

Plate Voltage	165 Vdc
Grid No. 2 Voltage	155 Vdc
DC Grid No. 3 Voltage	
Positive Value	30 Vdc
Negative Value	55 Vdc
DC Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Plate Dissipation	1.1 W
Grid No. 2 Dissipation	0.7 W
Plate Current	11 mAdc
Grid No. 3 Current	2 mAdc
Grid No. 2 Current	7 mAdc
Grid No. 1 Current	2 mAdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid No. 1 Circuit Resistance	1.1 Meg

QUICK REFERENCE DATA

The Premium Subminiature Type 5916 is a sharp cutoff, dual control pentode intended for use as a gated amplifier or mixer at frequencies up to 400 mc. Except for heater characteristics the Type 5916 is identical to the Type 5636. The Type 5916 employs a 26.5 volt, 45 ma heater. The Type 5916 is designed for operation under conditions of severe shock, vibration, high temperature, and high altitude, and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

AUGUST, 1957

CHARACTERISTICS

	Dual Control Amplifier		Mixer	
Plate Voltage	100	100	100 Vdc	
Grid No. 2 Voltage	100	100	100 Vdc	
Grid No. 3 Voltage	-1	Note 6	0 Vdc 15 Vac	
Cathode Resistor	150	150	150 Ohms	
Plate Current	4.0	5.3	3.5 mAdc	
Grid No. 2 Current	5.8	3.6	5.7 mAdc	
Grid No. 1 Transconductance	1950	3200	— μmhos	
Grid No. 3 Transconductance	950	500	— μmhos	
Plate Resistance	50000	110000	32000 Ohms	
Grid No. 1 Voltage for Ib = 100 μAdc	—	-7.5	— Vdc	Max.
Grid No. 3 Voltage for Ib = 100 μAdc	-8	—	— Vdc	Max.
Conversion Transconductance Direct Transformer Input	—	—	1400 μmhos	

NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded reduction of instantaneous voltage (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 26.5 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Grid No. 3 connected to cathode.*

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	26.5 V	Grid No. 3 Voltage (Tie to Cathode) Note 1	0 Vdc
Plate Voltage	100 Vdc	Heater-Cathode Voltage. . . Note 1	0 Vdc
Grid No. 1 Voltage	0 Vdc	Cathode Resistor	150 Ohms
Grid No. 2 Voltage	100 Vdc		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Tests	Limits Min.	Limits Bogey	Limits Max.	Units
Production Tests					
4.10.8	Heater Current:	40	45	50	mAdc
4.10.6.1	Grid No. 1 Current:	0	—	-0.3	μAdc
4.10.4.3	Grid No. 2 Current:	2.8	3.6	5.4	mAdc
4.10.4.1	Plate Current (1):	3.7	5.3	6.9	mAdc
4.10.9	Transconductance (1): Smg1p	2700	3350	4000	μmhos

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Tests	Limits Min.	Limits Bogey	Limits Max.	Units
Special Design Tests					
4.9.5.3	Subminiature Lead Fatigue:	4	—	—	arcs
4.9.19.2	Vibration F = 40 cps; G = 15; Ck = 1000 μf; Rp = 10,000 Ohms	—	—	60	mVac
4.10.15	Heater-Cathode Leakage: Ehk = +100 Vdc Ehk = −100 Vdc	0 0	— —	7 7	μAdc μAdc
4.8	Insulation of Electrodes: Eg1 to all = −100 Vdc; Ef = 26.5 V	100	—	—	Meg
4.10.4.1	Plate Current (3): Note 3 Ec3 = −8.0 Vdc	0	—	100	μAdc
4.10.3.2	AF Noise: Esig = 70 mVac; Rg1 = 0.1 Meg; Rp = 0.2 Meg; Rg2 = 1000 Ohms; Ecc2 = 19 Vdc; Ebb = 100 Vdc; Ck = 1000 μf	—	—	17	VU
Design Tests					
4.10.4.1	Plate Current (2): Ec1 = −7.5 Vdc	0	—	100	μAdc
4.10.9	Transconductance (2): Smg1p Ef = 24.0 V	2450	—	—	μmhos
4.10.9	Transconductance (3): Note 3 Smg3p Ec3 = −1.0 Vdc	500	950	1800	μmhos
4.10.14	Capacitance: With 0.405 in. dia. shield tied to cathode. Cg1p Cg3p Cg1g3 Cg1 to all Cg3 to all Cp to all	 — — — 3.5 3.5 2.9	 — — — — — —	 0.020 1.10 0.15 4.5 4.5 3.9	 μμf μμf μμf μμf μμf μμf
Degradation Tests					
4.9.20.5	Shock: Note 2 Hammer Angle = 30°				
4.9.20.6	Fatigue: Note 2				
-----	Post Shock Test End Points: Vibration	—	—	200	mVac
-----	Post Fatigue Test End Points: Vibration	—	—	100	mVac
-----	Post Shock and Fatigue Test End Points: Heater-Cathode Leakage Transconductance (1)	0 2350	— —	20 —	μAdc μmhos
Acceptance Life Tests					
4.11.7	Heater Cycling Life Test: Ef = 29.0 V; Eb = Ec1 = Ec2 = Ec3 = O V; Rk = 0 Ohms; Ehk = 140 Vac; One min. on, four min. off	2500	—	—	Cycles
4.11.5	Intermittent Life Test (1): Note 4 Ehk = +200 Vdc; TA = 175°C; Rg1 = 1.0 Meg	500	—	—	Hours
4.11.4	Intermittent Life Test End Points (1): Transconductance (1) Heater-Cathode Leakage Grid No. 1 Current	2000 0 —	— — —	— 20 −0.9	μmhos μAdc μAdc

ACCEPTANCE CRITERIA NOTES:

1: The reference point for heater and grid No. 3 potentials shall be the positive terminal of the cathode resistor.

2: Acceptance sampling procedure shall be in accordance with the shock test sampling procedure of the Inspection Instructions for Electron Tubes.

3: Reference pointer for grid No. 3 on this test shall be the negative terminal of the cathode resistor.

4: At the conclusion of the five hundred hour life test, the average life of the life test sample shall be not less than four hundred fifty hours. Life test sample size shall be ten tubes. Provision for release of tubes prior to completion of life test on a reduced basis as specified in Par. 4.3.1.3 of the Inspection Instructions for Electron Tubes shall not apply.

APPLICATION DATA

The Premium Subminiature Type 5916 is a sharp cutoff, dual control pentode employing a 26.5 volt, 45 ma heater. This type is otherwise identical to the Type 5636.

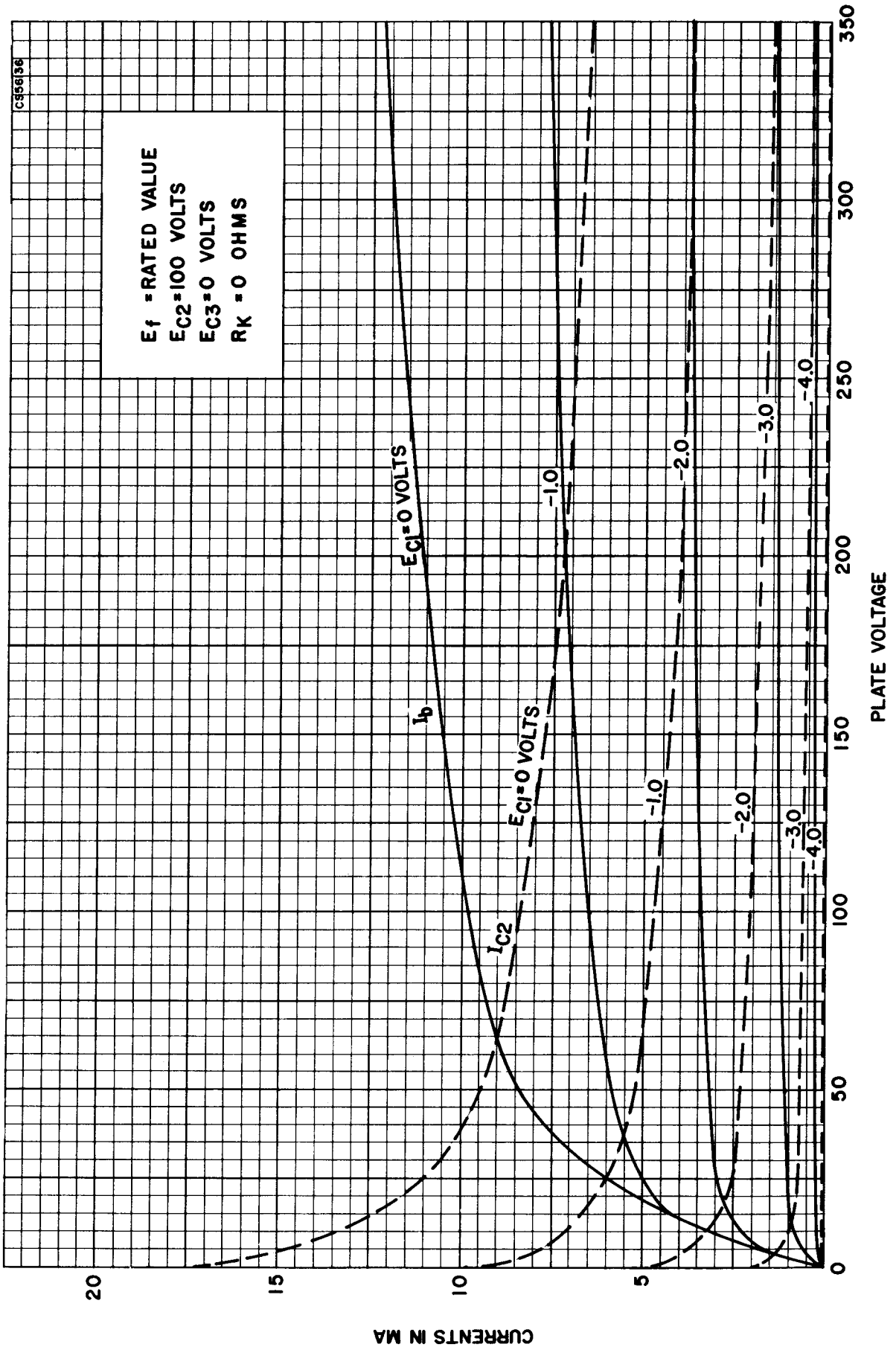
Both No. 1 and No. 3 grids have sharp cutoff characteristics and are intended for control purposes thus making the 5916 particularly useful in a variety of gated amplifier applications. This type is also useful as a mixer at frequencies up to 400 mc. The oscillator voltage is injected into grid No. 3.

The 5916 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability. Life expectance is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy.

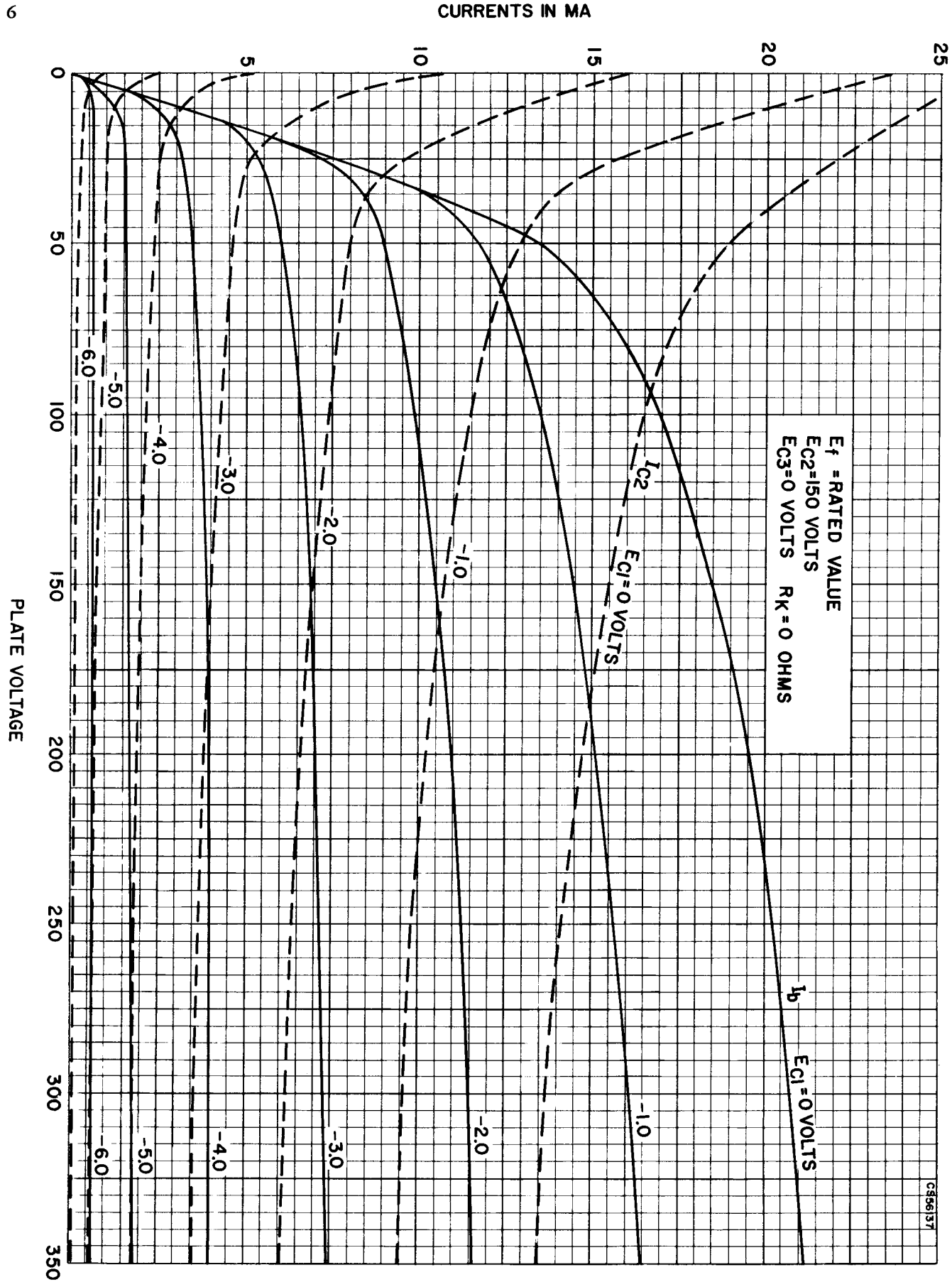
When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



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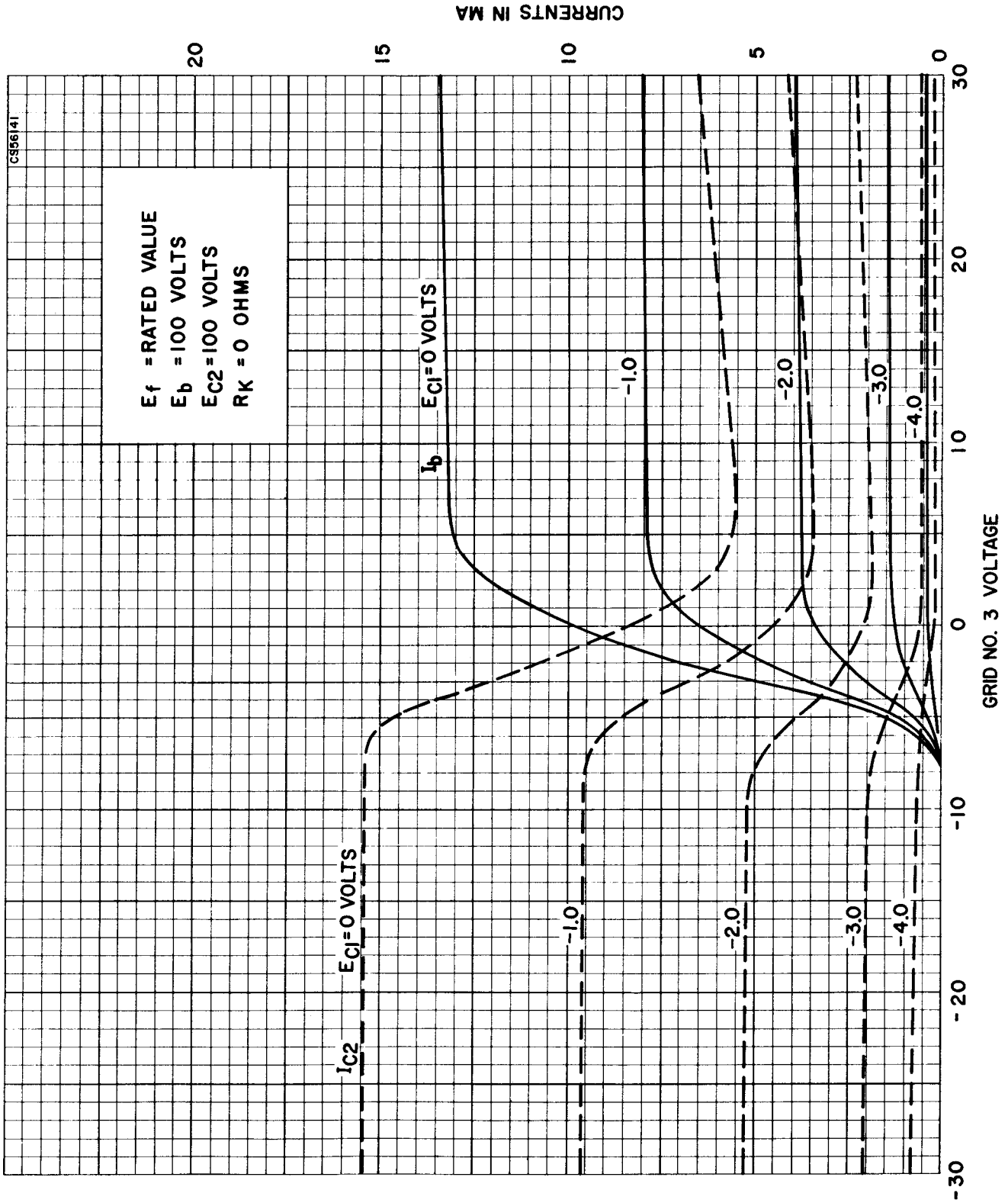

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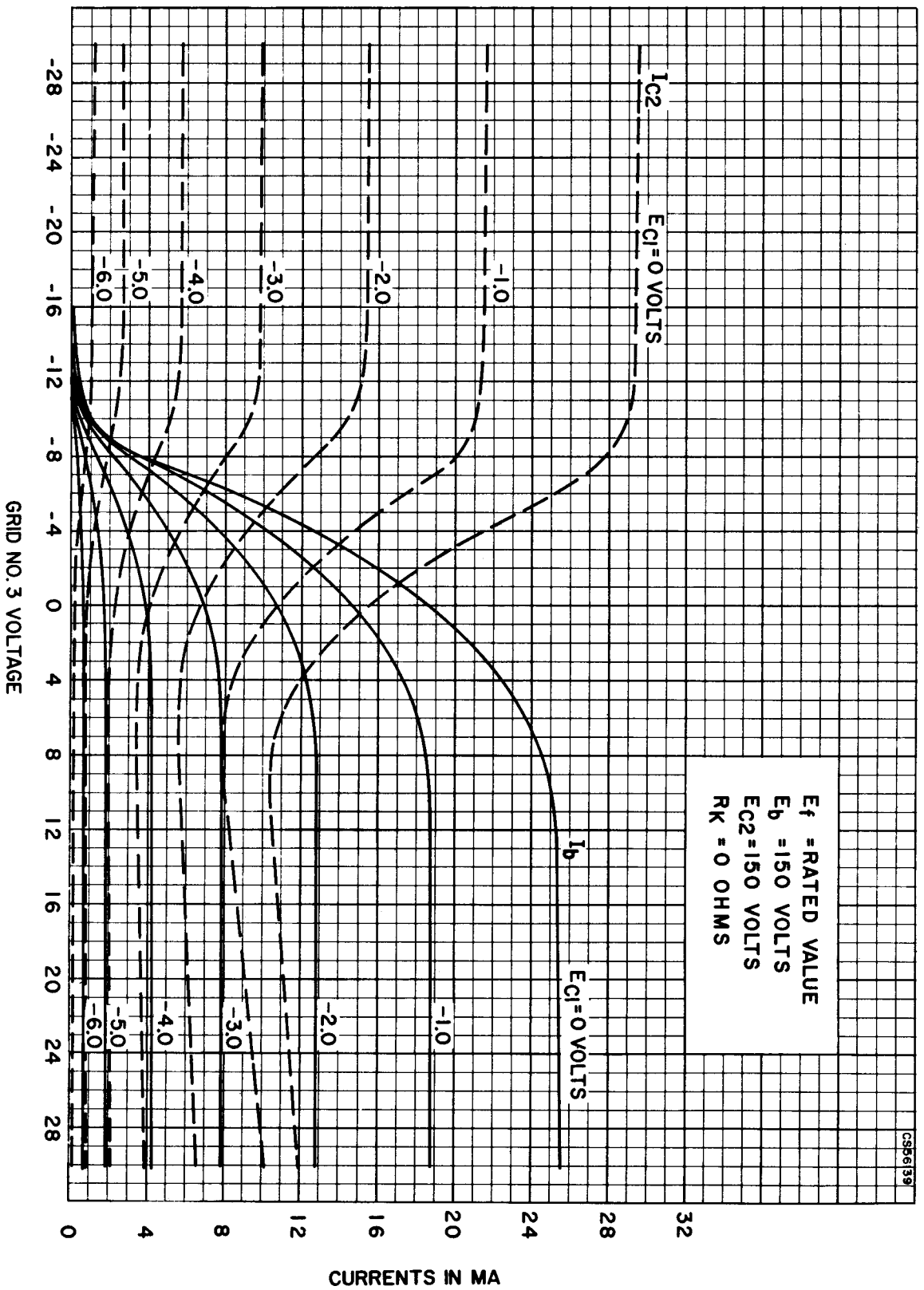

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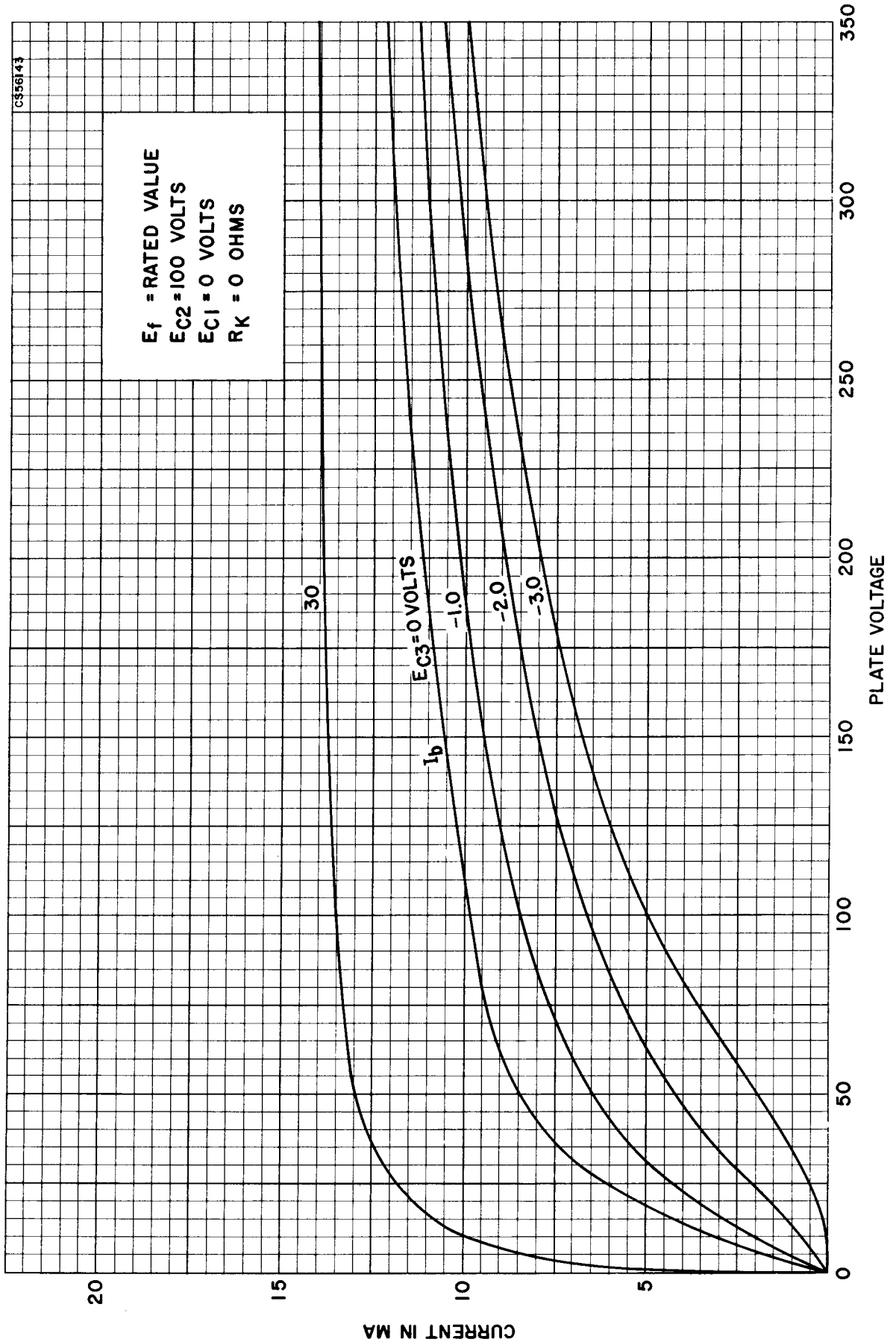
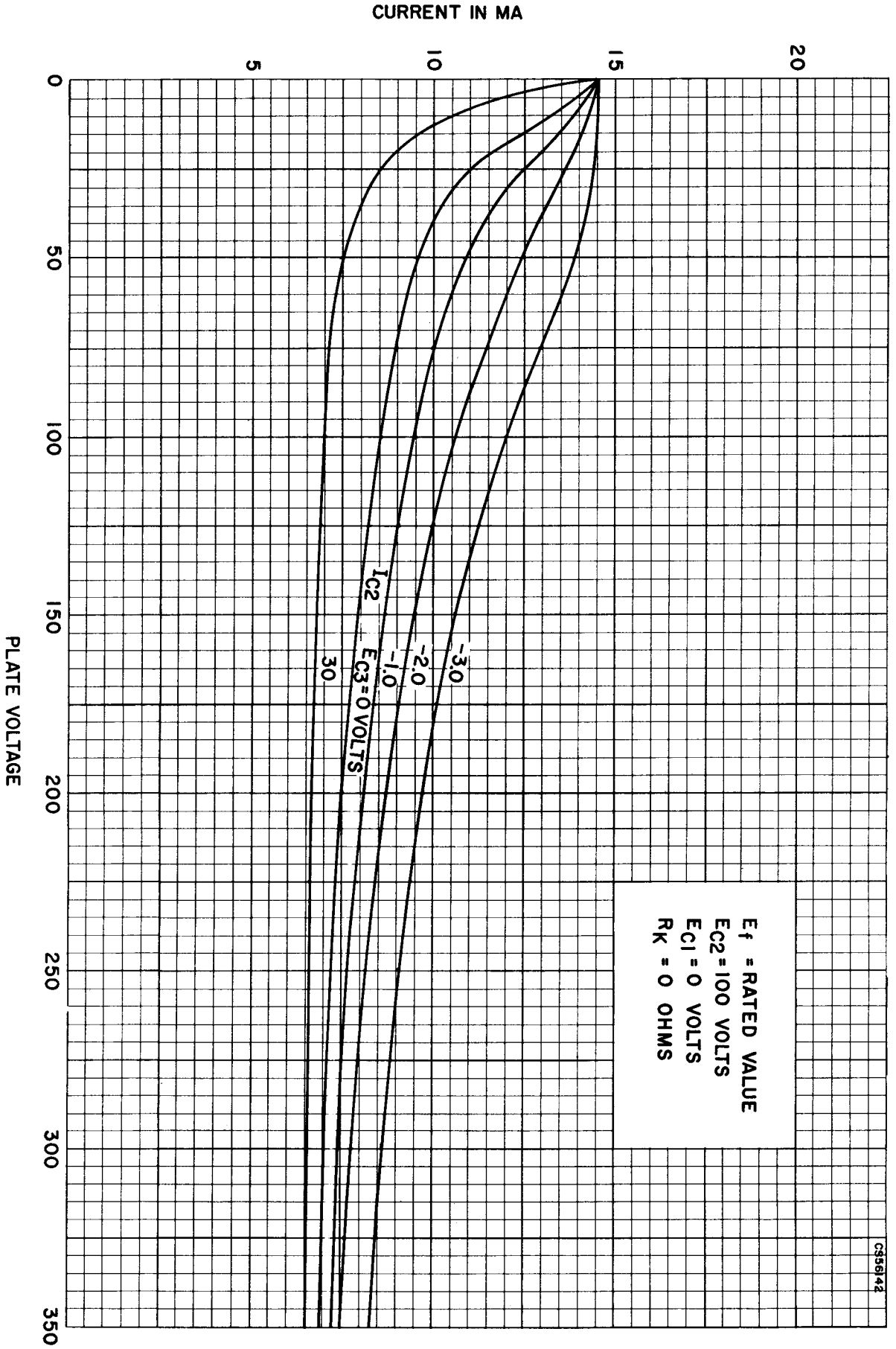
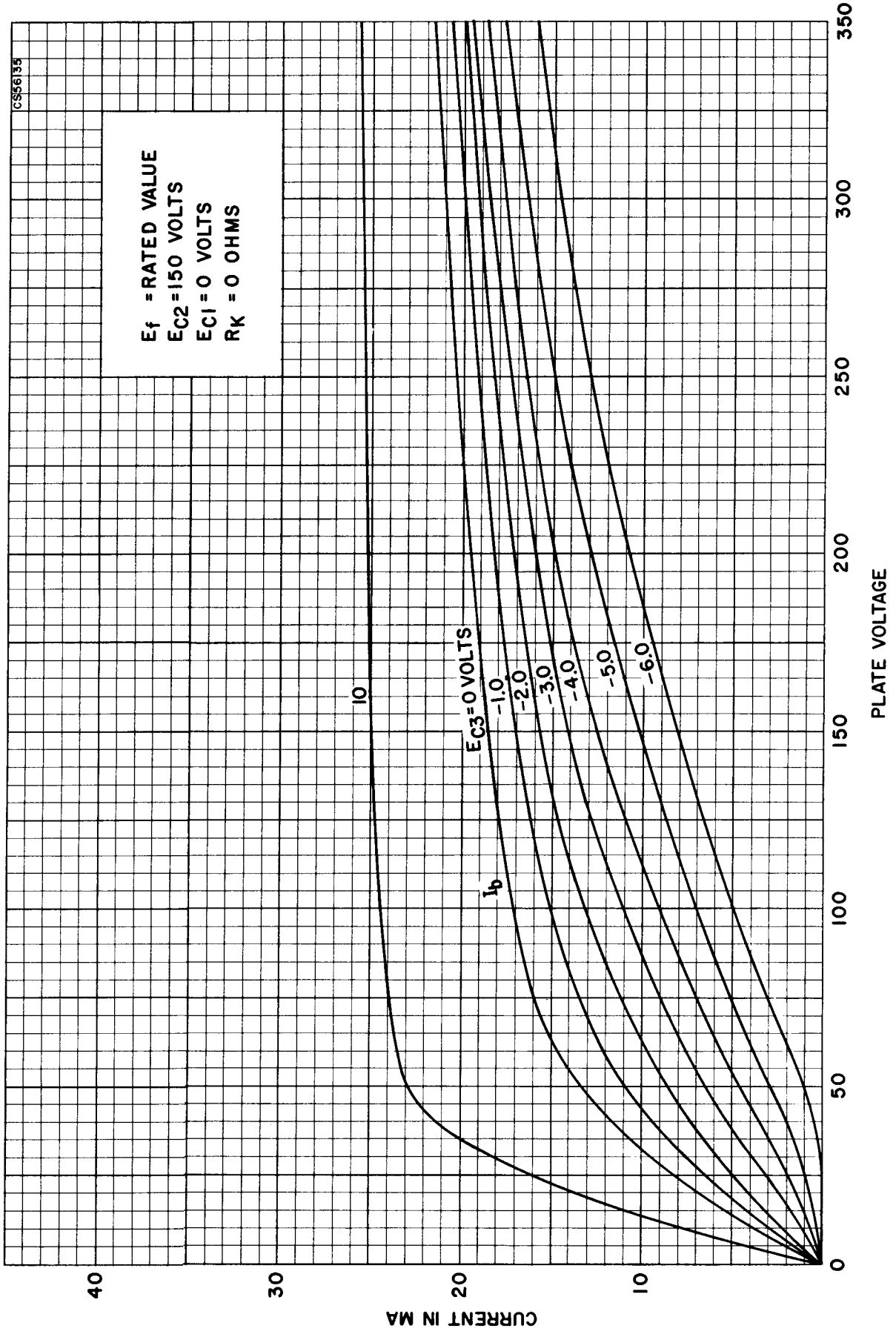


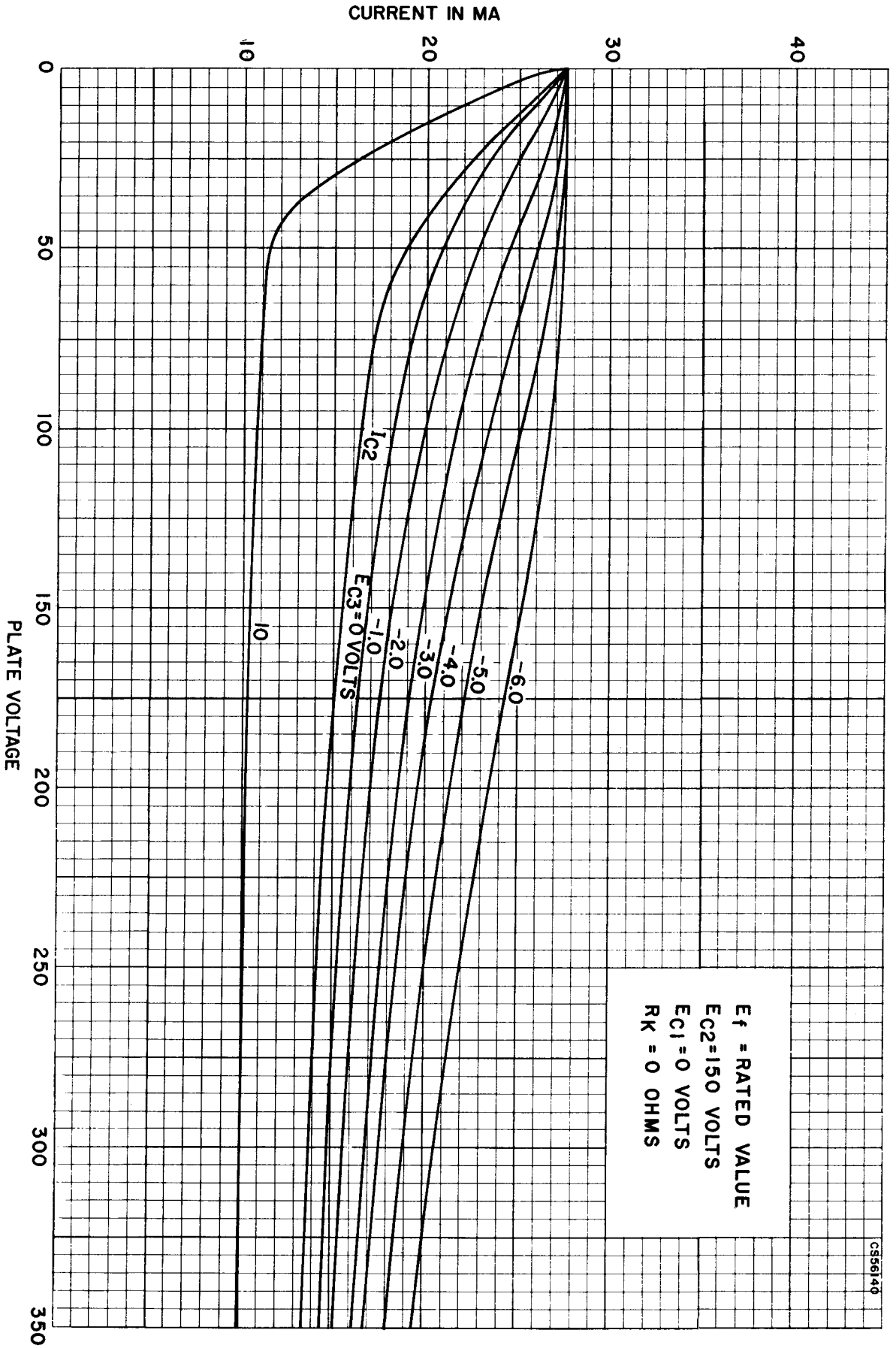
AVERAGE GRID No. 2 CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



AVERAGE GRID No. 2 CHARACTERISTICS



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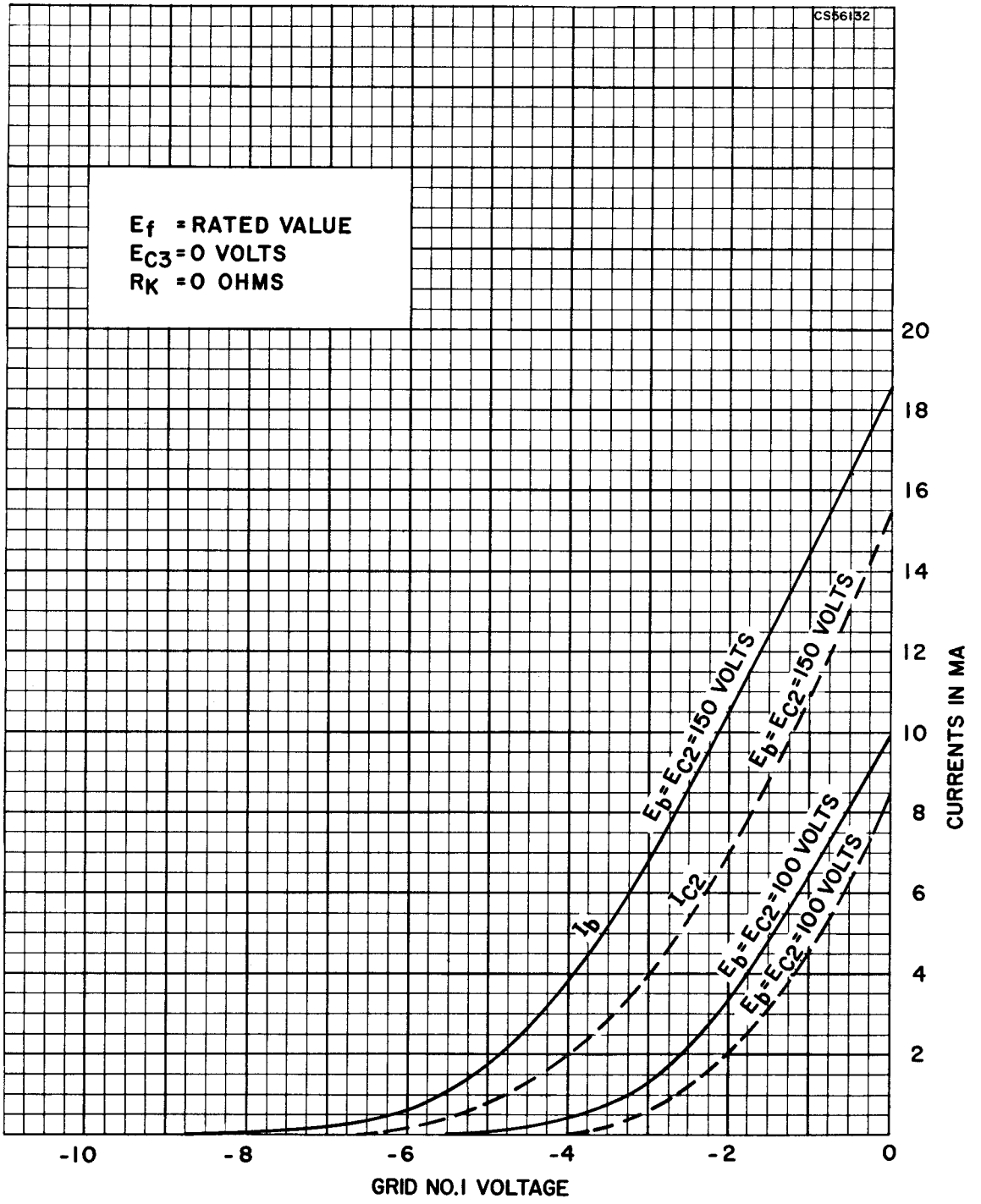

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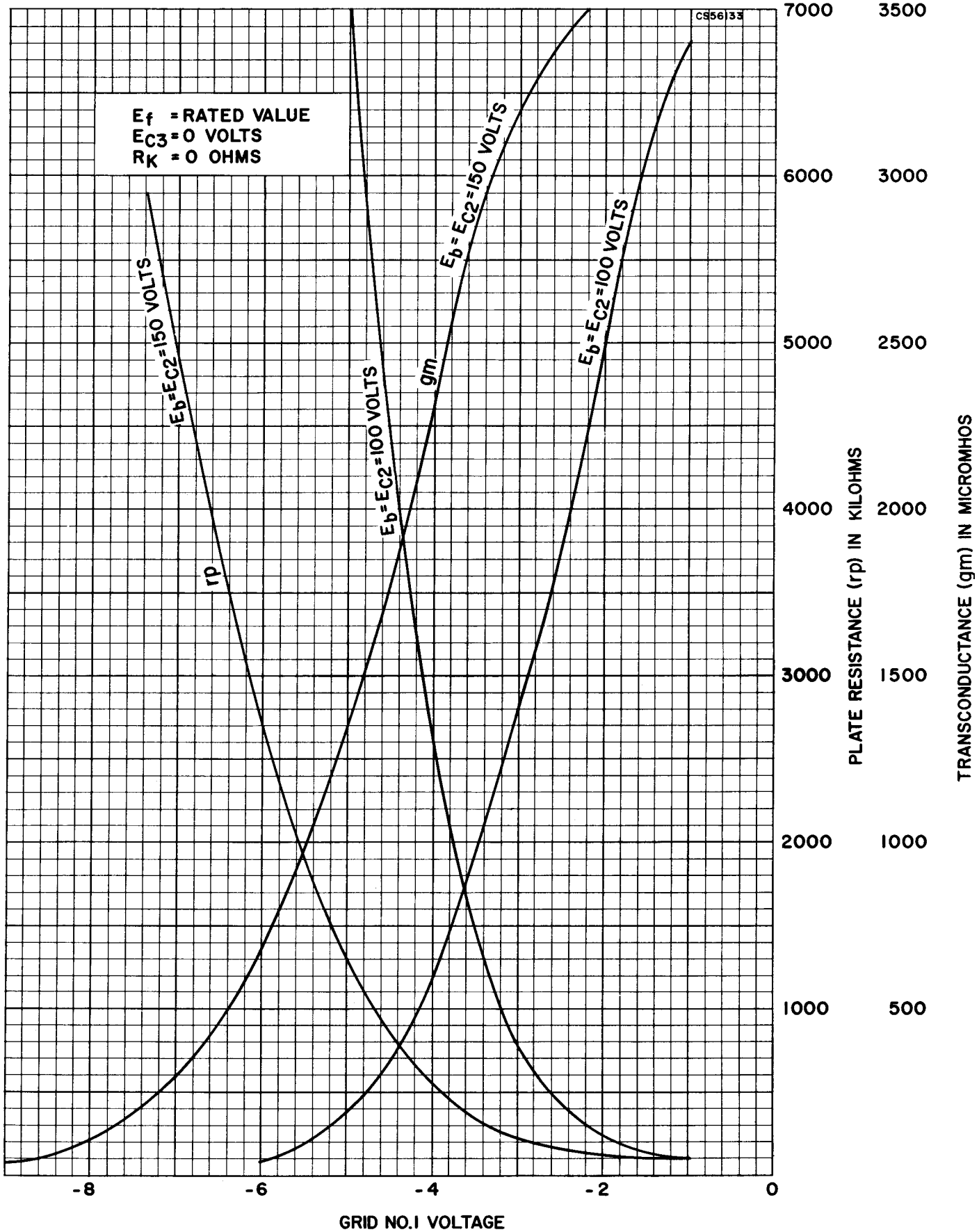
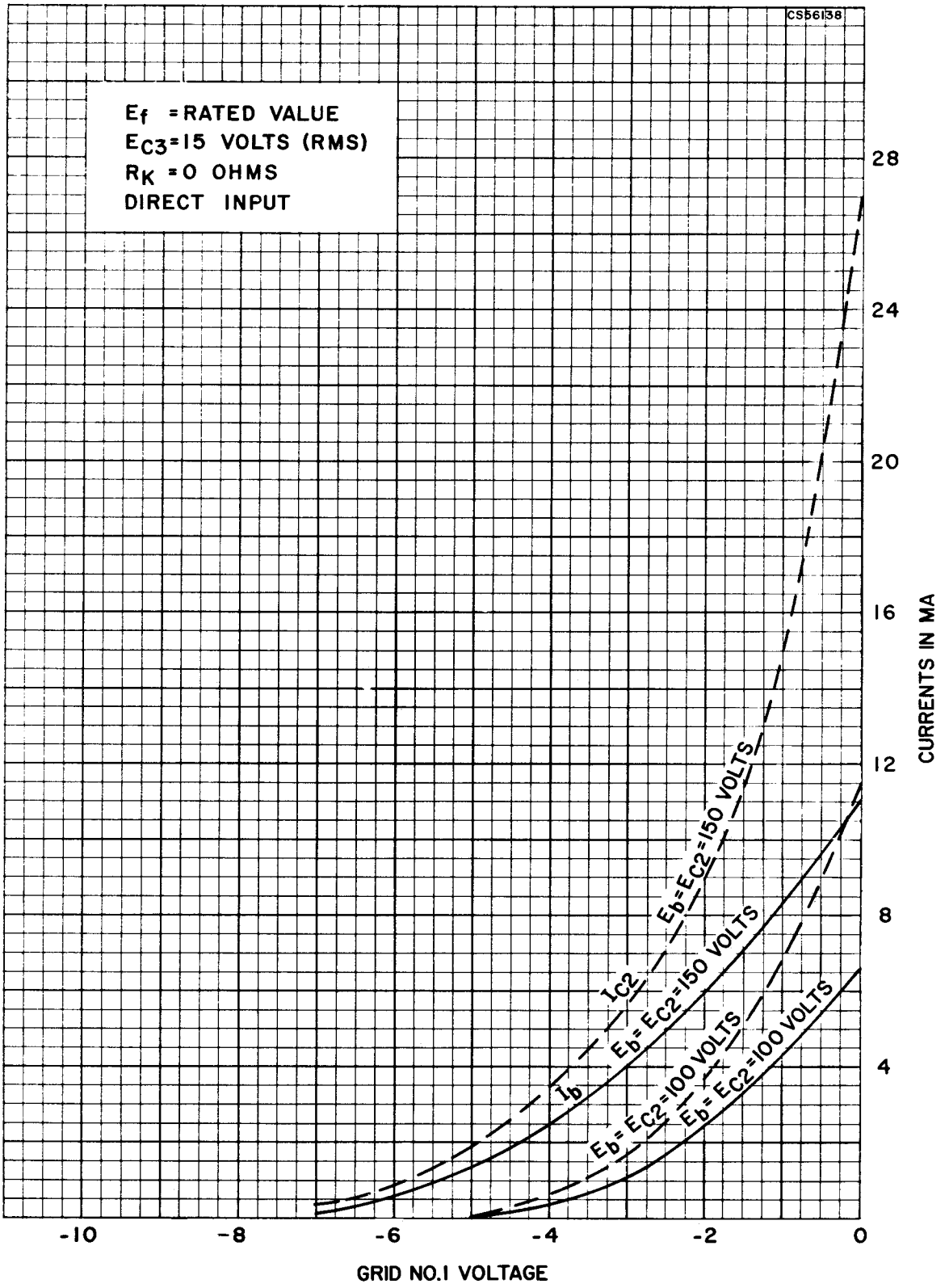


AVERAGE CONVERSION CHARACTERISTICS
DIRECT (TRANSFORMER) INPUT



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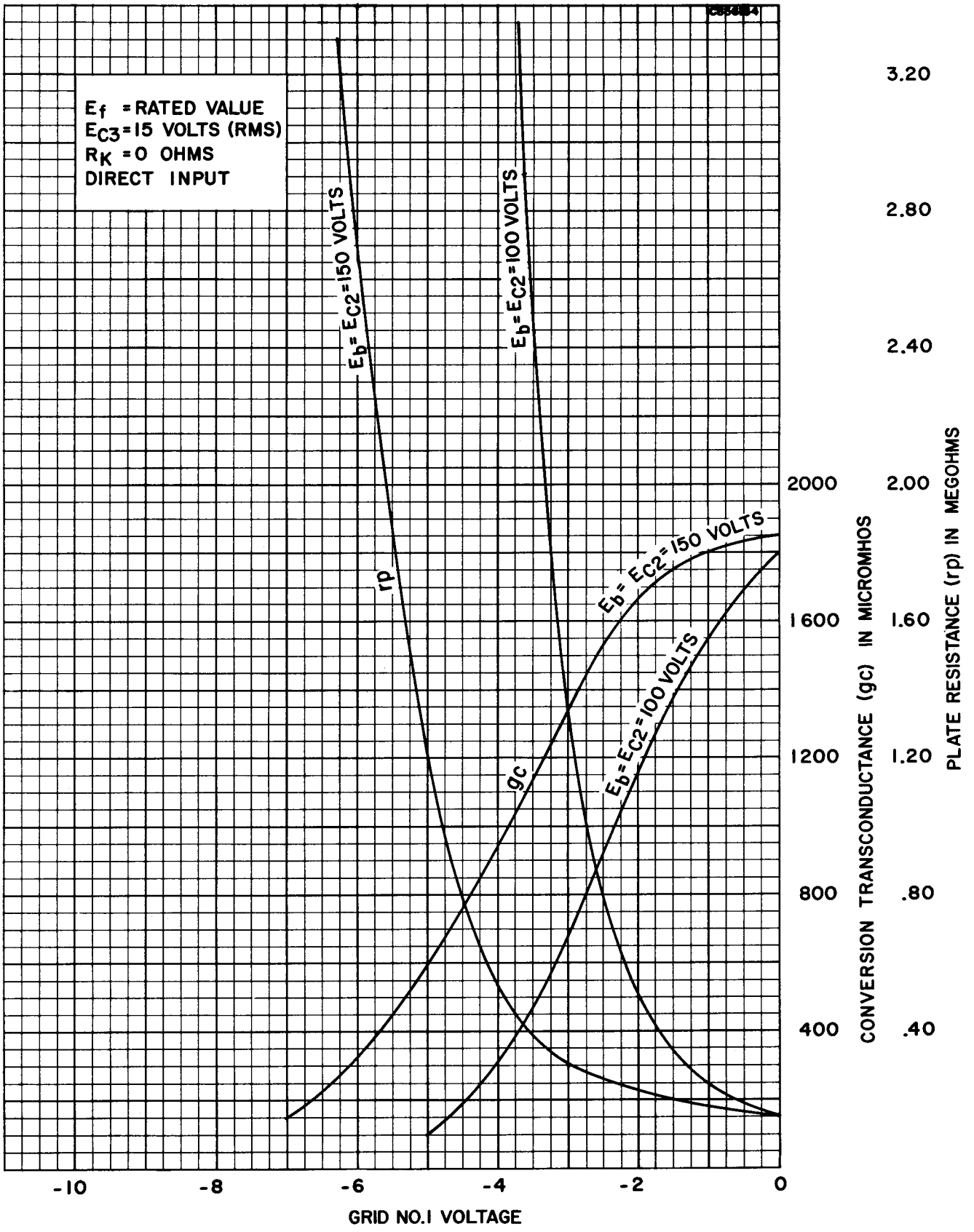

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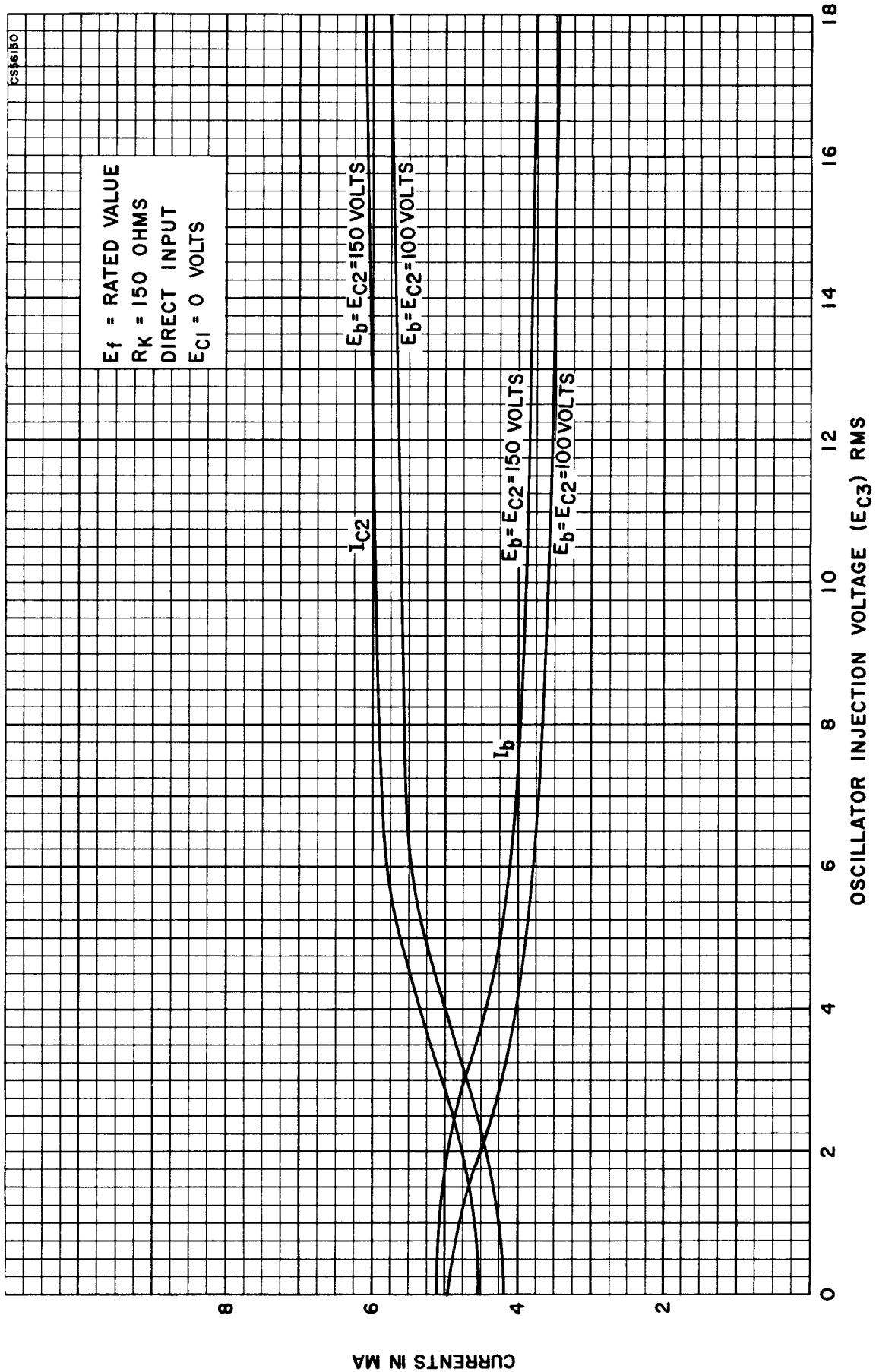
DIRECT (TRANSFORMER) INPUT



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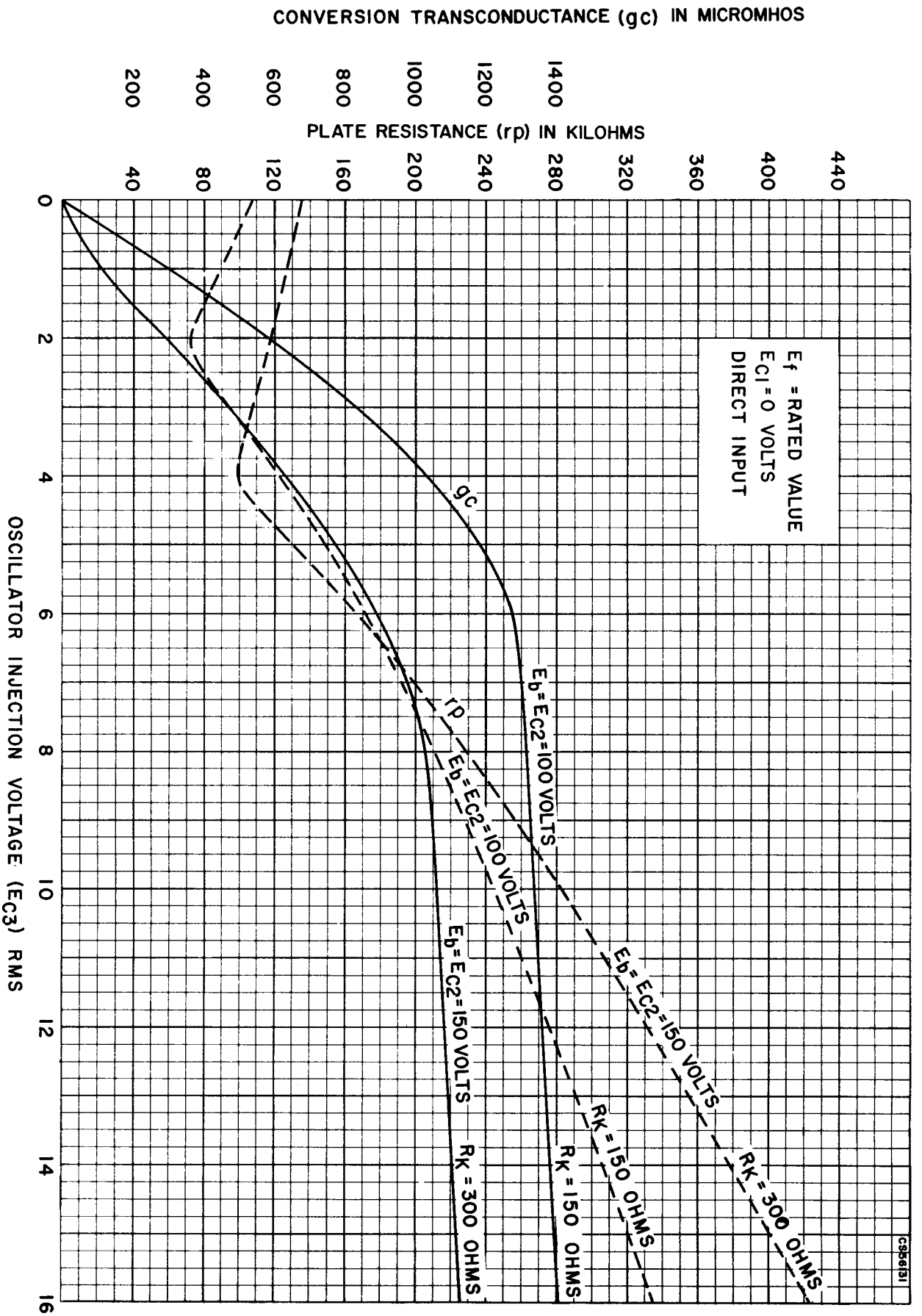


ELECTRICAL DATA

RATINGS

Transmitter Peak Power (min.)	20 kw
Transmitter Peak Power (max.)	1000 kw

GENERAL DATA

Center Frequency	3200 mc
Loaded Q (max.)	5.5
Low Level Characteristics:	
Equivalent Conductance at Center Frequency (max.)	0.05
Tuning Susceptance at Center Frequency	±0.05
High Level Characteristics:	
Firing Time (max.) (1)	10 sec
Arc Loss (max.) (1)	0.8 db

NOTES:

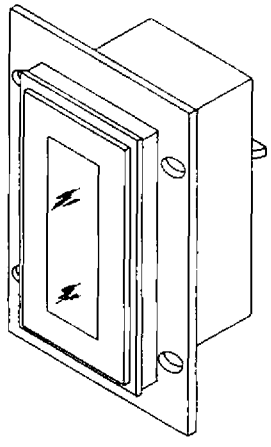
(1) Tested with line RF power of 20 kw, 1 usec pulse length, 1000 pps, and 3350 ± 3% mc.

MECHANICAL DATA

Dimensions:	Per outline.
Mounting Position:	Any.
Ambient Temperature Range:	-40°C to +100°C

QUICK REFERENCE DATA

The Sylvania Type 5921 is an anti-transmit-receive tube designed for use at a center frequency of 3200 megacycles.



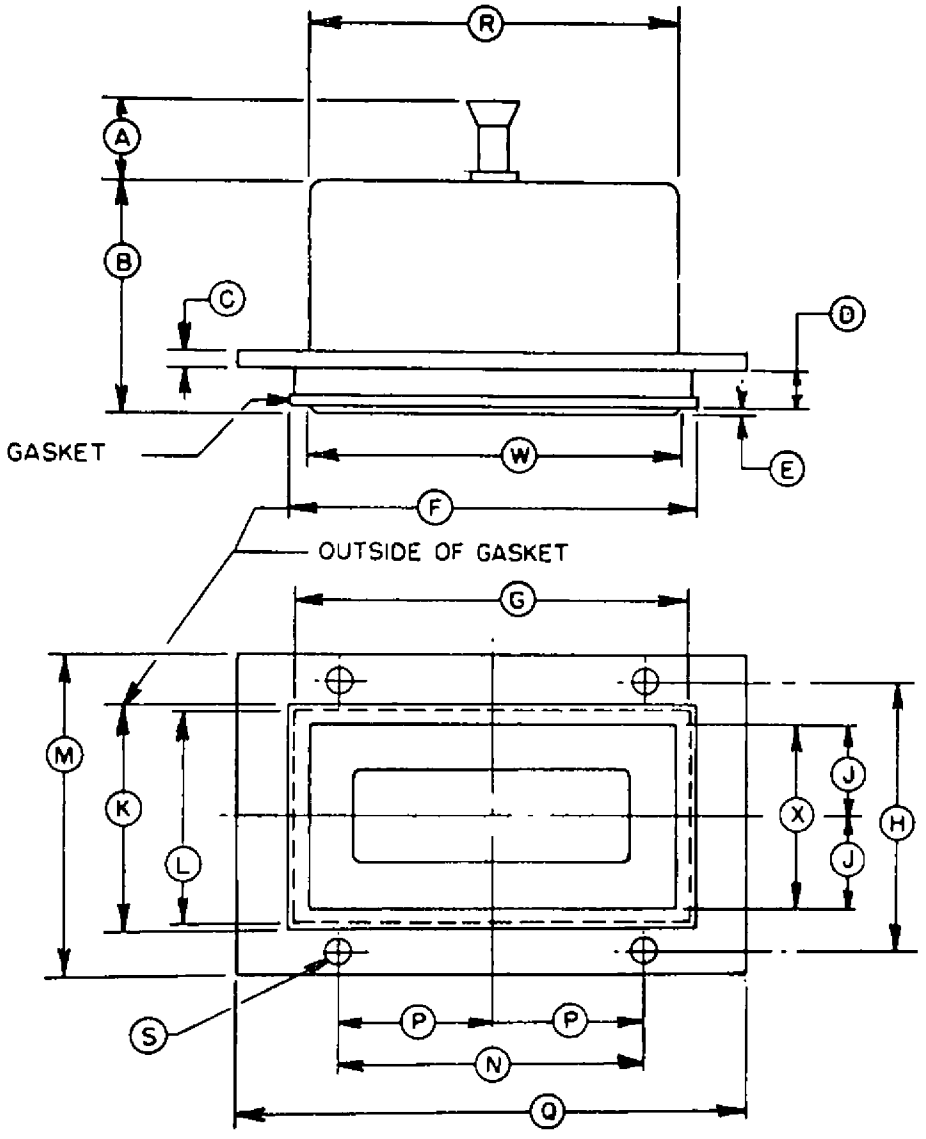
SYLVANIA ELECTRIC PRODUCTS, INC.
Electronics Division
Woburn, Mass.

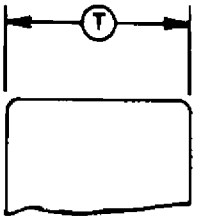
AUGUST 25, 1954

from JETEC release #1370, Nov. 8, 1954

SYLVANIA

5921





REF	DIMENSIONS
A	$\frac{5}{8}$ MAX
B	$1\frac{7}{8}$ MAX
C	$\frac{1}{8} \pm \frac{1}{64}$
D	.297 ± .020
E	.065 ± .015
F	3.223 MAX
G	3.218 ± .015
H	2.250 ± .010
J	1.125 ± .005
K	1.723 MAX
L	1.718 ± .015
M	$2\frac{5}{8} \pm \frac{1}{64}$
N	2.500 ± .010
P	1.250 ± .005
Q	$4\frac{1}{8} \pm \frac{1}{64}$
R	3.00 ± .015
S	$\frac{7}{32} \pm \frac{1}{64}$ DIA 4 HOLES
T	$1\frac{1}{2} \pm \frac{1}{64}$
W	3.000 ± .010
X	1.500 ± .010

ELECTRICAL DATA

RATINGS

Transmitter Peak Power (min.)	20 kw
Transmitter Peak Power (max.)	1000 kw

GENERAL DATA

Center Frequency	3400 mc
Loaded Q (max.)	5.5
Low Level Characteristics:	
Equivalent Conductance at Center Frequency (max.)	0.05
Tuning Susceptance at Center Frequency	±0.05
High Level Characteristics:	
Firing Time (max.) (1)	10 sec
Arc Loss (max.) (1)	0.8 db

NOTES:

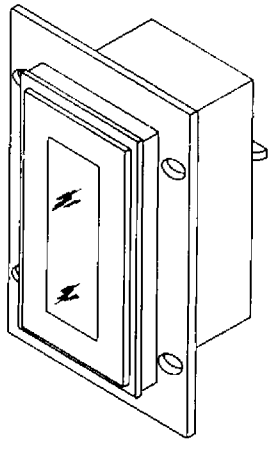
(1) Tested with line RF power of 20 kw, 1 usec pulse length, 1000 pps, and 3350 ± 3% mc.

MECHANICAL DATA

Dimensions:	Per outline.
Mounting Position:	Any.
Ambient Temperature Range:	-40°C to +100°C

QUICK REFERENCE DATA

The Sylvania Type 5922 is an anti-transmit-receive tube designed for use at a center frequency of 3400 megacycles.



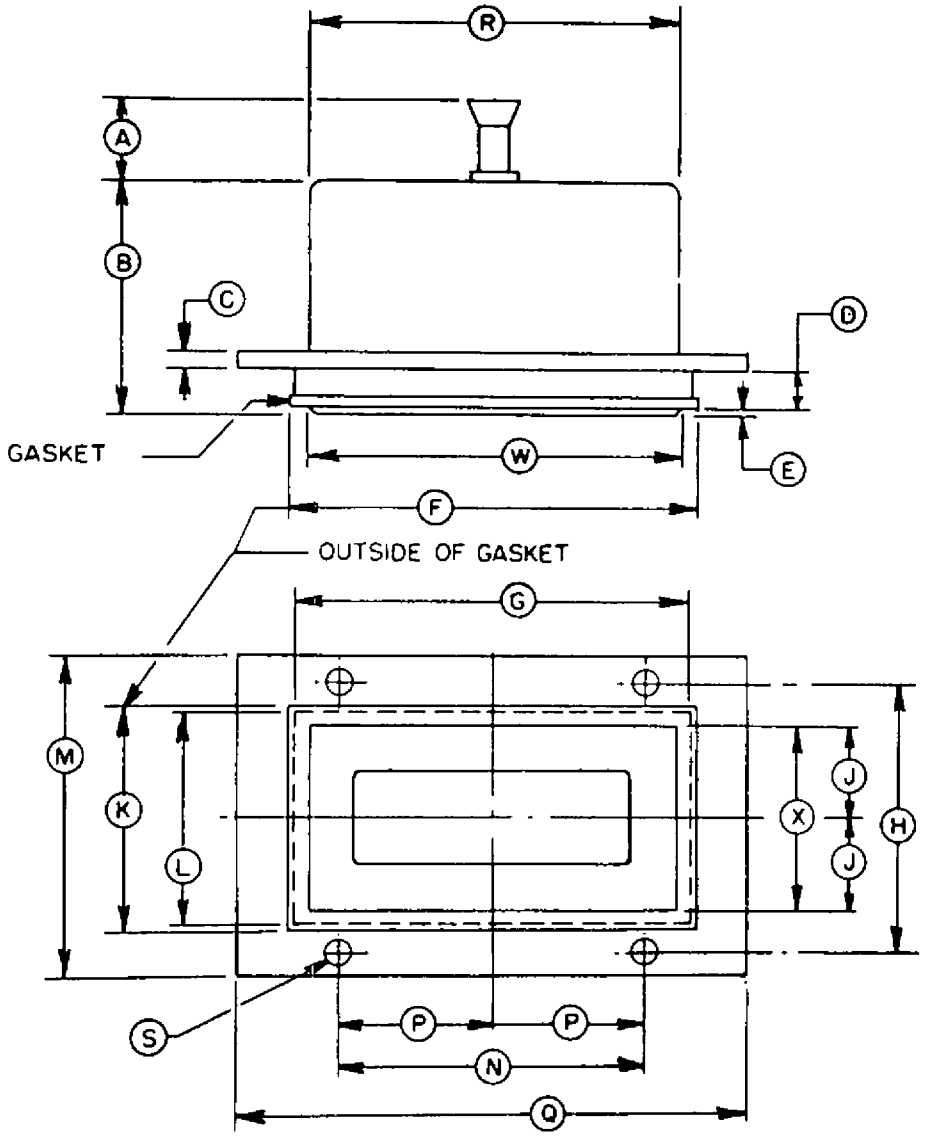
SYLVANIA ELECTRIC PRODUCTS, INC.
Electronics Division
Woburn, Mass.

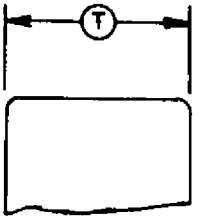
AUGUST 25, 1954

from JETEC release #1370, Nov. 8, 1954

SYLVANIA

5922





REF	DIMENSIONS
A	$^{5}/_{8}$ MAX
B	$1\,^{7}/_{8}$ MAX
C	$^{1}/_{8} \pm ^{1}/_{64}$
D	.297 ± .020
E	.065 ± .015
F	3.223 MAX
G	3.218 ± .015
H	2.250 ± .010
J	1.125 ± .005
K	1.723 MAX
L	1.718 ± .015
M	$2\,^{5}/_{8} \pm ^{1}/_{64}$
N	2.500 ± .010
P	1.250 ± .005
Q	$4\,^{1}/_{8} \pm ^{1}/_{64}$
R	3.00 ± .015
S	$^{7}/_{32} \pm ^{1}/_{64}$ DIA 4 HOLES
T	$1\,^{1}/_{2} \pm ^{1}/_{64}$
W	3.000 ± .010
X	1.500 ± .010

QUICK REFERENCE DATA

The Sylvania Type 5927 is an integral cavity broadband transmit-receive tube designed to effectively decouple the receiver from a common transmitting and receiving antenna during a period of transmission. Its operational band is 3100 to 3500 megacycles.

MECHANICAL DATA

Dimensions:	Per outline
Mounting Position:	Any
Number of Ignitors:	One
Ambient Temperature Range: (non-operating)	-40°C to +100°C

ELECTRICAL DATA

RATINGS

Transmitter Peak Power (min.)	100 kw
Ignitor Open Circuit Supply Voltage (min.)	-500 Vdc
Ignitor Open Circuit Supply Voltage (max.)	-700 Vdc

GENERAL DATA

Operational Band for Voltage Standing Wave Ratio of 1.6 max.	3100 to 3500 mc
Spike Leakage Energy (max.)	0.3 ergs
Flat Leakage Power (max.) (1)	50 mw
Insertion Loss at 3300 mc and zero Ignitor Current (max.)	0.7 db
Ignitor Interaction at 3300 mc and 200 uAdc Ignitor Current (max.)	0.3 db
Ignitor Voltage Drop at 200 uAdc Ignitor Current	-275 to -425 Vdc
Recovery Time (max.) (2)	15 usec

NOTES

(1) Tested at 200 KW RF power; pulse length of 1.0 ± .15 usec and 0.5 ± .15 usec; 1000 pps; at 3300 mc; with ignitor current of 200 uAdc.

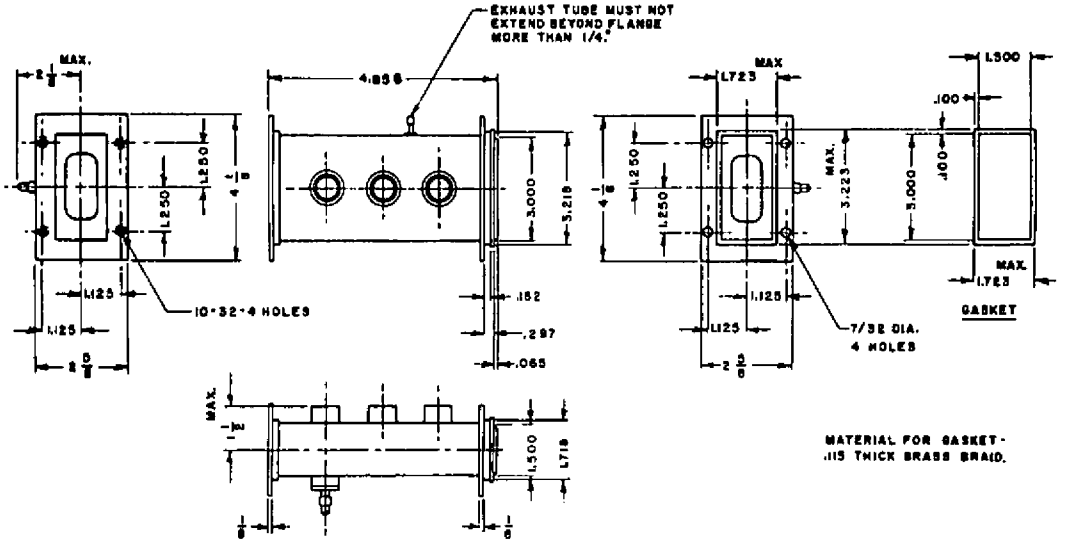
SYLVANIA ELECTRIC PRODUCTS INC. ELECTRONICS DIVISION
1740 Broadway, New York 19, New York

August 26, 1954

from JETEC release #1370, Nov. 8, 1954

NOTES (cont'd)

(2) Tested at 750 KW RF power; pulse length of 1.0 usec; 500 pps; at 3425 ± 25 mc; with ignitor current of 200 uAdc. The loss of signal in the tube at the specified time after the transmitter pulse shall not be greater than 3.0 db in excess of the loss at 800 to 1000 usec after the pulse.



SYLVANIA ELECTRIC

RMA Registration Data

TYPE 5930

TRIODE

The Type 5930 is a triode power amplifier designed to operate in applications where severe conditions of vibration and shock are encountered.

MECHANICAL DATA

GENERAL

Cathode	coated filament
Bulb	T-12
Base	*(see drawing, Page 2)* Large 4-Pin, low loss phenolic
Outline	*(see drawing, Page 2)*
Maximum Diameter	1.70 inches
Maximum Overall Length	4 1/2 inches
Maximum Seated Height	3 7/8 inches
Mounting Position:	
Vertical	base up or down
Horizontal	pins 1 and 4 in vertical plane
Basing	4D

Pin Connections:

Pin 1 .. filament (+)	Pin 3 .. grid
Pin 2 .. plate	Pin 4 .. filament (-)

RATINGS

Maximum Impact Acceleration(1)	450	g
Maximum Vibrational Acceleration for Extended Periods(2)	2.5	g

ELECTRICAL DATA

GENERAL

Filament Voltage (ac or dc)	2.5	volts
Filament Current	2.5	amps

RATINGS -- *Absolute System*

Maximum Plate Voltage (dc)	360	volts
Maximum Plate Dissipation	15	watts
Maximum Grid-Circuit Resistance (fixed bias)	50,000	ohms

CHARACTERISTICS

Conditions:		
Filament Voltage (ac or dc)	2.5	volts
Plate Voltage (dc)	250	volts
Grid Voltage(3) (dc)	-45	volts
Amplification Factor	4.2	
Plate Resistance	800	ohms
Transconductance	5,250	micromhos
Plate Current (dc)	60	milliamps

(See Page 2 for all notes.)

TYPE 5930

TYPICAL OPERATION

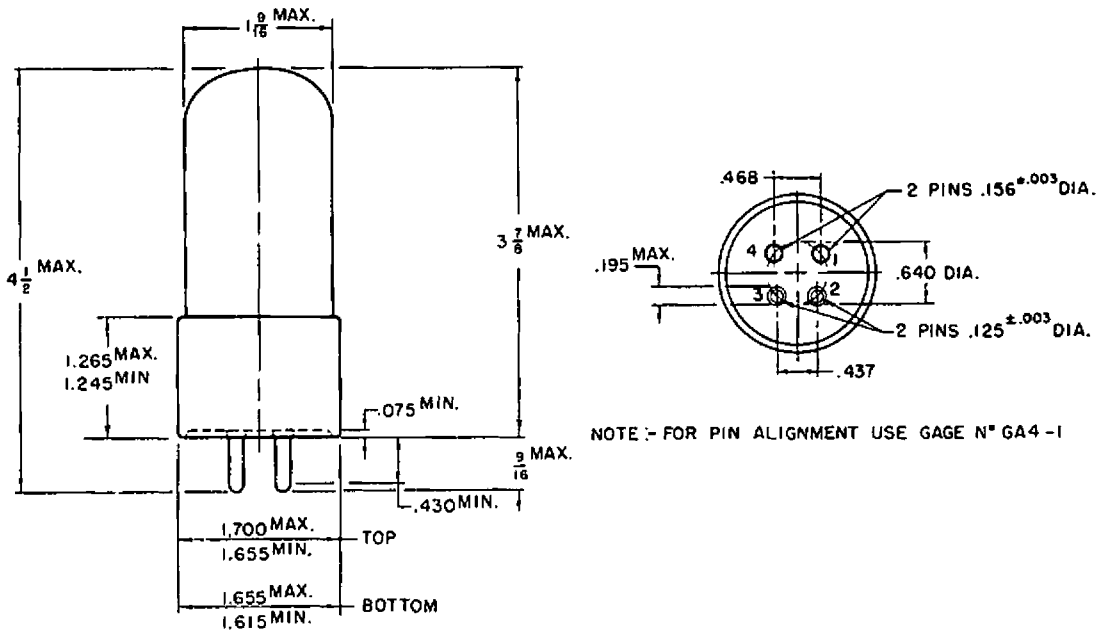
Class A_1 Amplifier

Filament Voltage (ac or dc)	2.5	volts
Plate Voltage (dc)	250	volts
Grid Voltage(3) (dc)	-45	volts
Plate Load Resistance	2,500	ohms
Power Output	3.5	watts
Distortion (2nd harmonic)	5.0	per cent

Push-Pull Class-AB_1 Amplifier (two tubes)

Filament Voltage (dc)	2.5	volts
Plate Voltage (dc)	300	volts
Grid Voltage(3) (dc)	-62	volts
Zero-Signal Plate Current (each tube) (dc)	40	milliamps
Effective Load Resistance (plate to plate)	3,000	ohms
Power Output	15	watts
Total Harmonic Distortion	2.5	per cent

OUTLINE & BASE



(1) Forces in any direction as applied by the Navy Type, High Impact Shock Machine for Electronic Devices, or its equivalent.

(2) Vibrational forces in any direction at 25 cycles per second for a period not exceeding 96 hours.

(3) Grid voltage measured from mid-point of ac operated filament.

SYLVANIA

engineering data service

SYLVANIA
5931
5U4WG

MECHANICAL DATA

Bulb	T-12
Base[1]	Octal Low Loss Phenolic 5-Pin
Basing	5T
Cathode	Filamentary
Mounting Position	Vertical[2]

RATINGS

Shock (Intermittent Service-Abs. Max.)	450 g
Vibration (Continuous Service-Design Center)	2.5 g
Mechanical Resonance	None Below 100 cps

ELECTRICAL DATA

FILAMENT CHARACTERISTICS

Filament Voltage (Avg.)	5.0 Volts
AC Filament Voltage (Abs. Max.)	5.5 Volts
AC Filament Voltage (Design Center)	5.0 Volts
Filament Current (Avg.)	3.0 Amperes
Filament Current (Max.)[3]	3.3 Amperes
Filament Current (Min.)[3]	2.7 Amperes

RATINGS

	Absolute Max.	Design Center
Peak Inverse Plate Voltage	1700	1550 Volts
Peak Plate Current Each Plate	750	675 Ma
Transient Peak Plate Current Each Plate	2.5	Amperes
DC Output Current	250	225 Ma
Tube Voltage Drop at 225 Ma Each Plate		58 Volts

TYPICAL OPERATION

Full-Wave Rectifier — Capacitor Input

AC Plate Voltage Each Plate (RMS)	450 Volts
Total Minimum Plate Supply Impedance Each Plate	75 Ohms
DC Output Current	225 Ma

Full-Wave Rectifier — Choke Input

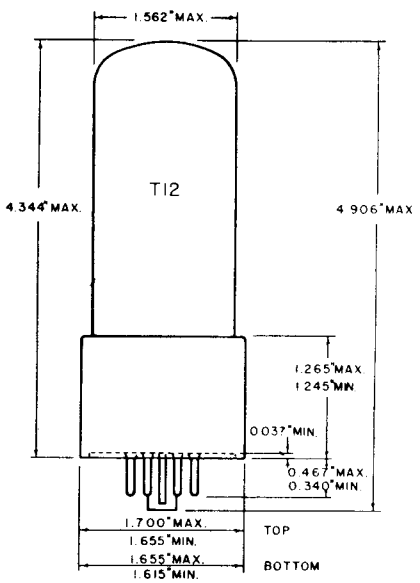
AC Plate Voltage Each Plate (RMS)	550 Volts
Minimum Input Choke Inductance	3 Henrys
DC Output Current	225 Ma

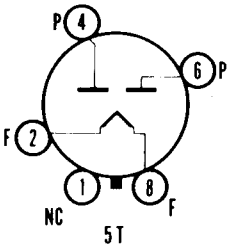
NOTES:

1. *Maximum Base dielectric loss factor is 0.1. Reference: ASTM Designation D-150-47T.*
2. *Horizontal mounting permissible if Pins 1 and 4 are in a vertical plane.*
3. *Limits given here are the extremes which may be found in production.*

QUICK REFERENCE DATA

Rugged full-wave filamentary type rectifier designed for use in applications requiring resistance to shock or vibration.





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SEPTEMBER 1952

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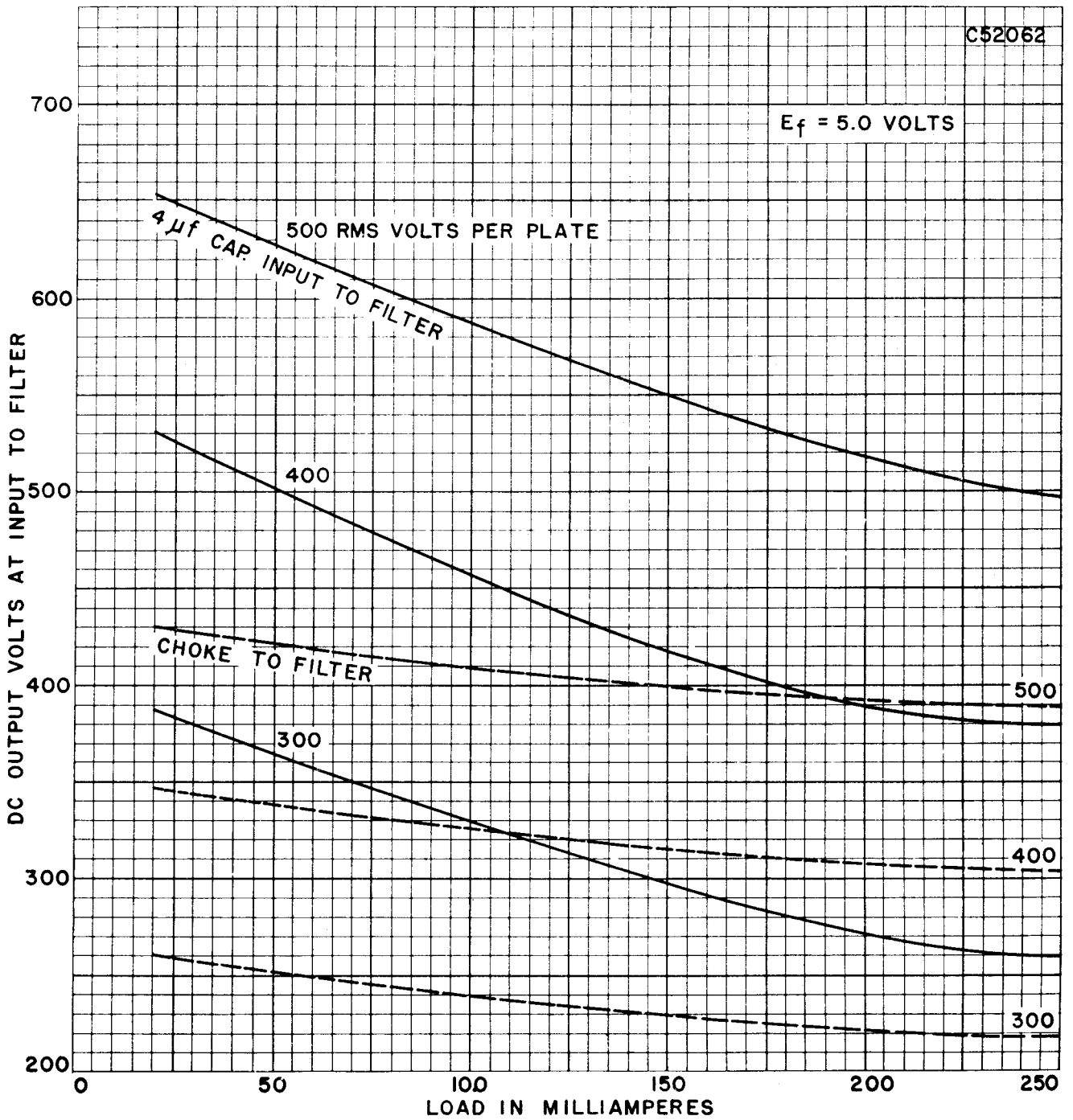
AVERAGE OPERATING CHARACTERISTICS



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MECHANICAL DATA

Bulb	T-12
Base[1]	Medium Octal Low Loss Phenolic 7-Pin
Basing	7S
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS

Shock (Intermittent Service-Abs. Max.)	450 g
Vibration (Continuous Service-Design Center)	2.5 g
Mechanical Resonance	None Below 100 cps

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (Avg.)	6.3 Volts
Heater Voltage (Abs. Max.)	7.0 Volts
Heater Voltage (Design Center)	6.3 Volts
Heater Current (Avg.)	900 Ma
Heater Current (Max.)[2]	960 Ma
Heater Current (Min.)[2]	840 Ma

RATINGS	Absolute Max.	Design Center	
Plate Voltage	400	360	Volts
Screen Voltage	300	270	Volts
Plate Dissipation	21	19.0	Watts
Screen Dissipation	2.75	2.5	Watts
Heater-Cathode Voltage	±200	±180	Volts

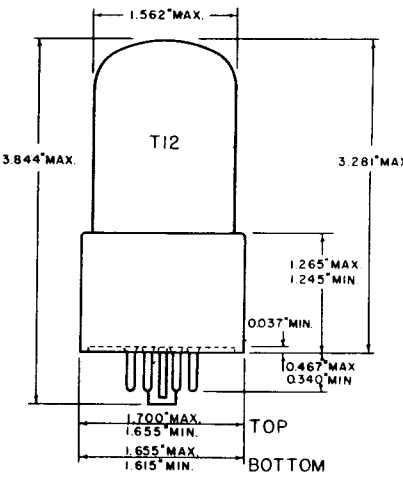
CHARACTERISTICS AND TYPICAL OPERATION

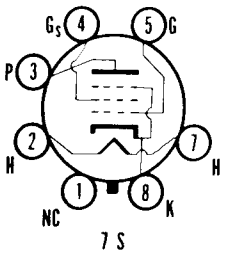
Class A_1 Amplifier (Single Tube)

	Min.[2]	Avg.	Max.[2]	
Plate Voltage		250		Volts
Screen Voltage		250		Volts
Grid Voltage[3]		−14		Volts
Peak A F Signal Voltage		14		Volts
Plate Current (Zero Signal)	58	72	86	Ma
Plate Current (Maximum Signal)		79		Ma
Screen Current (Zero Signal)	0	5	8	Ma
Screen Current (Maximum Signal)		7.3		Ma
Transconductance	5200	6000	6800	μmhos
Plate Resistance		22500		Ohms
Load Resistance		2500		Ohms
Power Output	5.4	6.5		Watts
Total Harmonic Distortion		10		Percent
Grid Current			3.0	μa
Heater-Cathode Leakage at ±200 Volts			75	μa

QUICK REFERENCE DATA

Rugged beam power amplifier designed for use in control or recording devices, or as an amplifier in equipment subjected to mechanical shock or vibration.





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CHARACTERISTICS AND TYPICAL OPERATION

Class A_1 Amplifier (Single Tube)

Plate Voltage	300	350	Volts
Screen Voltage	200	250	Volts
Grid Voltage[3]	-12.5	-18	Volts
Peak A F Signal Voltage	12.5	18	Volts
Plate Current (Zero Signal)	48	54	Ma
Plate Current (Maximum Signal)	55	66	Ma
Screen Current (Zero Signal)	2.5	2.5	Ma
Screen Current (Maximum Signal)	4.7	7.0	Ma
Transconductance	5300	5200	μmhos
Plate Resistance	35000	33000	Ohms
Load Resistance	4500	4200	Ohms
Power Output	6.5	10.8	Watts
Total Harmonic Distortion	11	15	Percent

Push-Pull Amplifier

	Class A_1		Class AB_1		Class AB_2		
Plate Voltage	250	270	360	360	360	360	Volts
Screen Voltage	250	250	270	270	225	270	Volts
Grid Voltage[3]	-16	-17.5	-22.5	-22.5	-18	-22.5	Volts
Peak A F Grid to Grid Voltage	32	35	45	45	52	72	Volts
Plate Current (Zero Signal)	120	134	88	88	78	88	Ma
Plate Current (Max. Signal)	140	155	132	140	142	205	Ma
Screen Current (Zero Signal)	10	11	5	5	3.5	5	Ma
Screen Current (Max. Signal)	16	17	15	11	11	16	Ma
Transconductance	5500	5700	—	—	—	—	μmhos
Plate Resistance	24500	23500	—	—	—	—	Ohms
Load Resistance	5000	5000	6600	3800	6000	3800	Ohms
Power Output	14.5	17.5	26.5	18	31	47	Watts
Total Harmonic Distortion	2	2	2	2	2	2	Percent

NOTES:

1. *Maximum base dielectric loss factor is 0.1. Reference: ASTM Designation D-150-47T.*
2. *Limits given here are the extremes which may be found in production.*
3. *For fixed bias operation the grid bias resistor should not exceed 0.1 megohm. A grid circuit resistance of .25 megohm may be used for self bias providing the heater voltage will not exceed 7.0 volts under any probable operating condition.*

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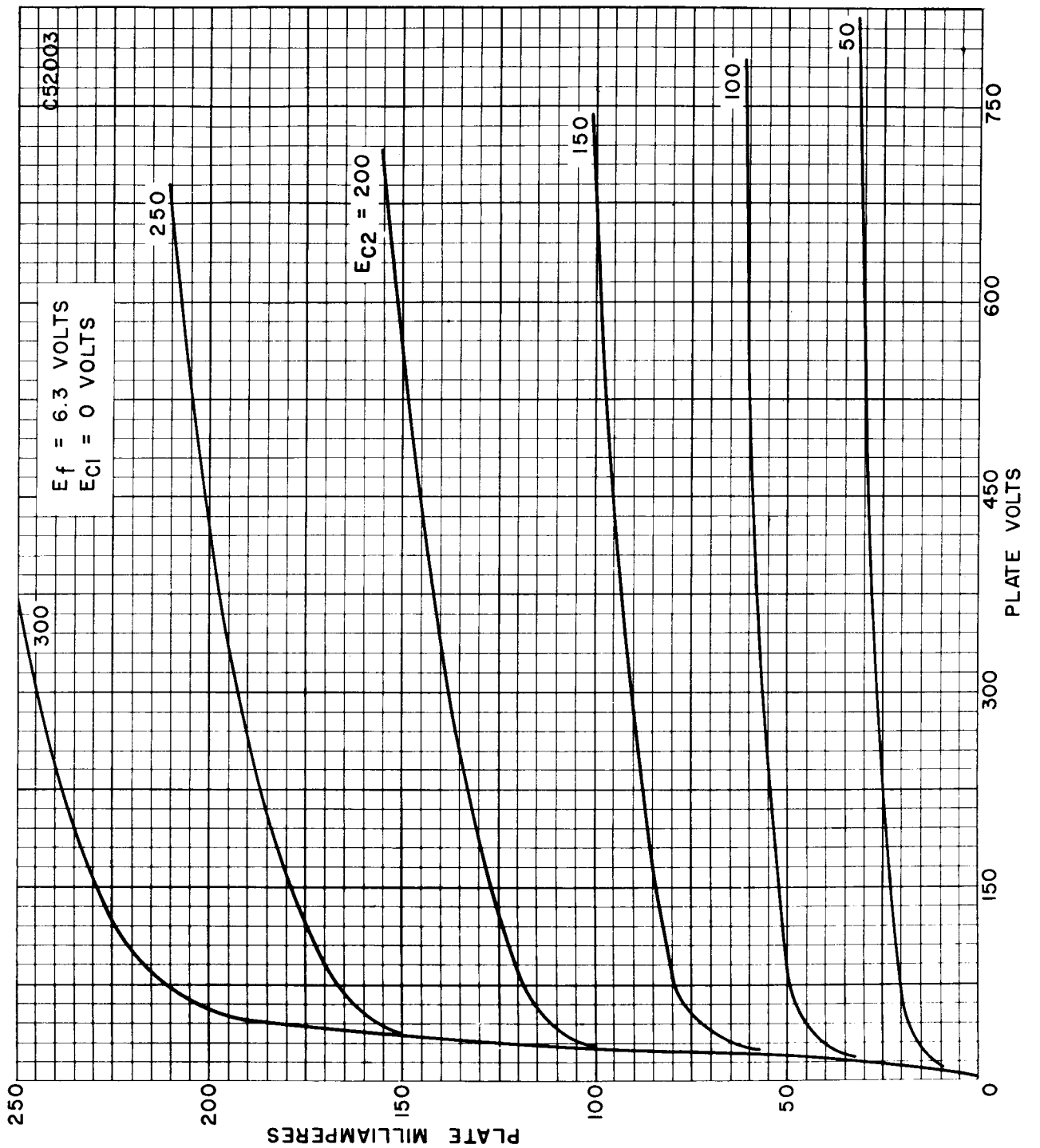
AVERAGE PLATE CHARACTERISTICS



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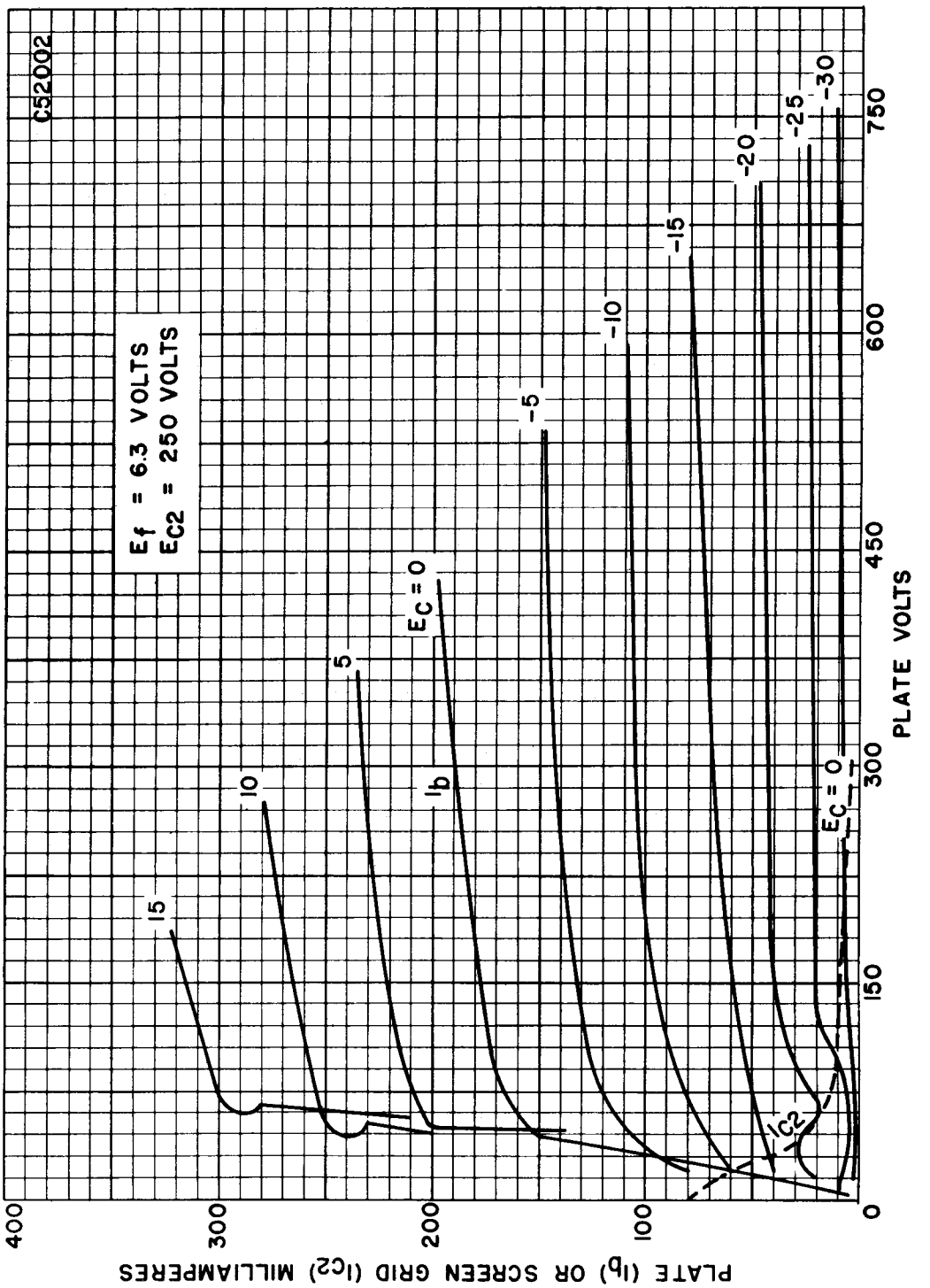
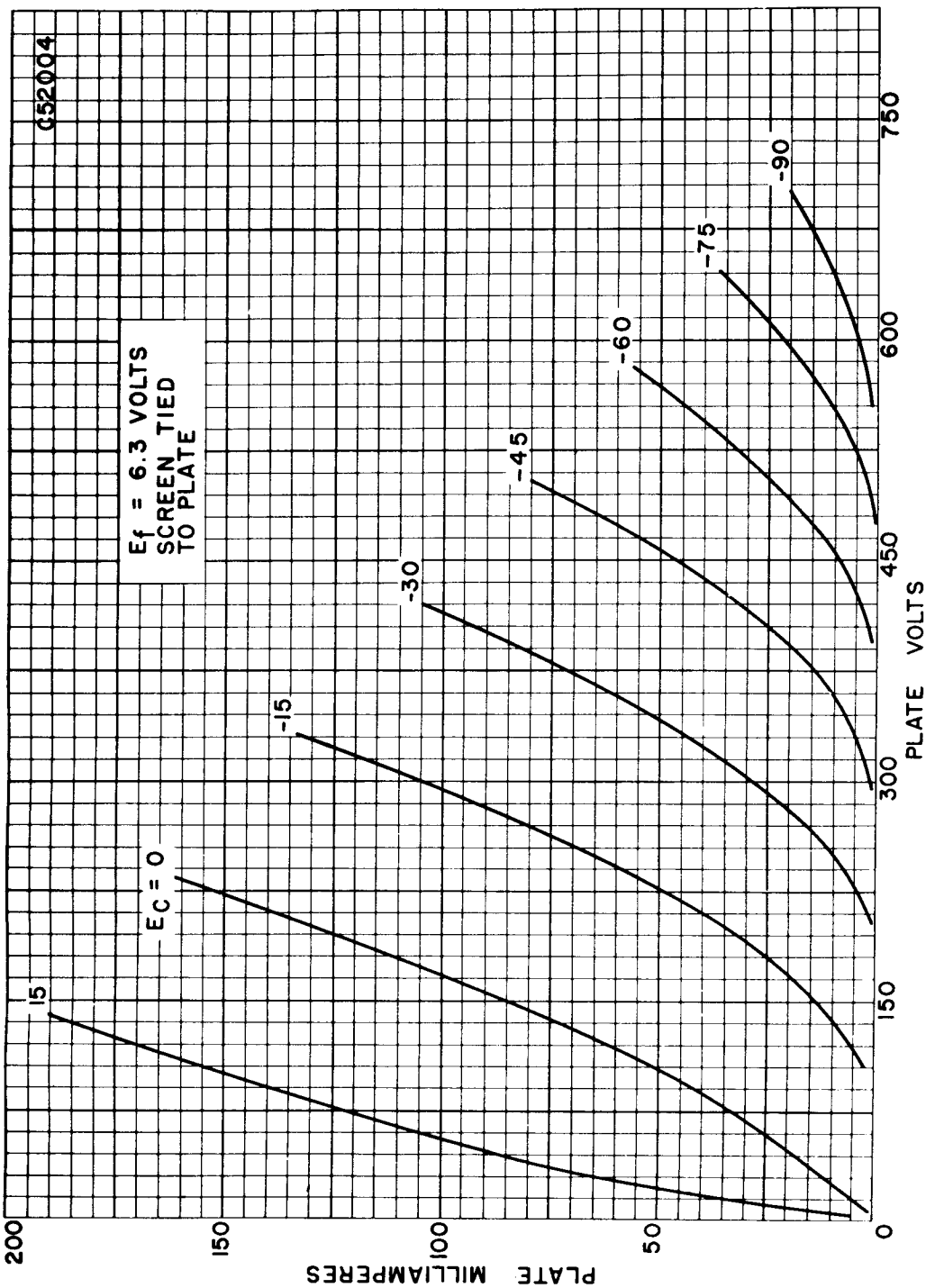
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS

TRIODE CONNECTED



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MECHANICAL DATA

Bulb	T-12
Base[1]	Low Loss Phenolic 5-Pin
Basing	5AW
Cathode	Unipotential
Mounting Position	Any

RATINGS

Shock (Intermittent Service-Abs. Max.)	450	g
Vibration (Continuous Service-Design Center)	2.5	g
Mechanical Resonance	None Below 100	cps

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3	Volts
Heater Current (Avg.)	900	Ma
Heater Current (Max.)[2]	990	Ma
Heater Current (Min.)[2]	810	Ma

DIRECT INTERELECTRODE CAPACITANCES

	Min.[2]	Avg.	Max.[2]	
Control Grid to Plate (Shielded)			0.2	μμf
Input (Unshielded)	10	12	14	μμf
Output (Unshielded)	5.3	7	8.7	μμf

RATINGS (Design Center Values)

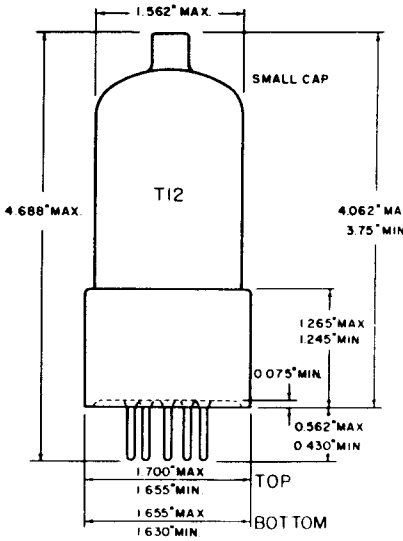
Plate Voltage (Class B, RF or AF)	600	Volts Max.
Plate Voltage (Class C, CW)	600	Volts Max.
Plate Voltage (Class C, Phone[3])	475	Volts Max.
Screen Voltage	300	Volts Max.
Control Grid Voltage (Class C)	-200	Volts Max.
Plate Dissipation (Class B, RF or AF)	25	Watts Max.
Plate Dissipation (Class C, CW)	25	Watts Max.
Plate Dissipation (Class C, Phone[3])	16.5	Watts Max.
Screen Dissipation (Class B, AF)	3.5	Watts Max.
Screen Dissipation (Class B, RF)	2.5	Watts Max.
Screen Dissipation (Class C, CW)	3.5	Watts Max.
Screen Dissipation (Class C, Phone[3])	2.5	Watts Max.
Plate Input (Class B, AF)	60	Watts Max.
Plate Input (Class B, RF)	37.5	Watts Max.
Plate Input (Class C, CW)	60	Watts Max.
Plate Input (Class C, Phone[3])	40	Watts Max.
Heater-Cathode Voltage	135	Volts Max.
Frequency for 100% Rating	60	Mc Max.
Frequency for 75% Rating (Class B, Class C Grid or Suppressor Modulated)	125	Mc Max.
Frequency for 55% Rating (Class C, or Plate Modulated)	125	Mc Max.

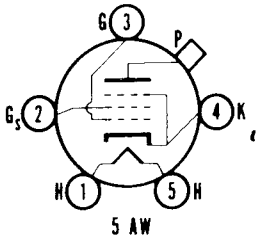
CHARACTERISTICS

	Min.[2]	Avg.	Max.[2]	
Plate Voltage	—	600	—	Volts
Screen Voltage	—	300	—	Volts
Control Grid Voltage	—	-29	—	Volts
Plate Current	24	36	48	Ma
Screen Current	—	—	4	Ma
Plate Current for E_c = -100 Volts	—	—	0.5	Ma
Power Output at 15 mc with Screen Volts = 200, I_b = 100 ma, I_c = 5 to 7 ma, R_L = 10,000 Ohms	33	—	—	Watts

QUICK REFERENCE DATA

Rugged beam amplifier tube designed for use in mobile transmitters or amplifiers which may be subjected to shock or vibration.





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TYPICAL OPERATION

Audio Amplifier or Modulator (Class AB_2) — Two Tubes

	CCS[4]			ICAS[5]	
Plate Voltage	400	500	600	750	Volts
Screen Grid Voltage[6]	300	300	300	300	Volts
Control Grid Voltage	-25	-29	-30	-32	Volts
Peak Grid to Grid Signal Voltage	78	86	78	92	Volts
Plate Current (Zero Signal)	90	72	60	52	Ma
Plate Current (Maximum Signal)	240	240	200	240	Ma
Screen Current (Zero Signal)	5	5	5	5	Ma
Screen Current (Maximum Signal)	10	10	10	10	Ma
Load Resistance (Plate to Plate)	3200	4240	6400	6950	Ohms
Driving Power (Maximum Signal) (approx.)[7]	0.2	0.2	0.1	0.2	Watt
Power Output (approx.)[8]	55	75	80	120	Watts

RF Power Amplifier (Class B Telephony)
Single Tube — 100% Modulation of Driver Stage

Plate Voltage	400	500	600	750	Volts
Screen Grid Voltage	250	250	250	300	Volts
Control Grid Voltage[9]	-25	-25	-25	-35	Volts
Peak Signal Voltage	30	30	20	27	Volts
Plate Current	75	75	62.5	60	Ma
Screen Current	4	4	3	3	Ma
Control Grid Current (approx.)	0	0	0	0	Ma
Driving Power (approx.)	0.25	0.25	0.2	0.12	Watt
Power Output (approx.)	9	12.5	12.5	15	Watts

RF Power Amplifier (Class C Telephony)
Single Tube — 100% Plate Modulation

Plate Voltage	325	400	475	600	Volts
Screen Grid Voltage[10]	225	225	225	275	Volts
Screen Dropping Resistor	20000	30000	50000	50000	Ohms
Control Grid Voltage[11]	-75	-80	-85	-90	Volts
Grid Leak Resistor	25000	22800	21300	22500	Ohms
Peak Signal Voltage	90	95	110	115	Volts
Plate Current	80	80	83	100	Ma
Screen Current	5	5.75	5	6.5	Ma
Grid Current (approx.)	3	3.5	4	4	Ma
Driving Power (approx.)	0.25	0.3	0.4	0.4	Watt
Power Output (approx.)	17.5	22.5	27.5	42.5	Watts

RF Power Amplifier or Oscillator (Class C Telegraphy)
Single Tube Key Down Unmodulated Condition

Plate Voltage	400	500	600	750	Volts
Screen Grid Voltage[12]	250	250	250	250	Volts
Screen Dropping Resistor	20000	42000	50000	85000	Ohms
Control Grid Voltage[13]	-45	-45	-45	-45	Volts
Peak Signal Voltage	65	65	65	65	Volts
Plate Current	100	100	100	100	Ma
Screen Current	7.5	6.0	7.0	6.0	Ma
Grid Current (approx.)	3.5	3.5	3.5	3.5	Ma
Driving Power (approx.)	0.2	0.2	0.2	0.2	Watt
Power Output (approx.)	25	30	40	50	Watts

NOTES:

1. *Base dielectric loss factor is 0.1 maximum. Reference: ASTM Designation D-150-47T.*
2. *Extreme values which may be expected in production.*
3. *With plate modulation.*
4. *Continuous commercial service.*
5. *Intermittent commercial and amateur service.*
6. *May be obtained from a separate, well-regulated source or from the plate supply voltage if a voltage divider is used.*
7. *The effective grid circuit resistance should not exceed 500 ohms per grid, or the impedance 700 ohms.*
8. *Distortion in practical circuits should not exceed 5%, 5% and 3%, respectively, under CCS conditions.*
9. *The total effective grid circuit resistance should not exceed 25,000 ohms. May be obtained by either fixed bias or bypassed cathode resistor.*
10. *Generally obtained from the modulated plate supply through the specified resistor but a separate source properly modulated may be used.*
11. *Bias may be provided by any method. When grid leak bias is used the grid circuit resistance should not exceed the specified value.*
12. *May be obtained from the plate voltage supply through the specified dropping resistor or a separate supply may be provided.*
13. *Bias may be provided by use of 12,800 ohm grid leak, 410 ohm cathode resistor, fixed separate source, or combination of these. The grid circuit resistance should not exceed 25,000 ohms.*

CIRCUIT APPLICATION

This type was primarily designed to make available the good characteristics of the Type 807 in a mechanical structure that could stand up under rough service. If it is desired to use this type for replacement in existing equipment, the effect of the different base diameter and bulb size (shown on the outline drawing) will require consideration.

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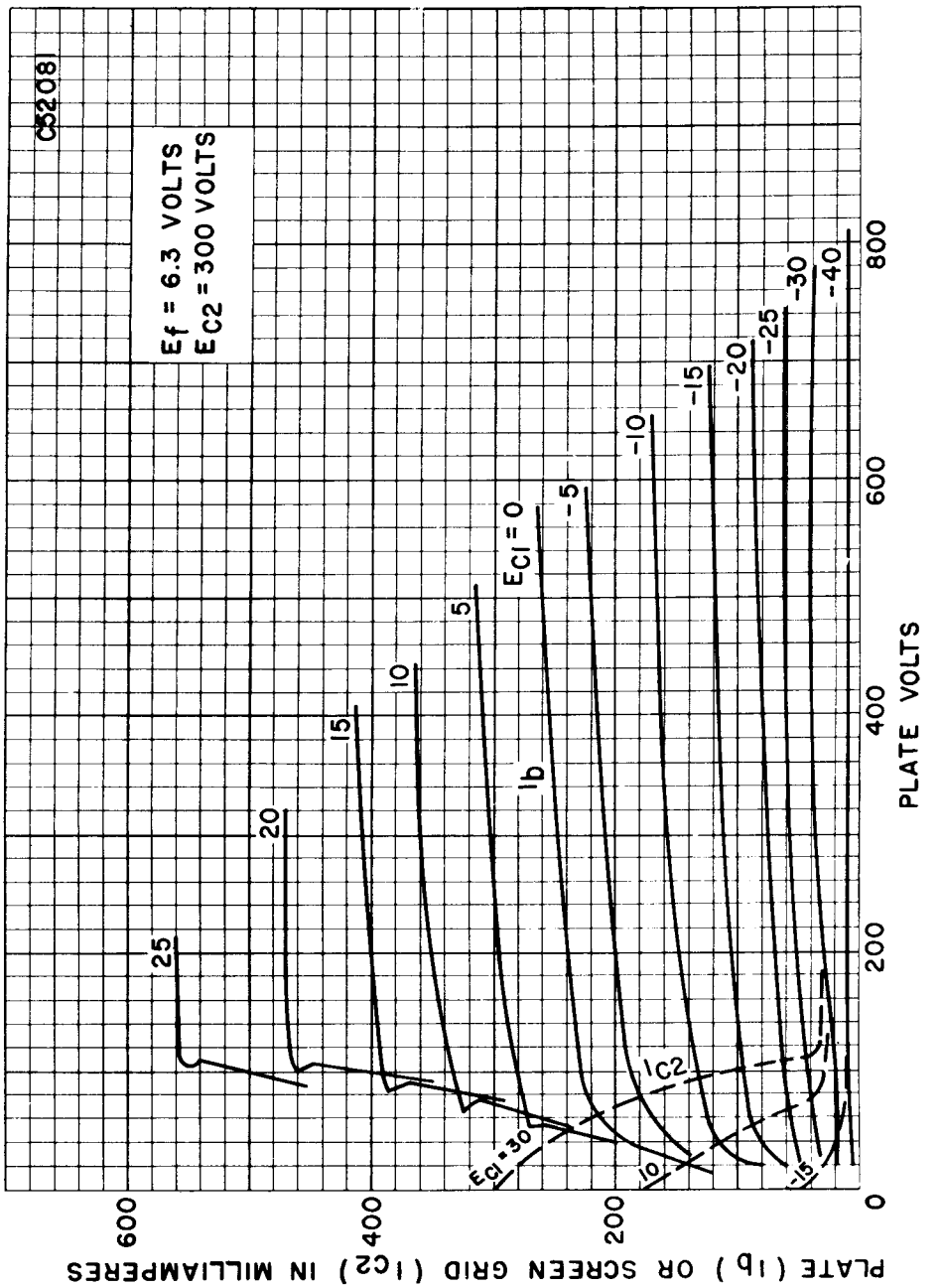
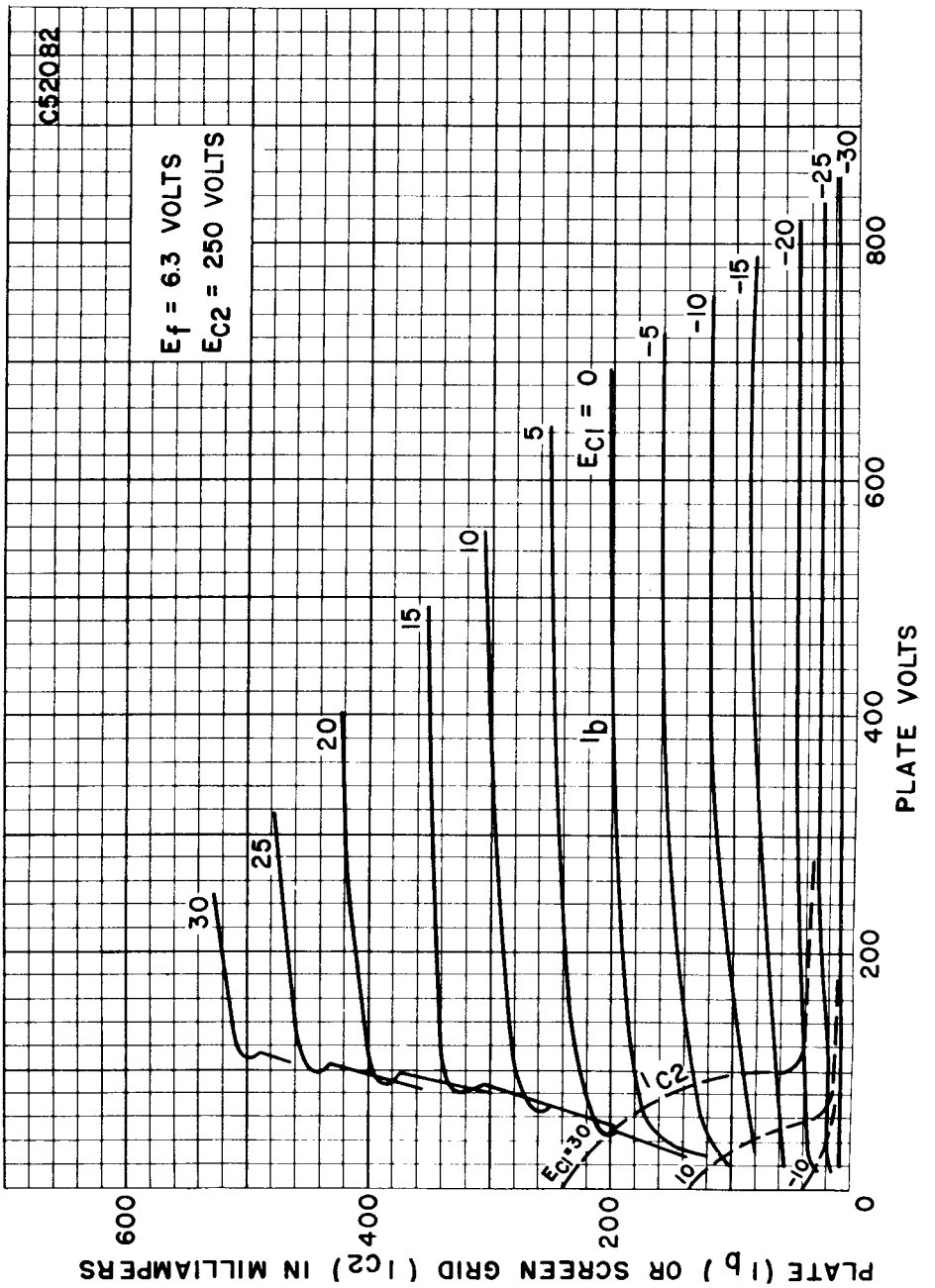
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



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MECHANICAL DATA

Bulb	T-6 ½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9A
Cathode	Unipotential
Mounting Position	Any
Heater	Pure Tungsten

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Series	Parallel
Heater Voltage	12.6	6.3 Volts
Heater Current	150	300 Ma
Heater-Cathode Voltage (Absolute Values)		
Heater Negative with Respect to Cathode		90 Volts Max.
Heater Positive with Respect to Cathode		90 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded—Approx.)

	Unit 1	Unit 2
Grid to Plate	1.5	1.5 μμf
Grid to Cathode and Heater	1.9	1.9 μμf
Plate to Cathode and Heater	0.5	0.35 μμf
Grid of Unit No. 1 to Grid of Unit No. 2	0.1	μμf Max.

RATINGS (Absolute Values)—Each Unit

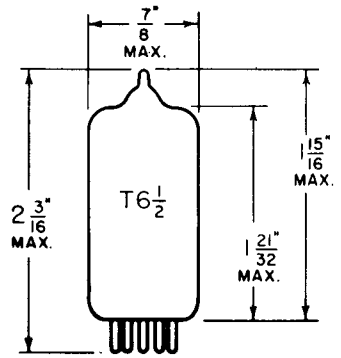
Plate Voltage	250 Volts Max.
Grid Voltage	
Negative Bias Value	100 Volts Max.
Positive Bias Value	0 Volts Max.
Peak Negative Value	200 Volts Max.
Plate Dissipation	2.5 Watts Max.
Grid Input	0.5 Watt Max.
Cathode Current	
Peak	100 Ma Max.
DC	20 Ma Max.
Grid Circuit Resistance	
Fixed Bias	0.5 Megohm Max.
Self Bias	1.0 Megohm Max.
Bulb Temperature (Hottest Point on Bulb Surface)	120° C Max.

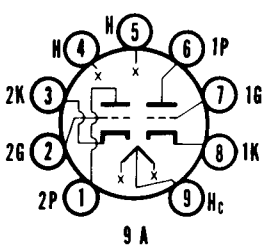
CHARACTERISTICS AND TYPICAL OPERATION (Each Section)

Plate Voltage	67.5 Volts
Grid Voltage	0 Volts
Amplification Factor	21
Plate Resistance (approx.)	6600 Ohms
Transconductance	3200 μmhos
Plate Current	8.5 Ma

QUICK REFERENCE DATA

The Sylvania Type 5963 is a miniature, medium-mu twin triode designed for long life computer applications.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

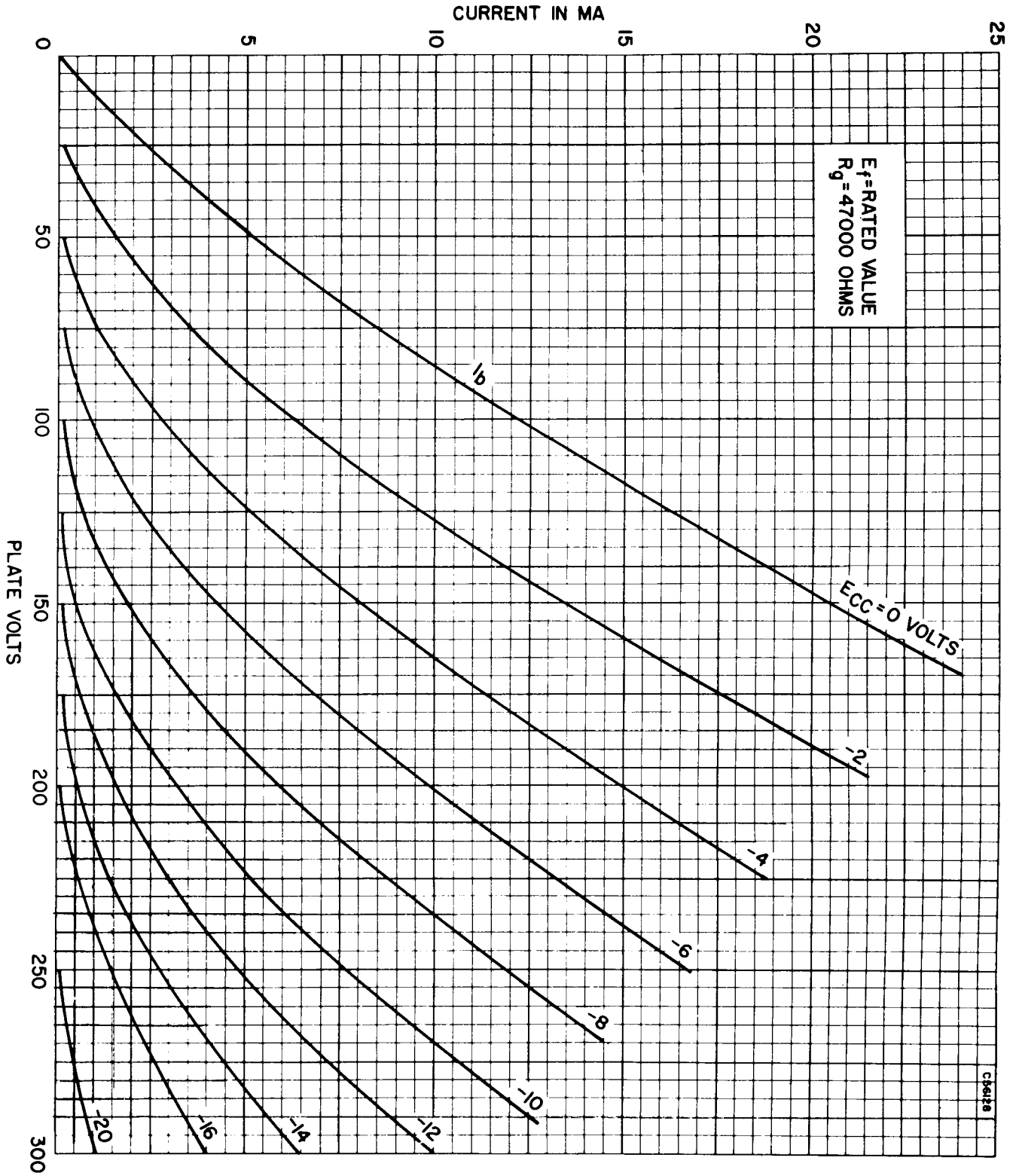
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

DEC. 1956

Computer Service

	Cutoff Condition	Zero Bias Condition
Plate Supply Voltage	150	150 Volts
Grid Voltage	-15	0 Volts
Plate Circuit Resistance	20000	20000 Ohms
Grid Circuit Resistance	47000	47000 Ohms
Plate Current	0	5.1 Ma

AVERAGE PLATE CHARACTERISTICS



MECHANICAL DATA

Bulb	T-5 ½
Base	E7-1, Miniature Button 7-Pin
Outline	5–2
Basing	7BF
Cathode	Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	450 Ma
Heater-Cathode Voltage (Absolute Values)	
Heater Negative with Respect to Cathode	90 Volts Max.
Heater Positive with Respect to Cathode	90 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded—Approx.) Each Unit

Grid to Plate	1.3 μμf
Grid to Cathode and Heater	2.1 μμf
Plate to Cathode and Heater	0.4 μμf
Grid of Unit No. 1 to Grid of Unit No. 2	0.4 μμf Max.

RATINGS (Absolute Values)—Each Unit

Plate Voltage	250 Volts Max.
Grid Voltage	
Negative Bias Value	100 Volts Max.
Positive Bias Value	0 Volts Max.
Peak Negative Value	200 Volts Max.
Plate Dissipation	1.5 Watts Max.
Grid Input	0.1 Watt Max.
DC Cathode Current[1]	15 Ma Max.
Peak Cathode Current[1]	75 Ma Max.
Grid Circuit Resistance	
Fixed Bias	0.5 Megohm Max.
Self Bias	1.0 Megohm Max.
Bulb Temperature (Hottest Point on Bulb Surface)	150° C Max.

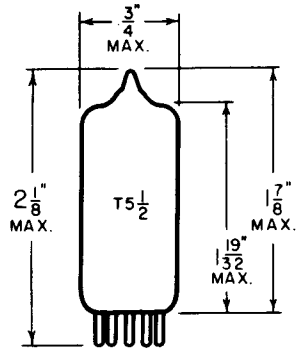
CHARACTERISTICS AND TYPICAL OPERATION

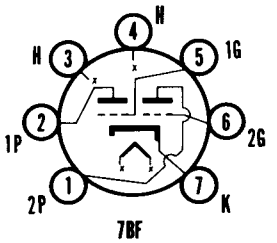
Each Unit, With Both Units Operating

Plate Voltage	100 Volts
Cathode Bias Resistor[2]	50 Ohms
Amplification Factor	39
Plate Resistance	6500 Ohms
Transconductance	6000 μmhos
Plate Current	9.5 Ma

QUICK REFERENCE DATA

The Sylvania Type 5964 is a miniature medium-mu dual triode having a common cathode. The type is designed for long life computer service.





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RADIO TUBE DIVISION
EMPORIUM, PA.

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EMPORIUM, PENNSYLVANIA

DEC. 1956

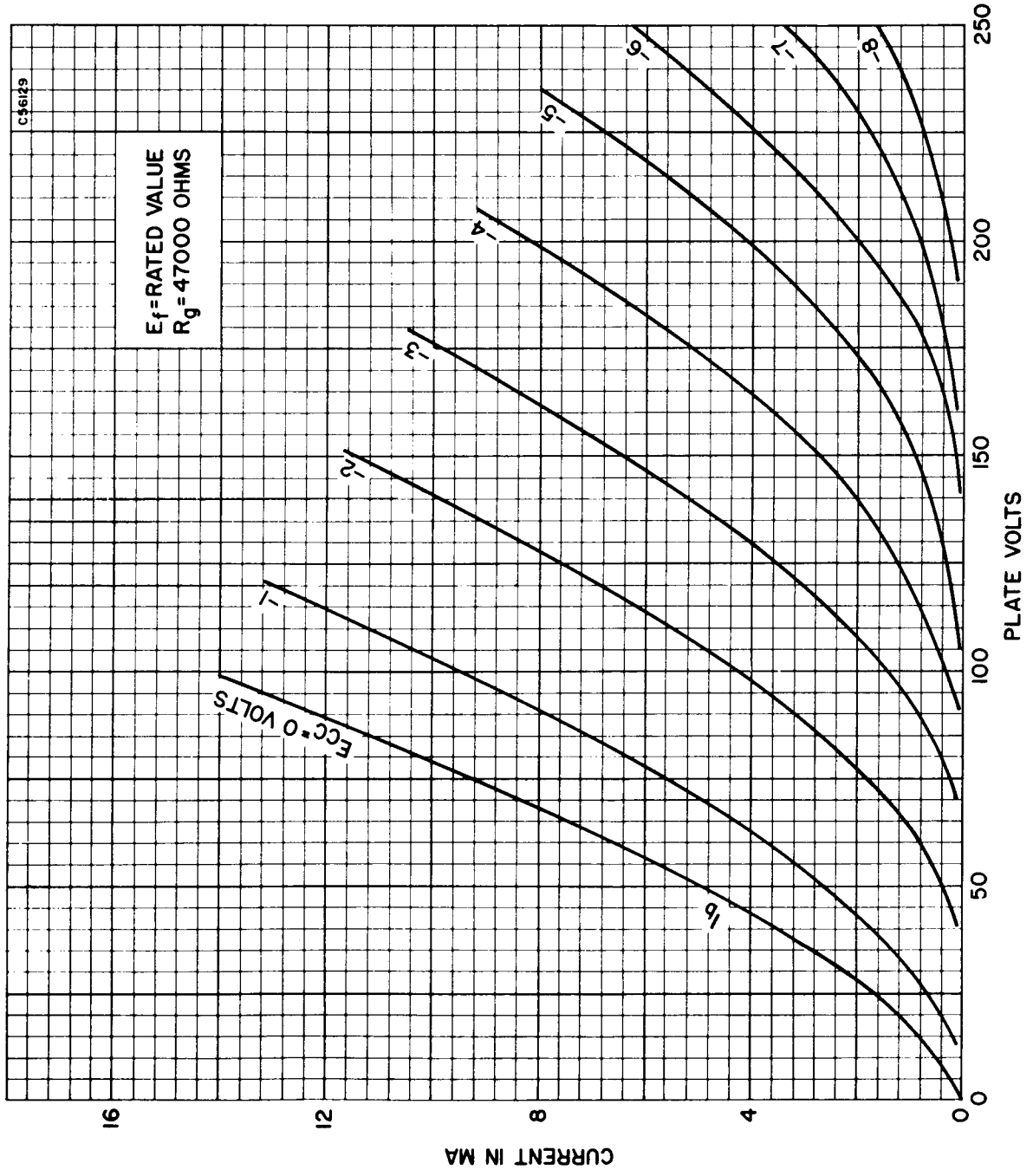
Computer Service

	Cutoff Condition	Zero Bias Condition
Plate Supply Voltage	150	150 Volts
Plate Circuit Resistance	20000	20000 Ohms
Grid Supply Voltage	−10	0 Volts
Grid Circuit Resistance	47000	47000 Ohms
Plate Current	0	5 Ma

NOTES:

1. *With both units operating, the dc cathode current should not exceed 30 milliamperes and the peak cathode current should not exceed 150 milliamperes.*
2. *Common to both units.*

AVERAGE PLATE CHARACTERISTICS



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MECHANICAL DATA

Bulb	T-6½
Base	Small Button 9-Pin
Basing	9A
Cathode	Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3	12.6	Volts
Heater Current	0.45	0.225	Ampere
Heater-Cathode Voltage			
Heater Positive with Respect to Cathode			
DC Component		90 Volts	Max.
Total DC and Peak		180 Volts	Max.
Heater Negative with Respect to Cathode			
Total DC and Peak		180 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate (Each Section)	3.0 μμf
Input (Each Section)	3.8 μμf
Output (Section 1)[1]	0.5 μμf
Output (Section 2)[1]	0.38 μμf
Plate to Plate	0.5 μμf

RATINGS (Design Center Values — Each Section)

Plate Voltage	300 Volts	Max.
Positive DC Grid Voltage	0 Volt	Max.
Plate Dissipation	2.2 Watts	Max.
Plate Dissipation (Both Plates)	4.0 Watts	Max.
Cathode Current	15 Ma	Max.
Grid Circuit Resistance		
Fixed Bias	0.1 Megohm	Max.
Cathode Bias	0.5 Megohm	Max.

AVERAGE CHARACTERISTICS (Each Section)

Plate Voltage	150 Volts
Cathode Bias Resistor	220 Ohms
Plate Current	8.2 Ma
Plate Resistance, approximate	7250 Ohms
Transconductance	6500 μmhos
Amplification Factor	47

TYPICAL OPERATION (Computer Service — Each Section)

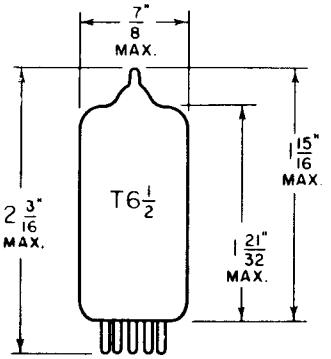
	On Condition	Off Condition	
Plate Supply Voltage	150	150	Volts
Plate Load Resistor	7200	7200	Ohms
Grid Voltage	0[2]	—	Volt
Plate Current, approximate	10.5	—	Ma
Grid Voltage			
I_b=150 Microampere[3], approx.	—	-5.5	Volts

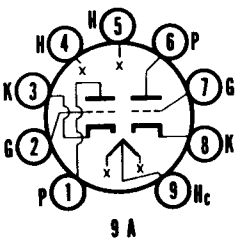
NOTES:

1. *Section 1 connects to pins 6, 7 and 8. Section 2 connects to pins 1, 2 and 3.*
2. *Approximate value of grid voltage with grid current adjusted for approximately 140 microamperes.*
3. *The grid voltage required to produce 150 microamperes in one section normally will not differ by more than 1.5 volts from the grid voltage required to produce 150 microamperes in the other section with a plate supply voltage of 150 volts and a plate load resistor of 7200 ohms.*

QUICK REFERENCE DATA

Miniature twin triode designed for use in high-speed digital computers. Each section features a high zero bias plate current, a sharp cut-off characteristic, and a separate cathode connection.





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SYLVANIA ELECTRIC PRODUCTS INC.

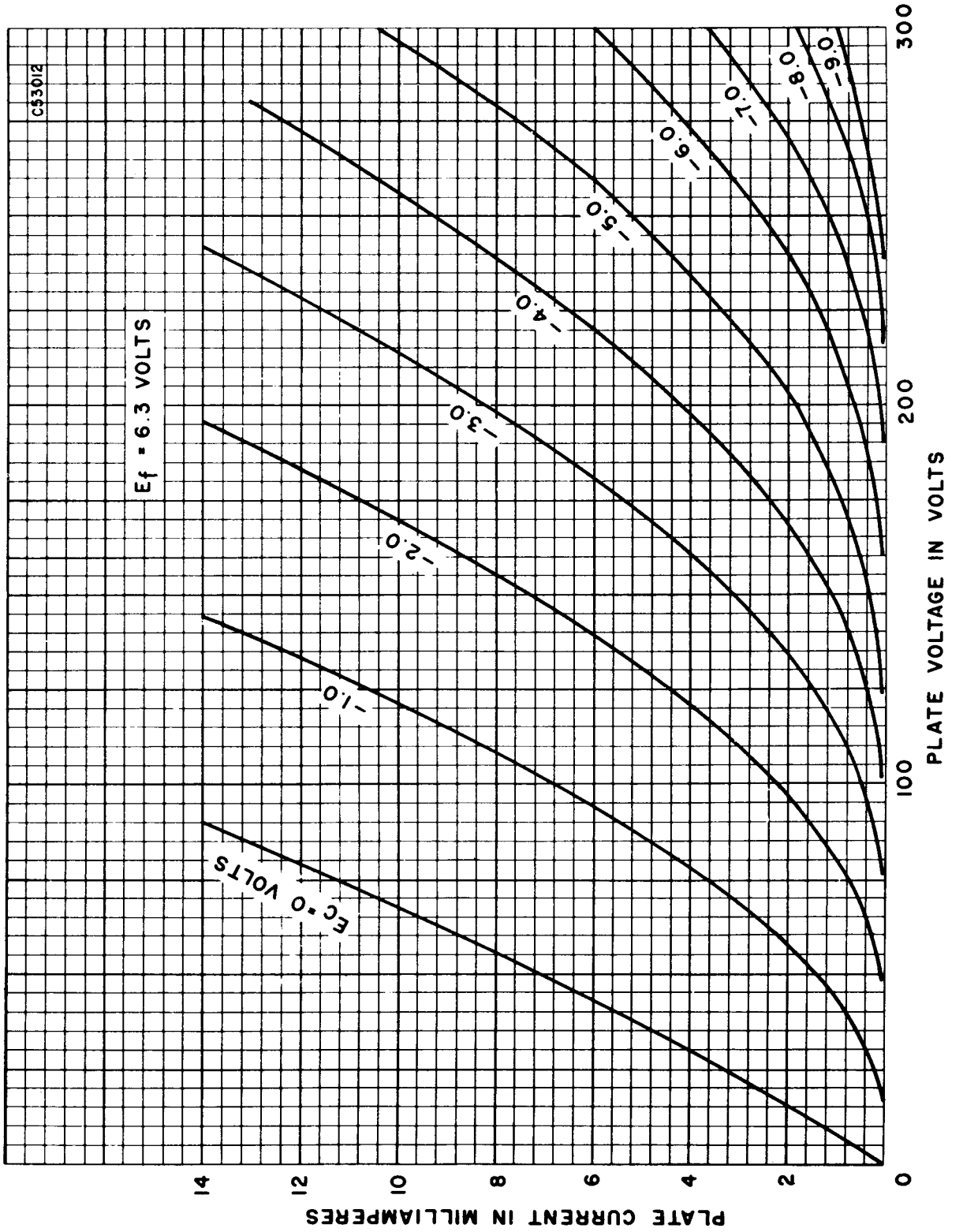
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

NOVEMBER 1953

SYLVANIA

5965

AVERAGE PLATE CHARACTERISTICS



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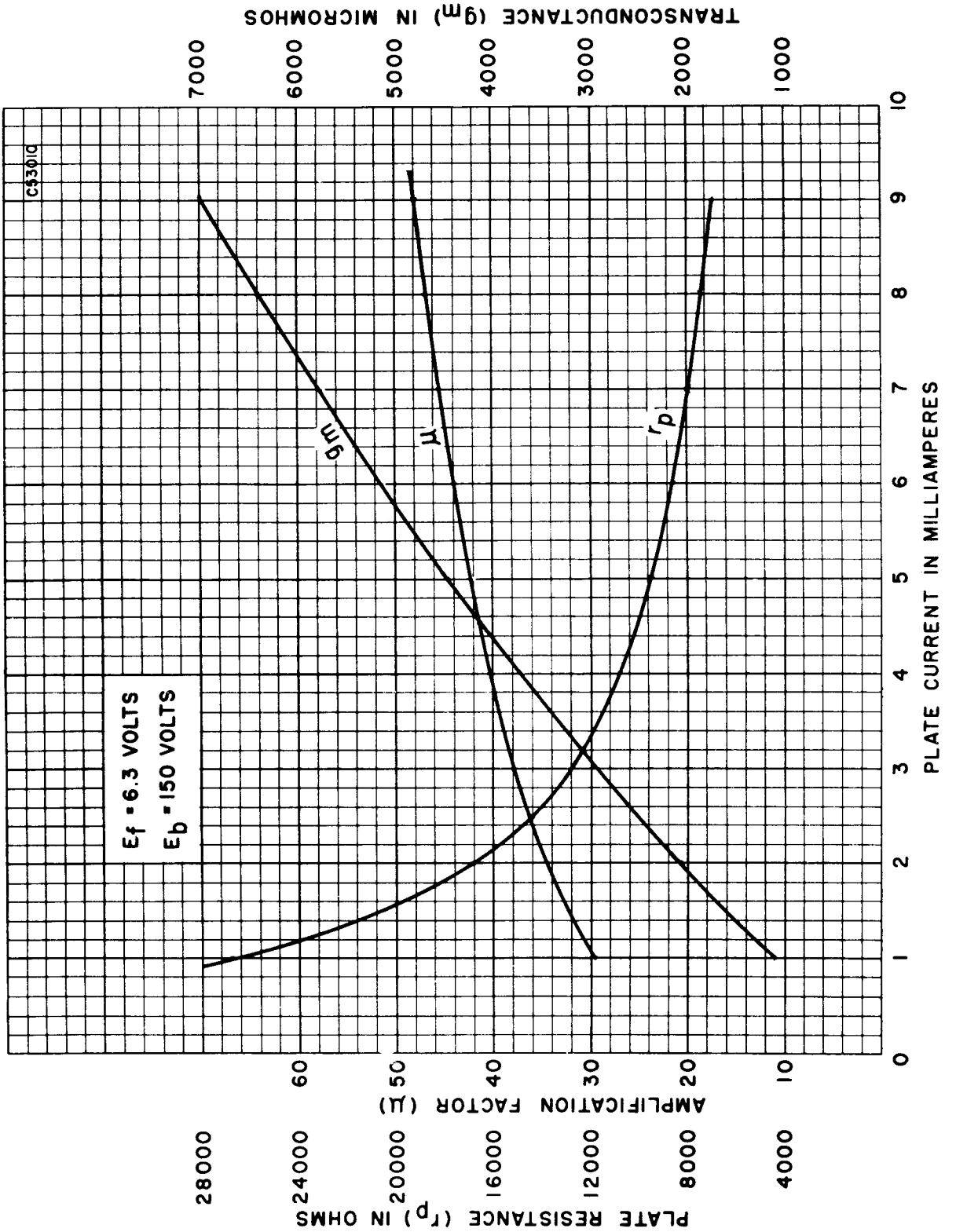
AVERAGE TRANSFER CHARACTERISTICS



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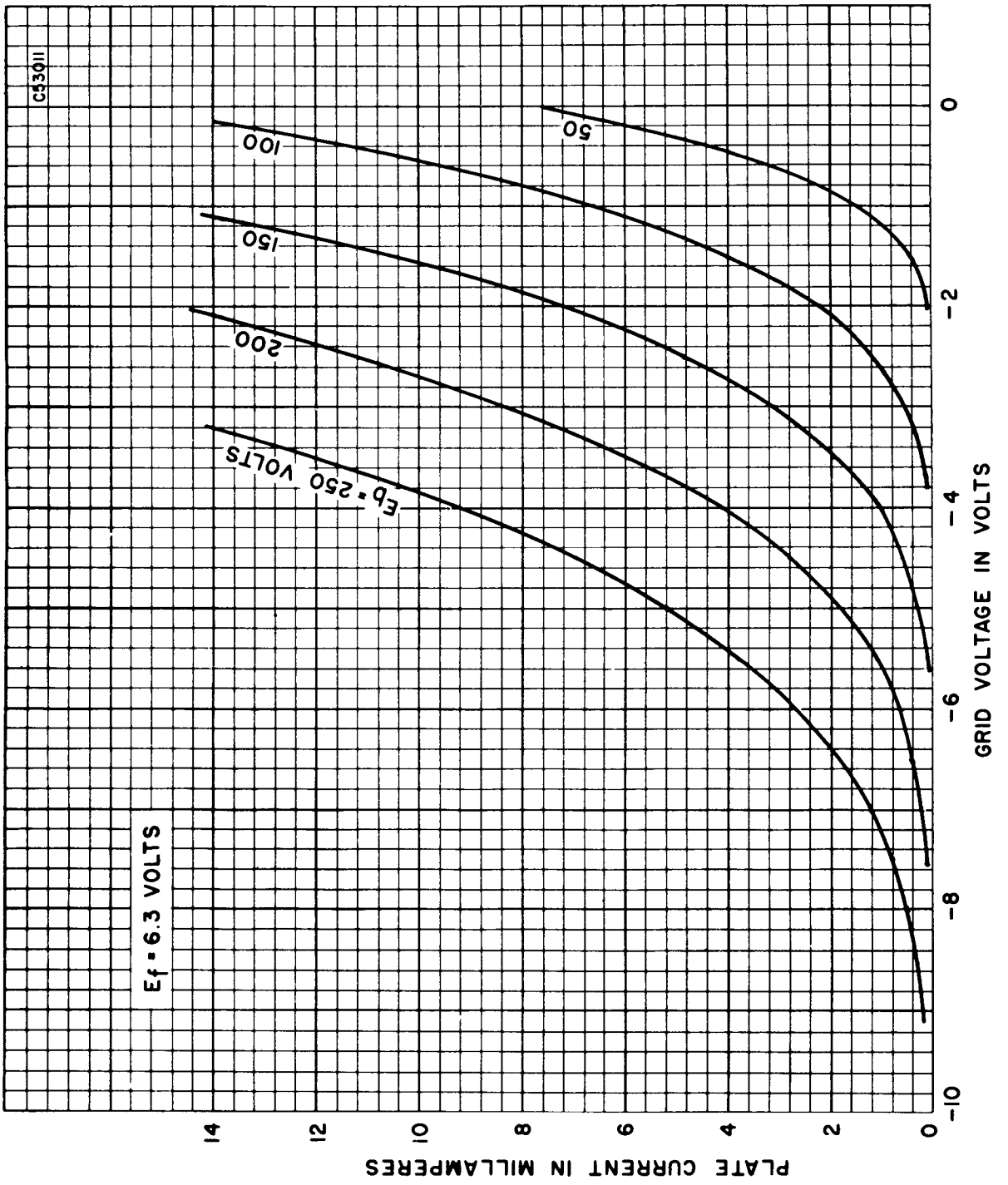
AVERAGE CHARACTERISTICS



SYLVANIA

engineering data service 5977

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DK
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		150	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid to Plate	1.3	1.3 μμf
Input	2.0	2.0 μμf
Output	2.2	0.8 μμf

RATINGS[1 & 5] (Absolute Maximum)

Plate Voltage	180 Vdc
Peak Plate Forward Voltage[6]	360 v
Plate Dissipation	3.3 W
Plate Current	22 mAdc
Grid Current	4.4 mAdc
DC Grid Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid Circuit Resistance	1.1 Meg

CHARACTERISTICS

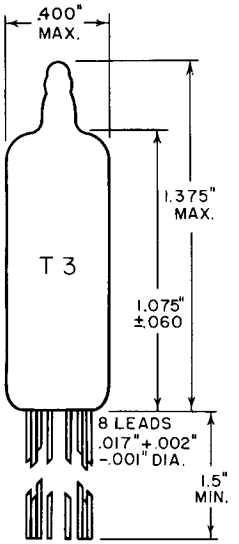
Plate Voltage	100 Vdc
Cathode Resistor	270 Ohms
Plate Current	10.0 mAdc
Amplification Factor	16
Transconductance	4500 μmhos
Grid Voltage for Ib = 100 μAdc Max.	-13.5 Vdc

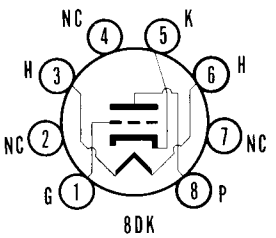
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Per MIL-E-1C Par. 6.5 and General Section of this Sylvania Subminiature Tube Manual titled Specifications and Ratings.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5977 is a relatively high perveance medium mu triode intended for a variety of applications: power amplifier driver, blocking oscillator, multivibrator and Class C amplifier. It is designed for operation under conditions of severe shock, vibration, high temperature and high altitude. The 5977 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1	0 V
Plate Voltage	100 Vdc	Cathode Resistor MIL-E-1 Par. 3.2.2.1	270 Ohms
Grid Voltage	0 V		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7 4.10.8	(Method A) Heater Current: ALD = 12	—	—	144	150	156	—	mA
4.10.8	Heater Current:	0.65	140	—	—	—	160	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid Current: Rg = 1.0 Meg	0.65	0	—	—	—	−0.4	μAdc
4.1.1.7 4.10.4.1	(Method A) Plate Current (1): ALD = 3.4	—	—	8.9	10.0	11.1	—	mAdc
4.10.4.1	Plate Current (1):	0.65	7.0	—	—	—	13.0	mAdc
4.10.4.1	Plate Current (2): Ec = −13.5 Vdc; Rk = 0 Ohms	0.65	—	—	—	—	100	μAdc
4.1.1.7 4.10.9	(Method A) Transconductance (1): ALD = 900 Sm	—	—	4200	4500	4800	—	μmhos
4.10.9	Transconductance (1): Sm	0.65	3700	—	—	—	5300	μmhos
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes:	2.5	—	—	—	—	—	
	g-all	—	100	—	—	—	—	Meg
	p-all	—	100	—	—	—	—	Meg
4.10.9	Transconductance (2): $\frac{\Delta Sm}{Ef}$ Ef = 5.7 V	2.5	—	—	—	—	15	%
4.10.6.2	Grid Emission: Note 4 Ef = 7.5 V; Ec = −13.5 Vdc; Rg = 1.0 Meg; Rk = 0 Ohms	2.5	0	—	—	—	−0.5	μAdc
4.10.3.2	AF Noise: Esig = 40 mVac; Ec = −4 Vdc; Rg = 0.1 Meg; Rp = 0.01 Meg; Rk = 0 Ohms	2.5	—	—	—	—	17	VU
4.10.11.1	Amplification Factor:	6.5	13.5	—	16.0	—	18.5	
- - - - -	Pulse Emission: Notes 6 and 7 Ef = 6.0 V; e pulse = 50 v; tp = 25 μsec; prr = 200 pps	6.5	300	—	—	—	—	ma
4.10.14	Capacitance:	6.5	—	—	—	—	—	
	No Shield Cgp	—	1.0	—	—	—	1.6	μμf
	No Shield Cin	—	1.5	—	—	—	2.5	μμf
	No Shield Cout	—	0.6	—	—	—	1.0	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 20 ±5 mm Hg.; Voltage = 300 Vac	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 2 (Continued)								
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
4.9.19.1	Vibration (2): Rp = 10,000 Ohms; Ck = 1000 μf; F = 40 cps; G = 15	2.5	—	—	—	—	50	mVac
4.9.19.1	White Noise: Note 5 Rp = 10,000 Ohms; Ck = 1000 μf; Peak Acceleration = 15 G	2.5 2.5	— —	— —	— —	— —	200 30	mv pk-pk mVac
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:	2.5	—	4	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc; Rg = 0.1 Meg	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
- - - -	Post Shock and Fatigue Test End Points: Vibration (2) Heater-Cathode Leakage Ehk = +100 Vdc Ehk = −100 Vdc Change in Transconductance (1) of Individual Tubes Δ_t^{Sm}	— — — —	— — — —	— — — —	— — — —	— — — —	200 20 20 20	mVac μAdc μAdc %
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic 1st Sample	Combined Samples	Limits Min.	Max.	Units
Acceptance Life Tests, Note 2							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec = Eb = O V	2.5	—	—	—	—	
4.11.3.1	Stability Life Test: (1 Hour) Ehk = +200 Vdc; Rg = 1.0 Meg; TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes Δ_t^{Sm}	—	—	—	—	10	%
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours). Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives) Transconductance (1) Sm	0.65 1.0	— —	— —	— 3300	— —	 μmhos
4.11.5 4.11.3.1	Intermittent Life Test: Note 3 Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2 (Continued)							
4.11.4 4.11.3.1	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Heater Current	—	2	5	138	164	mA
	Grid Current	—	1	3	0	-1.0	μAdc
	Change in Transconductance (1) of						
	Individual Tubes $\Delta \frac{Sm}{t}$	—	1	3	—	20	%
	Transconductance (2) $\Delta \frac{Sm}{Ef}$	—	2	5	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	10	μAdc
	Ehk = —100 Vdc	—	—	—	—	10	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	g-all	—	—	—	50	—	Meg
	p-all	—	—	—	50	—	Meg
	Transconductance (1) Average Change, Avg $\Delta \frac{Sm}{t}$	—	—	—	—	15	%
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature lead fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater cycling life test
4.11.5	Intermittent life test

3: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ringe of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

4: Prior to this test tubes shall be preheated five (5) minutes at conditions indicated below. Test within three (3) seconds after preheating. Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission Test.

Ef	Ec	Eb	Rk	Rg
V	Vdc	Vdc	Ohms	Meg
7.5	0	100	270	1.0

5: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "White Noise" spectrum which is free from discontinuities from 100 cps to 5000 cps. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 G's rms acceleration. With this the case, the rms value of acceleration for any bandwidth within the specified spectrum is equal to

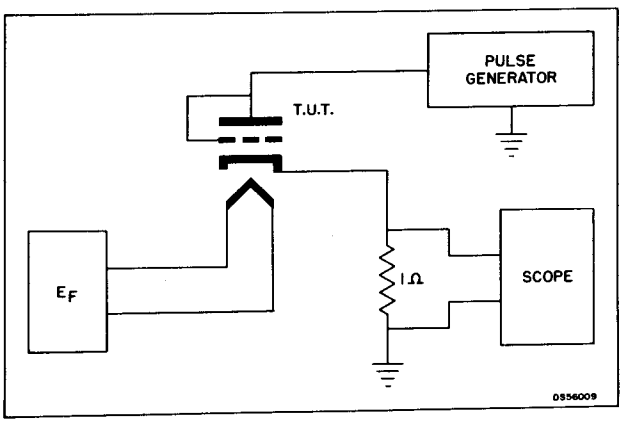
$$G\ rms = 2.3\ G \sqrt{3.32 \log_{10} (f2/f1)}$$

f2 and f1 are the upper and lower frequencies, respectively, of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at at least 15 G's.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (0.25 megohm or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 40 db at 13,000 cps. For reading the peak to peak value of output voltage the filter output shall be fed directly to the input of a Ballantine Model 305 peak to peak electronic voltmeter or equal, while the rms value shall be measured with a Hewlett-Packard Model 400C or equal.

6: Test each section separately.

7: The pulse is essentially a square wave with 1.0 μsec rise time and 0.8 μsec fall. The pulse shall be applied to plate and grid tied together. Pulse emission shall be measured in terms of voltage developed across a 1.0 ohm resistor in the cathode circuit. Test limit as measured by the leading edge of a calibrated oscilloscope trace, the amplitude of the trailing edge of which shall not vary by more than 20 percent from the value of the leading edge.



APPLICATION DATA

The Premium Subminiature Type 5977 is a medium mu triode having relatively high perveance. It is especially well suited to a wide variety of low frequency applications. These include resistance coupled amplifiers, sync clippers, blocking oscillators and multivibrators. Resistance coupled amplifier data is shown in the accompaning table and circuit. Its ability to handle large signals also lends the tube to power amplifier driver applications.

The 5977 may also be used as a uhf oscillator or Class C amplifier. A curve of power output vs frequency at a constant input of 3.3 watts is shown in Figure 1 for oscillator service. Figure 2 shows the variation of input resistance with frequency.

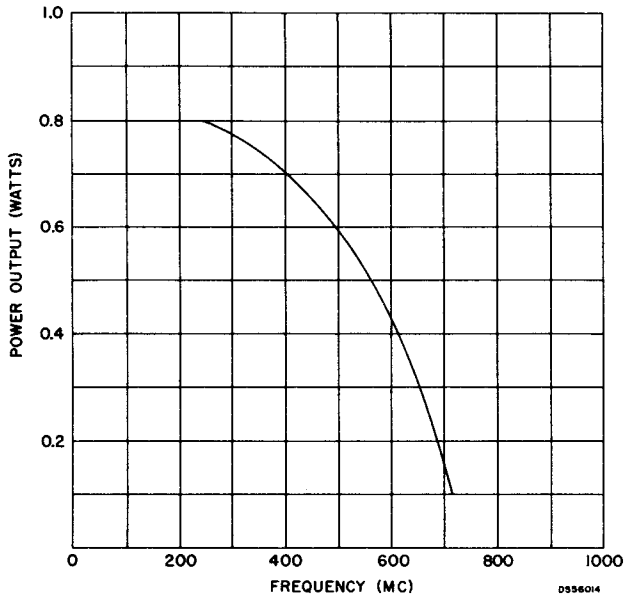


Figure 1—Oscillator performance curve

Electrically, the 5977 is similar to the 6AK4. The 5977, however, is manufactured and inspected to meet the applicable MIL-E-1 specification and is intended for operation under severe conditions of vibration, shock, high temperature and high altitude.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tubes to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's.

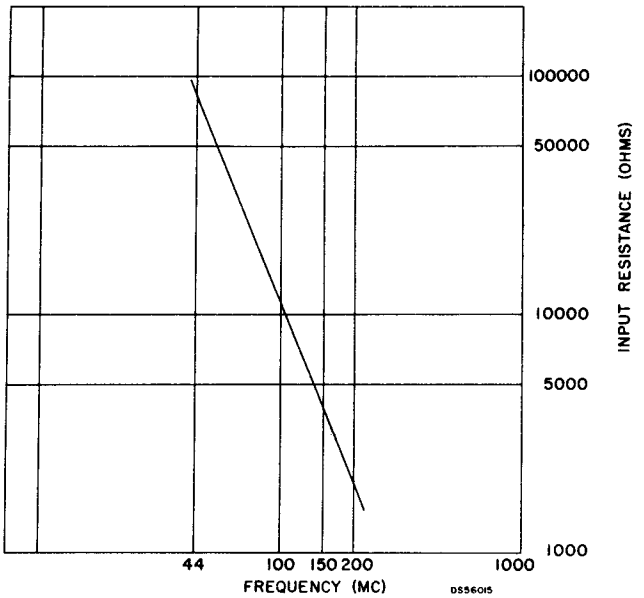


Figure 2—Input resistance vs frequency

Limits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

To insure optimum performance in pulse applications this type is subjected to a pulse emission test as shown in the accompaning data. The tube must, under the specified pulse operating conditions, deliver a minimum specified current. A further discussion of this test is included in the frontal section of this manual.

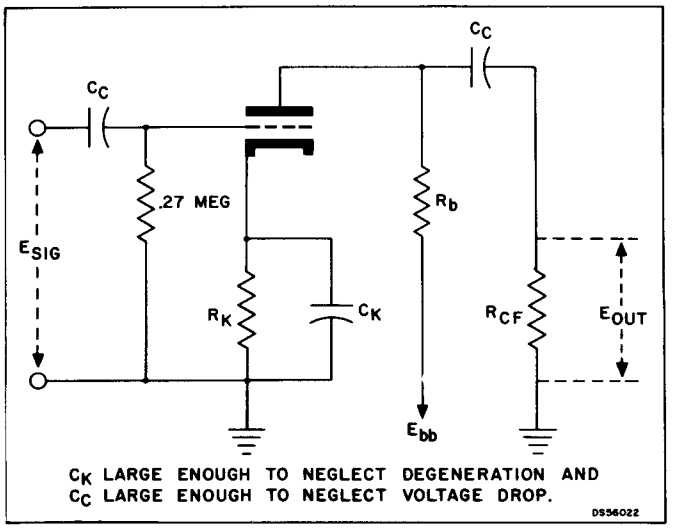
When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

RESISTANCE COUPLED AMPLIFIER DATA

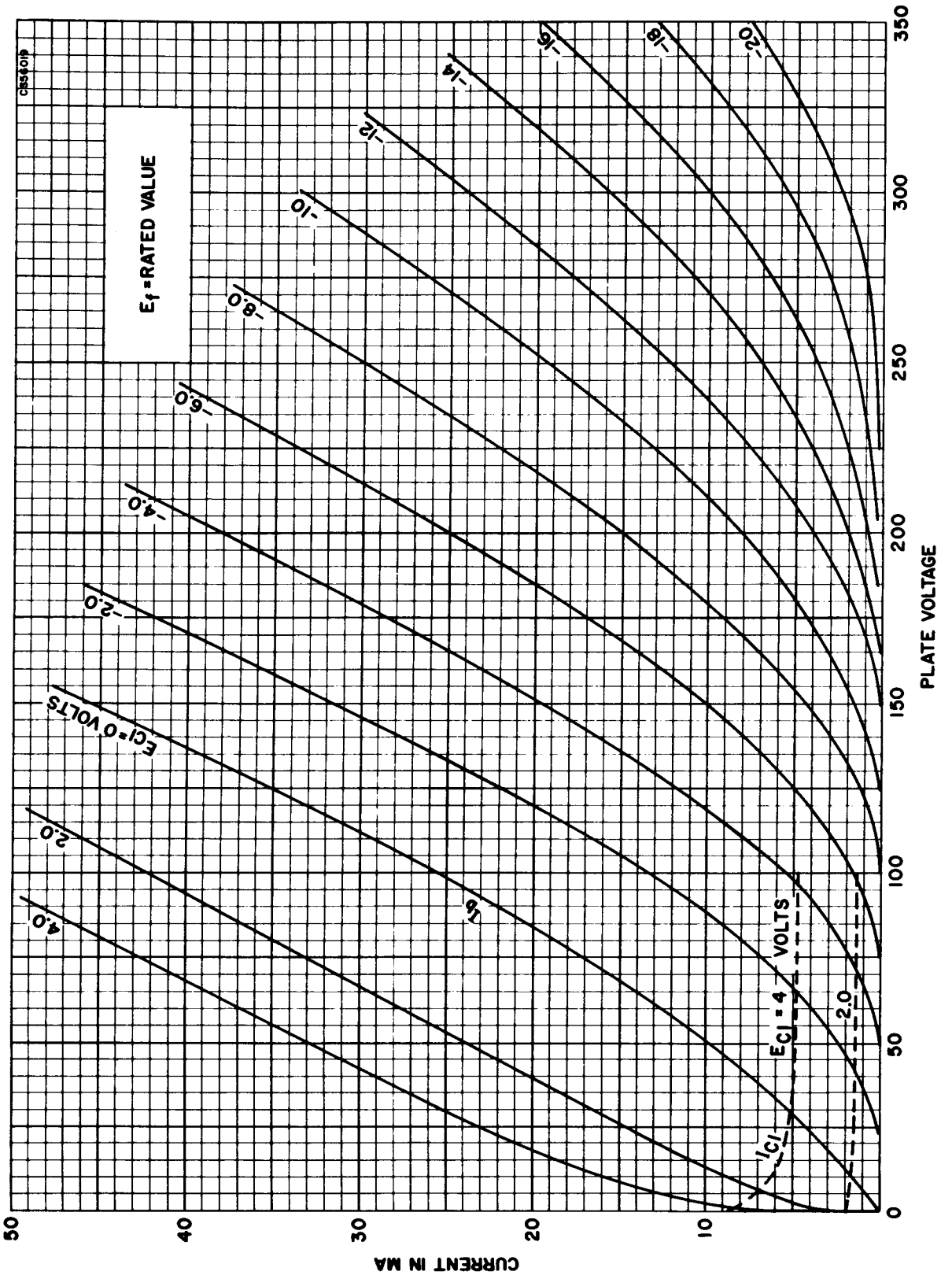
	Ebb = 100 Volts						Ebb = 200 Volts					
Rb (megohms)	0.047		0.10		0.27		0.047		0.10		0.27	
Rcf (megohms)	0.10	0.27	0.10	0.47	0.27	0.47	0.10	0.27	0.10	0.47	0.27	0.47
Rk (ohms)	2200	2700	3900	6800	15000	18000	1500	2200	3300	5600	12000	15000
Ib (ma)	1.11	1.05	0.602	0.484	0.210	0.197	2.59	2.28	1.29	1.08	0.455	0.419
Ec (volts)	−2.44	−2.84	−2.35	−3.29	−3.15	−3.55	−3.88	−5.02	−4.26	−6.05	−5.46	−6.29
Eb (volts)	47.8	50.6	39.8	51.6	43.3	46.8	78.4	92.8	71.0	92.0	77.0	86.8
Esig (volts, rms)	0.5	0.5	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0
Eout (volts, rms)	5.2	5.3	5.0	5.3	5.0	5.1	11.6	11.6	11.3	11.5	10.9	11.0
Gain	10.4	10.6	10.0	10.6	10.0	10.2	11.6	11.6	11.3	11.5	10.9	11.0
% Distortion	1.8	1.4	1.8	1.1	1.3	1.0	1.8	1.4	1.7	1.0	1.3	1.0
Esig* (volts, rms)	1.3	1.5	1.3	1.9	1.6	1.9	2.4	3.1	2.5	3.8	3.2	3.9
Eout (volts, rms)	13.6	15.9	13.0	19.9	15.4	19.3	28.0	36.2	28.0	43.3	33.5	41.5
Gain	10.4	10.6	10.0	10.5	9.6	10.2	11.6	11.7	11.2	11.4	10.5	10.6
% Distortion	5.0	4.8	5.0	4.9	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

*Maximum signal for 5% distortion or ⅛ microampere grid current.

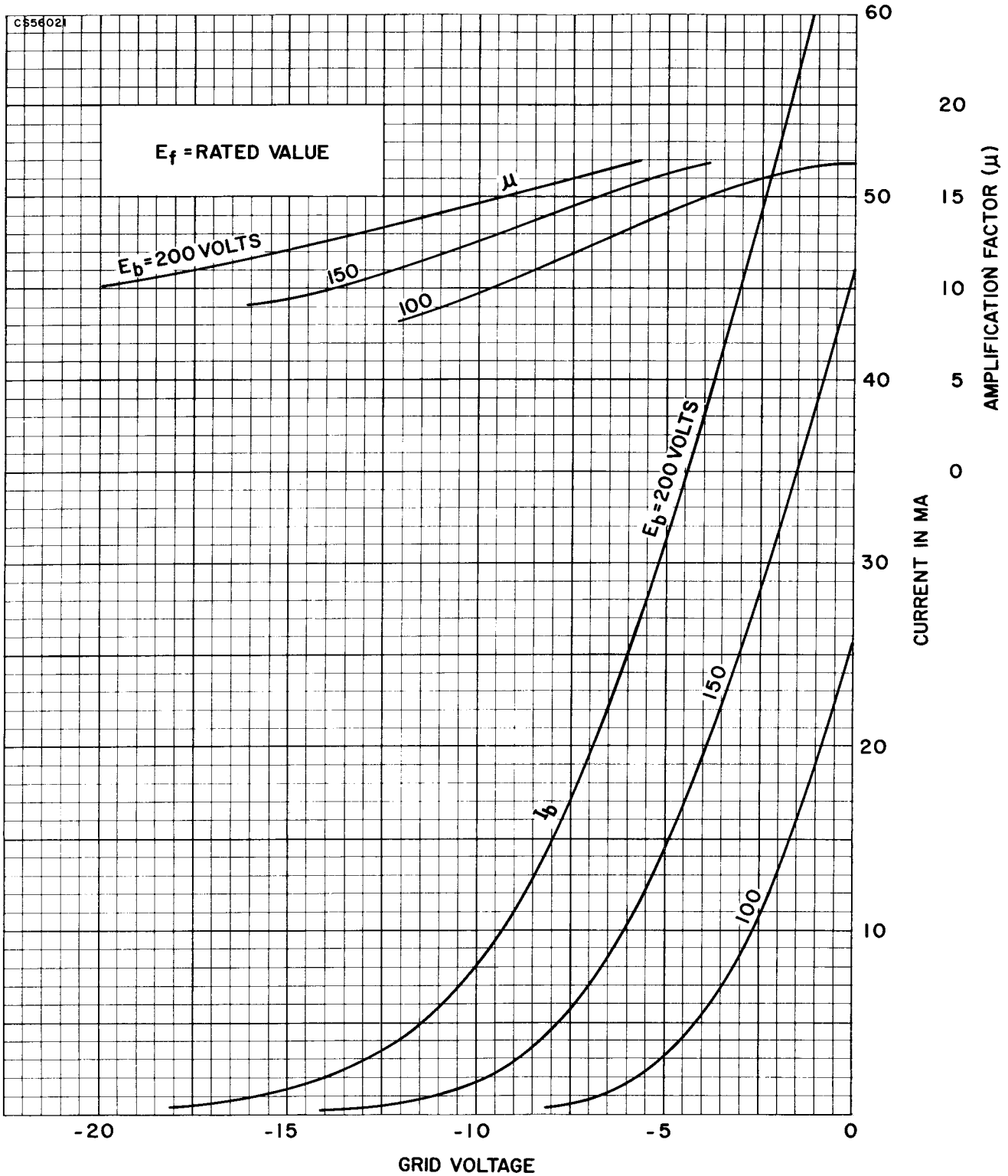


Resistance coupled amplifier circuit

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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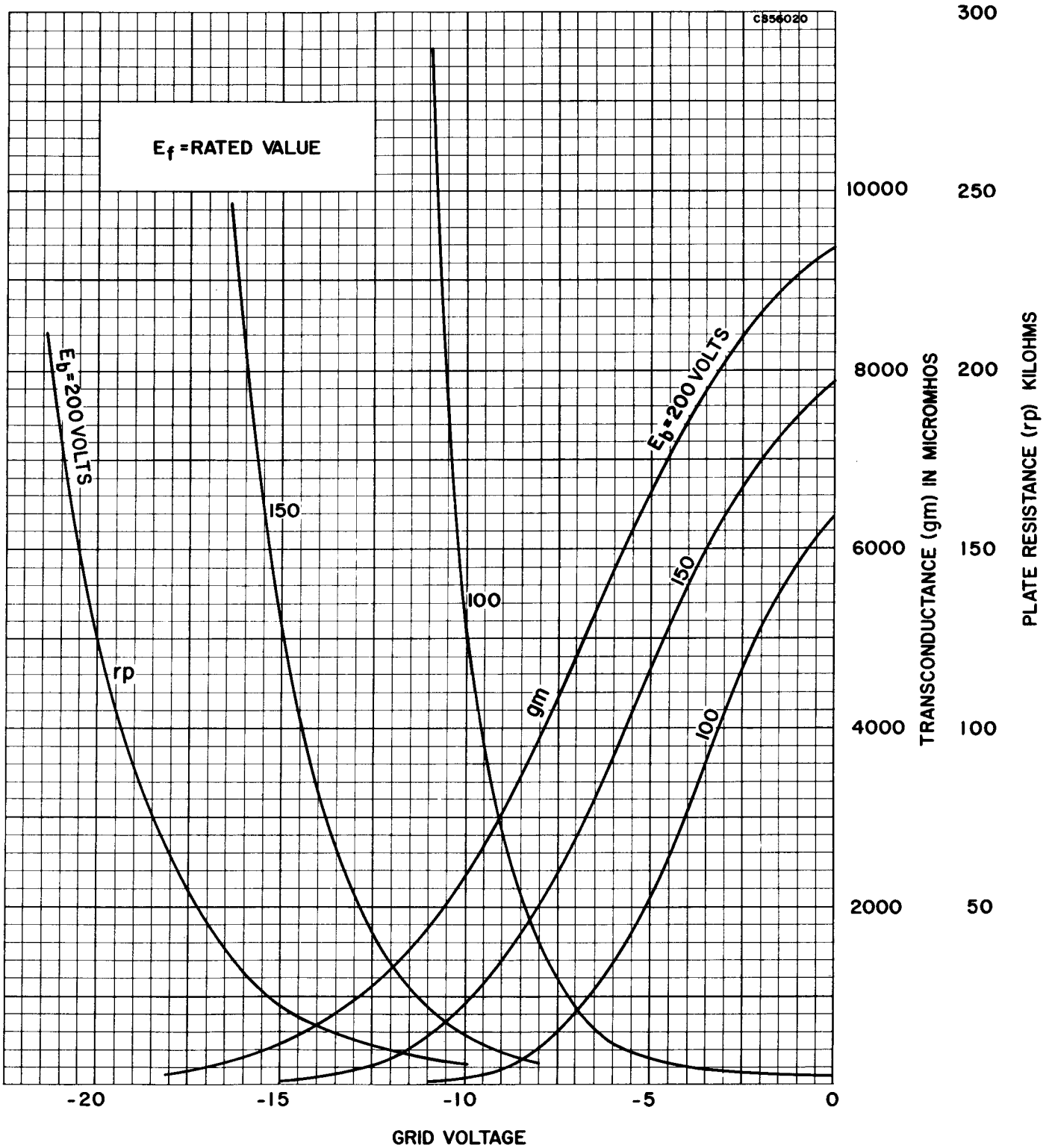


SYLVANIA engineering data service 5987

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-4
Basing	8DM
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		450	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid to Plate	3.0	3.2 μμf
Input	3.2	2.8 μμf
Output	4.6	1.5 μμf

RATINGS[1 & 5] (Absolute Maximum)

Plate Voltage	165 Vdc
Peak Plate Forward Voltage	330 v
Plate Current	50 mAdc
Plate Dissipation	4.0 W
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v

CHARACTERISTICS

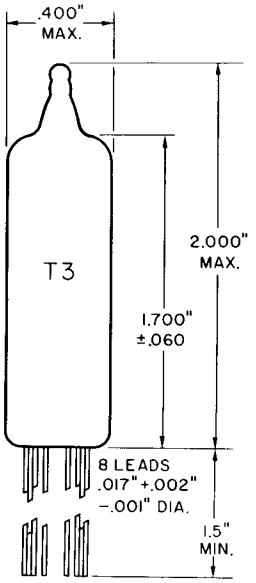
Plate Voltage	100 Vdc
Grid Voltage	−18 Vdc
Plate Current	9.0 mAdc
Transconductance	1850 μmhos
Amplification Factor	4.1

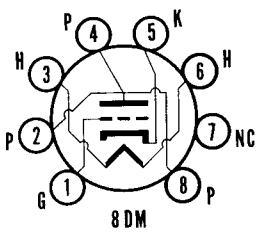
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts.*
4. *External shield of 0.405 inch inside diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5987 is a low-mu, high perveance, power triode designed for use as a control tube in servo circuits. It is intended for operation under conditions of severe shock, vibration, high temperature and high altitude. The Sylvania Type 5987 is manufactured and inspected to meet the applicable specifications for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Grid Voltage	
Plate Voltage	100 Vdc	Negative Value	18 Vdc
		Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1	0 V

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	Limits Min.	Limits Bogey	Limits Max.	Units
Production Tests					
4.10.8	Heater Current:	420	450	480	mA
4.10.6.1	Grid Current:	0	—	-0.8	μAdc
4.10.4.1	Plate Current:	6.8	9.0	11.2	mAdc
4.10.9	Transconductance (1): Sm	1480	1850	2220	μmhos
Special Design Tests					
4.9.5.3	Subminiature Lead Fatigue:	4	—	—	arcs
4.9.19.2	Vibration: Ep F = 40 cps; G = 15; Rp = 2000 Ohms	—	—	75	mVac
4.10.15	Heater-Cathode Leakage: Ehk = +100 Vdc Ehk = -100 Vdc	 0 0	 — —	 15 15	 μAdc μAdc
4.8	Insulation of Electrodes: Egk = 100 Vdc; Ef = 6.3 V	 100	 —	 —	 Meg
4.10.3.2	AF Noise: Pn Rp = 10,000 Ohms; Esig = 70 mVac	 —	 —	 14	 VU
Design Tests					
4.10.9	Transconductance (2): Sm Ef = 5.7 V	 1300	 —	 —	 μmhos
4.10.11.1	Amplification Factor:	3.6	4.1	4.6	
4.10.14	Capacitance: No Shield Cgp No Shield Cin No Shield Cout	 2.5 2.2 1.2	 3.2 2.8 1.5	 3.9 3.4 1.8	 μμf μμf μμf
Degradation Tests					
4.9.20.5	Shock: Hammer Angle = 30°	 —	 —	 —	
4.9.20.6	Fatigue: Note 1 F = 60 cps; G = 2.5	 —	 —	 —	
- - - -	Post Shock and Fatigue Test End Points: Vibration Heater-Cathode Leakage Transconductance (1) Sm	 — 0 1250	 — — —	 200 40 —	 mVac μAdc μmhos
Acceptance Life Tests					
- - - -	Heater Cycling Life Test: Note 2 Ef = 7.0 V; Eb = Ec = O V	 2500	 —	 —	 Cycles
4.11.5	Intermittent Life Test (1): Note 3 Rg = 0.47 Meg; Eb = 150 Vdc; Ec = O V; Rk = 1100 Ohms; Ehk = 140 Vac; TA = Room	 500	 —	 —	 Hours

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	Limits Min.	Bogey	Max.	Units
	Acceptance Life Tests (Continued)				
4.11.4	Intermittent Life Test End Point (1):				
	Transconductance (1) Sm	1250	—	—	μmhos
	Grid Current	0	—	-1.5	μAdc
	Heater-Cathode Leakage	0	—	60	μAdc
	Insulation of Electrodes				
	Rg-all	50	—	—	Meg
	Rp-all	50	—	—	Meg

ACCEPTANCE CRITERIA NOTES:

1: Acceptance sampling procedure shall be in accordance with the shock test sampling procedure of the Inspection Instructions for Electron Tubes.

2: The regulation of the heater voltage supply shall be not more than 3.0 percent. This test shall be made on a lot by lot basis. A cycle consists of operating the heater with the voltage "on" for one minute and "off" for four minutes. A heater-cathode voltage of 140 Vac rms shall be applied. The sample size for the cycling test shall be ten tubes from each lot. In case of failures, it shall be permissible at the manufacturer's discretion to select a second sample of 15 tubes and base the percent of life on both the first and second sample, or 25 tubes. The life of each tube shall be based on the number of heater cycles completed without a defect. The number of cycles completed on any tube shall be determined by adding to the number of cycles at the last satisfactory observation 50% of the cycles between the last satisfactory observation and the observed failure point or 10% of the total number of cycles, whichever is the lesser. A failure or defect shall consist of an open heater, or heater-cathode short. The minimum percent life requirement of a test shall be 95% and shall be calculated as follows:

$$\%\ \text{life at 2500 cycles} = \frac{\text{sum of cycles completed without failures}}{2500 \times \text{number of tubes}} \times 100$$

3: At the conclusion of the 500 hour life test, the average life of the life test sample shall be not less than 475 hours. Life test sample size shall be 10 tubes. Provision for release of tubes prior to completion of life test on a reduced basis as specified in 4.3.1.3 Inspection Instructions for Electron Tubes shall not apply.

APPLICATION DATA

The Premium Subminiature Type 5987 is a high perveance, low mu audio power-triode characterized by long life and stable operation under conditions of severe shock, vibration, high altitude and high temperature.

The 5987 is designed primarily for use as a control tube in servo systems and may be used with alternating voltage supplies. In this application, precautions should be taken to insure against poor tube and circuit reliability. In addition to causing forward currents which may be in excess of the cathode capabilities, abnormal positive plate voltage results in an appreciable increase in secondary emission. Likewise, presence of the negative half cycle encourages primary emission by the plate. Investigations have shown that the control grid is the collector for back emitted electrons. Consequently, a negative voltage, dependent upon the back emission current magnitude and value of grid circuit resistance, will be developed on the grid and may be of a value sufficient to influence circuit performance.

The effects of back emission can be minimized by (1) employing a low value grid resistor, (2) inserting series diodes, such as the Sylvania 5641, in the plate circuits. This makes it nearly impossible for current to flow in the reverse direction. (3) Operate the tubes conservatively with respect to supply voltage, peak currents, element dissipation and bulb temperature. Back emission approximates an exponential curve with increasing plate voltage swing and plate dissipation. For further discussion the reader is referred to the general section of this manual or "Effects of AC Plate Voltages on Tube Performance", Sylvania Engineering Information Service, Vol. 1, No. 10, May 1954.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave. Limits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

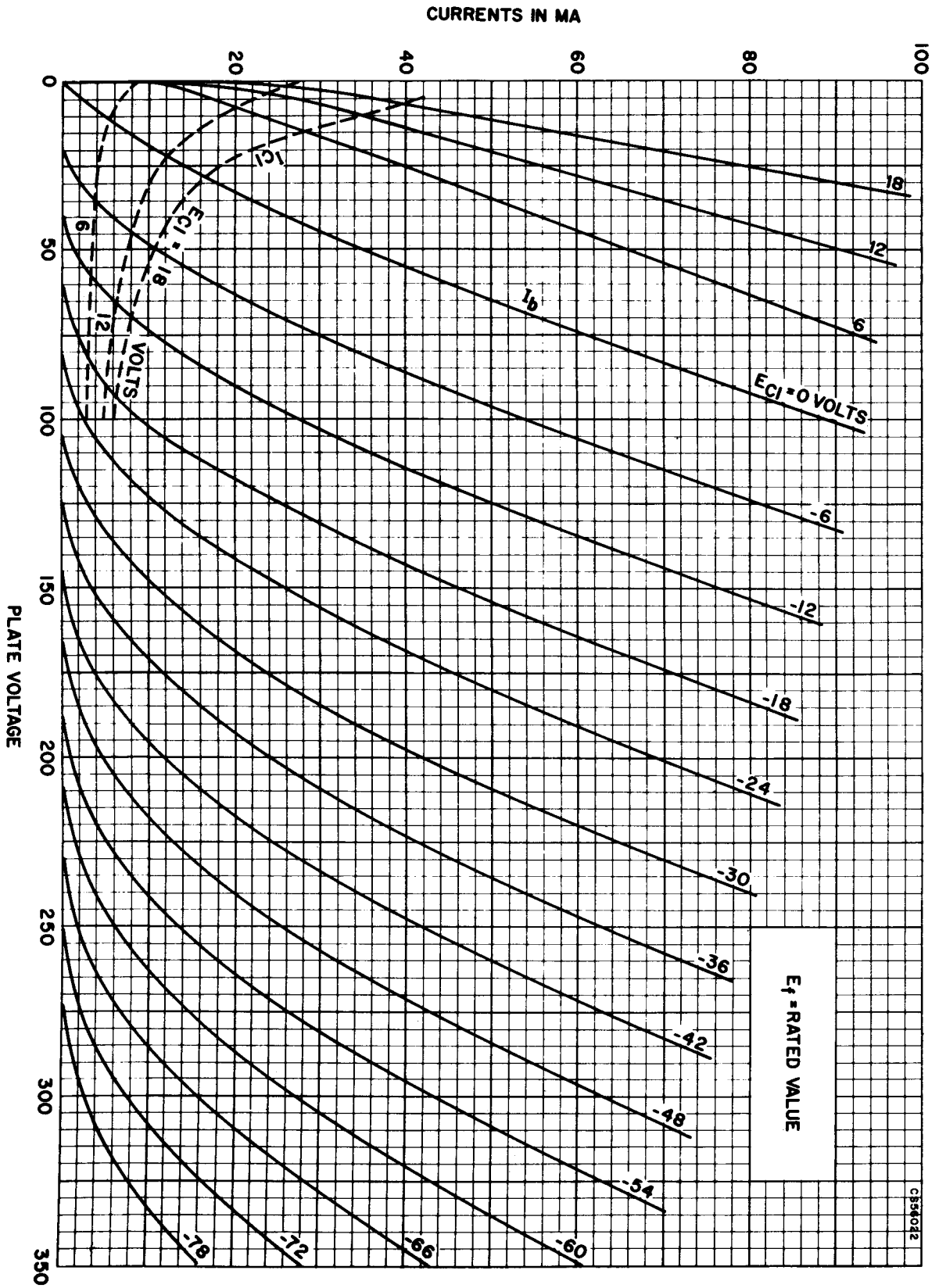
Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tube in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

To insure optimum performance in pulse applications this type is subjected to a pulse emission test as shown in the accompanying data. The tube must, under the specified pulse operating conditions, deliver a minimum specified current. A further discussion of this test is included in the general section of this manual.

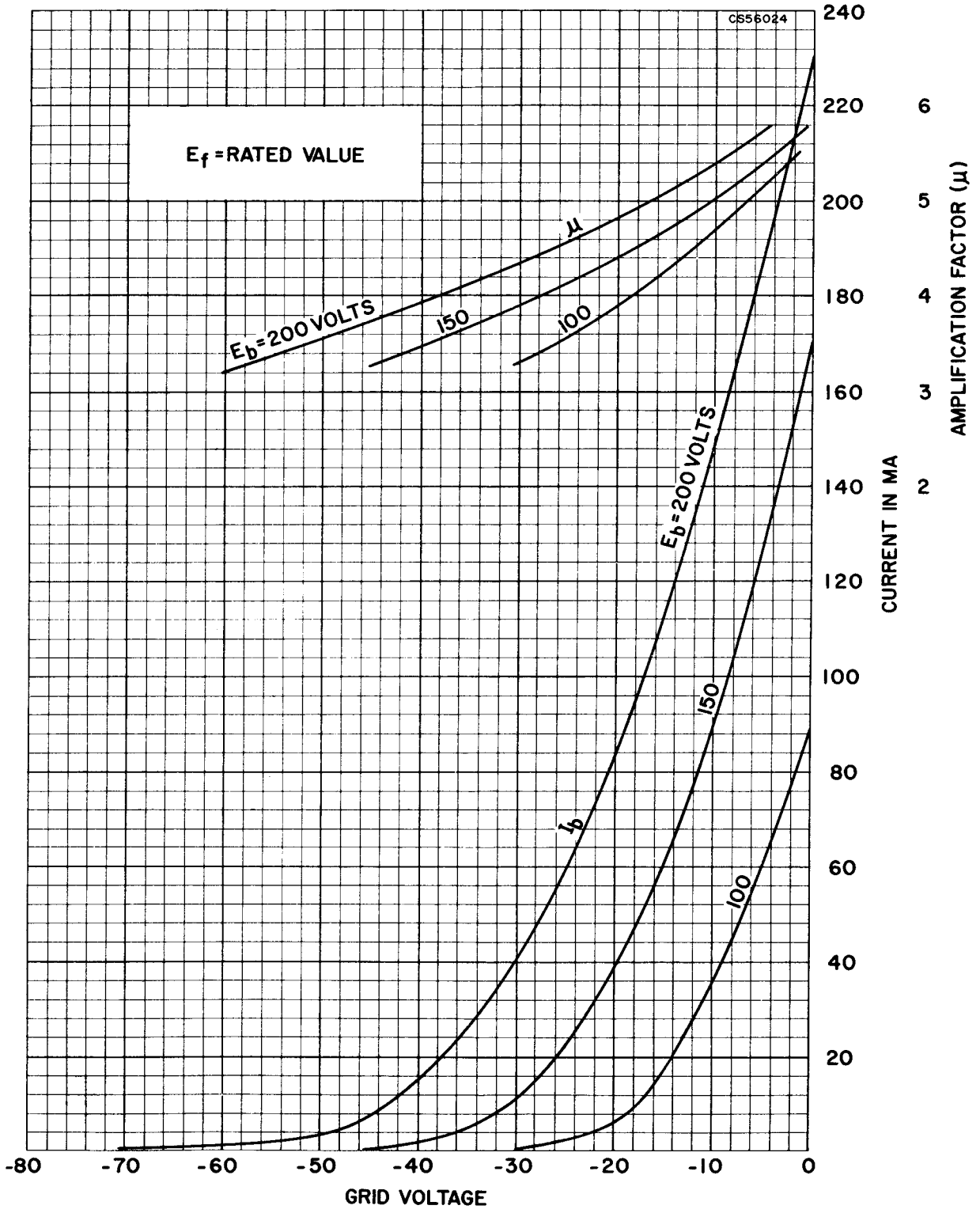
When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

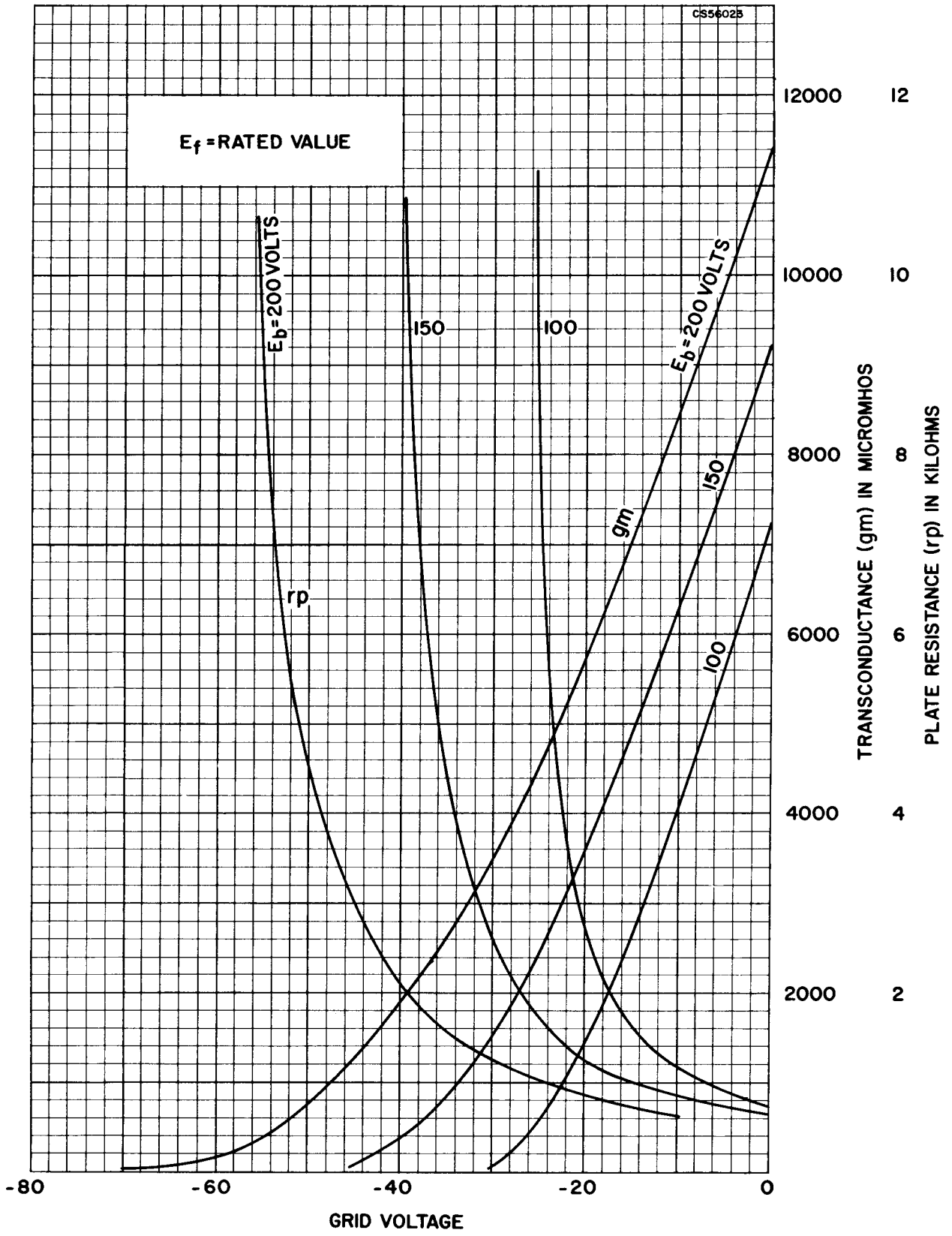
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA

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SYLVANIA
6018

MECHANICAL DATA

Maximum Overall Length	2⅜ Inches
Maximum Overall Diameter	0.814 Inches

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (AC or DC)	6.3 Volts
Heater Current	400 Ma

DIRECT INTERELECTRODE CAPACITANCES (AVERAGE)

Grid to Plate	1.90 $\mu\mu$f
Grid to Cathode	1.20 $\mu\mu$f
Plate to Cathode	0.38 $\mu\mu$f

RATINGS (Absolute Values)

Plate Dissipation	5.0 Watts	Max.
Seal Temperature	175° C	Max.
Plate Voltage (Pulsed)	1500 Volts	Max.
Operating Frequency	1750 Mc	Max.

CHARACTERISTICS

Conditions: (E_b=180 volts dc, R_k=400 ohms)

Transconductance	4500 μmhos
Amplification Factor	25
Plate Current	12.0 Ma

TYPICAL OPERATING CONDITIONS

UHF Oscillator — Plate Pulse Modulated

Peak Plate Voltage	1000 Volts
Peak Plate Current	900 Ma
Grid Voltage	0 Volts
Pulse Repetition Frequency	2000 PPS
Pulse Width	2.0 μsec.
Frequency of Operation	1000 Mc
Peak Power Output	200 Watts
Grid Voltage for I_b = 10 μa	-28 Volts

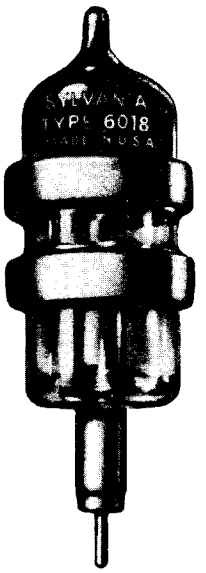
APPLICATION DATA

The Sylvania Type 6018 is designed for use as a pulse-modulated oscillator at frequencies up to 1200 mc. The 6018 has a built-in internal feedback circuit between cathode and anode and fits into a concentric circuit. A small amount of adjustable, external feedback is generally necessary in order to obtain optimum power output at any given frequency. A feedback probe between the output and input lines may be used. With plate-pulse modulation the grid may be operated at zero bias, eliminating the necessity of insulating the cathode from the grid in the input-line plunger. The folded plate and grid discs make this tube particularly adaptable to lumped constant and butterfly type circuits.

The Sylvania planar type construction features a stretched, parallel-wire grid that results in stable, uniform operation; a unique cathode design that minimizes discontinuities in the cathode structure; and, a disc-seal construction that satisfies the requirements for low lead inductance.

QUICK REFERENCE DATA

The Sylvania Type 6018 is a uhf triode designed for service as a pulse modulated oscillator at frequencies up to 1200 mc. Electrically, the Type 6018 is identical to the Type 2C36. The 6018, however, employs folded discs for both the grid and plate connectors. With plate pulsed modulation, the grid may be operated at zero bias.



SYLVANIA ELECTRIC PRODUCTS INC.
ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

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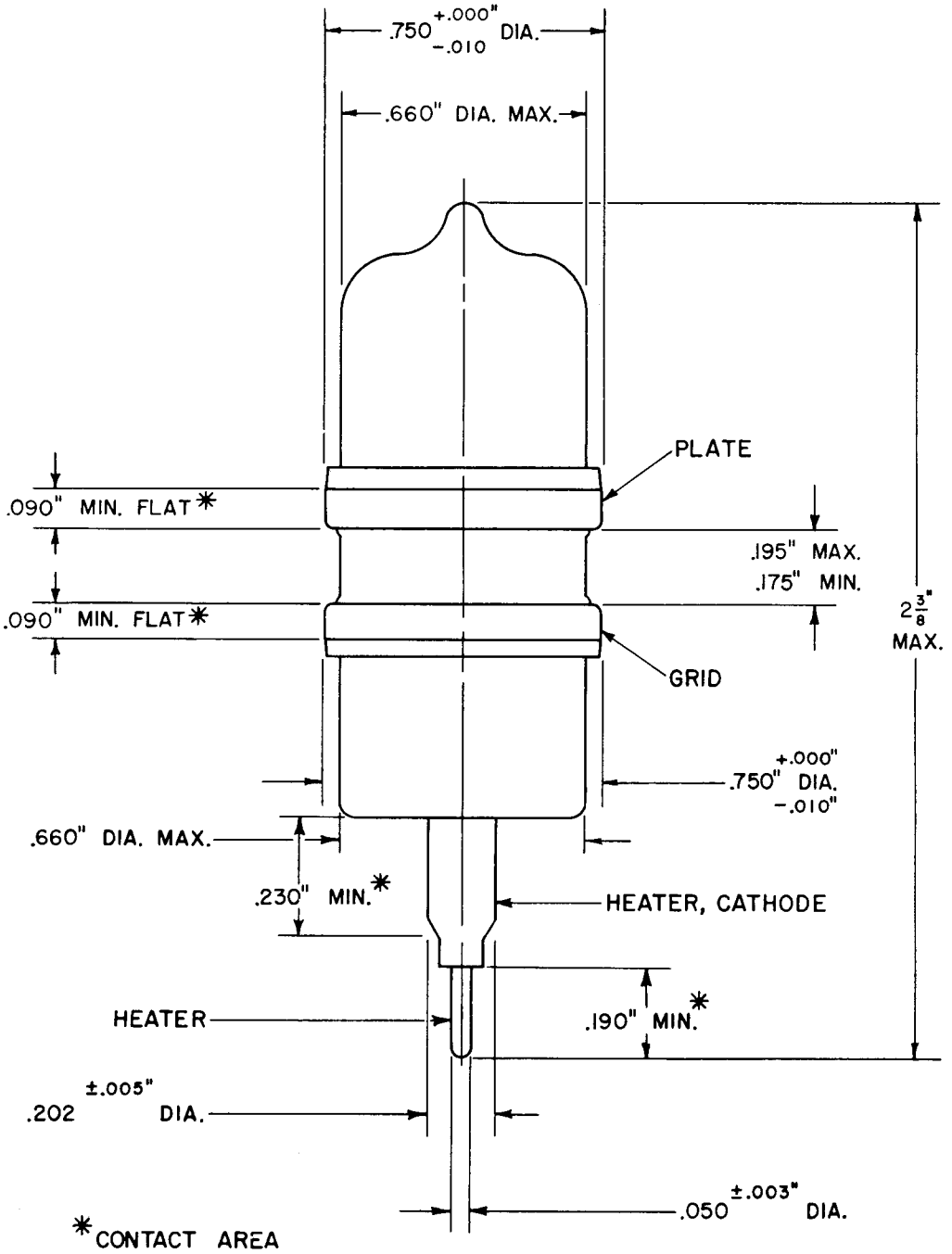
6018

OUTLINE DRAWING



SYLVANIA

engineering data service 6021

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DG
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		300	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid to Plate (Each Section)	1.4	1.5 μμf
Input (Each Section)	2.1	2.4 μμf
Output		
Section No. 1	1.3	0.28 μμf
Section No. 2	1.4	0.32 μμf
Grid to Grid	0.011	0.013 μμf Max.
Plate to Plate	0.33	0.52 μμf Max.

RATINGS[1 & 5] (Absolute Maximum)

Plate Voltage	165 Vdc
Peak Plate Forward Voltage[6]	330 v
Plate Dissipation (Each Section)	1.1 W
Plate Current (Each Section)	22 mAdc
DC Grid Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Grid Current	5.5 mAdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid Circuit Resistance	1.1 Meg

CHARACTERISTICS (Each Section)

Plate Voltage	100 Vdc
Cathode Resistor	150 Ohms
Plate Current	6.5 mAdc
Transconductance	5400 μmhos
Amplification Factor	35
Grid Voltage for Ib = 100 μAdc Max.	-6.5 Vdc

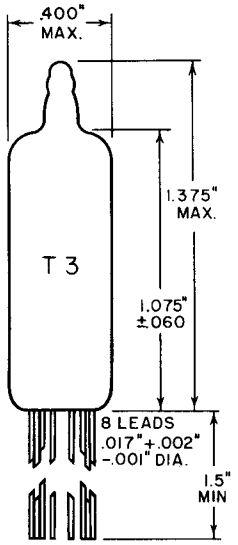
NOTES:

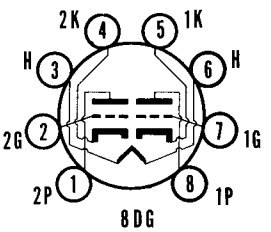
1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Per MIL-E-1C Par. 6.5 and General Section of this Sylvania Subminiature Tube Manual titled Specifications and Ratings.*

QUICK REFERENCE DATA

The Premium Subminiature Type 6021 is a general purpose, medium mu, double triode having separate cathode connections for each section. It is particularly useful in oscillator and amplifier applications where power requirements permit the use of two tubes in one envelope.

The 6021 is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage . . . . . 6.3 V
Plate Voltage . . . . . 100 Vdc
Grid Voltage . . . . . 0 V
Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1 . 0 V
Cathode Resistance Per Cathode MIL-E-1 Par. 3.2.2.1 . . . . . 150 Ohms

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7 4.10.8	(Method A) Heater Current: ALD = 24	—	—	288	300	312	—	mA
4.10.8	Heater Current:	0.65	280	—	—	—	320	mA
4.10.15	Heater-Cathode Leakage: Note 4	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = -100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid Current: Note 4 Eb = 150 Vdc; Rk = 300 Ohms; Rg = 1.0 Meg	0.65	0	—	—	—	-0.3	μAdc
4.1.1.7 4.10.4.1	(Method A) Plate Current (1): Note 4 ALD = 2.3	—	—	5.6	6.5	7.3	—	mAdc
4.10.4.1	Plate Current (1):	0.65	4.5	—	—	—	8.5	mAdc
4.10.4.1	Plate Current (2): Note 4 Ec = -6.5 Vdc; Rk = 0 Ohms	0.65	—	—	—	—	100	μAdc
4.1.1.7 4.10.9	Transconductance (1): Note 4 ALD = 1100 Sm	—	—	5000	5400	5800	—	μmhos
4.10.9	Transconductance (1): Sm	0.65	4450	—	—	—	6350	μmhos
4.7.5	Continuity and Shorts: (Inoperatives)	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes: Note 4	2.5	—	—	—	—	—	
	g-all	—	100	—	—	—	—	Meg
	p-all	—	100	—	—	—	—	Meg
4.10.4.1	Plate Current (1) Difference Between Sections:	2.5	—	—	—	—	1.6	mAdc
4.10.9	Transconductance (2): Note 4 $\triangle$ Sm Ef = 5.7 V $\triangle$ Ef	2.5	—	—	—	—	15	%
4.10.6.2	Grid Emission: Notes 4 and 5 Ef = 7.5 V; Ec = -7.5 Vdc; Eb = 150 Vdc; Rk = 0 Ohms; Rg = 1.0 Meg	2.5	0	—	—	—	-0.5	μAdc
4.10.3.2	AF Noise: Note 7 Esig = 65 mVac; Rg = 0.1 Meg; Rp = 0.01 Meg; Rk = 75 Ohms; Ck = 1000 μf	2.5	—	—	—	—	17	UV
- - - -	Pulse Emission: Notes 4 and 6 Ef = 6.0 V; e pulse = 50 v; tp = 25 μsec; prr = 200 pps	6.5	300	—	—	—	—	ma
4.10.11.1	Amplification Factor: Note 4	6.5	30	—	35	—	40	
4.10.14	Capacitance:	6.5	—	—	—	—	—	
	No Shield; Note 4 Cgp	—	1.2	—	—	—	1.8	μμf
	No Shield; Note 4 Cin	—	1.8	—	—	—	3.0	μμf
	No Shield; Section 1 Cout	—	0.20	—	—	—	0.36	μμf
	No Shield; Section 2 Cout	—	0.22	—	—	—	0.42	μμf
	No Shield Cgg	—	—	—	—	—	0.013	μμf
	No Shield Cpp	—	—	—	—	—	0.52	μμf

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 2 (Continued)								
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 20 ±5 mm Hg.; Voltage = 300 Vac	6.5	—	—	—	—	—	
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
4.9.19.1	Vibration (2): Note 4 Rp = 10,000 Ohms; Ck = 1000 μf; F = 40 cps; G = 15	2.5	—	—	—	—	50	mVac
4.9.19.1	White Noise: (Each Section); Note 8 Rp = 10,000 Ohms; Ck = 1000 μf; Peak Acceleration = 15 G	2.5 2.5	— —	— —	— —	— —	250 50	mv pk-pk mVac
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc; Rg = 0.1 Meg	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
- - - - -	Post Shock and Fatigue Test End Points: Vibration (2) Heater-Cathode Leakage Ehk = +100 Vdc Ehk = −100 Vdc Change in Transconductance (1) of Individual Tubes Δ_t Sm	— — — —	— — — —	— — — —	— — — —	— — — —	200 20 20 20	mVac μAdc μAdc %
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic 1st Sample	Combined Samples	Limits Min.	Max.	Units
Acceptance Life Tests, Note 2							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec = Eb = O V	2.5	—	—	—	—	
4.11.3.1	Stability Life Test: (1 Hour) Note 7 Ehk = +200 Vdc; Rg/g = 1.0 Meg; TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes Δ_t Sm	—	—	—	—	15	%
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives) Transconductance (1) Sm	0.65 1.0	— —	— —	— 40000	— —	 μmhos
4.11.5 4.11.3.1	Intermittent Life Test: Note 3 Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic: 1st Sample	Allowable Defectives per Characteristic: Combined Samples	Limits: Min.	Limits: Max.	Units
Acceptance Life Tests, Note 2 (Continued)							
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Grid Current	—	1	3	0	-0.9	μAdc
	Heater Current	—	2	5	276	328	mA
	Change in Transconductance (1) of Individual Tubes $\triangle \frac{Sm}{t}$	—	1	3	—	25	%
	Transconductance (2) $\triangle \frac{Sm}{Ef}$	—	2	5	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	10	μAdc
	Ehk = -100 Vdc	—	—	—	—	10	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	g-all	—	—	—	50	—	Meg
	p-all	—	—	—	50	—	Meg
	Transconductance (1) Average Change, Avg $\triangle \frac{Sm}{t}$	—	—	—	—	15	%
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature lead fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater cycling life test
4.11.5	Intermittent life test

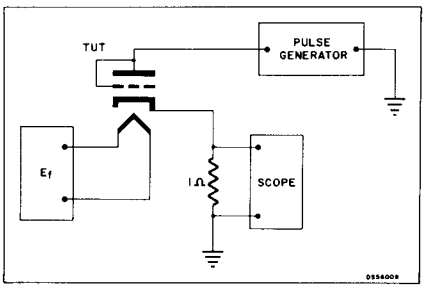
3: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life rack.

4: Test each section separately.

5: Prior to this test tubes shall be preheated five (5) minutes with each section operating separately at conditions indicated below. Test within three (3) seconds after preheating. Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission Test.

Ef	Ec	Eb	Rk	Rg
V	Vdc	Vdc	Ohms	Meg
7.5	0	150	500	1.0

6: The pulse is essentially a square wave with 1.0 μsec rise time and 0.8 μsec fall. The pulse shall be applied to plate and grid tied together. Pulse emission shall be measured in terms of voltage developed across a 1.0 ohm resistor in the cathode circuit. Test limit as measured by the leading edge of a calibrated trace, the amplitude of the trailing edge of which shall not vary by more than 20 percent from the value of the leading edge. Test each unit separately.



7: Tie 1k to 2k; 1g to 2g; and 1p to 2p.

8: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "White Noise" spectrum which is free from discontinuities from 100 cps to 5000 cps. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 G's rms acceleration. With this the case, the rms value of acceleration for any bandwidth within the specified spectrum is equal to

$$G\ rms = 2.3\ G \sqrt{3.32 \log_{10} (f2/f1)}$$

f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (0.25 megohm or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 40 db at 13,000 cps. For reading the peak to peak value of output voltage the filter output shall be fed directly to the input of a Ballantine Model 305 peak to peak electronic voltmeter or equal, while the rms value shall be measured with a Hewlett-Packard Model 400C or equal.

APPLICATION DATA

The Sylvania Premium Subminiature Type 6021 is a medium mu double triode having separate cathode connections for each section. It is intended as a general purpose tube and is particularly useful in applications where power requirements are such that the 6021 may be employed rather than two high power single triodes. Among the many uses for this type are a number of low frequency amplifier and oscillator configurations. To insure optimum performance in pulse applications this type is subjected to a pulse emission test as shown in the accompanying data. The tube must, under the specified pulse operating conditions, deliver a minimum specified current. A further discussion of this test is included in the general section of this manual.

Resistance coupled amplifier data is shown in the accompanying table.

The Type 6021 may also be used as uhf amplifier. Instability, however, may be noted with cascode arrangements at frequencies above approximately 100 mc. Input resistance is plotted as a function of frequency in Figure 1.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tubes to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

The Type 6021 is manufactured and inspected to meet the applicable MIL-E-1 specification and is intended for operation under severe conditions of vibration, shock, high temperature and high altitude.

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

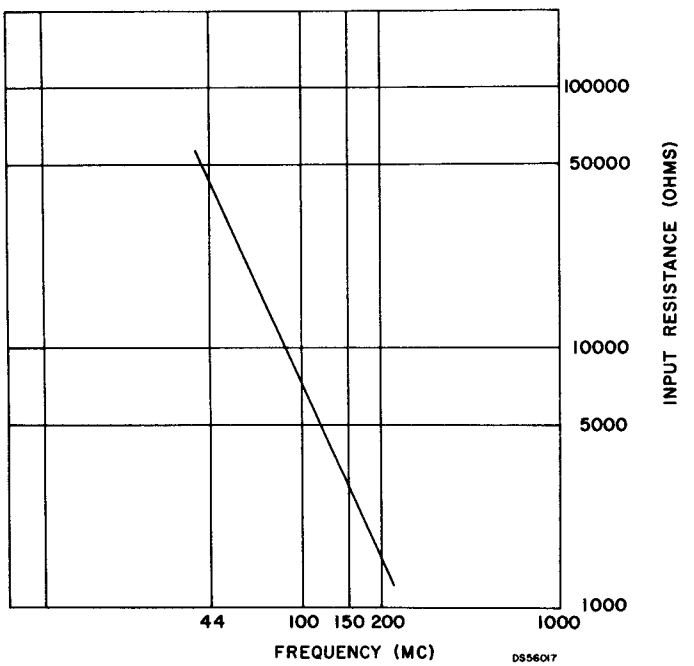


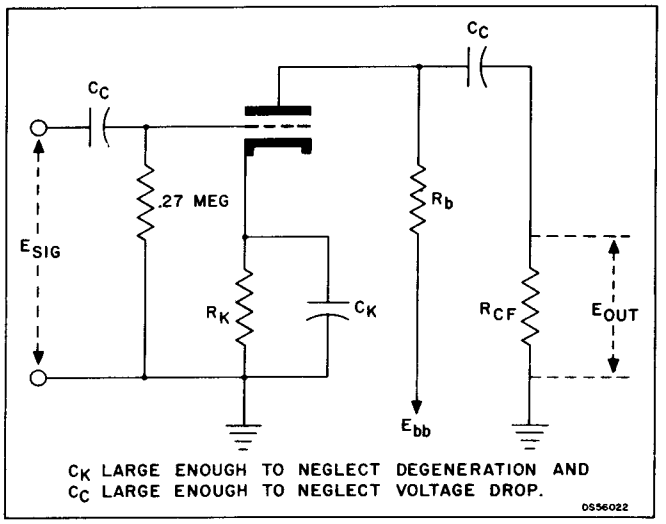
Figure 1—Input resistance vs frequency

The information presented on this data sheet is furnished without assuming any obligation.

RESISTANCE COUPLED AMPLIFIER DATA
SELF-BIAS OPERATION

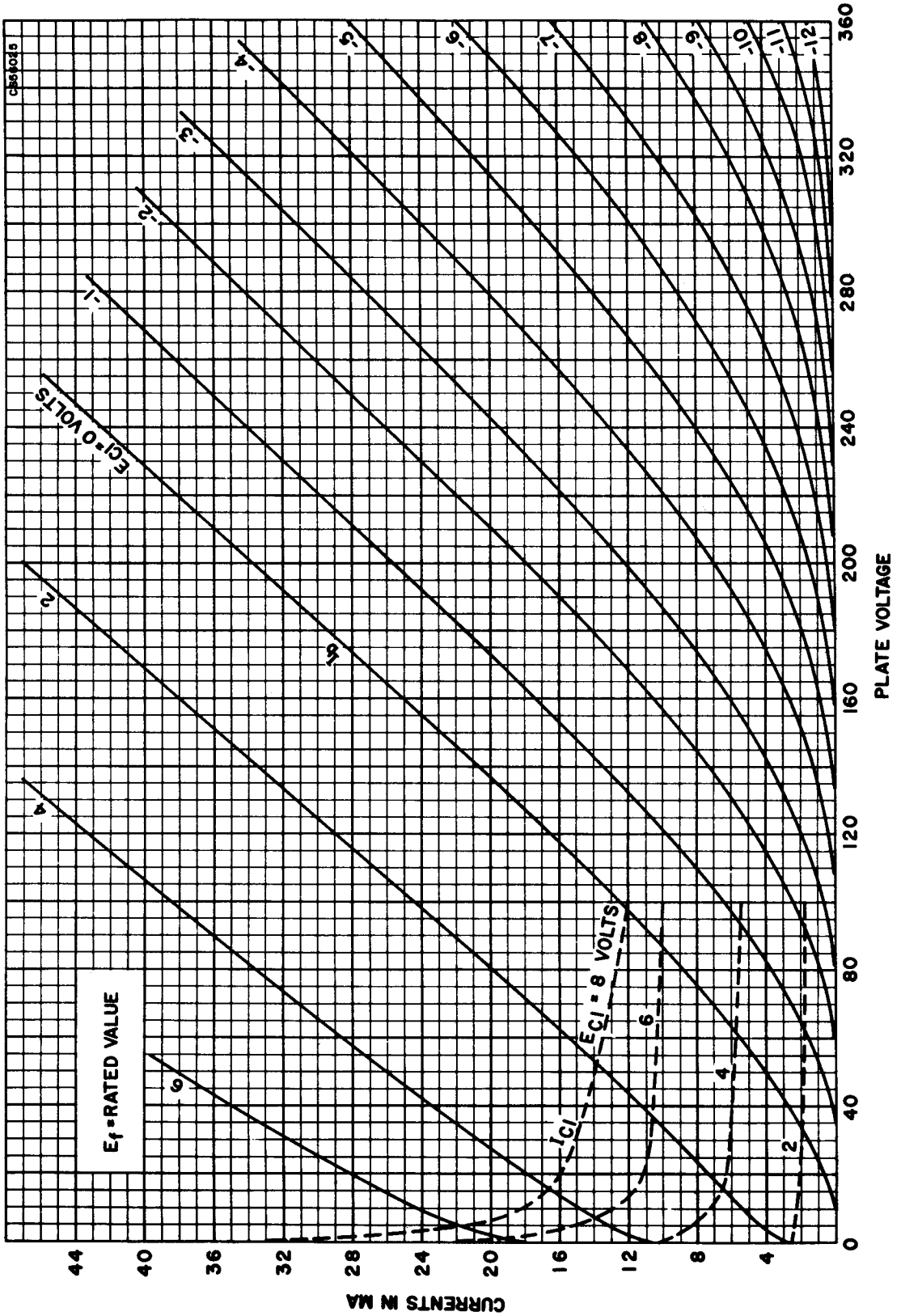
	Ebb = 100 Volts								Ebb = 200 Volts							
Rb (megohms)	.047		0.10		0.27		.47		.047		.10		.27		.47	
Rcf (megohms)	.10	.27	.10	.47	.27	.47	.47	1.0	.10	.27	.10	.47	.27	.47	.47	1.0
Rk (ohms)	1500	1500	2200	3300	6800	8200	12000	16000	1000	1200	1500	2700	4700	5600	9100	12000
Ib (ma)	.85	.86	.51	.44	.19	.18	.115	.10	2.05	1.95	1.20	.98	.45	.43	.26	.24
Ec (volts)	-1.27	-1.29	-1.12	-1.45	-1.29	-1.48	-1.38	-1.60	-2.05	-2.34	-1.80	-2.65	-2.12	-2.40	-2.36	-2.88
Eb (volts)	58.8	58.2	47.9	54.5	47.4	49.8	44.6	51.4	101.6	106.2	78.2	99.4	76.9	81.6	75.6	84.1
Esig (volts, rms)	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
Eout (volts, rms)	2.01	2.14	2.04	2.18	2.05	2.1	2.04	2.14	2.34	2.42	2.36	2.4	2.3	2.36	2.28	2.29
Gain	20.1	21.4	20.4	21.8	20.5	21.0	20.4	21.4	23.4	24.2	23.6	24.0	23.0	23.6	22.8	22.9
% Distortion	1.4	1.4	1.4	2.4	1.4	2.3	2.4	1.5	1.20	1.3	1.3	1.4	1.3	1.3	1.3	1.4
Esig* (volts, rms)	.47	.57	.42	.63	.55	.62	.58	.78	1.15	1.35	.97	1.41	1.15	1.35	1.2	1.6
Eout (volts, rms)	9.4	12.1	8.5	13.5	11.0	12.8	11.7	16.0	26.8	32.1	22.8	33.5	26.5	31.5	27.2	36.0
Gain	20.0	21.2	20.2	21.4	20.0	20.5	20.2	20.5	23.3	23.8	23.5	23.8	23.0	23.3	22.6	22.6
% Distortion	5.0	5.0	4.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.9	4.8	5.0

*Maximum signal for 5% distortion or 1/8 microampere grid current.

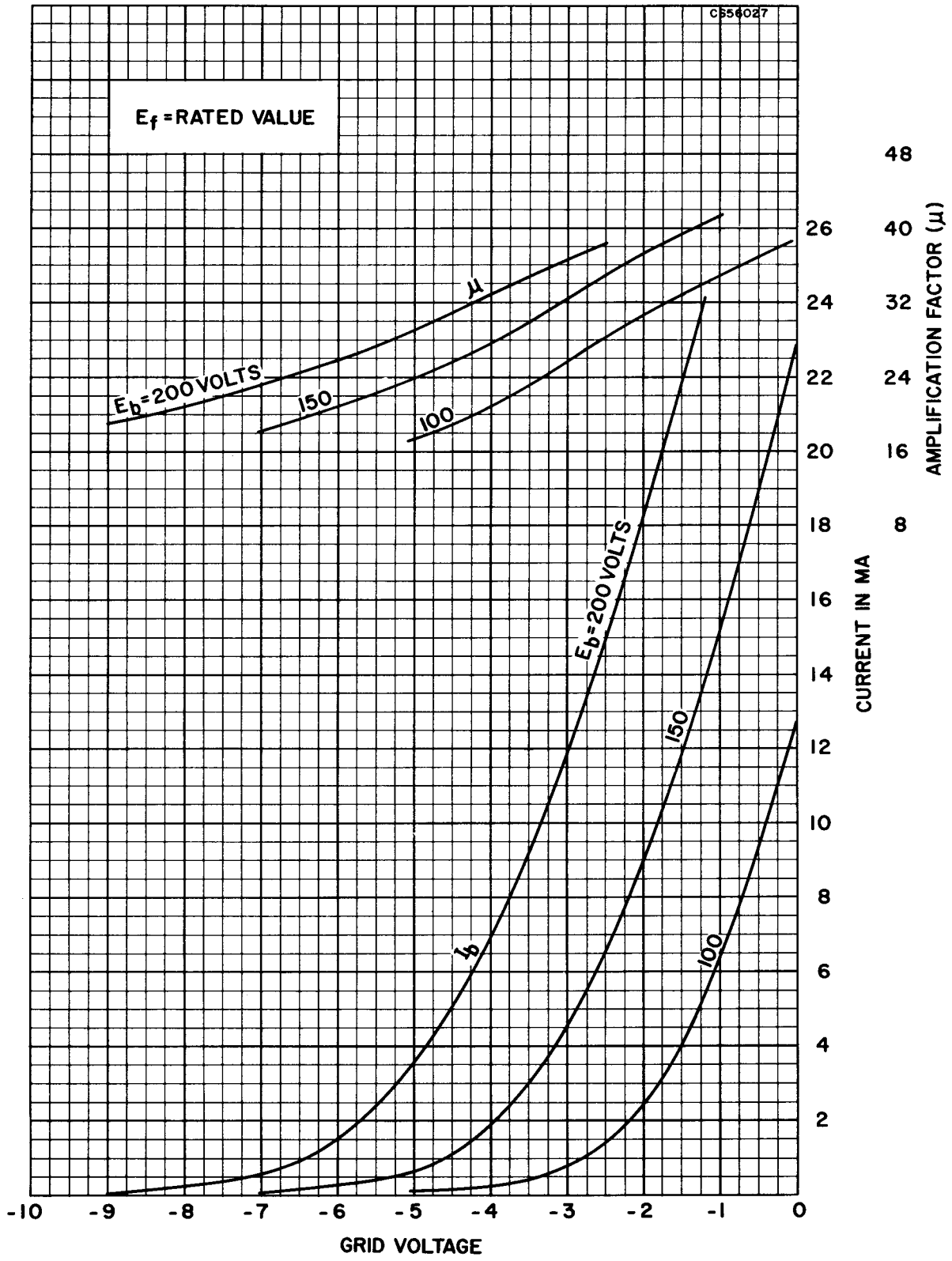


Resistance coupled amplifier circuit (Self-Bias)

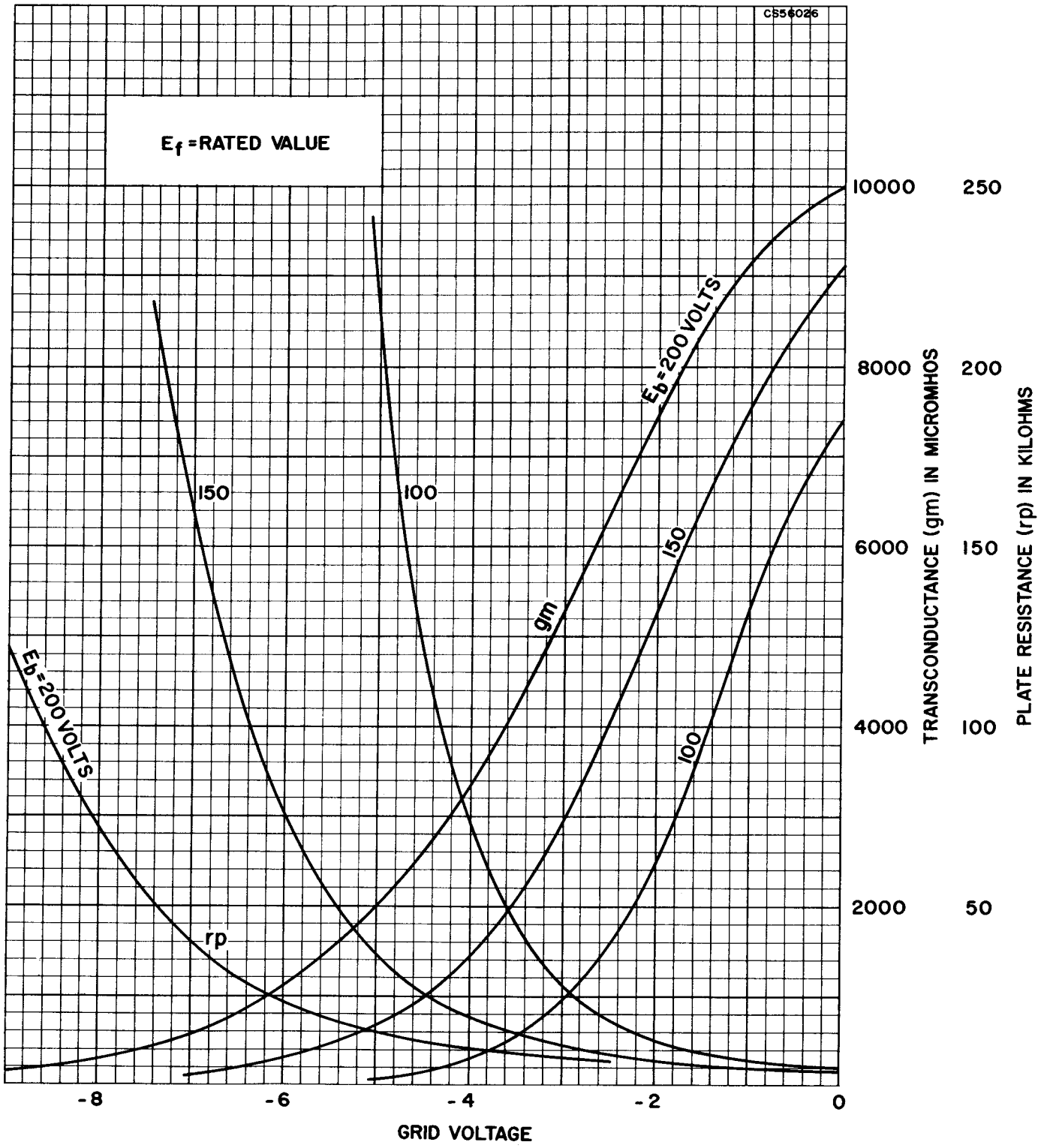
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA

TYPE 6024

JETEC Registration Data

ATR Gas Switching Tube

The Type 6024 is a broad-band ATR gas switching tube designed to decouple effectually the transmitter from a common transmitting and receiving antenna during a non-transmitting period, in radar applications.

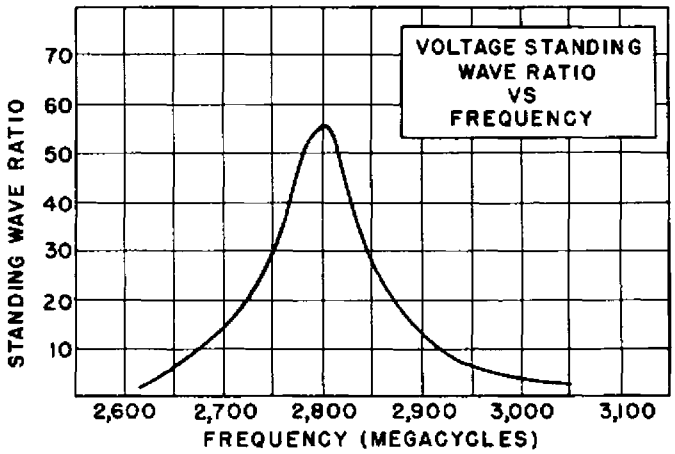
ELECTRICAL DATA

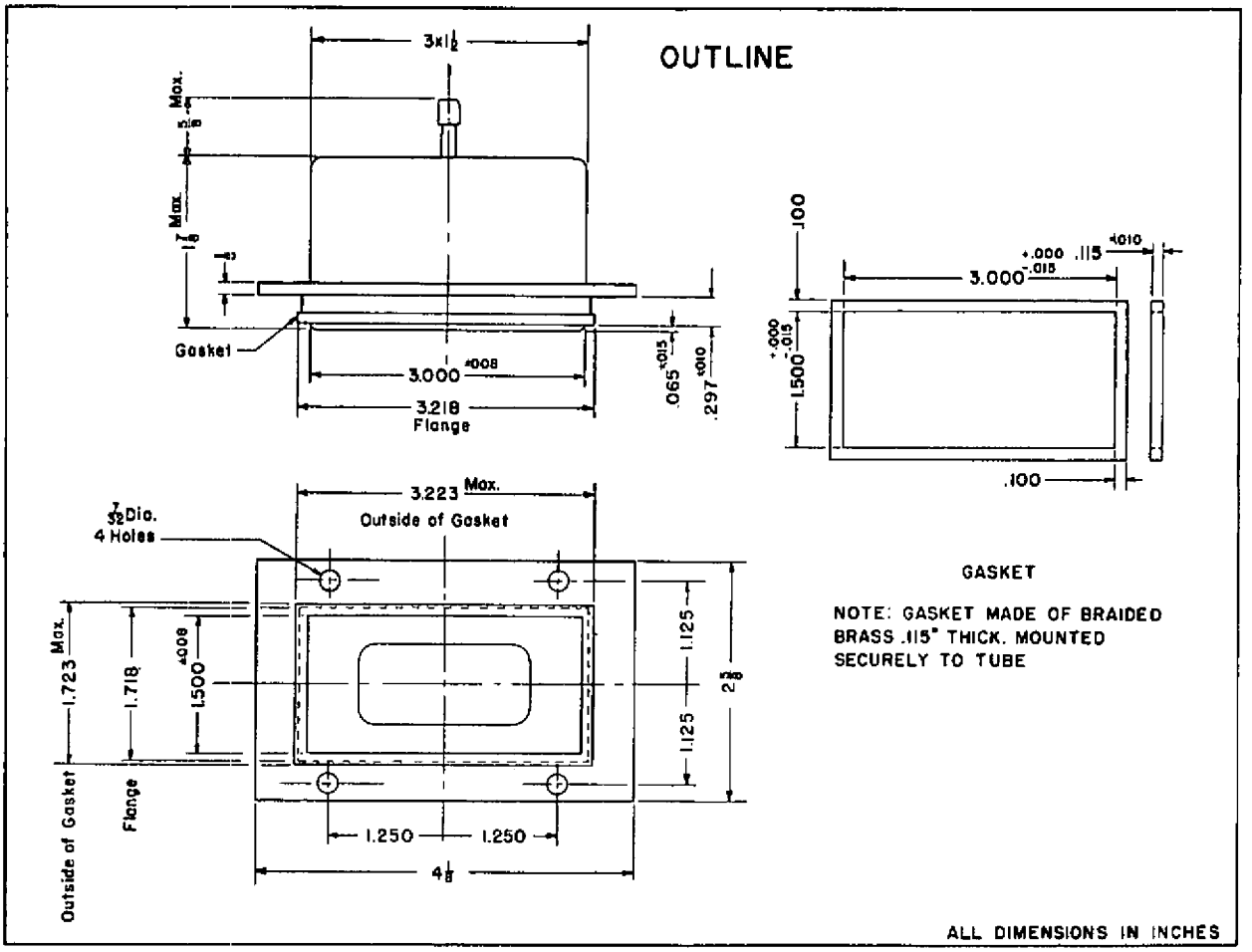
Center Frequency	2,800	megacycles
Operational Band, nominal	2,650 to 2,950	megacycles
Loaded Q, maximum	5.5	
Transmitter Peak Power:		
Minimum	20	kilowatts
Maximum	1,000	kilowatts
Normalized Conductance at Center Frequency	0.05	
Normalized Susceptance at Center Frequency	±0.05	
Arc Power Loss,* maximum	0.8	db

MECHANICAL DATA

Mounting Position	Any	
Ambient Temperature Range (non operating)	-40 to +100	°C
Net Weight, approximate	0.83	pounds

*At a peak power of 20 kilowatts, pulse repetition rate of 1,000 pulses per second, pulse width of 1.0 microseconds and a frequency of 2,800 megacycles.




OUTLINE
3x1½
Max.
Max.
Gasket
3.000 +.008
3.218
Flange
.065 +.015
.297 +.010
.100
3.000 +.000 -.015
.115 +.010
1.500 +.000 -.015
.100
3.223 Max.
Outside of Gasket
7/32 Dia.
4 Holes
1.723 Max.
1.718
1.500 +.008
Outside of Gasket
Flange
1.125
1.125
2⅝
1.250
1.250
4⅛
GASKET
NOTE: GASKET MADE OF BRAIDED BRASS .115" THICK. MOUNTED SECURELY TO TUBE
ALL DIMENSIONS IN INCHES

ADVANCE DATA

MECHANICAL DATA

Vibration (Non-Operating)	50 cycles - 10 G	
Maximum Altitude	10,000	Feet
Mounting Position	Any	
Overall Dimensions	5 3/8 x 5 1/4 x 4 29/64	Inches
Net Weight	4 3/4	Lbs.
Cooling	Convection Air	
Pressurization	45	psi abs.
Output Coupling	UG-40A/U	

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage - Preheat [1, 2]	6.3 ± 10%	Volts
Heater Current at 6.3 Volts	.43 - .60	Amp
Minimum Preheat Time	2	Minutes

RATINGS (Absolute Maximum) [3]

Heater Voltage	7.0	Volts
Peak Current	8.0	Amps
Peak Anode Voltage	8.0	kv
Average Power Input	80	Watts
Frequency Pulling at VSWR 1.5/1	15	mc
Anode Temperature	120°	C
Pulse Duration	2.5	μsecond
Duty Cycle	.0025	
Rate-of-Rise of Voltage	60	kv/μsecond
VSWR	1.5/1	
R F Bandwidth	2.5/tp	mc

TYPICAL OPERATION	Oscillation 1	Oscillation 2 [2]	
Pulse Recurrence Freq.	1000	2000	pps
Pulse Duration	1.0	1.0	μsecond
Peak Anode Voltage	6.9	6.5	kv
Peak Anode Current	7.5	3.5	amps
Average Anode Current	7.5	7.0	ma
Useful Range of Average Current	6-7.5	7.0-12.0	ma
Average Power Output	18		Watts Min.
Input Capacitance	6		μμf

NOTES:

1. The cathode heating time shall be a minimum of 120 seconds at temperature greater than 0°C and a minimum of 180 seconds at temperatures between 0°C and -55°C. For duty cycle greater than .001, reduce heater voltage according to manufacturer's recommendations.

from JETEC release #1628, April 9, 1956

QUICK REFERENCE DATA

Sylvania Type 6027 magnetron is similar to the 2J42, but is supplied with an additional magnet which increases the magnetic gap field. This permits higher power outputs as shown in the accompanying "operating characteristics" graphs.

The 6027 is a pulsed, fixed frequency (9345-9405 mc) magnetron.

The unit is supplied with magnets in place.

SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

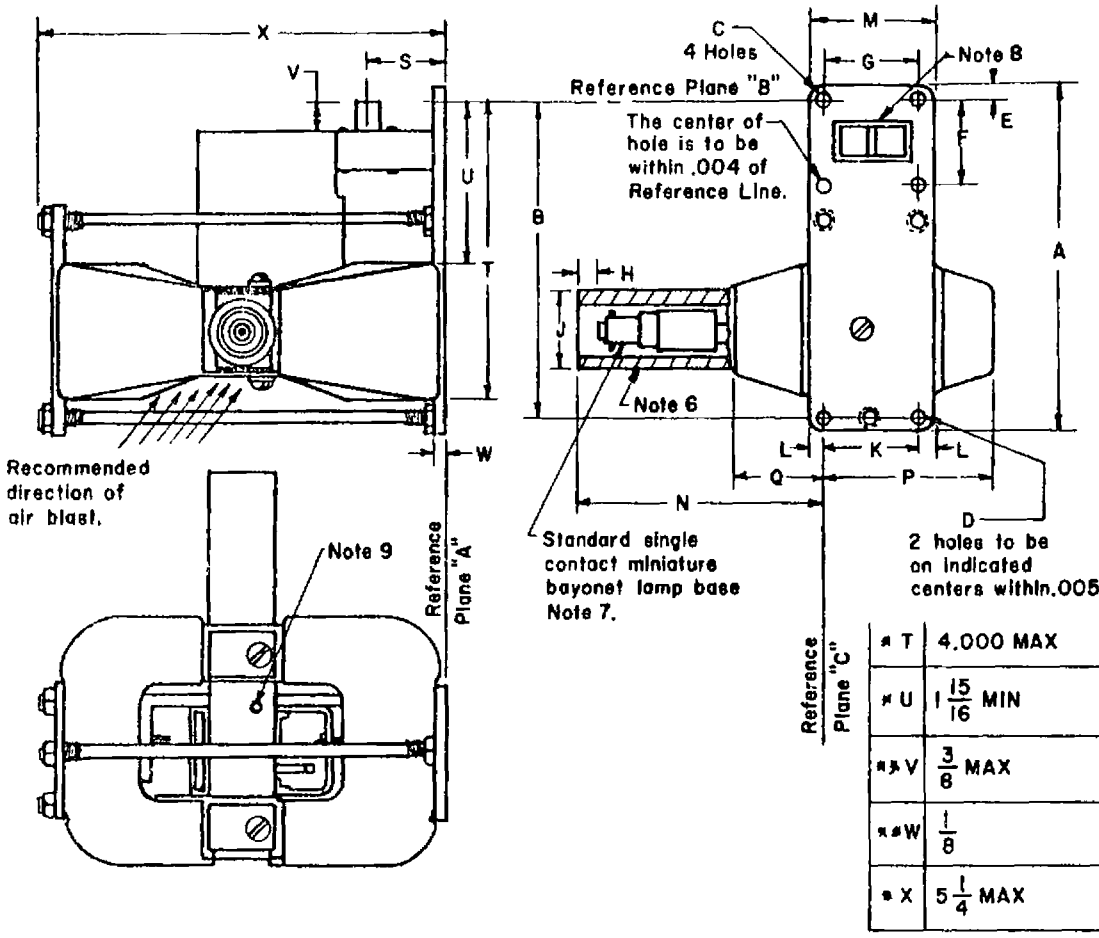
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

February 14, 1956

NOTES:

2. Reduce heater voltage to 4.5 volts three seconds after applying high voltage.

3. The values specified are based on the "absolute system" and are not to be exceeded under any service conditions. The ratings are limiting values above which serviceability of any individual tube may be impaired. It does not necessarily follow that combinations of absolute maximum ratings can be attained simultaneously.



LTR	DIMENSIONS
* T	4.000 MAX
* U	$1\frac{15}{16}$ MIN
*# V	$\frac{3}{8}$ MAX
*# W	$\frac{1}{8}$
* X	$5\frac{1}{4}$ MAX

LTR	DIMENSIONS
A	$4\frac{29}{64} \pm \frac{1}{64}$
B	4.103
C	.170 ± .003 DIA.
D	.175 ± .003 DIA
* E	$\frac{11}{64} \pm \frac{1}{64}$
F	1.280 ± .004
G	1.220 ± .004
* H	$\frac{1}{4}$ MAX
* J	1.000 MAX
K	1.220
* L	$\frac{13}{64} \pm \frac{1}{64}$
* M	$1\frac{5}{8} \pm \frac{1}{64}$
* N	$2\frac{11}{16}$ MIN $3\frac{3}{16}$ MAX
* P	$2\frac{3}{16}$ MAX
* Q	$1\frac{3}{16}$ MAX
*# S	$\frac{7}{8} \pm \frac{1}{8}$

Note 1: Reference plane "B" passes through the centers of the two top holes of the mounting plate as shown and is perpendicular to plane "A".

Note 2: Reference plane "C" passes through the upper left hole on mounting plate as shown and is mutually perpendicular to planes "A" and "B".

*Note 3: Surface "A" with tube resting on a flat surface a feeler gauge .020 thick and 1/8 wide shall not enter more than 1/8 at any point.

*#Note 4: Surface "A" and interior surfaces of wave guide shall be plated 10 MSI of gold or 30 MSI of silver.

Note 5: All metal surfaces except surface "A" and the bayonet base shall be painted black.

*Note 6: The axis of the filament lead protector must be within 5° of a normal to reference plane "C".

*Note 7: The clearance between the inside surface of the protector and the 3/8 diameter cylindrical surface of the bayonet base shall not be less than 1/8.

Note 8: This area is gasketed for pressurizing wave guide output as with coupler UG-40 A/U.

Note 9: Make anode temperature measurements at this point on round anode surface between radiator fin and pole piece.

FIG. 1

TYPE 6027 RIEKE DIAGRAM

Peak Anode Current — 8Amp
Pulse Duration — 1 μ sec
P.R.F — 1000

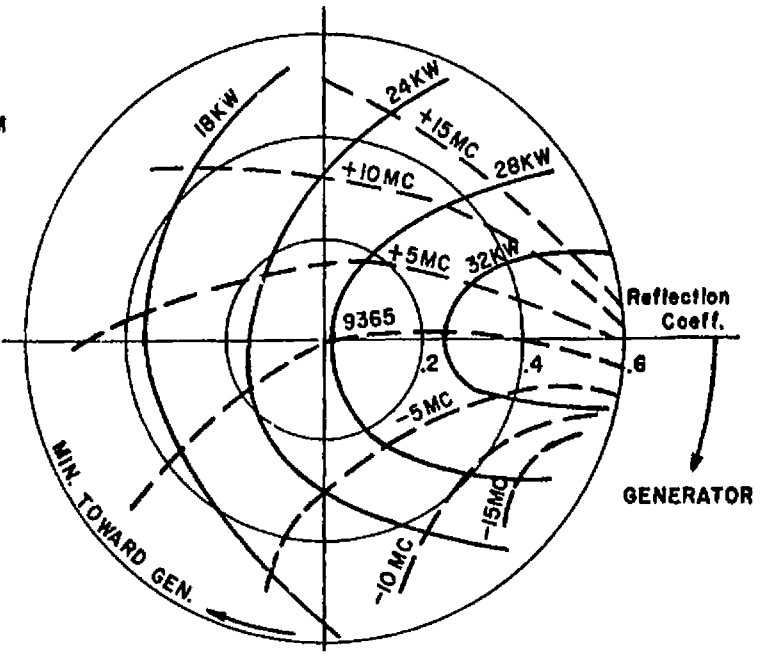
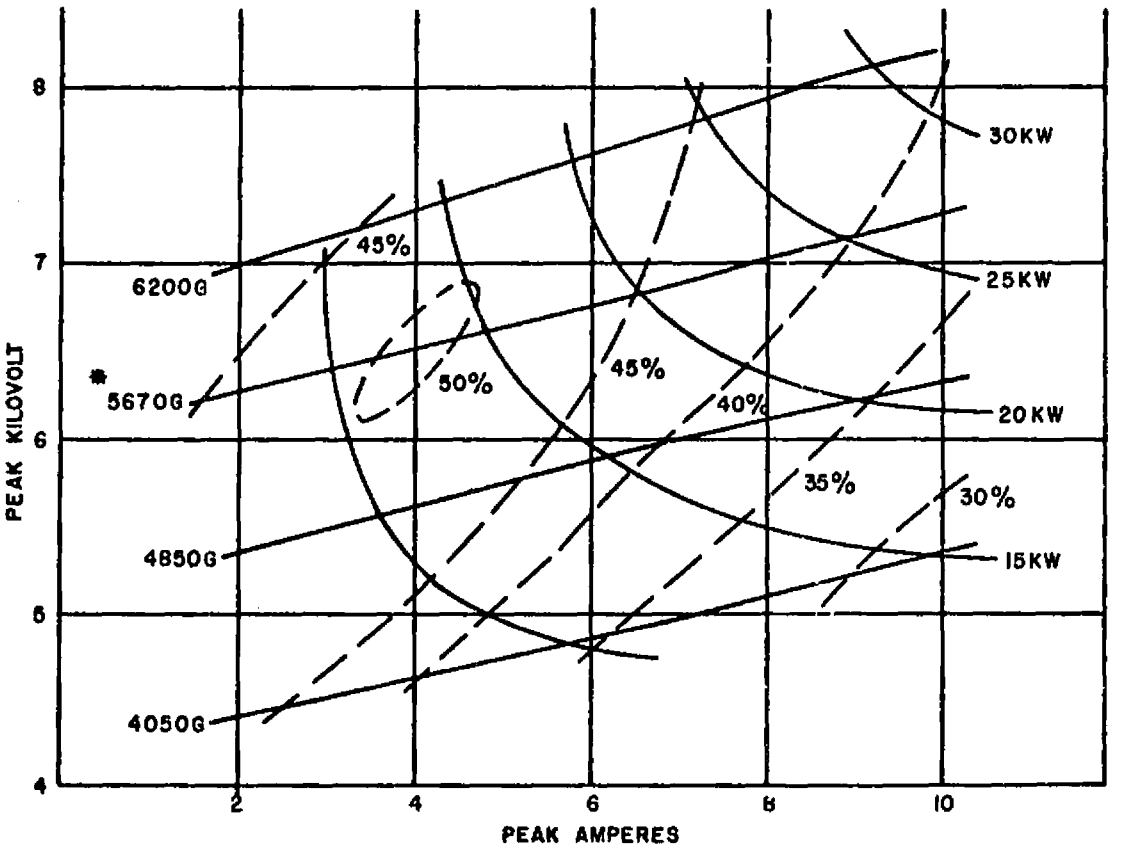


FIG. 2

TYPE 6027 OPERATING CHARACTERISTICS



* Operating Line for Standard Attached Magnet.

Frequency 9375 mc/s
Pulses Duration 1μs
1000 Pulses/s
15 mc/s pulling (max)

from RTMA release #1021,
Sept. 19, 1951

SYLVANIA ELECTRIC

RTMA Registration Data

TYPE 6033

ATR TUBE

The Type 6033 is an ATR gas switching tube with a center frequency of 9,300 megacycles. The contact surface (bottom face of end plate) of this type is precisely made to permit a minimum of leakage from the joint connecting tube to associated equipment.

ELECTRICAL DATA

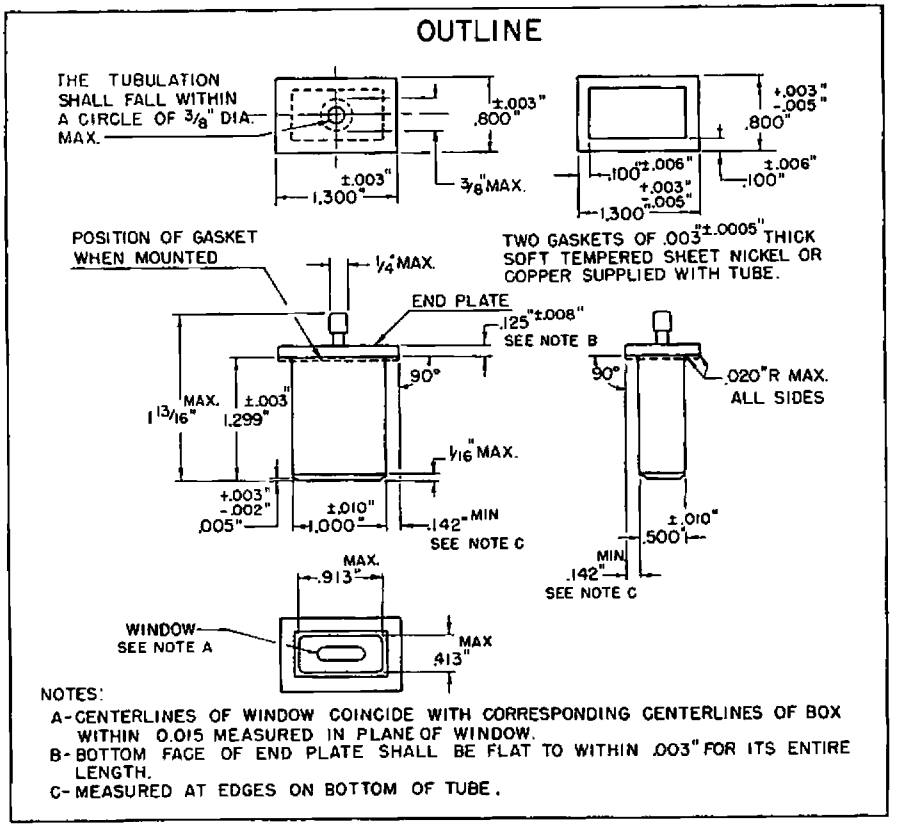
Center Frequency	9,300	megacycles
Loaded Q, maximum	6.5	
Transmitter Peak Power, minimum	5	kilowatts
Normalized Conductance, maximum	0.1	
Normalized Susceptance, maximum	±0.06	
Arc Power Loss(1), maximum	0.8	decibel
High Level Standing Wave Ratio, maximum	1.10	

MECHANICAL DATA

Mounting Position	any
Ambient Temperature Range	-40 to +100 degrees centigrade

(1) At a peak power of 4 kilowatts, frequency of 9,025 megacycles, pulse repetition rate of 1,000 pulses per second, and a pulse width of 0.5 microseconds.

OUTLINE



NOTES:

A- CENTERLINES OF WINDOW COINCIDE WITH CORRESPONDING CENTERLINES OF BOX WITHIN 0.015 MEASURED IN PLANE OF WINDOW.

B- BOTTOM FACE OF END PLATE SHALL BE FLAT TO WITHIN .003" FOR ITS ENTIRE LENGTH.

C- MEASURED AT EDGES ON BOTTOM OF TUBE.

from RTMA release #1021,
Sept. 19, 1951

SYLVANIA ELECTRIC

RTMA Registration Data

TYPE 6034

ATR TUBE

The Type 6034 is an ATR gas switching tube with a center frequency of 8,750 megacycles. The contact surface (bottom face of end plate) of this type is precisely made to permit a minimum of leakage from the joint connecting the tube to associated equipment.

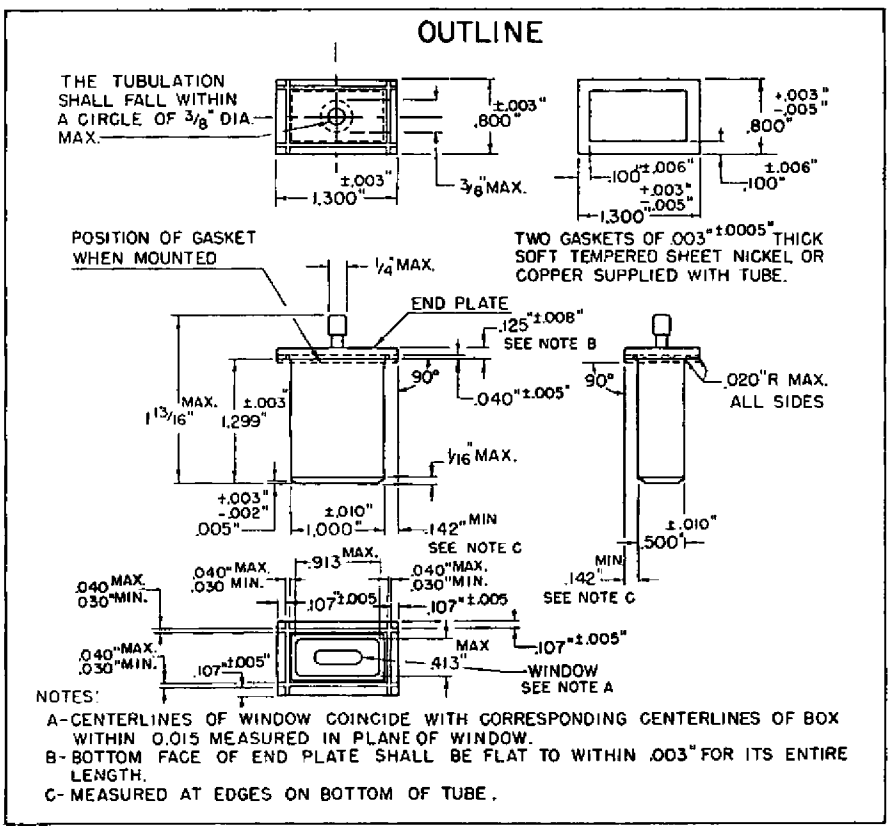
ELECTRICAL DATA

Center Frequency	8,750	megacycles
Loaded Q, maximum	6.5	
Transmitter Peak Power, minimum	5	kilowatts
Normalized Conductance, maximum	0.1	
Normalized Susceptance, maximum	±0.06	
Arc Power Loss(1), maximum	0.8	decibel
High Level Standing Wave Ratio, maximum	1.10	

MECHANICAL DATA

Mounting Position ..... any
Ambient Temperature Range ..... -40 to +100 degrees centigrade

(1) At a peak power of 4 kilowatts, frequency of 9,025 megacycles, pulse repetition rate of 1,000 pulses per second, and a pulse width of 0.5 microseconds.



NOTES:
A-CENTERLINES OF WINDOW COINCIDE WITH CORRESPONDING CENTERLINES OF BOX WITHIN 0.015 MEASURED IN PLANE OF WINDOW.
B-BOTTOM FACE OF END PLATE SHALL BE FLAT TO WITHIN .003" FOR ITS ENTIRE LENGTH.
C-MEASURED AT EDGES ON BOTTOM OF TUBE.

DESCRIPTION

Sylvania Type 6035 is a fixed-tuned broad band transmit-receive tube which allows the same antenna to be used for transmitting and receiving microwave energy. Designed for use with the Sylvania type 1B35A or 1B37A, ATR, it is similar to the Sylvania type 1B63A except that the tube has the added advantage of being better able to withstand high humidity and service under corrosive conditions.

FREQUENCY RANGE . . . . . 8490 to 9578 mc

IGNITOR CHARACTERISTICS

Ignitor Open Circuit Voltage	—650 Vdc min.
Ignitor Current	100 μa
Ignitor Tube Drop	200 to 375 volts

LOW POWER LEVEL UNFIRED CHARACTERISTICS

Insertion Loss	0.7 db max.
Ignitor Interaction	0.2 db max.

HIGH POWER LEVEL FIRED CHARACTERISTICS

Leakage Power (Flat) (40 kw)	40 mw max.
Spike Leakage Energy at (40 kw)	0.2 erg
Recovery Time	4 usec max. @ 3 db
Arc Loss (4 kw)	0.8 db max.
Position of VSW minimum	0.065″—0.007″

TEMPERATURE AND MECHANICAL CHARACTERISTICS

Ambient Temperature Range (non-operative): —40° to 100°C

Mounting: Between standard rectangular rf choke flanges in 0.400″ x 0.900″ ID 0.050″ WT waveguide.

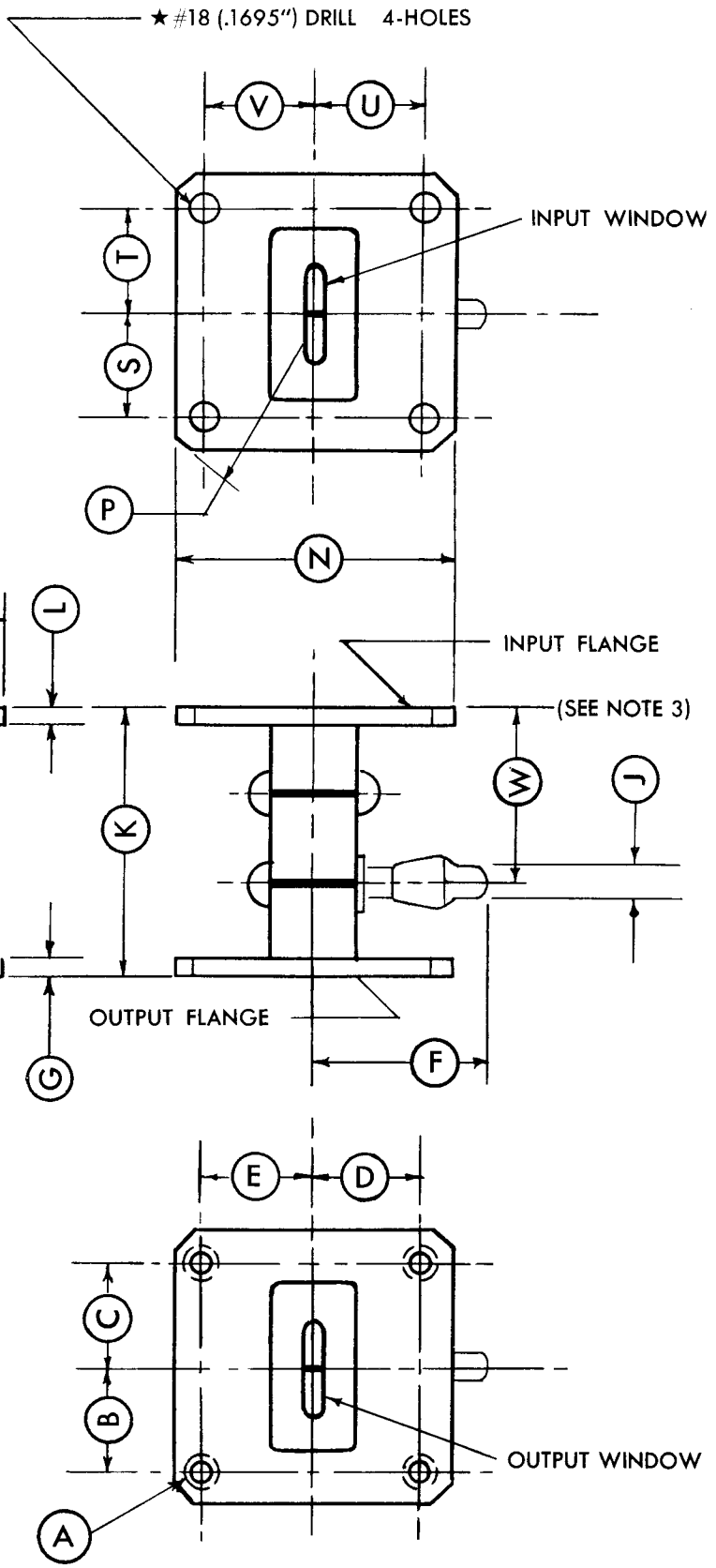
SYLVANIA ELECTRIC PRODUCTS INC. ELECTRONICS DIVISION
1740 Broadway, New York 19, New York

NOTE 2.

End flanges are parallel planes flat within 0.006 when measured within the area between concentric circles of 1 3/16 and 1 5/8. The area outside of the 1 5/8 circle may measure less than the minimum measured dimension by an additional 0.004.

NOTE 3.

Ignitor terminal to fall within area defined by a reference circle of 3/8 max. dia. located 1.028 nom. from outside edge of input flange.



REFERENCE	DIMENSIONS
A	*8-32 NC-2 TAP, 4-HOLES
B	.610±.002
C	.610±.002
D	.640±.002
E	.640±.002
F	1 1/8 MAX.
G	.093±.010
J	.250
K	1.555±.010
L	.093±.010
M	1 5/8
N	1 5/8
P	1 1/16 R.
S	.610±.002
T	.610±.002
U	.640±.002
V	.640±.002
W	1.028 NOM.

from RTMA release #1021,
Sept. 19, 1951

SYLVANIA ELECTRIC

RTMA Registration Data

TYPE 6038

ATR TUBE

The Type 6038 is an ATR gas switching tube with a center frequency of 9,300 megacycles. This type is designed to have a low recovery time.

ELECTRICAL DATA

Center Frequency	9,300	megacycles
Loaded Q, maximum	6.5	
Transmitter Peak Power:		
Minimum	5	Kilowatts
Maximum (1)	100	Kilowatts
Normalized Conductance, maximum	0.1	
Normalized Susceptance, maximum	±0.06	
Arc Power Loss (2), maximum	0.6	decibel
High Level Standing Wave Ratio, maximum	1.10	
Recovery Time (3), maximum	8.0	microseconds

MECHANICAL DATA

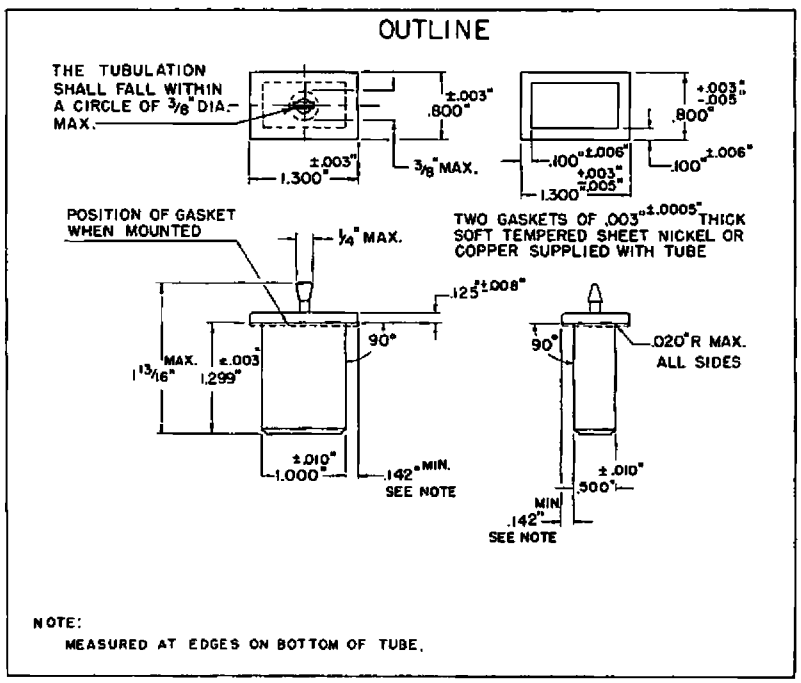
Mounting Position ..... any

Ambient Temperature Range ..... -40 to +100 degrees centigrade

(1) At a duty cycle of 0.001.

(2) At a peak power of 4 kilowatts, pulse repetition rate of 1,000 pulses per second, a pulse width of 0.5 microsecond, and a frequency of 9,025 megacycles.

(3) At a peak power of 20 kilowatts, pulse repetition rate of 1,000 pulses per second, a pulse width of 0.5 microseconds, and a frequency of 9,375 megacycles.



SYLVANIA

TYPE 6045

JETEC Registration Data

DOUBLE TRIODE

MECHANICAL DATA

Style	miniature
Cathode	coated unipotential
Bulb	T-5 1/2
Base	E7-1, Miniature Button 7 Pin
Outline	5-2
Maximum Diameter	3/4 inch
Maximum Overall Length	2 1/8 inches
Maximum Seated Height	1 7/8 inches
Mounting Position	any
Basing	7BF

Connections:

Pin 1 - #2 plate	Pin 5 - #1 grid
Pin 2 - #1 plate	Pin 6 - #2 grid
Pin 3 - heater	Pin 7 - cathode
Pin 4 - heater	

ELECTRICAL DATA

GENERAL

Heater Voltage (ac or dc)	6.3 volts
Heater Current	350 ma

Direct Interelectrode Capacitances:

Grid to Plate(1)	1.3 µµf
Input(1)	2.0 µµf
Output, Section #1	0.45 µµf
Output, Section #2	0.34 µµf

RATINGS(2) - Absolute Values

Heater Voltage	6.3(±10%) volts
Maximum Plate Voltage (dc)	330 volts
Maximum Cathode Current(1)	22 ma
Maximum Plate Dissipation(1)	1.6 watts
Maximum Heater-Cathode Voltage	±200 volts

CHARACTERISTICS(1)

Conditions:		
Heater Voltage	6.3	6.3 volts
Plate Voltage(dc)	300	100 volts
Grid Voltage	-16	--- volts
Cathode Bias Resistor(3)	0	50 ohms
Plate Current	0.1 max.	9.0 ma
Transconductance		6,400 µmhos
Amplification Factor		38
Noise Output Voltage(4), maximum		125 mv

Notes

(1) Each section.

(2) Limitations beyond which normal tube performance and tube life may be impaired.

(3) Value is for both sections operating simultaneously.

(4) Across plate resistor of 2,000 ohms, at plate voltage of 250 volts, grid voltage of -8 volts, with applied vibrational acceleration of 10 g at 50 cycles per second, sections in parallel.

from RTMA release #1179, April 17, 1953

1401

ADVANCE DATA

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	3-1
Basing	8DL
Cathode	Coated Unipotential
Mounting Position	Any

[1]

RATINGS (Absolute Values)

Impact Acceleration [2]	450	g	Max.
Vibrational Acceleration for Extended Periods [3]	2.5	g	Max.
Bulb Temperature (At Hottest Point)	300°	C	Max.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage, ±5% [1, 5] (Absolute Values)	6.3	Volts	
Heater Current	150	Ma	
Heater-Cathode Voltage (Absolute Values)			
Heater Negative with Respect to Cathode	200	Volts	Max.
Heater Positive with Respect to Cathode	200	Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Shielded) [4]

Grid No. 1 to Plate	.009	μμf	Max.
Input: g1 to (h+k+g3+g2+E.S.)	3.6	μμf	
Output: p to (h+k+g3+g2+E.S.)	3.8	μμf	

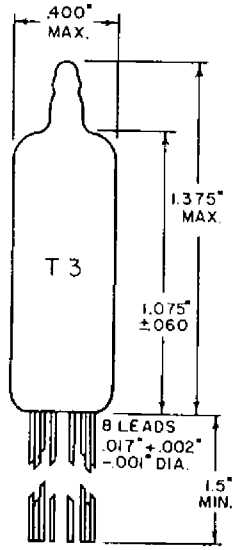
[1]

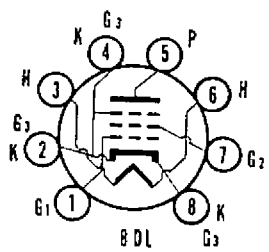
RATINGS (Absolute Values)

Plate Voltage, DC	165	Volts	Max.
Grid No. 2 Voltage, DC	155	Volts	Max.
Plate Dissipation	1.1	Watts	Max.
Grid No. 2 Dissipation	0.55	Watts	Max.
Cathode Current	16.5	Ma	Max.
Negative Grid No. 1 Voltage	55	Volts	Max.

QUICK REFERENCE DATA

The Sylvania Type 6049 is a subminiature semi-remote cutoff r f pentode capable of operation in the u h f region. This type is characterized by long life and stable performance and is suitable for service where severe conditions of mechanical shock, vibration and high temperature are encountered.





SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

December 30, 1954

from JETEC release #1401, Jan. 17, 1955

CHARACTERISTICS

Plate Voltage	100	Volts
Grid No. 2 Voltage	100	Volts
Cathode Bias Resistor	150	Ohms
Plate Current	7.5	Ma
Grid No. 2 Current	2.5	Ma
Transconductance	3550	μmhos
Plate Resistance (approx.)	0.4	Megohm
Grid No. 1 Voltage for Gm = 25 μmhos	-25	Volts
Noise Output Voltage (Maximum) [6]	100	Mv
Life Expectancy		
30° C Ambient Temperature	5000	Hours
250° C Ambient Temperature	1000	Hours

NOTES:

1. Limitations beyond which normal tube performance and tube life may be impaired.
2. Forces in any direction as applied by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices, or equivalent.
3. Vibrational forces in any direction at 60 cycles per second for a period exceeding 100 hours.
4. With external shield of 0.405 inch diameter connected to cathode.
5. Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts.
6. Across plate resistor of 10,000 ohms with applied vibrational acceleration of 15 g at 40 cycles per second.

SYLVANIA ELECTRIC

RTMA Registration Data

from RTMA release #946,
Feb. 20, 1951

TYPE 6052

DOUBLE DIODE

The Type 6052 is a subminiature double diode capable of operation in the uhf region. This type is characterized by long life and stable performance. It is designed for service where severe conditions of mechanical shock and vibration are encountered.

MECHANICAL DATA

GENERAL

Style	subminiature
Cathode	coated, unipotential
Bulb	T-3
Base	K8-1,(1) Subminiature Button--Flexible Leads
Outline	3-1
Maximum Bulb Diameter	0.400 inch
Maximum Overall Bulb Length	1.375 inches
Minimum Lead Length	1.500 inches
Mounting Position	any
Basing	8DJ-0-4

Lead Connections:

Lead 1 .. #2 diode plate	Lead 5 .. #1 diode plate
Lead 2 .. #2 diode cathode	Lead 6 .. heater
Lead 3 .. heater	Lead 7 .. #1 diode cathode
Lead 4 .. internal shield	Lead 8 .. no connection

RATINGS(2)

Maximum Impact Acceleration(3)	450	g
Maximum Uniform Acceleration(4)	1,000	g
Maximum Vibrational Acceleration for Extended Periods(5)	2.5	g

ELECTRICAL DATA

GENERAL

Direct Interelectrode Capacitances:(6)		
Plate to Plate, maximum	0.026	μμf
Input (each section): Plate to Cathode, Heater, Internal Shield and External Shield	3.4	μμf
Cathode to Heater, Plate, Internal Shield, and External Shield (each section)	4.0	μμf
Resonant Frequency, minimum	900	megacycles
Heater Voltage (ac or dc)	6.3	volts
Heater Current	300	milliamps

RATINGS(2) -- *Absolute System*

Heater Voltage (ac or dc)(7)	6.3 (±5%)	volts
Maximum Inverse Peak Plate Voltage	460	volts
Maximum Peak Plate Current (each plate)	60	milliamps
Maximum Output Current (dc) (each plate)	10	milliamps
Maximum Heater-Cathode Voltage	±360	volts

(See Page 2 for notes.)

TYPE 6052

CHARACTERISTICS

Tube Voltage Drop for 50 milliamps Plate Current, each plate (dc)	10	volts
Life Expectancy, at 160 °C Maximum Bulb Temperature	5,000	hours

TYPICAL OPERATION --*Full-Wave Rectifier*

Heater Voltage (ac or dc)	6.3	volts
Plate Voltage, each plate (ac,rms)	150	volts
Effective Plate Supply Impedance, minimum	300	ohms
Output Current (dc)	18	milliamps

(1) With 1.500 inches Minimum Lead Length as specified above.

(2) Limitations beyond which normal tube performance and tube life may be impaired.

(3) Forces in any direction as applied by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices, or equivalent.

(4) Forces in any direction applied gradually, as in centrifuge.

(5) Vibrational forces in any direction at 60 cycles per second for a period exceeding 100 hours.

(6) With external shield of 0.405 inch diameter.

(7) Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts.

SYLVANIA ELECTRIC

RTMA Registration Data

from RTMA release #946,
Feb. 20, 1951

TYPE 6053

DOUBLE DIODE

The Type 6053 is a subminiature double diode capable of operation in the uhf region. This type is characterized by long life and stable performance. It is designed for service where severe conditions of mechanical shock and vibration are encountered.

MECHANICAL DATA

GENERAL

Style	subminiature
Cathode	coated, unipotential
Bulb	T-3
Base	K8-1,(1) Subminiature Button--Flexible Leads
Outline	3-1
Maximum Bulb Diameter	0.400 inch
Maximum Overall Bulb Length	1.375 inches
Minimum Lead Length	1.500 inches
Mounting Position	any
Basing	8DJ-O-4

Lead Connections:

Lead 1 .. #2 diode plate	Lead 5 .. #1 diode plate
Lead 2 .. #2 diode cathode	Lead 6 .. heater
Lead 3 .. heater	Lead 7 .. #1 diode cathode
Lead 4 .. internal shield	Lead 8 .. no connection

RATINGS(2)

Maximum Impact Acceleration(3)	450	g
Maximum Uniform Acceleration(4)	1,000	g
Maximum Vibrational Acceleration for Extended Periods(5)	2.5	g

ELECTRICAL DATA

GENERAL

Direct Interelectrode Capacitances:(6)		
Plate to Plate, maximum	0.026	μμf
Input (each section): Plate to Cathode, Heater, Internal Shield and External Shield	3.4	μμf
Cathode to Heater, Plate, Internal Shield, and External Shield (each section)	4.6	μμf
Resonant Frequency, minimum	900	megacycles
Heater Voltage (ac or dc)	26.5	volts
Heater Current	75	milliamps

RATINGS(2) -- *Absolute System*

Heater Voltage (ac or dc)(7)	26.5 (±5%)	volts
Maximum Inverse Peak Plate Voltage	460	volts
Maximum Peak Plate Current (each plate)	60	milliamps
Maximum Output Current (dc) (each plate)	10	milliamps
Maximum Heater-Cathode Voltage	±360	volts

(See Page 2 for notes.)

TYPE 6053

CHARACTERISTICS

Tube Voltage Drop for 50 milliamps Plate Current, each plate (dc)	10	volts
Life Expectancy, at 160 °C Maximum Bulb Temperature	5,000	hours

TYPICAL OPERATION -- *Full-Wave Rectifier*

Heater Voltage (ac or dc)	26.5	volts
Plate Voltage, each plate (ac, rms)	150	volts
Effective Plate Supply Impedance	300	ohms
Output Current (dc)	18	milliamps

(1) With 1.500 inches Minimum Lead Length as specified above.

(2) Limitations beyond which normal tube performance and tube life may be impaired.

(3) Forces in any direction as applied by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices, or equivalent.

(4) Forces in any direction applied gradually, as in centrifuge.

(5) Vibrational forces in any direction at 60 cycles per second for a period exceeding 100 hours.

(6) With external shield of 0.405 inch diameter.

(7) Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 26.5 volts.

SYLVANIA ELECTRIC

RTMA Registration Data

from RTMA release #946,
Feb. 20, 1951

TYPE 6055

TRIODE

The Type 6055 is a subminiature medium-mu triode capable of operation in the uhf region. This type is characterized by long life and stable performance. It is designed for service where severe conditions of mechanical shock and vibration are encountered.

MECHANICAL DATA

GENERAL

Style	subminiature
Cathode	coated, unipotential
Bulb	T-3
Base	K8-1,(1) Subminiature Button--Flexible Leads
Outline	3-1
Maximum Bulb Diameter	0.400 inch
Maximum Overall Bulb Length	1.375 inches
Maximum Lead Length	1.500 inches
Mounting Position	any
Basing	8DK

Lead Connections:

Lead 1 .. grid #1	Lead 5 .. cathode
Lead 2 .. no connection	Lead 6 .. heater
Lead 3 .. heater	Lead 7 .. no connection
Lead 4 .. no connection	Lead 8 .. plate

RATINGS(2)

Maximum Impact Acceleration(3)	450	g
Maximum Uniform Acceleration(4)	1,000	g
Maximum Vibrational Acceleration for Extended Periods(5)	2.5	g

ELECTRICAL DATA

GENERAL

Direct Interelectrode Capacitances:		
Grid to Plate	1.80	μμf
Input	2.20	μμf
Output	0.80	μμf
Heater Voltage (ac or dc)	26.5	volts
Heater Current	45	milliamps

RATINGS(2) -- *Absolute System*

Heater Voltage (ac or dc)(6)	26.5	(±5%)	volts
Maximum Plate Voltage (dc)	55		volts
Maximum Plate Current	22		milliamps
Maximum Grid Current	8.5		milliamps
Maximum Heater-Cathode Voltage	±200		volts

(See Page 2 for notes.)

TYPE 6055

CHARACTERISTICS

Conditions:		
Heater Voltage (ac or dc)	26.5	volts
Plate Voltage (dc)	26.5	volts
Grid Resistor	2.2	megohms
Plate Current	3.0	milliamps
Transconductance	5,000	micromhos
Amplification Factor	19	
Grid Voltage for 10 μamps Plate Current	-3.5	volts
Noise Output Voltage, maximum(7)	100	millivolts
Life Expectancy, at 160 °C Maximum Bulb Temperature	5,000	hours

(1) With 1.500 inches Minimum Lead Length as specified above.

(2) Limitations beyond which normal tube performance and tube life may be impaired.

(3) Forces in any direction as applied by the Navy Type High Impact (Flyweight) Shock Machine for Electric Devices, or equivalent.

(4) Forces in any direction applied gradually, as in centrifuge.

(5) Vibrational forces in any direction at 60 cycles per second for a period exceeding 100 hours.

(6) Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 26.5 volts.

(7) Across plate resistor of 10,000 ohms, with applied vibrational acceleration of 15 g at 40 cycles per second.

SYLVANIA ELECTRIC

RTMA Registration Data

from RTMA release #946,
Feb. 20, 1951

TYPE 6056

PENTODE

The Type 6056 is a subminiature remote-cut off rf pentode capable of operation in the uhf region. This type is characterized by long life and stable performance. It is designed for service where severe conditions of mechanical shock and vibration are encountered.

MECHANICAL DATA

GENERAL

Style	subminiature
Cathode	coated, unipotential
Bulb	T-3
Base	K8-1,(1) Subminiature Button--Flexible Leads
Outline	3-1
Maximum Bulb Diameter	0.400 inch
Maximum Overall Bulb Length	1.375 inches
Minimum Lead Length	1.500 inches
Mounting Position	any
Basing	8DL

Lead Connections:

Lead 1 .. grid #1	Lead 5 .. plate
Lead 2 .. cathode and grid #3	Lead 6 .. heater
Lead 3 .. heater	Lead 7 .. grid #2
Lead 4 .. cathode and grid #3	Lead 8 .. cathode and grid #3

RATINGS (2)

Maximum Impact Acceleration(3)	450	g
Maximum Uniform Acceleration(4)	1,000	g
Maximum Vibrational Acceleration for Extended Periods(5)	2.5	g

ELECTRICAL DATA

GENERAL

Direct Interelectrode Capacitances:(6)		
Grid #1 to plate, maximum	0.015	μμf
Input	4.40	μμf
Output	3.4	μμf
Heater Voltage (ac or dc)	26.5	volts
Heater Current	45	milliamps

RATINGS(2) -- *Absolute System*

Heater Voltage (ac or dc)(7)	26.5 (±5%)	volts
Maximum Plate Voltage (dc)	55	volts
Maximum Grid #2 Voltage (dc)	55	volts
Maximum Cathode Current (dc)	10	milliamps
Maximum Heater-Cathode Voltage	±200	volts

(See Page 2 for notes.)

TYPE 6056

CHARACTERISTICS

Conditions:		
Heater Voltage (ac or dc)	26.5	volts
Plate Voltage (dc)	26.5	volts
Grid #2 Voltage (dc)	26.5	volts
Grid #1 Resistor	2.2	megohms
Plate Current	2.7	milliamps
Grid #2 Current	1.1	milliamps
Transconductance	3,000	micromhos
Plate Resistance	125,000	ohms
Grid #1 Voltage for 10 μmhos Transconductance	-4.5	volts
Noise Output Voltage, maximum(8)	100	millivolts
Life Expectancy, at 160 °C Maximum Bulb Temperature	5,000	hours

(1) With 1.500 inches Minimum Lead Length as specified above.

(2) Limitations beyond which normal tube performance and tube life may be impaired.

(3) Forces in any direction as applied by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices, or equivalent.

(4) Forces in any direction applied gradually, as in centrifuge.

(5) Vibrational forces in any direction at 60 cycles per second for a period exceeding 100 hours.

(6) With external shield of 0.405 inch diameter connected to cathode.

(7) Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 26.5 volts.

(8) Across plate resistor of 10,000 ohms, with applied vibrational acceleration of 15 g at 40 cycles per second.

SYLVANIA

TYPE 6081

JETEC Registration Data

ATR GAS SWITCHING TUBE

The Type 6081 is an ATR tube designed for operation at approximately 5,600 megacycles.

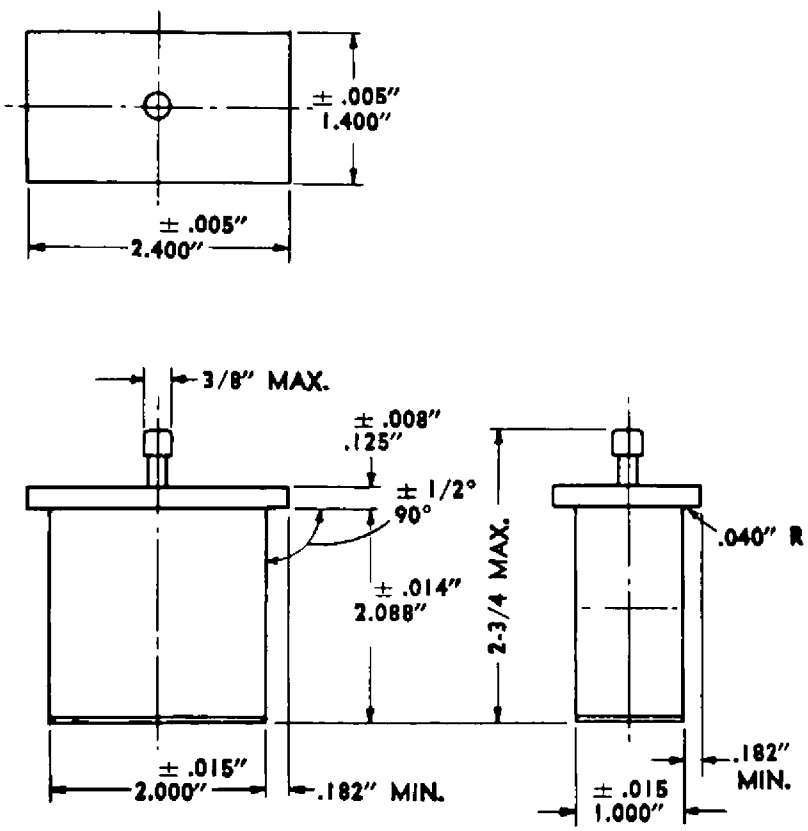
ELECTRICAL DATA

Center Frequency	5640 mc
Transmitter Peak Power(min.)	10 kw
Equivalent Conductance(max.)	0.1
Tuning Susceptance	±0.06
Arc Loss(max.)	0.8 db
Firing Time(max.)	10 sec

MECHANICAL DATA

Mounting Position	any
Ambient Temperature Range	-40 to +100°C

OUTLINE



from JETEC release #1318, May 21, 1954

SYLVANIA

engineering data service 6110

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DJ
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	60000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		150	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Plate to Plate	0.026	0.15 μμf Max.
Input (Each Section)[5]	2.2	1.5 μμf
Cathode to All Other Electrodes (Each Section)[6]	2.6	2.6 μμf

RATINGS[1 & 7] (Absolute Maximum)

Plate Supply Voltage (Each Plate)	156 Vac
Peak Inverse Plate Voltage[8]	460 v
Steady State Peak Plate Current (Each Plate)	26.5 ma
Transient Peak Plate Current (Each Plate)	160 ma
Output Current (Each Plate)	4.4 mAdc
Heater-Cathode Voltage[8]	
Heater Positive with Respect to Cathode	360 v
Heater Negative with Respect to Cathode	360 v

CHARACTERISTICS

Tube Voltage Drop for Ib = 15 mAdc (Each Plate)	10 Vdc

TYPICAL OPERATION

Full-Wave Rectifier — Capacitor Input to Filter	
Plate Voltage (Each Plate)	150 Vac
Filter Input Capacitance	8 μf
Effective Plate Supply Impedance	1500 Ohms
Output Current	8 mAdc

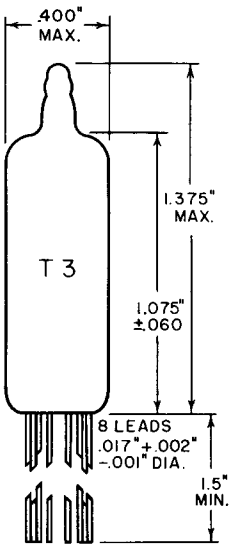
NOTES:

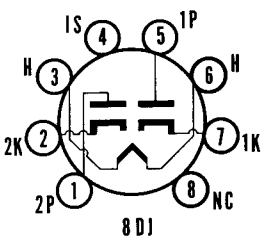
1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to heater.*
5. *Plate to cathode, heater, internal shield and external shield.*
6. *Cathode to heater, plate, internal shield and external shield.*
7. *Values shown are as registered with RETMA.*
8. *The maximum voltage appearing between any pair of leads shall be no greater than the maximum peak inverse plate voltage.*

QUICK REFERENCE DATA

The 6110 is a Premium Subminiature heater-cathode type double diode having separate cathode connections for each section. It is intended primarily for detector service at uhf as well as low frequencies.

The 6110 is designed to provide dependable service under conditions of severe shock, vibration, high temperature and high altitude, and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Load Resistance	20000 Ohms
Plate Supply Voltage Per Plate	165 Vac	Load Capacitance	8 μf

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7 4.10.8	(Method A) Heater Current: ALD = 12	—	—	144	150	156	—	mA
4.10.8	Heater Current:	0.65	140	—	—	—	160	mA
4.10.15	Heater-Cathode Leakage: Note 4	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	20	μAdc
	Ehk = -100 Vdc	—	—	—	—	—	20	μAdc
4.10.13	Operation: Note 5 Io	0.65	7.8	—	—	—	—	mAdc
4.7.5	Continuity and Shorts (Inoperatives):	0.40	—	—	—	—	—	
4.9.1	Mechanical:							
	Envelope (8-1)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8	Insulation of Electrodes: Note 4							
	p-all	2.5	100	—	—	—	—	Meg
4.10.1.1	Emission: Note 4 Is							
	Eb = 10 Vdc	2.5	7.5	—	—	—	—	mAdc
4.10.4.1	Plate Current: Note 4							
	Ebb = O V; Rp = 40,000 Ohms	2.5	2.0	—	—	—	22	μAdc
4.10.4.1	Plate Current Difference Between Sections:	2.5	—	—	—	—	5.0	μAdc
4.10.14	Capacitance: 0.405 In. Dia. Shield	6.5	—	—	—	—	—	
	C1p to 2p	—	—	—	—	—	0.026	μμf
	C1p to h+1k+sd	—	1.8	—	—	—	2.6	μμf
	C2p to h+2k+sd	—	1.8	—	—	—	2.6	μμf
	C1k to h+1p+sd	—	2.1	—	—	—	3.1	μμf
	C2k to h+2p+sd	—	2.1	—	—	—	3.1	μμf
4.9.12.1	Low Pressure Voltage Breakdown:							
	Pressure = 55 ±5 mm Hg.; Voltage = 330 Vac	6.5	—	—	—	—	—	
4.9.20.3	Vibration:							
	No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock:							
	Hammer Angle = 30°; Ehk = +100 Vdc	20	—	—	—	—	—	
4.9.20.6	Fatigue:							
	G = 2.5; Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
- - - -	Post Shock and Fatigue Test End Points:							
	Heater-Cathode Leakage							
	Ehk = +100 Vdc	—	—	—	—	—	40	μAdc
	Ehk = -100 Vdc	—	—	—	—	—	40	μAdc
	Operation Io	—	7.0	—	—	—	—	mAdc
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2							
4.11.3.1	Stability Life Test: (1 Hour) Note 6						
	TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points:						
	Change in Operation of Individual Tubes Δ Io$_t$	—	—	—	—	10.0	%
4.11.3.1							
4.11.3.1.1	Survival Rate Life Test: (100 Hours)						
	Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points:						
	Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	
	Operation Io	1.0	—	—	7	—	mAdc
4.11.7	Heater Cycling Life Test:						
	Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; E1b = E2b = O V	2.5	—	—	—	—	
4.11.5							
4.11.3.1	Intermittent Life Test: Note 3						
	Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	
4.11.3.1							
4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Heater Current	—	2	5	138	164	mA
	Operation Io	—	1	3	6.8	—	mAdc
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	40	μAdc
	Ehk = -100 Vdc	—	—	—	—	40	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	p-all	—	—	—	25	—	Meg
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature lead fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater cycling life test
4.11.5	Intermittent life test

3: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the bulb. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

4: Test each section separately.

5: In a full-wave circuit, adjust Zp/p so that a bogey tube gives Io = 8.8 mAdc. A bogey tube has a tube drop of Etd = 10 Vdc at Is = 15 mAdc per plate. Ehk = Eo +117 Vac.

6: In a full-wave life test circuit, the values specified for RL and CL shall be considered as approximate and shall be adjusted initially to give not less than Io = 8.8 mAdc and ib = 24 ma. Ehk = Eo +117 Vac.

APPLICATION DATA

The 6110 is a Premium Subminiature heater-cathode type double diode manufactured and inspected to meet the applicable MIL-E-1 specification for reliability. The 6110 is intended for operation under conditions of extreme shock, vibration, high altitude and high temperature.

In application, this type is intended primarily for detector service and may be used efficiently at uhf as well as low frequencies. Separate cathode connections permit independent operation of each section. Its many uses include ratio and discriminator type detectors in communications equipment, frequency control, moderate power clamping or limiting and gating.

The 6110 exhibits a much lower perveance than the double diode Type 5896. The 6110, however, offers the advantage of lower heater power consumption, i.e., 150 ma against 300 ma for the 6021, at 6.3 volts.

APPLICATION DATA (Continued)

In critical detector applications, a reduction in hum output and contact potential voltage may be realized by lowering the operating heater voltage. Such a reduction will, however, result in a plate characteristic curve which departs from that obtained with rated heater voltage, Figure 1. With practical values of reduced heater voltage, hum output may be lowered by as much as 60% and contact potential by 20 to 30%. Operation under these conditions is satisfactory, providing the current requirements are consistent with values normally encountered in low level detection. An alternative method of lowering hum output and contact potential is to bias the heater with respect to the cathode.

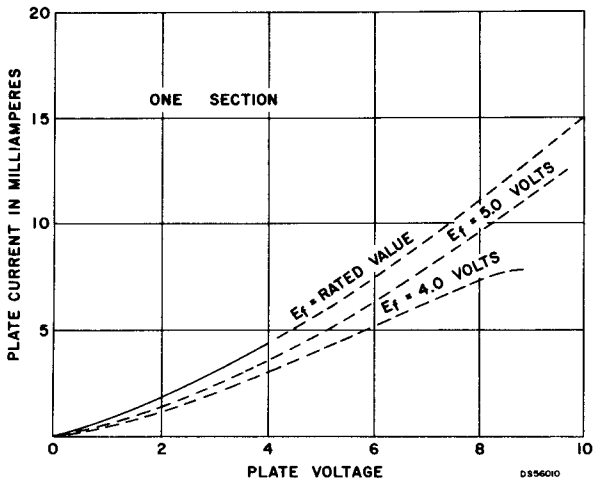


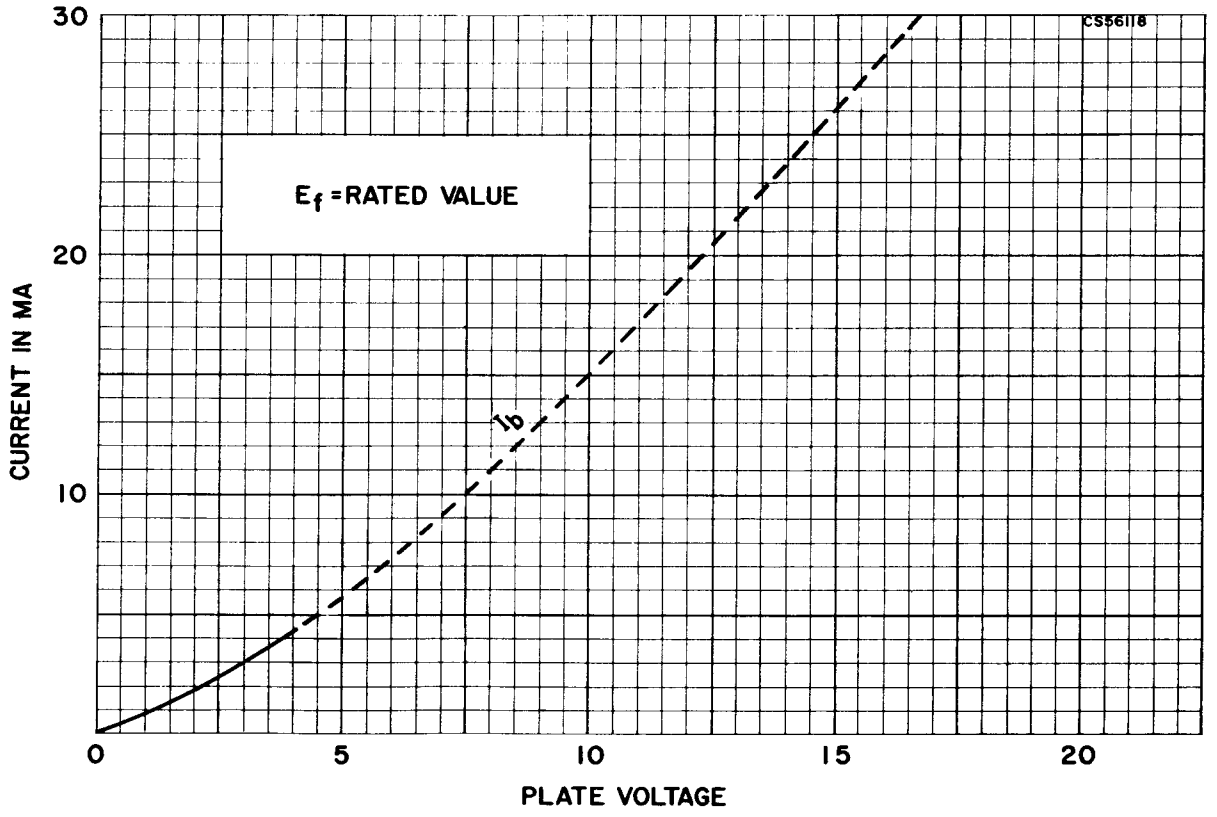
Figure 1—Approximate Plate Characteristics at reduced heater voltage

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

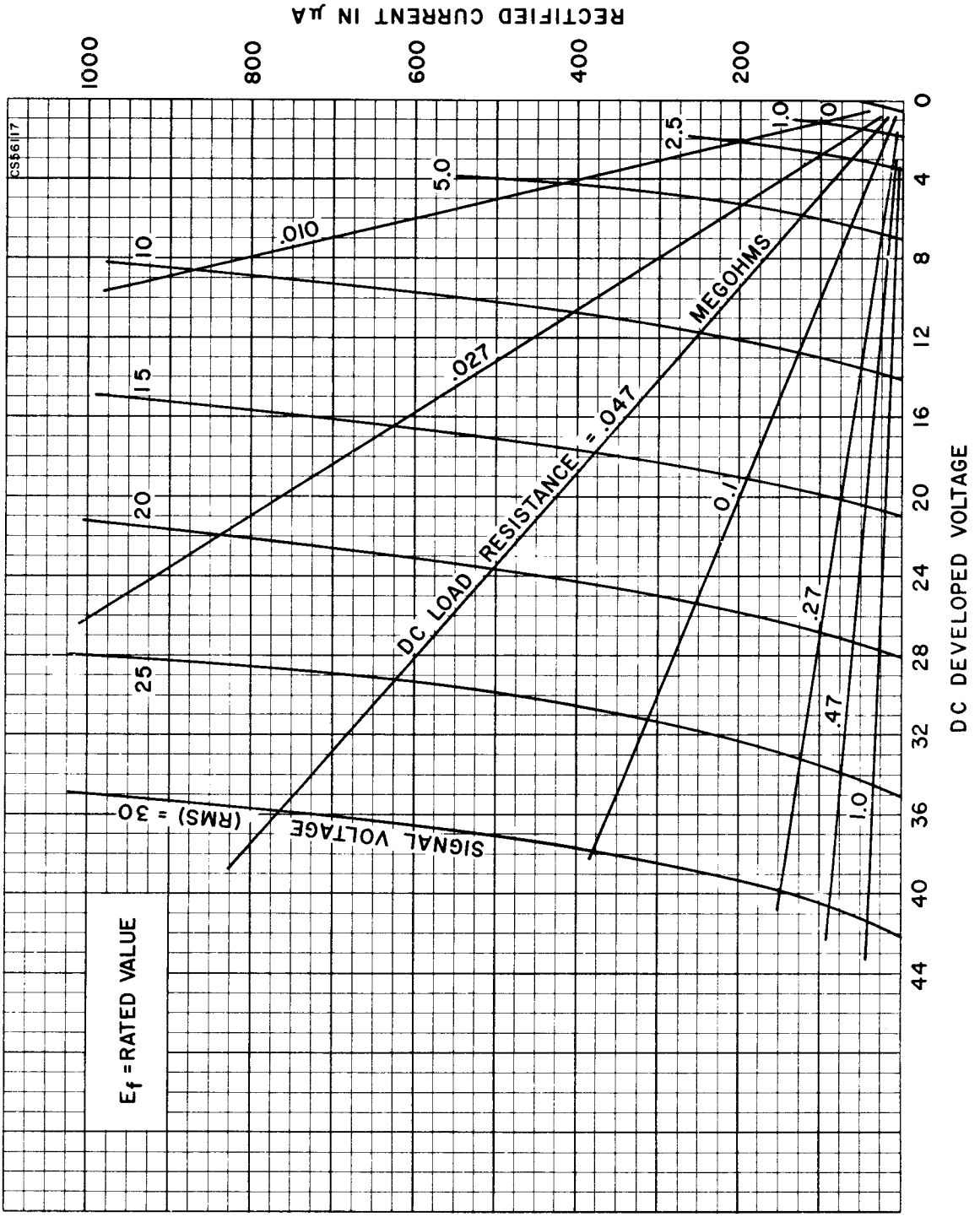
When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

AVERAGE PLATE CHARACTERISTICS



AVERAGE OPERATION CHARACTERISTICS



MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DG
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	60000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		300	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid to Plate (Each Section)	1.0	1.0 μμf
Input (Each Section)	1.9	1.7 μμf
Output		
Section No. 1	1.5	0.23 μμf
Section No. 2	1.5	0.28 μμf
Grid to Grid	0.011	0.014 μμf Max.
Plate to Plate	0.60	0.80 μμf Max.

RATINGS[1 & 5] (Absolute Maximum)

Plate Voltage	165 Vdc
Peak Plate Forward Voltage[6]	330 v
Plate Dissipation (Per Plate)	0.55 W
Plate Current (Each Section)	3.3 mAdc
Grid Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid Circuit Resistance	1.1 Meg

CHARACTERISTICS (Each Section)

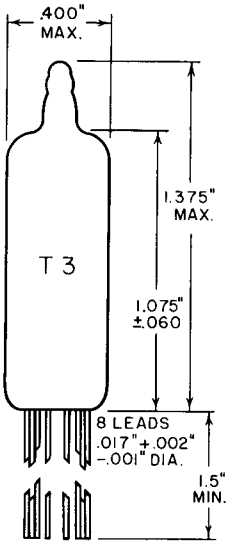
Plate Voltage	100	150 Vdc
Cathode Resistor	1500	820 Ohms
Transconductance	1800	2500 μmhos
Amplification Factor	70	70
Plate Current	0.8	1.75 mAdc
Grid Voltage for Ib ± 50 μAdc Max.	−2.8	−3.7 Vdc

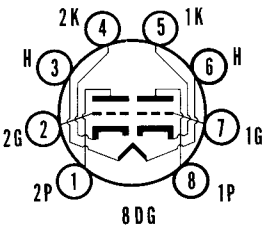
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Per MIL-E-1C par. 6.5 and General Section of this Sylvania Subminiature Tube Manual titled Specifications and Ratings.*

QUICK REFERENCE DATA

The Premium Subminiature Type 6112 is a high mu double triode having separate cathode connections for each section. It is intended primarily for use in low level audio circuits and is designed to provide dependable service under conditions of severe shock, vibration, high temperature and high altitude. The 6112 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
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FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1	0 V
Plate Voltage	100 Vdc	Cathode Resistance Per Cathode MIL-E-1 Par. 3.2.2.1	1500 Ohms
Grid Voltage	0 V		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7 4.10.8	(Method A) Heater Current: ALD = 24	—	—	288	300	312	—	mA
4.10.8	Heater Current:	0.65	280	—	—	—	320	mA
4.10.15	Heater-Cathode Leakage: Note 4	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = -100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid Current: Note 4 Ic Eb = 150 Vdc; Ec = O V; Rk = 820 Ohms; Rg/g = 1.0 Meg	0.65	0	—	—	—	-0.3	μAdc
4.10.4.1	Plate Current (1): Note 4	0.65	0.50	—	—	—	1.10	mAdc
4.10.4.1	Plate Current (2): Note 4 Ec = -2.8 Vdc; Rk = O Ohms	0.65	—	—	—	—	50	μAdc
4.1.1.7 4.10.9	(Method A) Transconductance (1): Note 4 ALD = 350 Sm	—	—	1650	1800	1950	—	μmhos
4.10.9	Transconductance (1): Note 4 Sm	0.65	1500	—	—	—	2100	μmhos
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes: Note 4	2.5	—	—	—	—	—	
	g-all	—	100	—	—	—	—	Meg
	p-all	—	100	—	—	—	—	Meg
4.10.9	Transconductance (2): Note 4 Δ Sm Ef = 5.7 V Δ Ef	2.5	—	—	—	—	15	%
4.10.6.2	Grid Emission: Notes 4 and 5 Ic Ef = 7.5 V; Ec = -4.0 Vdc; Eb = 150 Vdc; Rk = 0 Ohms; Rg/g = 1.0 1.0 Meg	2.5	0	—	—	—	-0.5	μAdc
4.10.3.2	AF Noise: Note 6 Esig = 45 mVac; Rg = 0.5 Meg; Rp = 0.2 Meg; Rk = 750 Ohms; Ck = 1000 μf	2.5	—	—	—	—	17	VU
4.10.11.1	Amplification Factor: Note 4	6.5	60	—	70	—	80	
4.10.11.2	AC Amplification: Note 4 Ebb = 100 Vdc; Ecc = 0 Vdc; Esig = 0.2 Vac; Rk = 0 Ohms	6.5	8.0	—	—	—	—	Vac
4.10.14	Capacitance:	6.5	—	—	—	—	—	
	No Shield; Note 4 Cgp	—	0.8	—	—	—	1.20	μμf
	No Shield; Note 4 Cin	—	1.30	—	—	—	2.10	μμf
	No Shield; Section 1 Cout	—	0.16	—	—	—	0.30	μμf
	No Shield; Section 2 Cout	—	0.21	—	—	—	0.35	μμf
	No Shield Cgg	—	—	—	—	—	0.014	μμf
	No Shield Cpp	—	—	—	—	—	0.80	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 20 ±5 mm Hg.; Voltage = 300 Vac	6.5	—	—	—	—	—	

The information presented on this data sheet is furnished without assuming any obligation.

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 2 (Continued)								
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
4.9.19.1	Vibration (2): Note 4 Rp = 10,000 Ohms; Ck = 1000 μf; F = 40 cps; G = 15	2.5	—	—	—	—	25	mVac
4.9.19.1	White Noise: (Each Section); Note 7; Rp = 10,000 Ohms; Ck = 1000 μf;	2.5	—	—	—	—	175	mv pk-pk
	Peak Acceleration = 15 G	2.5	—	—	—	—	25	mVac
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc; Rg = 0.1 Meg	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
- - - - -	Post Shock and Fatigue Test End Points: Vibration (2)	—	—	—	—	—	100	mVac
	Heater-Cathode Leakage Ehk = +100 Vdc	—	—	—	—	—	20	μAdc
	Ehk = -100 Vdc	—	—	—	—	—	20	μAdc
	Change in Transconductance (1) of Individual Tubes Δ_t Sm	—	—	—	—	—	20	%
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic 1st Sample	Combined Samples	Limits Min.	Max.	Units
Acceptance Life Tests, Note 2							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec = Eb = O V	2.5	—	—	—	—	
4.11.3.1	Stability Life Test: (1 Hour) Note 4 Eb = 150 Vdc; Ehk = +200 Vdc; Rg/g = 1.0 Meg; Rk/k = 820 Ohms; TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes Δ_t Sm	—	—	—	—	10	%
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	
	Transconductance (1) Sm	1.0	—	—	1200	—	μmhos
4.11.5 4.11.3.1	Intermittent Life Test: Notes 3 and 4 Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic: 1st Sample	Allowable Defectives per Characteristic: Combined Samples	Limits: Min.	Limits: Max.	Units
Acceptance Life Tests, Note 2 (Continued)							
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Grid Current	—	1	3	0	-0.9	μAdc
	Heater Current	—	2	5	276	328	mA
	Change in Transconductance (1) of						
	Individual Tubes $\Delta \frac{Sm}{t}$	—	1	3	—	25	%
	Transconductance (2) $\Delta \frac{Sm}{Ef}$	—	2	5	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	10	μAdc
	Ehk = -100 Vdc	—	—	—	—	10	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	g-all	—	—	—	50	—	Meg
	p-all	—	—	—	50	—	Meg
	Transconductance (1) Average Change, Avg $\Delta \frac{Sm}{t}$	—	—	—	—	15	%
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature lead fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater cycling life test
4.11.5	Intermittent life test

3: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

4: Test each section separately.

5: Prior to this test tubes shall be preheated five (5) minutes with both sections operating separately at conditions indicated below. Test within three (3) seconds after preheating .Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission Test.

Ef	Ec1	Eb	Rk	Rg
V	Vdc	Vdc	Ohms	Meg
7.5	0	150	820	1.0

6: Tie 1k to 2k; 1g to 2g; and 1p to 2p.

7: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "White Noise" spectrum which is free from discontinuities from 100 cps to 5000 cps. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 G's rms acceleration. With this the case, the rms value of acceleration for any bandwidth within the specified spectrum is equal to

$$G\ rms = 2.3\ G \sqrt{3.32 \log_{10} (f2/f1)}$$

f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (0.25 megohm or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 40 db at 13,000 cps. For reading the peak to peak value of output voltage the filter output shall be fed directly to the input of a Ballantine Model 305 peak to peak electronic voltmeter or equal, while the rms value shall be measured with a Hewlett-Packard Model 400C or equal.

APPLICATION DATA

The Sylvania Premium Subminiature Type 6112 is a high mu, double triode of subminiature construction intended primarily for application as a low level, resistance coupled amplifier. In such circuits the high mu (70) of the 6112 can easily yield a voltage gain of 50 for each section. Resistance coupled amplifier data is shown in the accompanying tables for both cathode bias and zero bias operation. In zero bias circuits a grid circuit resistance of from 5 to 10 megohms should be employed to reduce contact potential loading and provide better plate current balance between sections and/or individual tubes.

Electrically, the 6112 is essentially equivalent to two Type 5719's in one envelope. The 6112 is particularly useful in applications where the power requirements permit the use of two tubes in one envelope.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tubes to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A fur-

APPLICATION DATA (Continued)

ther discussion of the white noise vibrational test is included in the frontal section of this manual.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

The 6112 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation and is intended for service under conditions of severe vibration, shock, high temperature and high altitude.

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

RESISTANCE COUPLED AMPLIFIER DATA
SELF-BIAS OPERATION

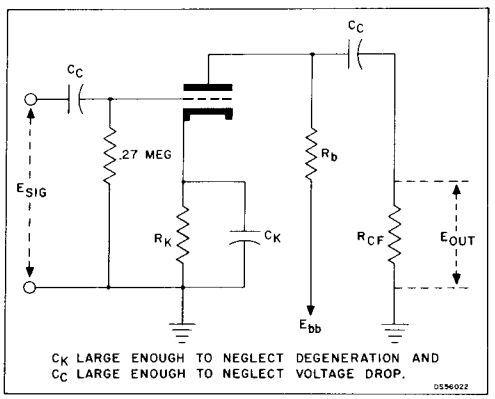
	Ebb = 100 Volts						Ebb = 200 Volts					
Rb (megohms)	0.10		0.27		0.47		0.10		0.27		0.47	
Rcf (megohms)	0.27	0.47	0.47	1.0	0.47	1.0	0.27	0.47	0.47	1.0	0.47	1.0
Rk (ohms)	2200	2200	4700	4700	6800	8200	1200	1500	3300	3900	4700	5600
Ib (ma)	.375	.37	.175	.175	.11	.105	.92	.845	.385	.365	.25	.235
Ec (volts)	.825	.813	.822	.822	.75	.862	1.10	1.27	1.27	1.42	1.17	1.31
Eb (volts)	61.7	62.2	52	52	47.5	49.8	106.9	114.2	94.7	100.1	81.8	88.2
Esig (volts, rms)	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
Eout (volts, rms)	3.9	4.05	4.20	4.5	4.15	4.42	4.80	4.80	4.95	5.1	4.95	5.15
Gain	39.0	40.5	42.0	45.0	41.5	44.2	48.0	48.0	49.5	51.0	49.5	51.5
% Distortion	2.04	2.2	2.15	1.8	2.2	1.95	0.90	1.42	1.43	1.46	1.50	1.58
Esig* (volts, rms)	.24	.26	.26	.28	.25	.32	.55	.58	.56	.66	.52	.67
Eout (volts, rms)	9.2	10.4	10.8	12.4	10.3	13.9	26.1	27.8	27.8	33.0	25.3	33.9
Gain	38.3	40.0	41.5	44.2	41.2	43.4	47.5	48.0	49.6	50.0	48.6	50.5
% Distortion	5.00	4.95	4.90	4.25	5.00	5.00	4.95	5.00	4.95	5.00	5.0	5.0

*Maximum signal for 5% distortion or 1/8 microampere grid current.

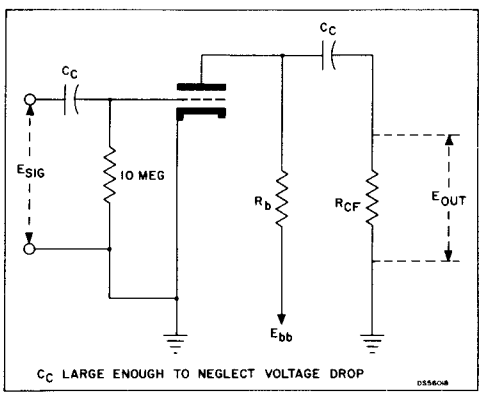
RESISTANCE COUPLED AMPLIFIER DATA
ZERO-BIAS OPERATION

	Ebb = 100 Volts						Ebb = 200 Volts					
Rb (megohms)	0.1		0.27		0.47		0.1		0.27		0.47	
Rcf (megohms)	.27	.47	.47	1.0	.47	1.0	.27	.47	.47	1.0	.47	1.0
Rk (ohms)	—	—	—	—	—	—	—	—	—	—	—	—
Ib (ma)	.41	.41	.19	.19	.12	.12	1.14	1.14	.50	.50	.31	.31
Ec (volts)	—	—	—	—	—	—	—	—	—	—	—	—
Eb (volts)	59	59	48.7	48.7	43.7	43.7	86	86	65	65	54	54
Esig (volts, rms)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Eout (volts, rms)	4.0	4.2	4.4	4.5	4.28	4.6	5.0	5.35	5.5	5.75	5.3	5.65
Gain	40.0	42.0	44.0	45.0	42.8	46.0	50.0	53.5	55.0	57.5	53.0	56.5
% Distortion	2.2	2.0	2.2	1.9	2.35	1.95	1.6	1.6	1.6	1.6	1.7	1.6
Esig* (volts, rms)	.23	.25	.25	.31	.23	.30	.54	.58	.56	.65	.51	.65
Eout (volts, rms)	8.6	9.45	10.4	12.8	9.3	12.9	25.2	28.0	27.8	33.3	24.9	33.0
Gain	37.4	37.8	41.6	41.3	40.4	43.0	46.7	48.2	49.7	51.2	48.8	50.8
% Distortion	5.0	5.0	5.0	4.9	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

*Maximum signal for 5% distortion or 1/8 microampere grid current.

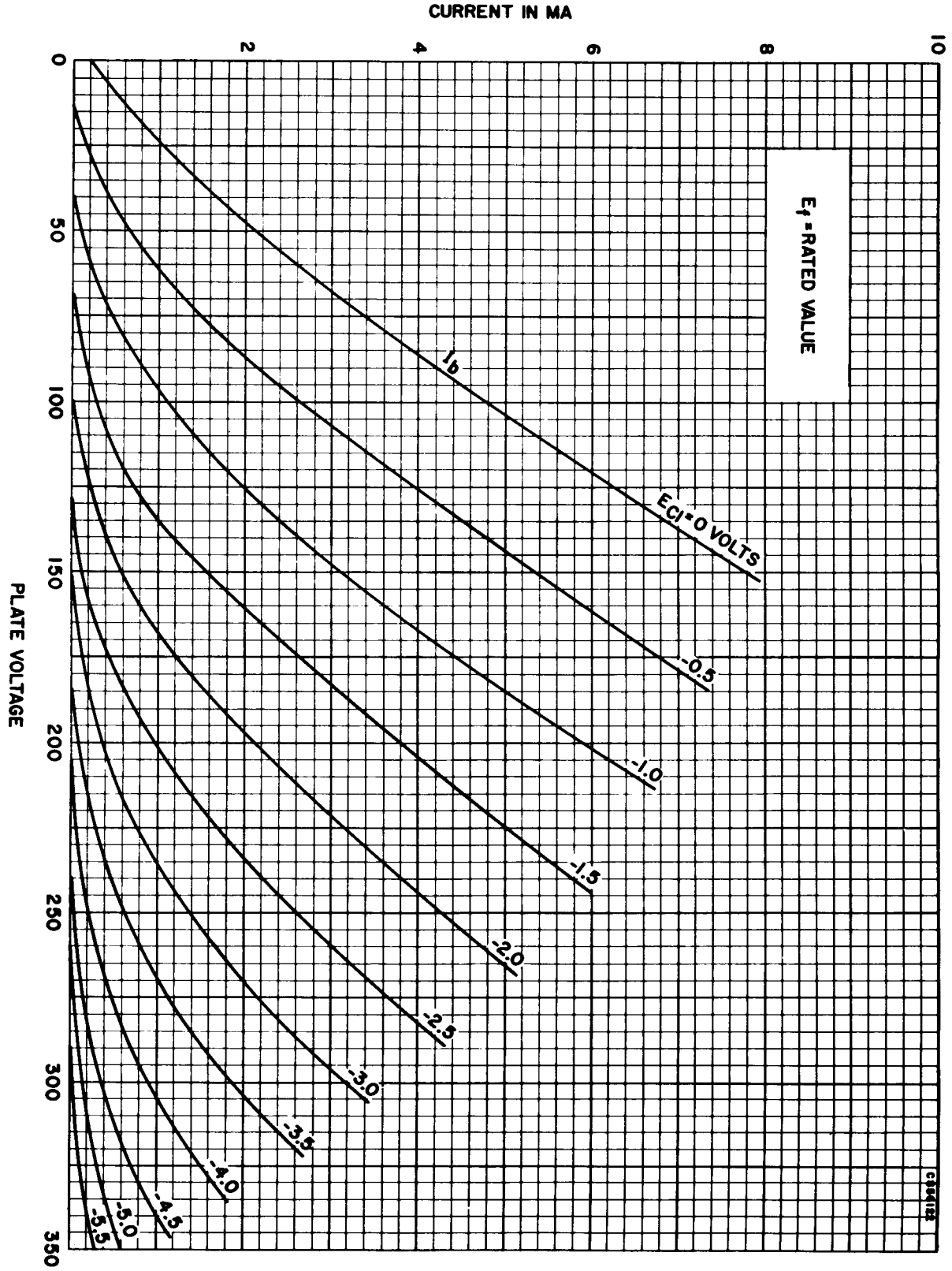


Resistance coupled amplifier circuit (Self-Bias).

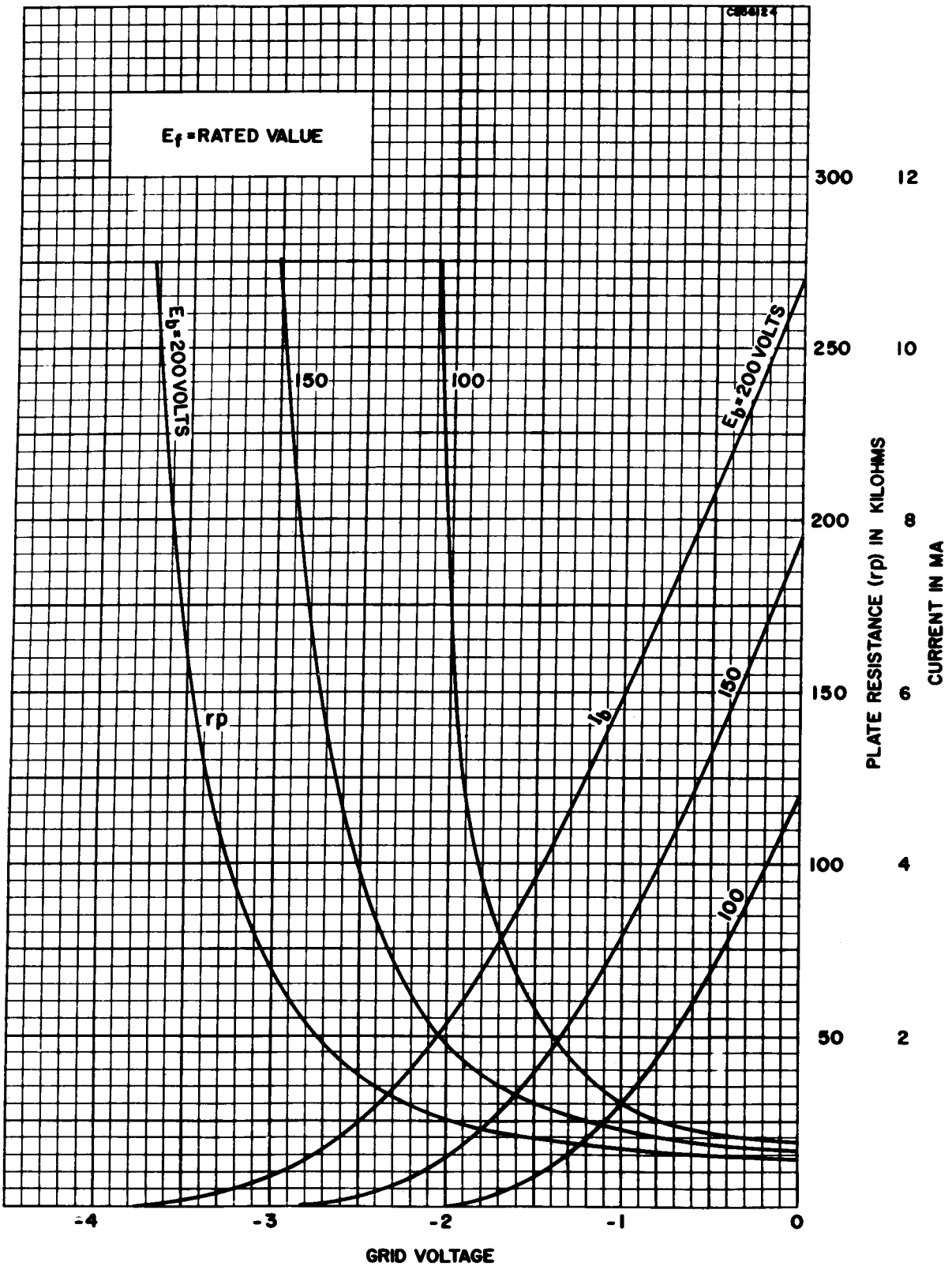


Resistance coupled amplifier circuit (Zero-Bias).

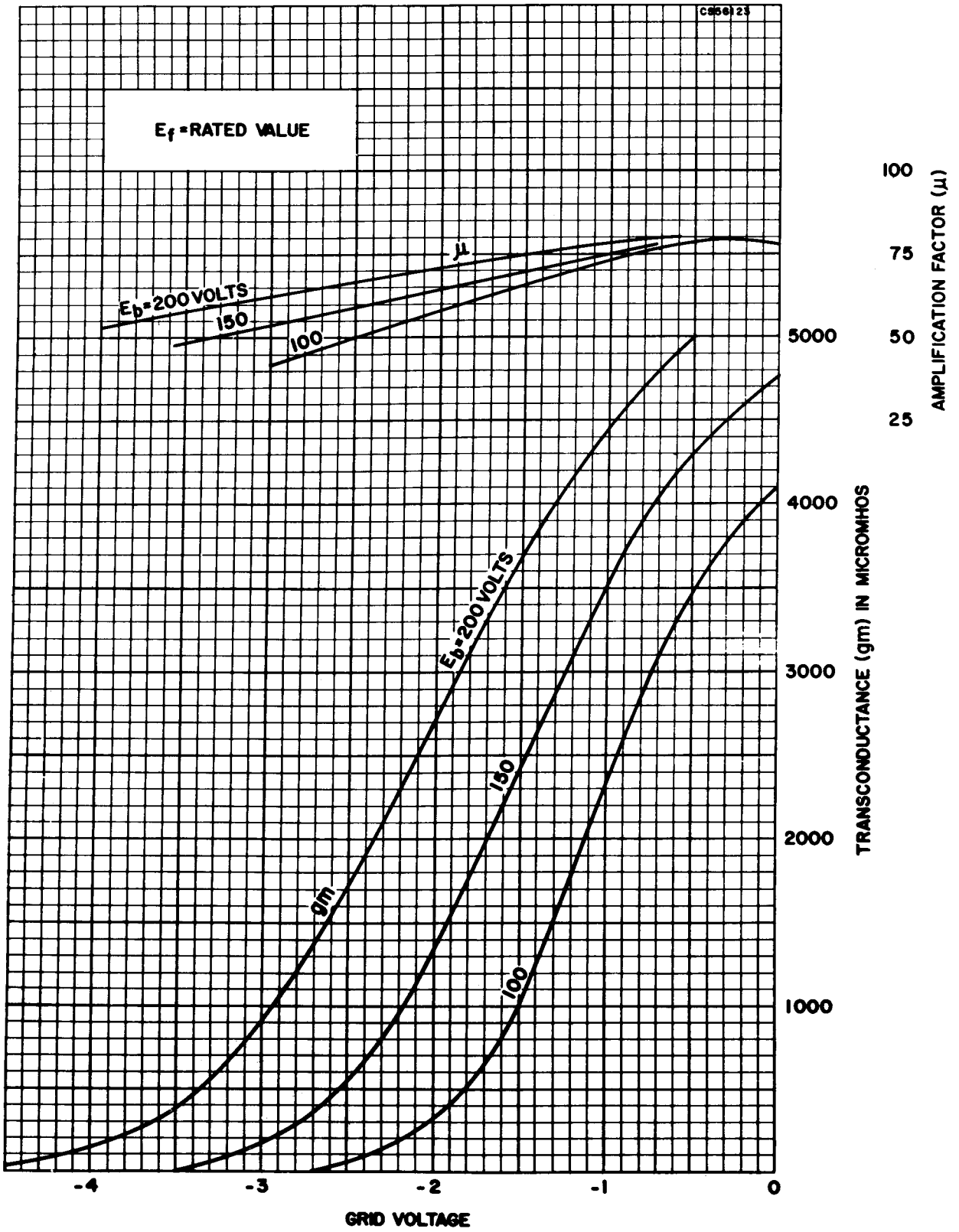
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA

engineering data service

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6145

MECHANICAL DATA

Bulb	T-9
Base	D8-1, Lock-in 8-Pin
Basing	8V
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	600 Ma

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[1]

Control Grid to Plate (Max.)	.060 $\mu\mu$f
Control Grid Input	14 $\mu\mu$f
Output	7.5 $\mu\mu$f

RATINGS (Design Center Values)

Plate Voltage	300 Volts Max.
Plate Dissipation	10 Watts Max
Screen Grid Supply Voltage	300 Volts Max.
Screen Grid Voltage	See JETEC J5-C4
Screen Dissipation	2.5 Watts Max.
Positive Control Grid Voltage	0 Volts Max.
Heater-Cathode Voltage	±200 Volts Max.

CHARACTERISTICS

Conditions

Plate Voltage	60	150 Volts
Suppressor Grid Voltage[2]	0	0 Volts
Screen Grid Voltage	100	100 Volts
Control Grid Voltage	0	0 Volts
Plate Current		34 Ma
Screen Grid Current 12 Ma Max.		8 Ma
Transconductance[2]		9,700 μmhos
Plate Resistance		0.1 Megohm
Control Grid Voltage for I_b=2.0 Ma Max.		-5.3 Volts

TYPICAL OPERATION

Pulse Amplifier

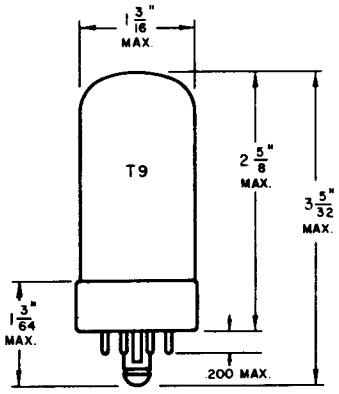
Plate Voltage	150 Volts
Suppressor Grid Voltage[3]	0 Volts
Screen Grid Voltage	250 Volts
Control Grid Voltage	-10 Volts
Peak Positive Pulse Voltage[4]	16 Volts
Peak Plate Current, Minimum	120 Ma

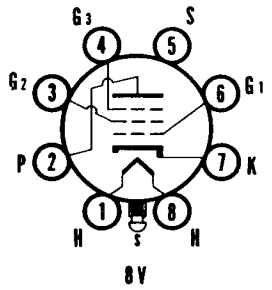
NOTES:

1. *External shield No. 308 connected to cathode.*
2. *At fixed bias of -2 volts.*
3. *Suppressor grid connected to cathode at socket.*
4. *Rectangular pulse, 2 microseconds duration, 60 cps repetition rate.*

QUICK REFERENCE DATA

Lock-in, sharp cutoff pentode amplifier designed for service in electronic computers.





SYLVANIA ELECTRIC PRODUCTS INC.

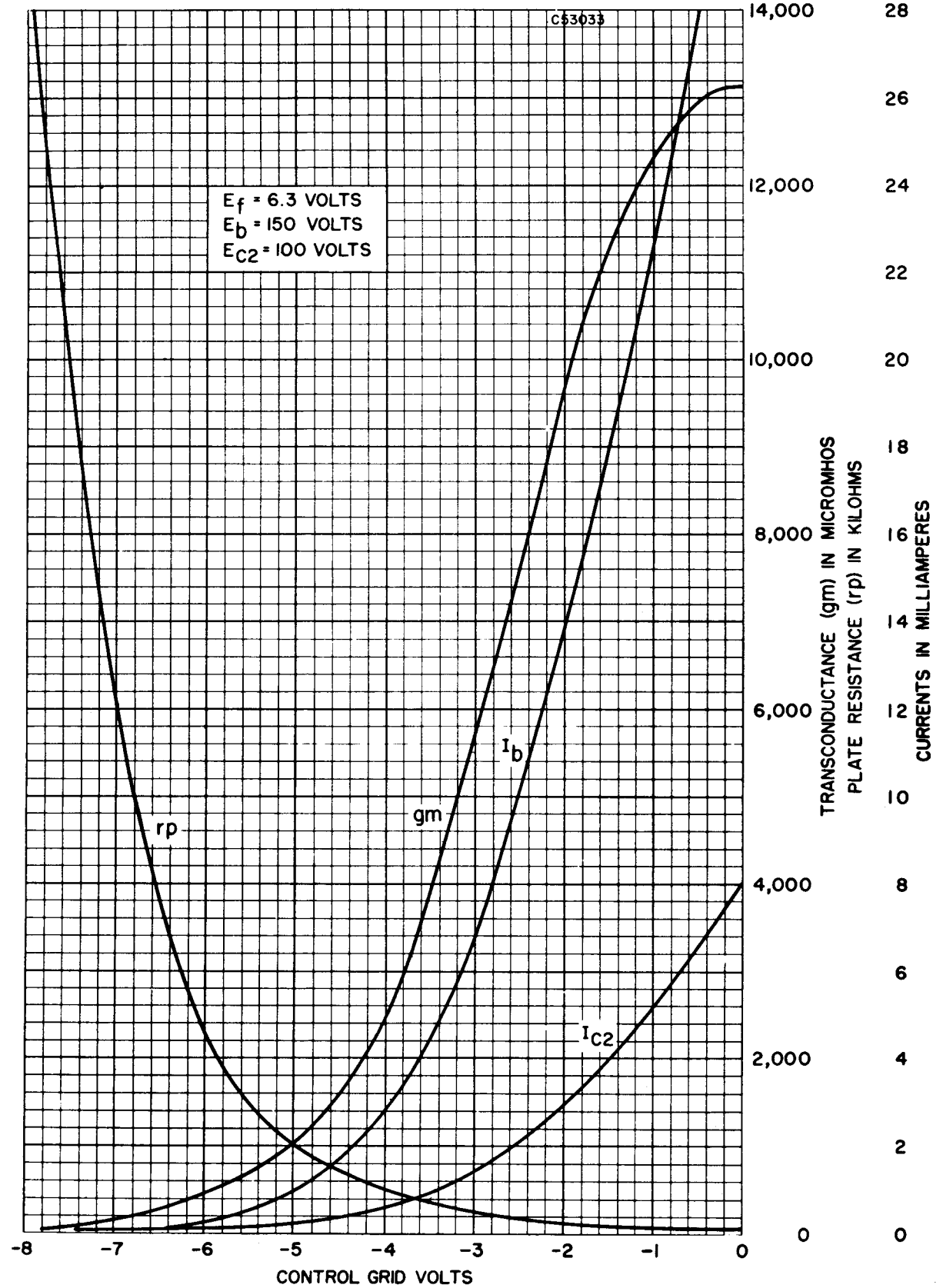
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JULY 1953

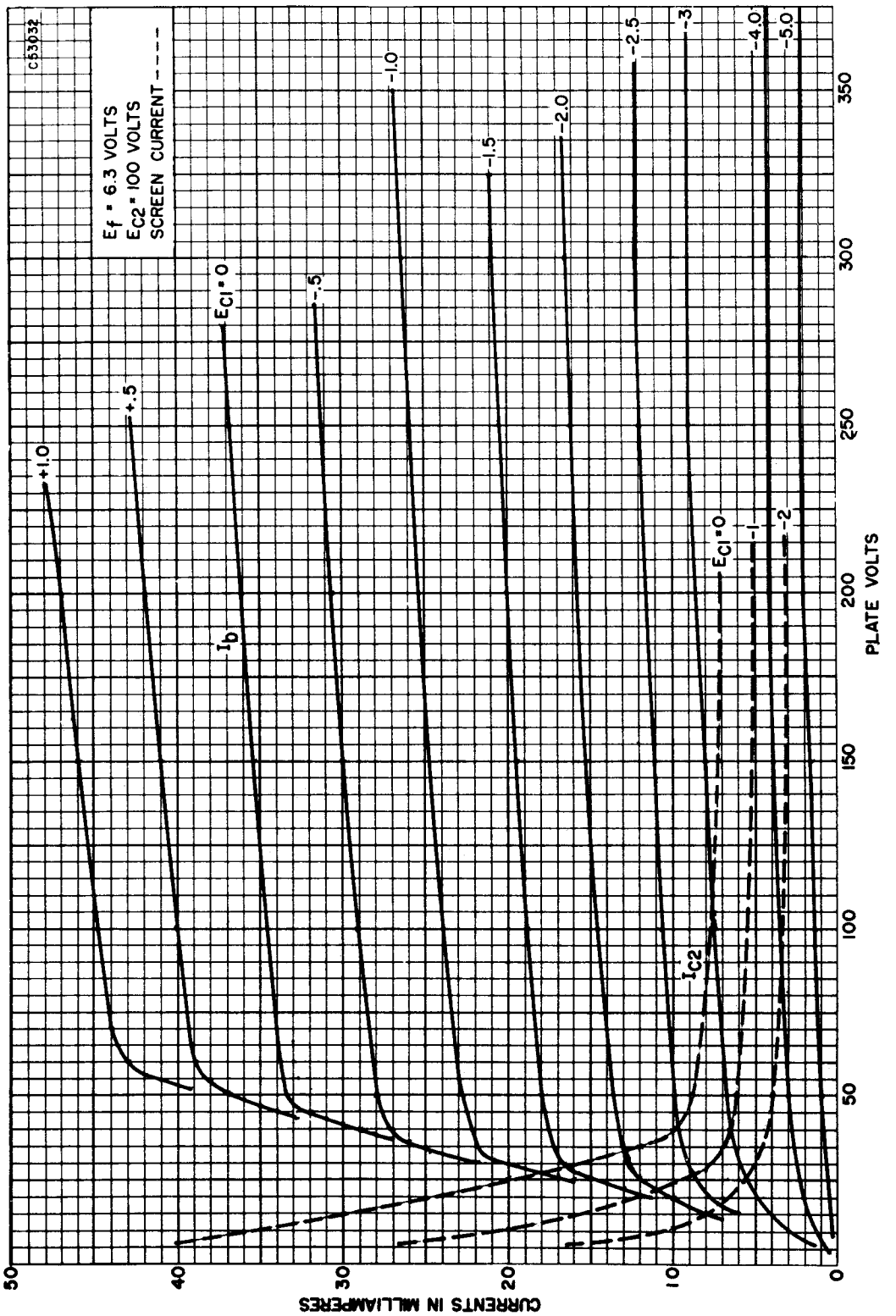
SYLVANIA

6145

AVERAGE TRANSFER CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



ADVANCE DATA

MECHANICAL DATA

Bulb	T-12
Base	B8-98, B8-86, Large Wafer Octal 8-Pin With Metal Sleeve
	B8-150, B8-159, Small Wafer Octal 8-Pin With Metal Sleeve
Outline	See Drawing
Top Cap	C1-1 or C1-38
Basing	7CK
Cathode	Coated Unipotential
Mounting Position	Any
Bulb Temperature (At Hottest Point)	220°C

ELECTRICAL DATA

HEATER CHARACTERISTICS

	6146A	6883A	6159A	
Heater Voltage ± 10%	6.3	12.6	26.5	Volts
Heater Current at Specified Voltage	1250	625	300	Ma.
Heater Current Range at Specified Voltage	1175-1325	588-663	280-320	Ma.
Heater-Cathode Voltage (Absolute Maximum Values)				
Heater Negative with Respect to Cathode			135	Volts
Heater Positive with Respect to Cathode			135	Volts

MAINTENANCE OF POWER CAPABILITY

With heater voltage reduced to 5.0 Volts for Type 6146A, 10.0 Volts for Type 6883A and 21.0 Volts for Type 6159A, the power output obtained under the classes of service contained in these defining data will not be reduced by more than ten percent from that obtained at rated heater voltage. Plate input power for the classes of service would be maintained at that obtained using rated heater voltage.

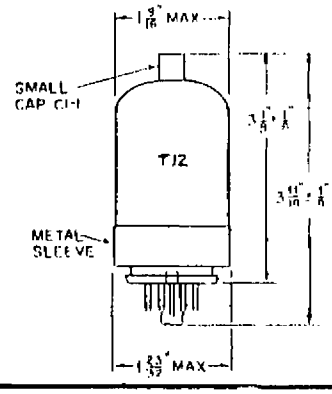
DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

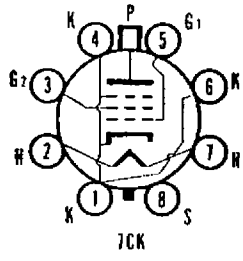
Grid No. 1 to Plate	0.24	µµf Max.
Input	13.5	µµf
Output	8.5	µµf

QUICK REFERENCE DATA

Sylvania Types 6146A, 6159A and 6883A are beam power pentodes designed for use at frequencies up to 175 Mc's. In Class "C" Telegraphy Service they can furnish 70 watts of power output under ICAS conditions.

6146A, 6159A and 6883A are designed to provide more stable power output when operating at reduced heater voltage than the prototype versions 6146, 6159 and 6883. An additional feature is a new base (see outline) that offers greater flexibility to the design engineer.





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products, Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PENNSYLVANIA

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

August 15, 1961

146 (10-58)

from JEDEC release #3405, Sept. 4, 1961

RATINGS (Absolute Maximum Values)

AF Amplifier Service

	P-P Class AB1		P-P Class AB2		
	CCS	ICAS	CCS	ICAS	
Plate Voltage	600	750	600	750	Volts
Grid No. 2 Voltage	250	250	250	250	Volts
Plate Current (Max. Signal)	125	135	125	135	Volts
Plate Input (Max. Signal)	60	85	62.5	90	Ma.
Plate Dissipation	20	25	20	25	Watts
Grid No. 2 Input (Max. Signal)	3	3	3	3	Watts
Grid No. 1 Circuit Resistance	0.1	0.1	.03	.03	Megohm

RF Amplifier Service - Class "C"

	Telephony[1]		Telegraphy or F.M. Telephony		
	CCS	ICAS	CCS	ICAS	
Plate Voltage	480	600	600	750	Volts
Grid No. 2 Voltage	250	250	250	250	Volts
Grid No. 1 Voltage	-150	-150	-150	-150	Volts
Plate Current	117	125	140	150	Ma.
Grid No. 1 Current	3.5	4.0	3.5	4.0	Ma.
Plate Input	45	67.5	67.5	90	Watts
Plate Dissipation	13.3	16.7	20	25	Watts
Grid No. 2 Input	2	2	3	3	Watts
Grid No. 1 Circuit Resistance	.03	.03	.03	.03	Megohm

CHARACTERISTICS

Plate Voltage	200	Volts
Grid No. 2 Voltage	200	Volts
Plate Current	100	Ma.
Transconductance	7000	µmhos
Amplification Factor (G1 to G2)	4.5	

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Minimum	Maximum	
Heater Current			
6146A at 6.3 Volts	1175	1325	Ma.
6883A at 12.6 Volts	588	663	Ma.
6159A at 26.5 Volts	280	320	Ma.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN (Cont'd)

Grid No. 1 to Plate[6]	-	0.24	µµf
Input: g1 to (k+g3+I.S.+Base Sleeve+g2+h)[6]	11.1	15.9	µµf
Output: p to (k+g3+I.S.+Base Sleeve+g2+h)[6]	6.4	10.6	µµf
Plate Current (Ef = Rated Value, Eb = 300V, Ec2 = 200V, Ec1 = -33V)	46	94	Ma.
Grid No. 2 Current (Ef = Rated Value, Eb = 300V, Ec2 = 200V, Ec1 = -33V)	-	5.5	Ma.
Useful Power Output - Self Excited Oscillator Circuit (Ef = Rated Value, Eb = 600V, Ec2 = 180V, Rg1 = 30,000 Ohms ± 10%, Ib = 100-112 Ma. and Ic1 = 2 to 2.5 Ma at a Frequency of 15 Mc's.)	47	-	Watts

TYPICAL OPERATION

AF Power Amplifier - Class AB1

	CCS	CCS	CCS	ICAS	ICAS	
Plate Voltage	400	500	600	600	750	Volts
Grid No. 2 Voltage	190	185	180	200	195	Volts
Grid No. 1 Voltage	-40	-40	-45	-50	-50	Volts
Peak AF G1 to G1 Voltage	80	80	90	100	100	Volts
Plate Current (Zero Signal)	63	57	26	28	23	Ma.
Plate Current (Max. Signal)	228	215	200	229	220	Ma.
Grid No. 2 Current (Zero Signal)	2.5	2.0	1.0	1.0	1.0	Ma.
Grid No. 2 Current (Max. Signal)	25	25	23	27	26	Ma.
Load Resistance (P1. to P1.)	4K	5.5K	7K	6K	8K	Ohms
Power Output	55	70	82	95	120	Watts

AF Power Amplifier - Class AB2

Plate Voltage	400	500	600	600	750	Volts
Grid No. 2 Voltage[2]	175	175	165	190	165	Volts
Grid No. 1 Voltage	-41	-44	-44	-48	-46	Volts
Peak AF G1 to G1 Voltage	95	102	97	109	108	Volts
Plate Current (Zero Signal)	33	27	22	28	22	Ma.
Plate Current (Max. Signal)	232	242	207	270	240	Ma.
Grid No. 2 Current (Zero Signal)	1.1	0.7	0.6	1.2	0.3	Ma.
Grid No. 2 Current (Max. Signal)	18	18	17	20	20	Ma.
Grid No. 1 Current (Max. Signal)	1.6	1.9	1.1	2.0	2.6	Ma.
Load Resistance (P1. to P1.)	3.7K	4.6K	6.8K	5.0K	7.4K	Ohms
Driving Power (Max. Signal)[3]	0.2	0.3	0.2	0.3	0.4	Watts
Power Output (Max. Signal)	62	83	90	113	131	Watts

TYPICAL OPERATION (Cont'd)

RF Power Amplifier - Class "C"

Telephony (Up to 60 Mc)

	CCS	CCS	ICAS	
Plate Voltage	400	475	600	Volts
For Grid No. 2 Voltage Use[4]	150	135	150	Volts
Grid No. 2 Dropping Resistor	33K	51K	56K	Ohms
For Grid No. 1 Voltages[5]	-87	-77	-87	Volts
Use Grid No. 1 Resistor	27K	27K	27K	Ohms
Peak RF Grid No. 1 Voltage	107	95	107	Volts
Grid No. 1 Current	3.4	2.8	3.4	Ma.
Plate Current	112	94	112	Ma.
Grid No. 2 Current	7.8	6.4	7.8	Ma.
Driving Power (Approx.)	0.4	0.3	0.4	Watts
Power Output (Approx.)	32	34	52	Watts

RF Power Amplifier - Class "C"

Telegraphy - F.M. Telephony

		Up to 60 Mc			Up to 175 Mc		
	CCS	CCS	ICAS	ICAS	CCS	ICAS	
Plate Voltage	500	600	600	750	320	400	Volts
For Grid No. 2 Voltage of	170	150	180	160	180	190	Volts
Use Grid No. 2 Dropping Resistor	36K	51K	43K	56K	13K	20K	Ohms
For Grid No. 1 Voltage of[5]	-66	-58	-71	-62	-51	-54	Volts
Use Grid No. 1 Resistor or	27K	20K	24K	20K	27K	24K	Ohms
Use Cathode Resistor	470	470	430	470	330	330	Ohms
Peak RF Grid No. 1 Voltage	84	73	91	79	64	68	Volts
Grid No. 1 Current	2.5	2.8	2.8	3.1	2	2.2	Ma.
Plate Current	135	112	150	120	140	150	Ma.
Grid No. 2 Current	9	9	10	11	10	10.4	Ma.
Driving Power (Approx.)	0.2	0.2	0.3	0.2	3.0	3.0	Watts
Power Output	48	52	66	70	25	35	Watts

NOTES:

1. Carrier conditions per tube with a maximum modulation factor of 1.0.

2. Preferably obtained from a separate source or from the plate-voltage supply with a voltage divider.

NOTES: (Cont'd).

3. The driver stage should be capable of supplying the specified driving power at low distortion to the No. 1 grids of the AB2 stage. To minimize distortion, the effective resistance per Grid No. 1 Circuit should be held to a low value. For this purpose use of transformer coupling is recommended. In no case, however, should the total DC grid circuit resistance exceed 30,000 ohms when the tube is operated at maximum ratings. For operation at less than maximum ratings, the DC grid circuit resistance may be as high as 100,000 ohms.

4. Obtained preferably from a separate source modulated with the plate supply, or from the modulated plate supply through a series resistor.

5. Grid No. 1 voltage obtained from Grid No. 1 resistor or from a combination of Grid No. 1 resistor with the fixed supply or cathode resistor.

6. Unshielded bulb.

from RTMA release #1066, March 17, 1952

SYLVANIA

JETEC Registration Data

TYPE 6162

ATR Gas Switching Tube

The Type 6162 is a broad-band ATR gas switching tube designed to decouple effectually the transmitter from a common transmitting and receiving antenna during a non-transmitting period, in radar applications.

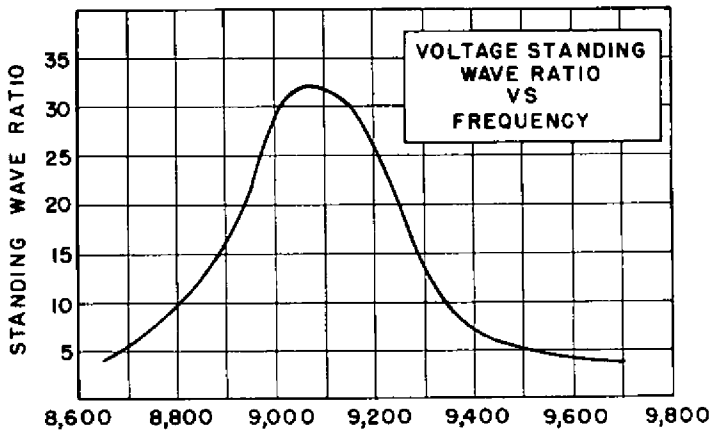
ELECTRICAL DATA

Center Frequency	9,080	megacycles
Operational Band at Minimum Voltage Standing Wave Ratio of 5	8,750 to 9,410	megacycles
Loaded Q, maximum	6.5	
Transmitter Peak Power, minimum	4	kilowatts
Normalized Conductance at Center Frequency	0.1	
Normalized Susceptance at Center Frequency	±0.06	
Arc Power Loss,* maximum	0.8	db

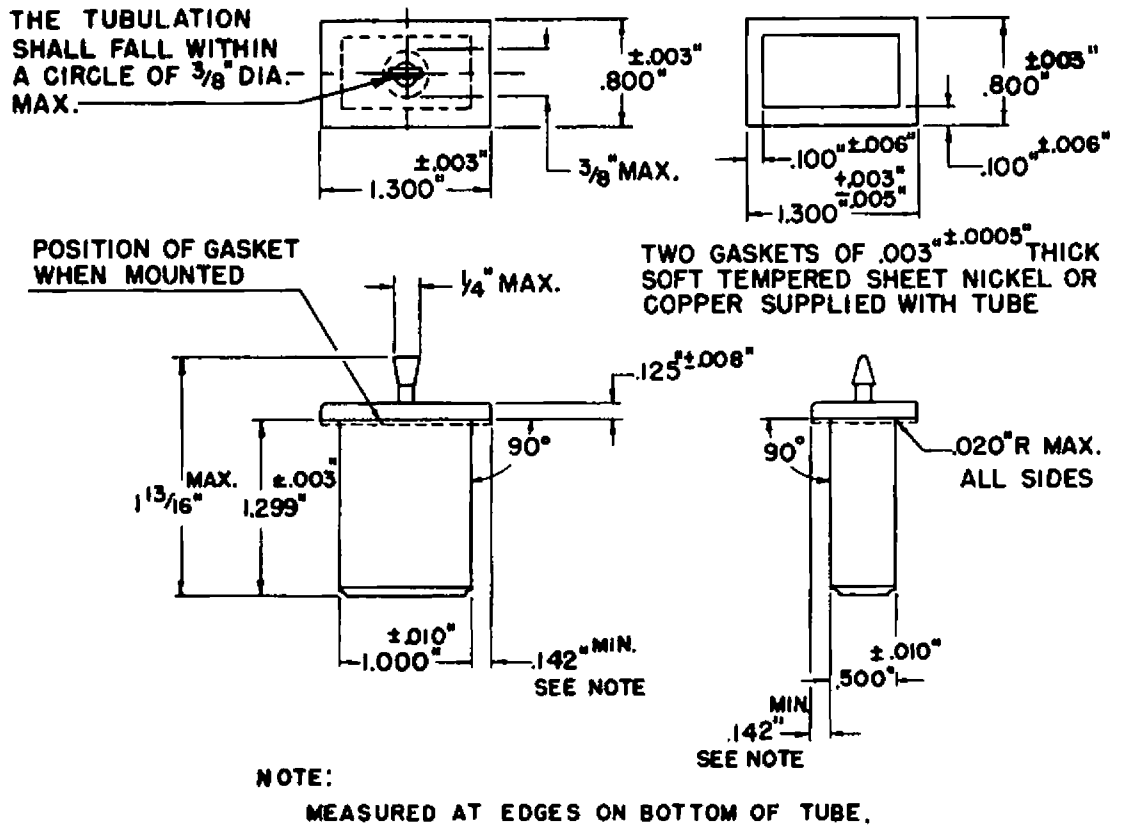
MECHANICAL DATA

Mounting Position	Any	
Ambient Temperature Range (non operating)	-40 to +100	°C
Net Weight, approximate	0.13	pounds

*At a peak power of 4 kilowatts, pulse repetition rate of 1,000 pulses per second, pulse width of 0.5 microseconds and a frequency of 9,025 (±4%)



OUTLINE



NOTE:
MEASURED AT EDGES ON BOTTOM OF TUBE.

ADVANCE DATA

MECHANICAL DATA

Mounting Position	Any	
Ambient Temperature Range (Non-Operating)	-40 to +100°	C
Dimensions	Per Outline	
Net Weight (Approx.)	0.13	Pound

ELECTRICAL DATA

RATINGS

Transmitter Peak Power	4	Kw	Min.
	250	Kw	Max.

GENERAL DATA

Center Frequency	9050	Mc	
Loaded Q	6.5	Max.	
Tuning Susceptance $B/_{Yo}$	±0.06		
Electrical Symmetry [1]	0.06	Cm	Max.
Equivalent Conductance $G/_{Yo}$	0.06	Max.	
Arc Loss (4 Kw) [2]	1.3	db	Max.
Recovery Time (20 Kw) [3]	8.0	µsec	Max.
High Level VSWR (20 Kw)	1.12	Min.	
	1.27	Max.	
Firing Time (4 Kw)	10	Seconds	Max.

NOTES:

1. The shift in the position of the minimum measured in RG-51/U waveguide, caused by reversing the tube in the mount shall be within the limits specified.

2. At a peak power of 4 Kw, pulse repetition rate of 1000 pps, pulse width of 0.5 µsec, and frequency of 9050 mc.

3. With line power of 20 Kw peak, the shift in position of the minimum from unfired position to 0.05 λ g (when fired) nearer the magnetron in specified time.

QUICK REFERENCE DATA

The Sylvania Type 6163 is an X-band ATR tube designed for application in pairs or singly (with the proper waveguide) in conjunction with the 6164 TR.

SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

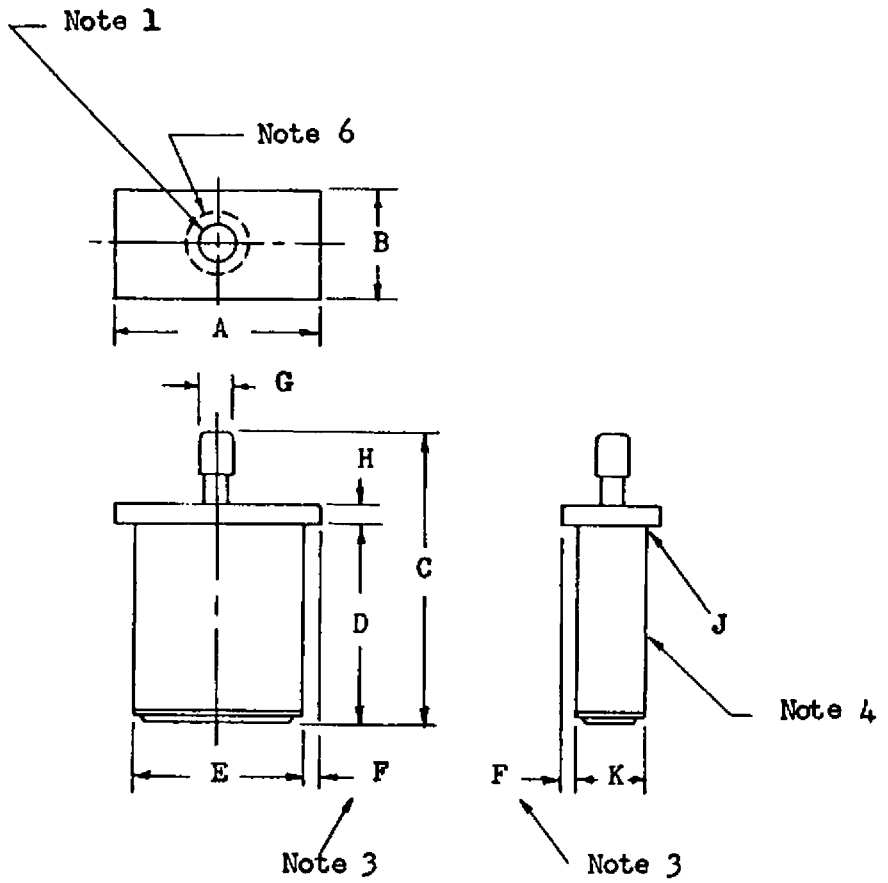
June 14, 1956

from JETEC release 1221B, July 30, 1956

APPLICATION DATA

The Sylvania Type 6163 ATR is recommended in conjunction with 6164 TR for application in amplitude sensitive monopulse systems employing RG-51/U waveguide.

The tube is designed to be used either in pairs mounted opposite each other in the wide walls of RG-51/U waveguide for high power broadband applications or singly in reduced impedance (1/2 height) RG-51/U waveguide. The tube may be used at peak powers exceeding 250 Kw under proper pulse conditions, where average power is maintained at 250 watts. For operation under these conditions consult manufacturer.



Ref.	Dimensions
A	1.275" ±.010"
B	.775" ±.005"
C	1 23/32" Max.
D	1.299" ±.003"
E	1.000" ±.005"
F	.125" Min.
G	9/32" Dia. Max.
H	.125" ±.008"
J	.020" R. Max.
K	.500" ±.005"

NOTES:

1. The tubulation shall fall within a circle of 7/16" max. dia. located from the centerlines of the flange.
2. Silver plate 100 M.S.I. or equivalent.
3. Applies to four walls for full length up to radius J, and to window end plate.
4. Four long edges of tube body shall have approx. radius .020" ±.010".
5. A radius of 1/32" max. or a chamfer of 1/64" x 45° max. will be permitted on the corners of the window end plate.
6. Spread of solder to be held within 7/16" dia. area as shown.
7. Window plate optional flat or lipped.

SYLVANIA

engineering data service

TENTATIVE DATA

SYLVANIA

6164

Formerly TR429

MECHANICAL DATA

Dimensions	Per Outline
Mounting Position	Any
Number of Ignitors	One
Ambient Temperature Range (non-operating)	-40 to + 100°C

ELECTRICAL DATA

RATINGS

Transmitter Peak Power (min.)	4 KW
Ignitor Open Circuit Supply Voltage (min.)	-650 Vdc

GENERAL DATA

Operational Band (1)	8500 to 9600 mc
Spike Leakage Energy (mas.) (2)	0.15 ergs
Flat Leakage Power (max.)	30 mW
Insertion Loss at 9000 mc and Zero ignitor current (max.)	0.7 db
Ignitor Interaction at 9000 mc and 100 μAdc ignitor current (max.)	0.3 db
Ignitor Voltage Drop at 100 μAdc ignitor current	-200 to -375 Vdc
Recovery Time (max.) (3)	10 μsec.
Arc Power Loss (max.) (4)	0.8 db
Life (min.)	500 hours

APPLICATION DATA

The Sylvania Type 6164 is designed for use in amplitude sensitive monopulse systems employing RG 51/U waveguide in the RF section. The use of this tube eliminates extraneous amplitude and phsae effects in the determination of target position.

NOTES

(1) The 6164 is tuned so that no tube will differ from any other tube in vector reflection coefficient and phase of transmission by more than 4db SWR and 10 degrees respectively.

(2) Tested at F=9000 Mc; Po=40KW; tp=1.0±.15 μsec. and 0.5±.15 μsec.; prr=1000 pps; Ii=100 μAdc.

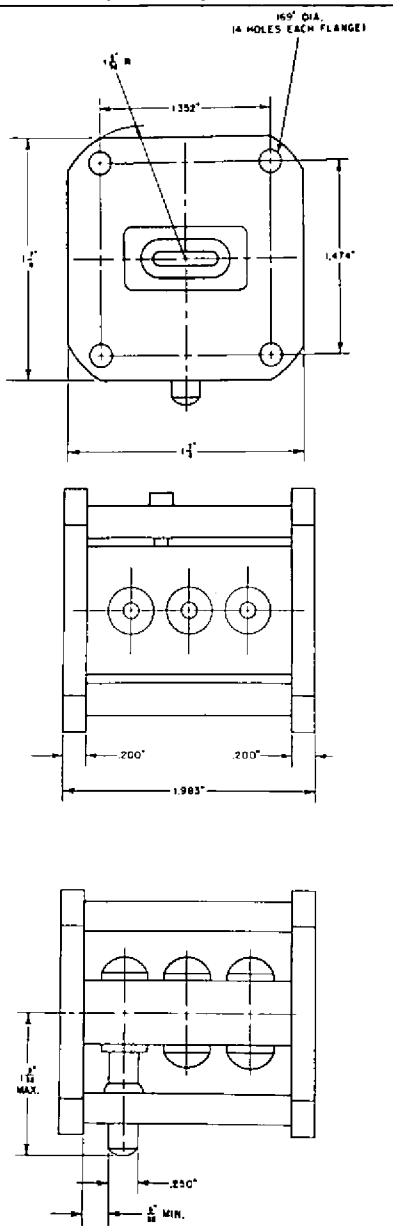
(3) Tested at F=9000 Mc; Po=200Kw; tp=1.0±.15 μsec.; prr=1000 pps; Ii=100 μAdc. The loss of signal in the tube at the specified time after the transmitter pulse shall not be greater than 3.0 db in excess of the loss at 800 to 1000 μsec. after the pulse.

(4) Tested at Po=4KW and duty cycle of .001

from JETEC release #1390, Dec. 27, 1954

QUICK REFERENCE DATA

The Sylvania Type 6164 is an integral cavity broad-band transmit- receive tube designed to operate from 8500 to 9600 Mc. Tuning is such that no two tubes differ in vector reflection coefficient or phase of transmission by more than 4 db SWR or 10 degrees respectively.



Note: Exhaust tubulation not to extend beyond flange more than 1/4"

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DC
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	60000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		150	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid No. 1 to Plate	0.015	0.03 μμf Max.
Input	4.2	4.0 μμf
Output	3.4	1.9 μμf

RATINGS[1 & 5] (Absolute Maximum)

Plate Voltage	165 Vdc
Peak Plate Forward Voltage[6]	330 v
Grid No. 3 Voltage	22 Vdc
Grid No. 2 Voltage	155 Vdc
Plate Dissipation	1.1 W
Grid No. 2 Dissipation	0.55 W
Cathode Current	16.5 mAdc
Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid No. 1 Circuit Resistance	1.1 Meg

CHARACTERISTICS

Plate Voltage	100 Vdc
Grid No. 3 Voltage	0 Vdc
Grid No. 2 Voltage	100 Vdc
Cathode Resistor	150 Ohms
Plate Current	7.5 mAdc
Grid No. 2 Current	2.4 mAdc
Transconductance	5000 μmhos
Plate Resistance	260,000 Ohms
Grid No. 1 Voltage for Ib = 50 μAdc Max.	-9.0 Vdc

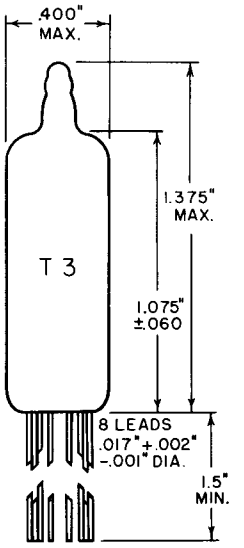
NOTES:

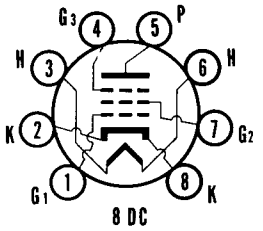
1. *Limitations beyond which normal tube performance and tube life may be imparied.*
2. *If altitude rating is exceeded, reduction of instantaneous voltage (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Per MIL-E-1C par. 6.5 and General Section of this Sylvania Subminiature Tube Manual titled Specifications and Ratings.*

QUICK REFERENCE DATA

The Premium Subminiature Type 6205 is a sharp cutoff pentode having an external Grid No. 3 connection. It is otherwise identical to the 5840. The 6205 is well suited to amplifier service at frequencies up to 900 mc and is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude.

It is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Grid No. 3 Voltage MIL-E-1 Par. 3.2.2.1 Note 4	0 V
Plate Voltage	100 Vdc	Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1	0 V
Grid No. 1 Voltage	0 V	Cathode Resistor	150 Ohms
Grid No. 2 Voltage	100 Vdc		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7 4.10.8	(Method A) Heater Current: ALD = 12	—	—	144	150	156	—	mA
4.10.8	Heater Current:	0.65	140	—	—	—	160	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid Current: Ic1 Rg1 = 1.0 Meg	0.65	0	—	—	—	−0.3	μAdc
4.1.1.7 4.10.4.1	(Method A) Plate Current (1): ALD = 2.3	—	—	6.7	7.5	8.3	—	mAdc
4.10.4.1	Plate Current (1):	0.65	5.5	—	—	—	9.5	mAdc
4.10.4.1	Plate Current (2): Ec1 = −9.0 Vdc; Rk = 0 Ohms	0.65	—	—	—	—	50	μAdc
4.10.4.3	Screen Grid Current: Ic2	0.65	1.5	—	—	—	3.3	mAdc
4.1.1.7 4.10.9	(Method A) Transconductance (1): ALD = 900 Sm	—	—	4700	5000	5300	—	μmhos
4.10.9	Transconductance (1): Sm	0.65	4200	—	—	—	5800	μmhos
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes:	2.5	—	—	—	—	—	
	g1-all	—	100	—	—	—	—	Meg
	p-all	—	100	—	—	—	—	Meg
4.10.9	Transconductance (2): Δ Sm Ef = 5.7 V Δ Ef	2.5	—	—	—	—	10	%
4.10.6.2	Grid Emission: Note 5 Ef = 7.5 V; Ec1 = −9.0 Vdc; Rg1 = 1.0 Meg; Rk = 0 Ohms	2.5	0	—	—	—	−0.5	μAdc
4.10.3.2	AF Noise: Esig = 70 mVac; Ec2 = 19 Vdc; Rg1 = 0.1 Meg; Rg2 = 1000 Ohms; Rp = 0.2 Meg; Ck = 1000 μf	2.5	—	—	—	—	17	VU
4.10.10	Plate Resistance:	6.5	0.175	—	—	—	—	Meg
4.10.14	Capacitance:	6.5	—	—	—	—	—	
	0.405 In. Dia. Shield Cg1p	—	—	—	—	—	0.015	μμf
	0.405 In. Dia. Shield Cin	—	3.5	—	—	—	4.9	μμf
	0.405 In. Dia. Shield Cout	—	2.9	—	—	—	3.9	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 20 ±5 mm Hg.; Voltage = 300 Vac	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 2 (Continued)								
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
4.9.19.1	Vibration (2): Rp = 10,000 Ohms; Ck = 1000 μf; F = 40 cps; G = 15	2.5	—	—	—	—	60	mVac
4.9.19.1	White Noise: Note 6 Rp = 10,000 Ohms; Ck = 1000 μf; Peak Acceleration = 15 G	2.5 2.5	— —	— —	— —	— —	800 150	mv pk-pk mVac
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc; Rg1 = 0.1 Meg	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
- - - -	Post Shock and Fatigue Test End Points: Vibration (2) Heater-Cathode Leakage Ehk = +100 Vdc Ehk = -100 Vdc Change in Transconductance (1) of Individual Tubes Δ_t Sm	— — — —	— — — —	— — — —	— — — —	— — — —	200 20 20 20	mVac μAdc μAdc %
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec1 = Ec2 = Ec3 = Eb = O V	2.5	—	—	—	—	
4.11.3.1	Stability Life Test: (1 Hour) Ehk = +200 Vdc; Rg1 = 1.0 Meg; TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes Δ_t Sm	—	—	—	—	10	%
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives) Transconductance (1) Sm	0.65 1.0	— —	— —	— 3750	— —	 μmhos
4.11.5 4.11.3.1	Intermittent Life Test: Note 3 Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2 (Continued)							
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Grid Current Ic1	—	1	3	0	-0.8	μAdc
	Heater Current	—	2	5	138	164	mA
	Change in Transconductance (1) of						
	Individual Tubes $\Delta \frac{Sm}{t}$	—	1	3	—	20	%
	Transconductance (2) $\Delta \frac{Sm}{Ef}$	—	2	5	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	10	μAdc
	Ehk = -100 Vdc	—	—	—	—	10	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	g1-all	—	—	—	50	—	Meg
	p-all	—	—	—	50	—	Meg
	Transconductance (1) Average						
	Change, Avg $\Delta \frac{Sm}{t}$	—	—	—	—	15	%
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3 Subminiature lead fatigue
4.9.20.5 Shock
4.9.20.6 Fatigue
4.11.7 Heater cycling life test
4.11.5 Intermittent life test

3: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

4: Types 5840 and 6205 are the same except for suppressor grid and cathode connection. Type 6205 has not been designed for control or gating purposes using the number 3 grid.

5: Prior to this test, tubes shall be preheated five (5) minutes at conditions indicated below. Test within three (3) seconds after preheating. Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission Test.

Ef V	Ec1 Vdc	Ec2 Vdc	Ec3 Vdc	Eb Vdc	Rk Ohms	Rg1 Meg
7.5	0	100	0	100	150	1.0

6: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "White Noise" spectrum which is free from discontinuities from 100 cps to 5000 cps. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 G's rms acceleration. With this the case, the rms value of acceleration for any bandwidth within the specified spectrum is equal to

$$G\ rms = 2.3\ G \sqrt{3.32 \log_{10} (f2/f1)}$$

f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (0.25 megohm or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 40 db at 13,000 cps. For reading the peak to peak value of output voltage the filter output shall be fed directly to the input of a Ballantine Model 305 peak to peak electronic voltmeter or equal, while the rms value shall be measured with a Hewlett-Packard Model 400C or equal.

APPLICATION DATA

The 6205 is a Premium Subminiature, sharp cutoff pentode having an external suppressor grid connection. Electrically, the 6205 is otherwise identical to the 5840. This type is characterized by long life and stable performance under conditions of severe shock, vibration, high altitude and high temperature.

The 6205 is intended for use as an rf amplifier at frequencies up to 400 mc, as well as many low frequency applications. As the frequency of operation is increased, consideration should be given to the resultant decrease in input and output resistance, Figure 1. Assuming matched input and output impedance, approximate tube gain can be obtained from the formula:

$$\text{Voltage Gain} = \frac{gm \sqrt{Rinput \times Routput}}{2}$$

APPLICATION DATA (Continued)

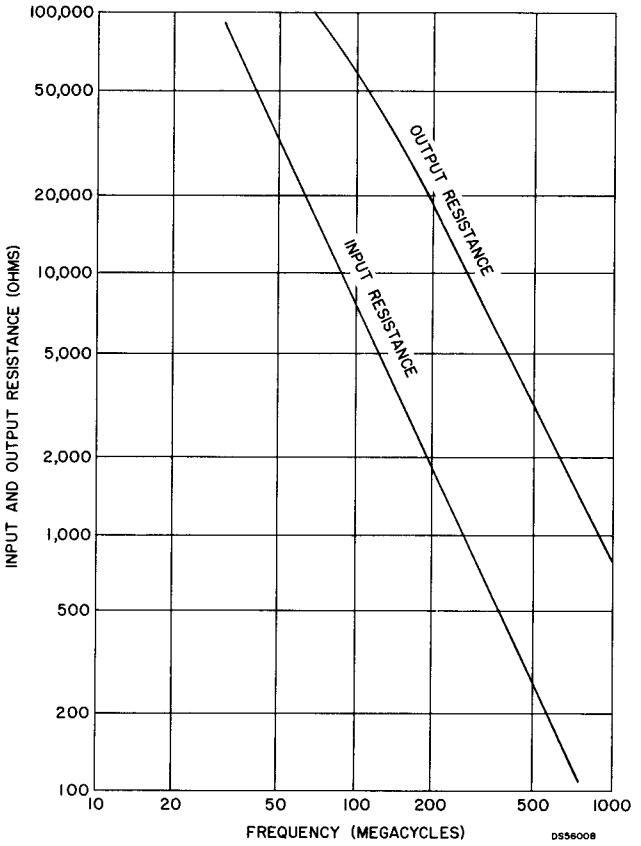


Figure 1—Input and output resistance vs frequency.

where the values of Rinput and Routput are obtained from the curves of Figure 1. The use of this formula assumes matched impedances into and out of the amplifier stage under consideration. If the source impedance is lower than the input resistance or if the load resistance is higher than the output resistance, much greater voltage gain per stage can be obtained than that indicated by the above formula. The voltage gain of a matching circuit is equal to the square root of the impedance ratio.

In some applications it may be advantageous to place an unbypassed resistance in the cathode circuit to compensate for the change in input capacitance with bias. This unbypassed resistance reduces the effective gm of the tube by the factor

$$\frac{1}{1 + gm\ Rk \left(\frac{Ib + Ic2}{Ib}\right)}$$

However, it also has the effect of raising the input resistance of the tube under certain operating conditions so that both a net increase in gain and a net decrease in input capacitance change may result. The 6205 is particularly well suited to such applications since the suppressor grid may be grounded directly, thus providing greater stability. It should be noted that the suppressor grid is not intended as a control electrode.

The self neutralization frequency of the 6205 is approximately 200 mc. At this point the inductance of the tube leads resonate with the grid plate capacitance to effect neutralization. At higher frequencies the feedback is inductive and takes place through the tube leads. Two cathode leads are provided to minimize this effect and permit isolation of the input and output circuits. The external suppressor grid connection also facilitates the possible employment of suppressor grid neutralization techniques*.

Resistance coupled amplifier data is presented in the accompanying table.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

The 6205 is manufactured and inspected to meet the applicable Mil-E-1 specification for reliability.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

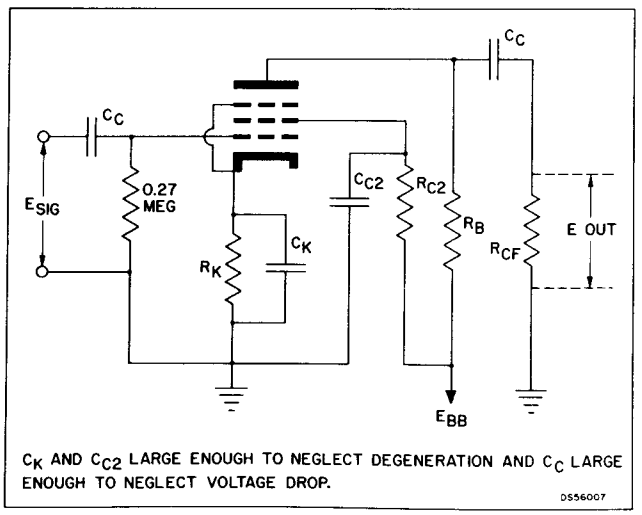
*"A Method of Neutralizing IF Amplifier Tubes at 44 Mc by Means of Suppressor Grid Reaction", Sylvania Engineering Information Service, Vol. 3, No. 1, April, 1956.

The information presented on this data sheet is furnished without assuming any obligation.

RESISTANCE COUPLED AMPLIFIER DATA

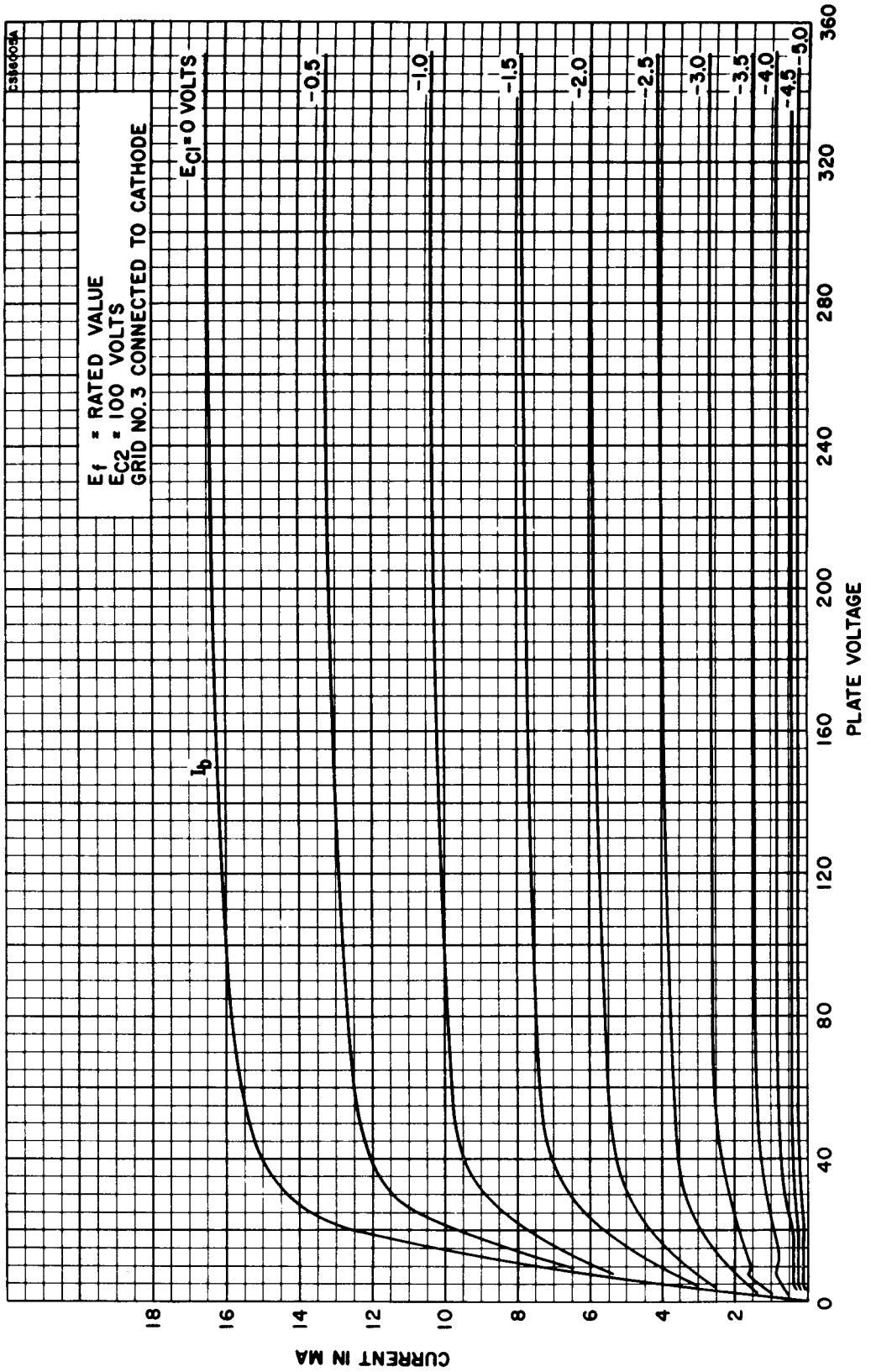
	Ebb = 100 Volts						Ebb = 150 Volts					
Rb (megohms)	0.100		0.270		0.470		0.100		0.270		0.470	
Rc2 (megohms)	0.220		0.680		1.20		0.270		0.820		1.50	
Rcf (megohms)	0.27	0.47	0.47	1.0	0.47	1.0	0.27	0.47	0.47	1.0	0.47	1.0
Rk (ohms)	820	820	2200	2200	3300	3300	560	560	1500	1500	2200	2200
Ib (ma)	0.75	0.75	0.273	0.273	0.164	0.164	1.13	1.13	0.42	0.42	0.247	0.247
Ic2 (ma)	0.292	0.292	0.102	0.102	0.062	0.062	0.41	0.41	0.143	0.143	0.083	0.083
Ec1 (volts)	−0.855	−0.855	−0.825	−0.825	−0.746	−0.746	−0.862	−0.862	−0.845	−0.845	−0.726	−0.726
Ec2 (volts)	35.8	35.8	31.4	31.4	25.5	25.5	39.3	39.3	32.8	32.8	25.6	25.6
Eb (volts)	25.0	25.0	26.3	26.3	22.9	22.9	37.0	37.0	36.7	36.7	34.0	34.0
Esig (volts, rms)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Eout (volts, rms)	8.2	9.0	9.5	11.8	9.2	11.7	11.5	12.5	13.2	15.5	13.0	16.7
Gain	82	90	95	118	92	117	115	125	132	155	130	167
% Distortion	2.8	3.8	2.5	3.0	3.1	2.3	1.5	2.2	2.4	2.4	3.7	3.0
Esig* (volts, rms)	0.23	0.22	0.15	0.16	0.12	0.14	0.20	0.18	0.16	0.16	0.11	0.14
Eout (volts, rms)	17.7	18.6	13.6	17.0	11.0	16.0	21.7	21.7	20.5	24.0	14.0	22.2
Gain	77	85	91	106	92	114	109	120	128	150	127	159
% Distortion	4.9	4.8	4.7	4.4	4.8	5.0	4.8	5.0	4.9	4.8	4.2	4.8

*Maximum signal for 5% distortion or M microampere grid current.

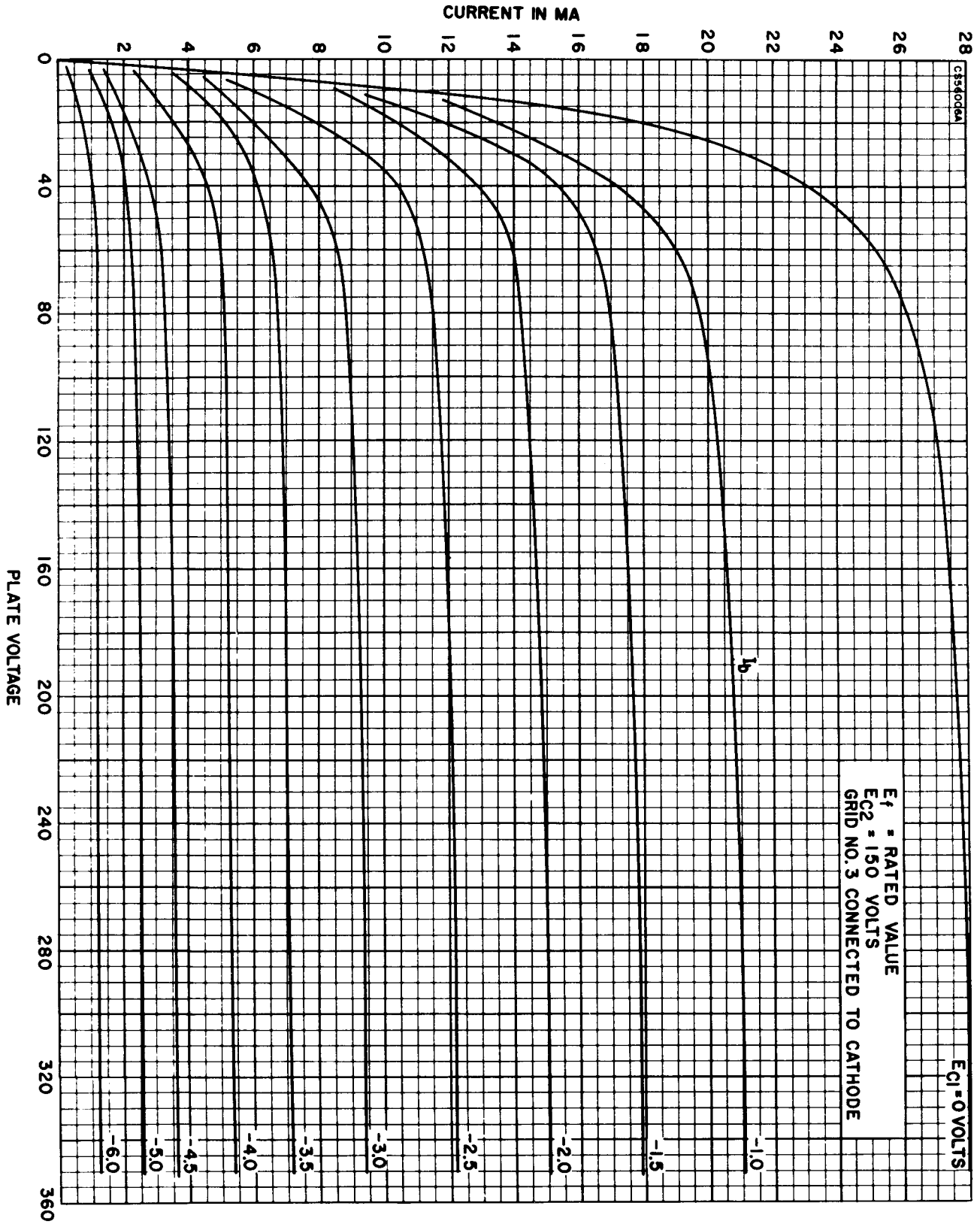


Resistance coupled amplifier circuit.
(Grid No. 3 externally connected to cathode)

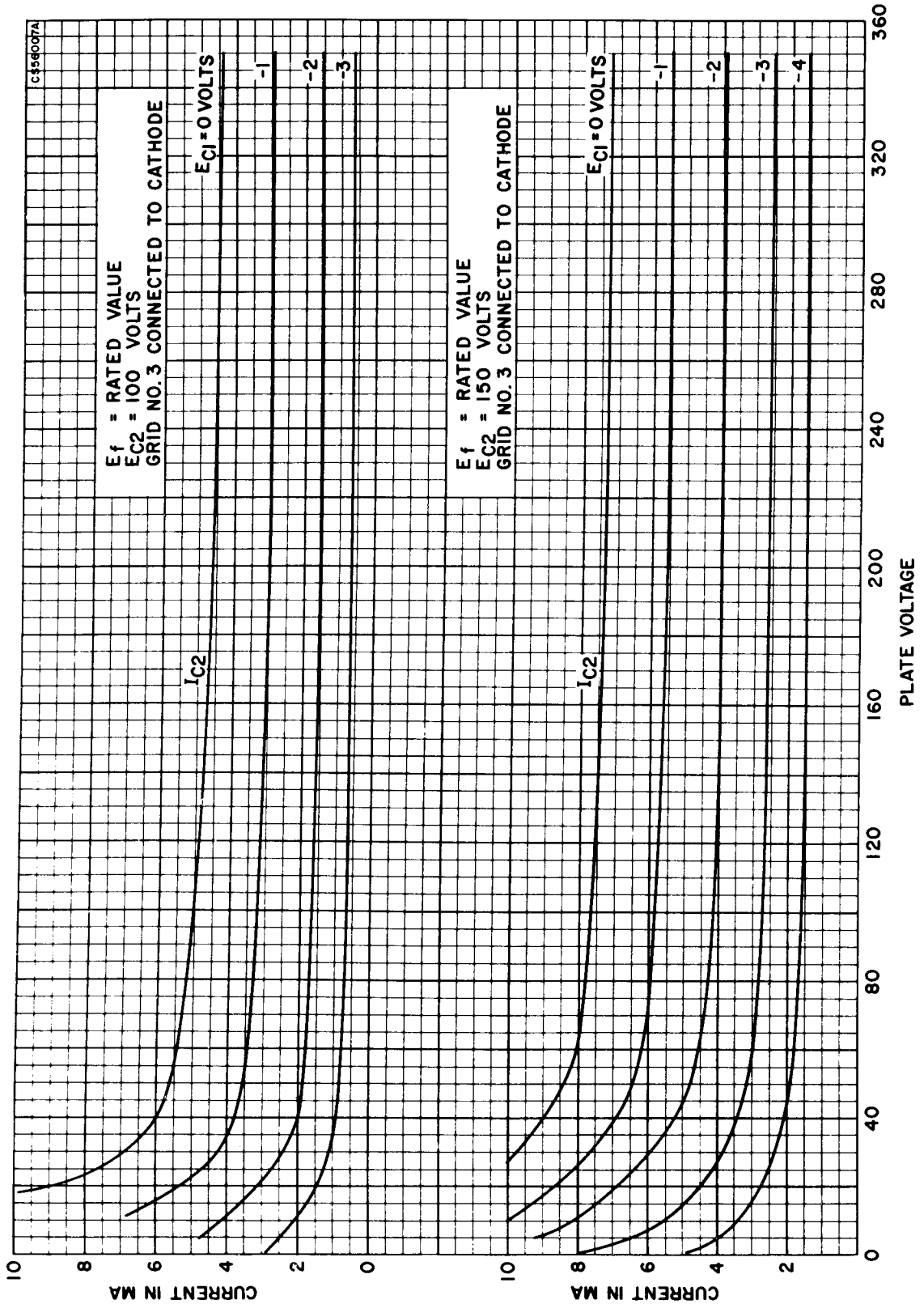
AVERAGE PLATE CHARACTERISTICS
(PENTODE CONNECTED)



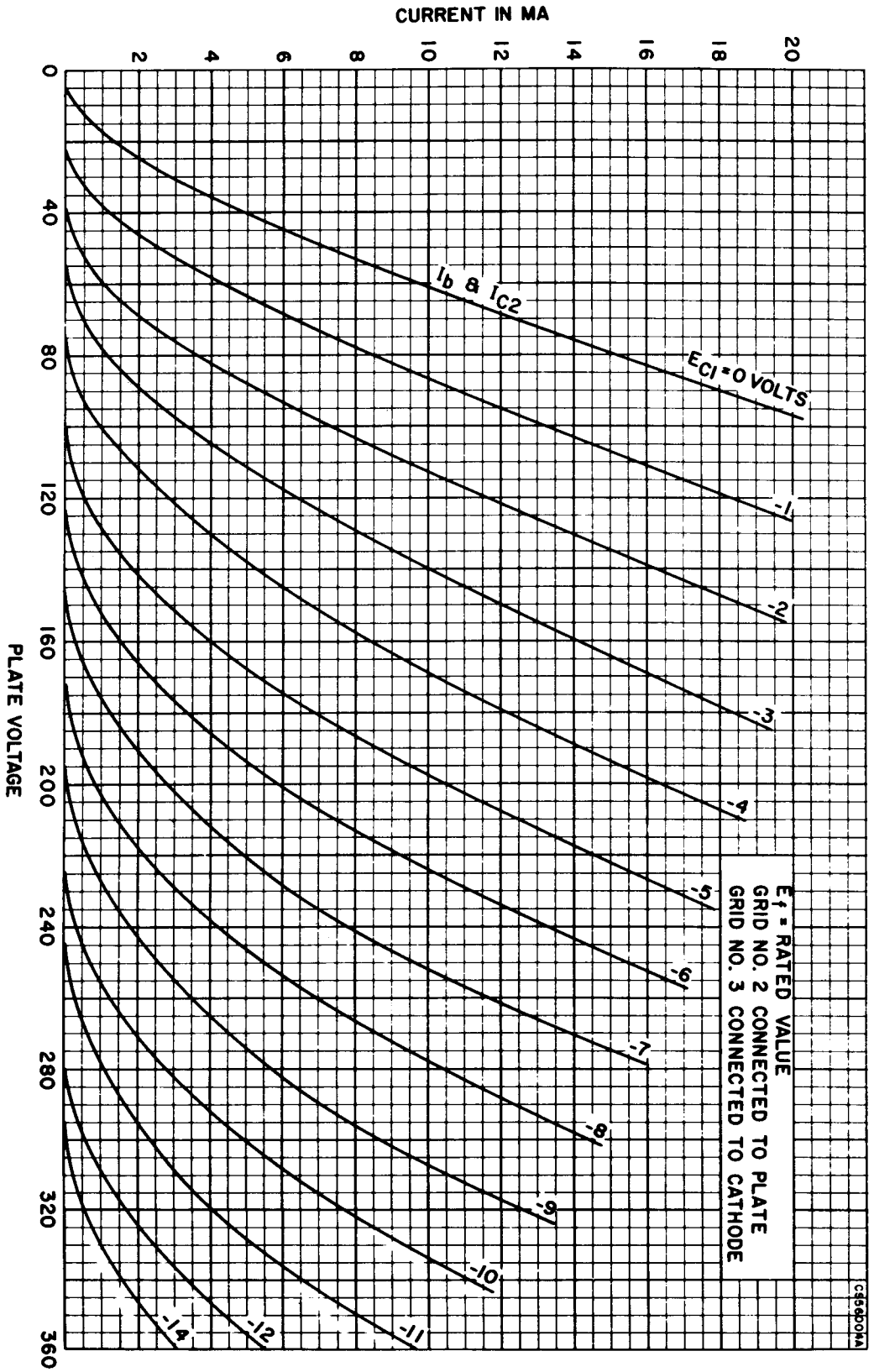
AVERAGE PLATE CHARACTERISTICS
(PENTODE CONNECTED)



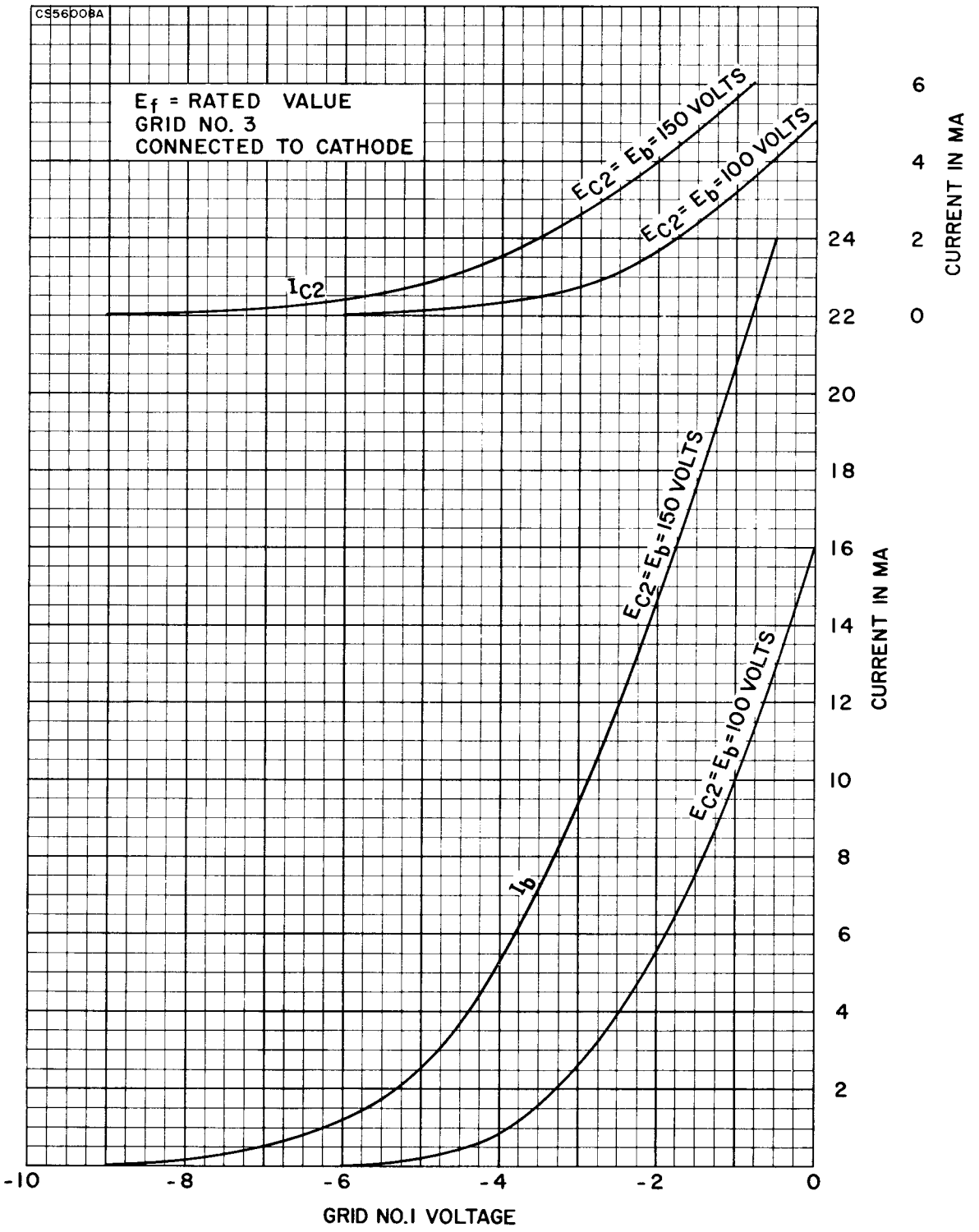
AVERAGE GRID No. 2 CHARACTERISTICS
(PENTODE CONNECTED)



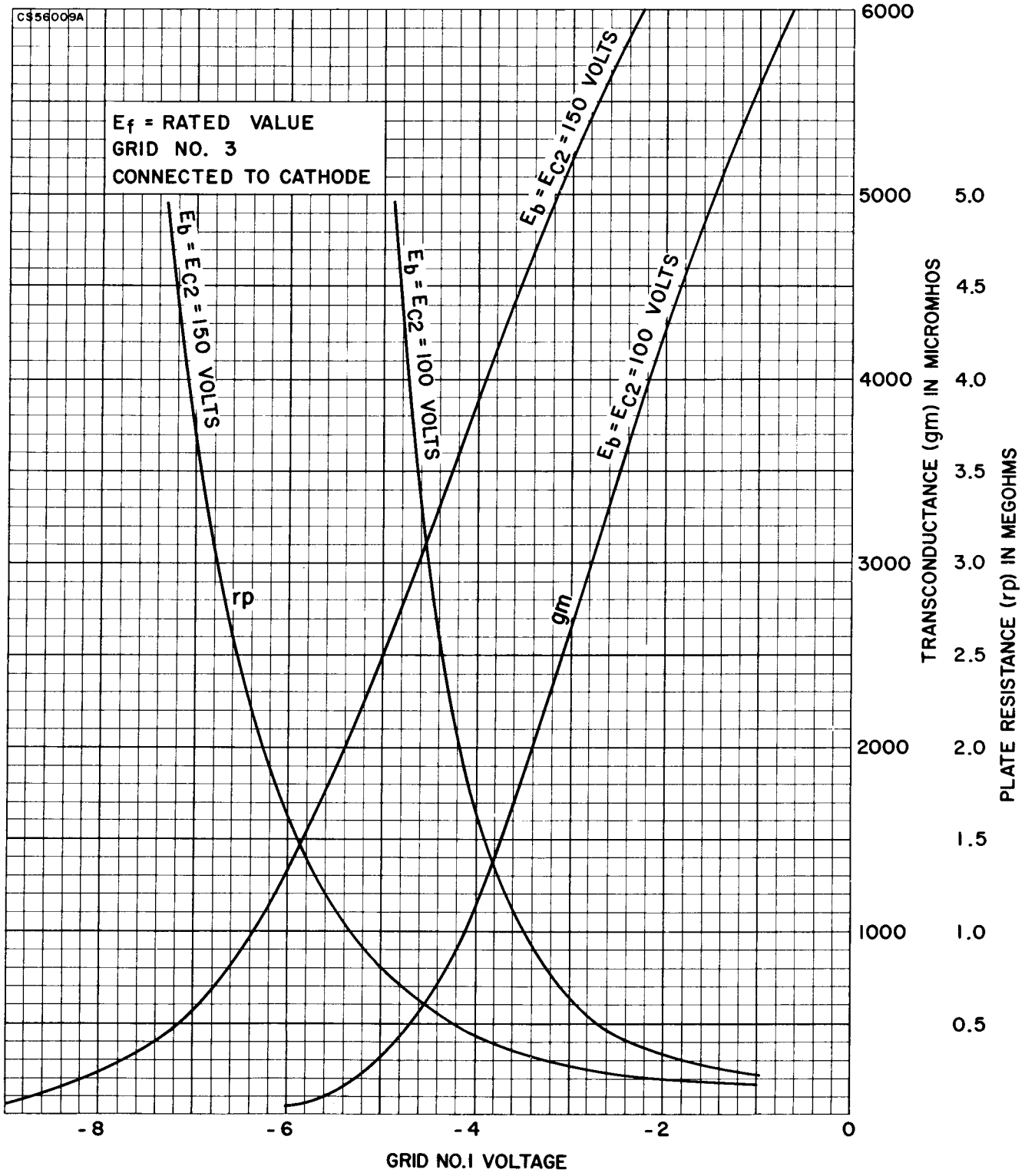
AVERAGE PLATE CHARACTERISTICS
(TRIODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE CONNECTED)



SYLVANIA engineering data service 6206

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DL
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		150	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid No. 1 to Plate	0.015	0.03 μμf Max.
Input	4.20	4.00 μμf
Output	3.40	1.90 μμf

RATINGS[1 & 5] (Absolute Maximum)

Plate Voltage	165 Vdc
Peak Plate Forward Voltage[6]	330 v
Grid No. 3 Voltage	22 Vdc
Grid No. 2 Voltage	155 Vdc
Plate Dissipation	1.1 W
Grid No. 2 Dissipation	0.55 W
Cathode Current	16.5 mAdc
Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid No. 1 Circuit Resistance	1.1 Meg

CHARACTERISTICS

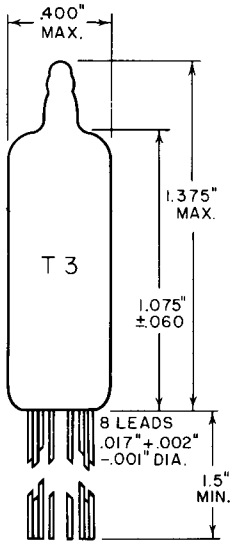
Plate Voltage	100 Vdc
Grid No. 3 Voltage	0 Vdc
Grid No. 2 Voltage	100 Vdc
Cathode Resistor	120 Ohms
Plate Current	7.2 mAdc
Grid No. 2 Current	2.2 mAdc
Transconductance	4500 μmhos
Plate Resistance	260,000 Ohms
Grid No. 1 Voltage for Transconductance = Approx. 25 μmhos (75 μmhos Max.)	−14 Vdc

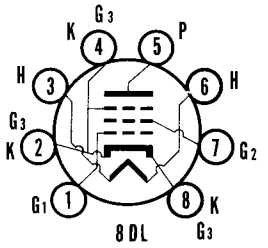
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Per MIL-E-1C par. 6.5 and General Section of this Sylvania Subminiature Tube Manual titled Specifications and Ratings.*

QUICK REFERENCE DATA

The Premium Subminiature Type 6206 is a semi-remote cut-off pentode amplifier. It is designed for operation in the uhf region under conditions of severe shock, vibration, high temperature and high altitude. The tube is identical to Type 5899 except for an external suppressor grid connection. The Sylvania Type 6206 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
FEBRUARY 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Grid No. 3 Voltage MIL-E-1 Par. 3.2.2.1 Note 4	0 V
Plate Voltage	100 Vdc	Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1	0 V
Grid No. 1 Voltage	0 V	Cathode Resistor	120 Ohms
Grid No. 2 Voltage	100 Vdc		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7 4.10.8	(Method A) Heater Current: ALD = 12	—	—	144	150	156	—	mA
4.10.8	Heater Current:	0.65	140	—	—	—	160	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +100 Vdc:	—	—	—	—	—	5.0	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid Current: Ic1 Rg1 = 1.0 Meg	0.65	0	—	—	—	−0.3	μAdc
4.1.1.7 4.10.4.1	(Method A) Plate Current (1): ALD = 2.3	—	—	6.4	7.2	8.0	—	mAdc
4.10.4.1	Plate Current (1):	0.65	5.2	—	—	—	9.2	mAdc
4.10.4.3	Screen Grid Current: Ic2	0.65	1.0	—	—	—	3.0	mAdc
4.1.1.7 4.10.9	(Method A) Transconductance (1): ALD = 800 Sm	—	—	4200	4500	4800	—	μmhos
4.10.9	Transconductance (1): Sm	0.65	3800	—	—	—	5200	μmhos
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes:	2.5	—	—	—	—	—	
	g1-all	—	100	—	—	—	—	Meg
	p-all	—	100	—	—	—	—	Meg
4.10.9	Transconductance (2): M Sm Ef = 5.7 V M Ef	2.5	—	—	—	—	10	%
4.10.9	Transconductance (3): Sm Ec1 = −14 Vdc; Rk = 0 Ohms	2.5	1.0	—	25	—	75	μmhos
4.10.6.2	Grid Emission: Note 5 Ic1 Ef = 7.5 V; Ec1 = −14 Vdc; Rg1 = 1.0 Meg; Rk = 0 Ohms	2.5	0	—	—	—	−0.5	μAdc
4.10.3.2	AF Noise: Esig = 70 mVac; Ec2 = 19 Vdc; Rg1 = 0.1 Meg; Rg2 = 1000 Ohms; Rp = 0.2 Meg; Ck = 1000 μf	2.5	—	—	—	—	17	VU
4.10.10	Plate Resistance:	6.5	0.175	—	—	—	—	Meg
4.10.14	Capacitance:	6.5	—	—	—	—	—	
	0.405 In. Dia. Shield Cg1p	—	—	—	—	—	0.015	μμf
	0.405 In. Dia. Shield Cin	—	3.8	—	—	—	4.8	μμf
	0.405 In. Dia. Shield Cout	—	2.9	—	—	—	3.9	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 20 ±5 mm Hg.; Voltage = 300 Vac	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 2 (Continued)								
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
4.9.19.1	Vibration (2): F = 40 cps; G = 15; Rp = 10,000 Ohms; Ck = 1000 μf.....	2.5	—	—	—	—	60	mVac
4.9.19.1	White Noise: Note 6 Rp = 10,000 Ohms; Ck = 1000 μf;..... Peak Acceleration = 15 G.....	2.5 2.5	— —	— —	— —	— —	1000 150	mv pk-pk mVac
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:.....	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc; Rg1 = 0.1 Meg...	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max.....	6.5	—	—	—	—	—	
- - - -	Post Shock and Fatigue Test End Points: Vibration (2)..... Heater-Cathode Leakage Ehk = +100 Vdc..... Ehk = -100 Vdc..... Change in Transconductance (1) of Individual Tubes Δ_t Sm.....	— — — —	— — — —	— — — —	— — — —	— — — —	200 20 20 20	mVac μAdc μAdc %
4.9.6.3	Glass Strain:.....	6.5	—	—	—	—	—	

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec1 = Ec2 = Eb = Ec3 = O V.....	2.5	—	—	—	—	
4.11.3.1	Stability Life Test: (1 Hour) Ehk = +200 Vdc; Rg1 = 1.0 Meg; TA = Room.....	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes Δ_t Sm.....	—	—	—	—	10	%
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room...	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives)..... Transconductance (1) Sm.....	0.65 1.0	— —	— —	— 3350	— —	 μmhos
4.11.5 4.11.3.1	Intermittent Life Test: Note 3 Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply.....	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic: 1st Sample	Allowable Defectives per Characteristic: Combined Samples	Limits: Min.	Limits: Max.	Units
Acceptance Life Tests, Note 2 (Continued)							
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Grid Current Ic1	—	1	3	0	-0.8	μAdc
	Heater Current	—	2	5	138	164	mA
	Change in Transconductance (1) of						
	Individual Tubes $\triangle \frac{Sm}{t}$	—	1	3	—	20	%
	Transconductance (2) $\triangle \frac{Sm}{Ef}$	—	2	5	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	10	μAdc
	Ehk = -100 Vdc	—	—	—	—	10	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	g1-all	—	—	—	50	—	Meg
	p-all	—	—	—	50	—	Meg
	Transconductance (1) Average Change, Avg $\triangle \frac{Sm}{t}$	—	—	—	—	15	%
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3 Subminiature lead fatigue
4.9.20.5 Shock
4.9.20.6 Fatigue
4.11.7 Heater cycling life test
4.11.5 Intermittent life test

3: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

4: Types 5899 and 6206 are the same except for suppressor grid and cathode connections. Type 6206 has not been designed for control or gating purposes using the number 3 grid.

5: Prior to this test, tubes shall be preheated five (5) minutes at conditions indicated below. Test within three (3) seconds after preheating. Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission Test.

Ef	Ec1	Ec2	Ec3	Eb	Rk	Rg1
V	Vdc	Vdc	Vdc	Vdc	Ohms	Meg
7.5	0	100	0	100	120	1.0

6: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "White Noise" spectrum which is free from discontinuities from 100 cps to 5000 cps. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 G's rms acceleration. With this the case, the rms value of acceleration for any bandwidth within the specified spectrum is equal to

$$G\ rms = 2.3\ G \sqrt{3.32 \log_{10} (f2/f1)}$$

f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (0.25 megohm or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 40 db at 13,000 cps. For reading the peak to peak value of output voltage the filter output shall be fed directly to the input of a Ballantine Model 305 peak to peak electronic voltmeter or equal, while the rms value shall be measured with a Hewlett-Packard Model 400C or equal.

APPLICATION DATA

The 6206 is a Premium Subminiature, semi-remote cutoff pentode having an external suppressor grid connection. Electrically, the 6206 is otherwise identical to the 5899. This type is characterized by long life and stable performance under conditions of severe shock, vibration, high altitude and high temperature.

The 6206 is intended for use as an agc controlled rf and/or if amplifier at frequencies up to 400 mc, as well as many low frequency applications. As the frequency of operation is increased, consideration should be given to the resultant decrease in input and output resistance, Figure 1. Assuming matched input and output impedance, approximate tube gain can be obtained from the formula:

$$\text{Voltage Gain} = \frac{gm \sqrt{Rinput \times Routput}}{2}$$

where the values of Rinput and Routput are obtained from the curves of Figure 1. The use of this formula assumes matched impedances into and out of the ampli-

APPLICATION DATA (Continued)

fier stage under consideration. If the source impedance is lower than the input resistance or if the load resistance is higher than the output resistance, much greater voltage gain per stage can be obtained than that indicated by the above formula. The voltage gain of a matching circuit is equal to the square root of the impedance ratio.

In the use of agc at high frequencies it may be advantageous to place an unbypassed resistance in the cathode circuit to compensate for the change in input capacitance with bias. This unbypassed resistance reduces the effective gm of the tube by the factor

$$\frac{1}{1 + gm\ Rk\left(\frac{Ib + Ic2.}{Ib}\right)}$$

However, it also has the effect of raising the input resistance of the tube under certain operating conditions so that both a net increase in gain and a net decrease in input capacitance change may result. The 6206 is particularly well suited to such applications since the suppressor grid may be grounded directly, thus providing greater stability. It should be noted that the suppressor grid is not intended as a control electrode.

The self neutralization frequency of the 6206 is approximately 200 mc. At this point the inductance of the tube leads resonate with the grid plate capacitance to effect neutralization. At higher frequencies the feedback is inductive and takes place through the tube leads. Two cathode leads are provided to minimize this effect and permit isolation of the input and output circuits. The external suppressor grid connection also facilitates the possible employment of suppressor grid neutralization techiques*.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

The 6206 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

*"A Method of Neutralizing IF Amplifier Tubes at 44 Mc by Means of Suppressor Grid Reaction", Sylvania Engineering Information Service, Vol. 3, No. 1, April, 1956.

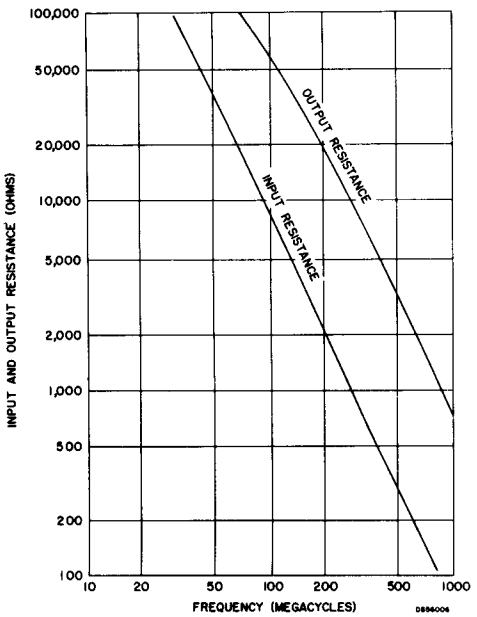
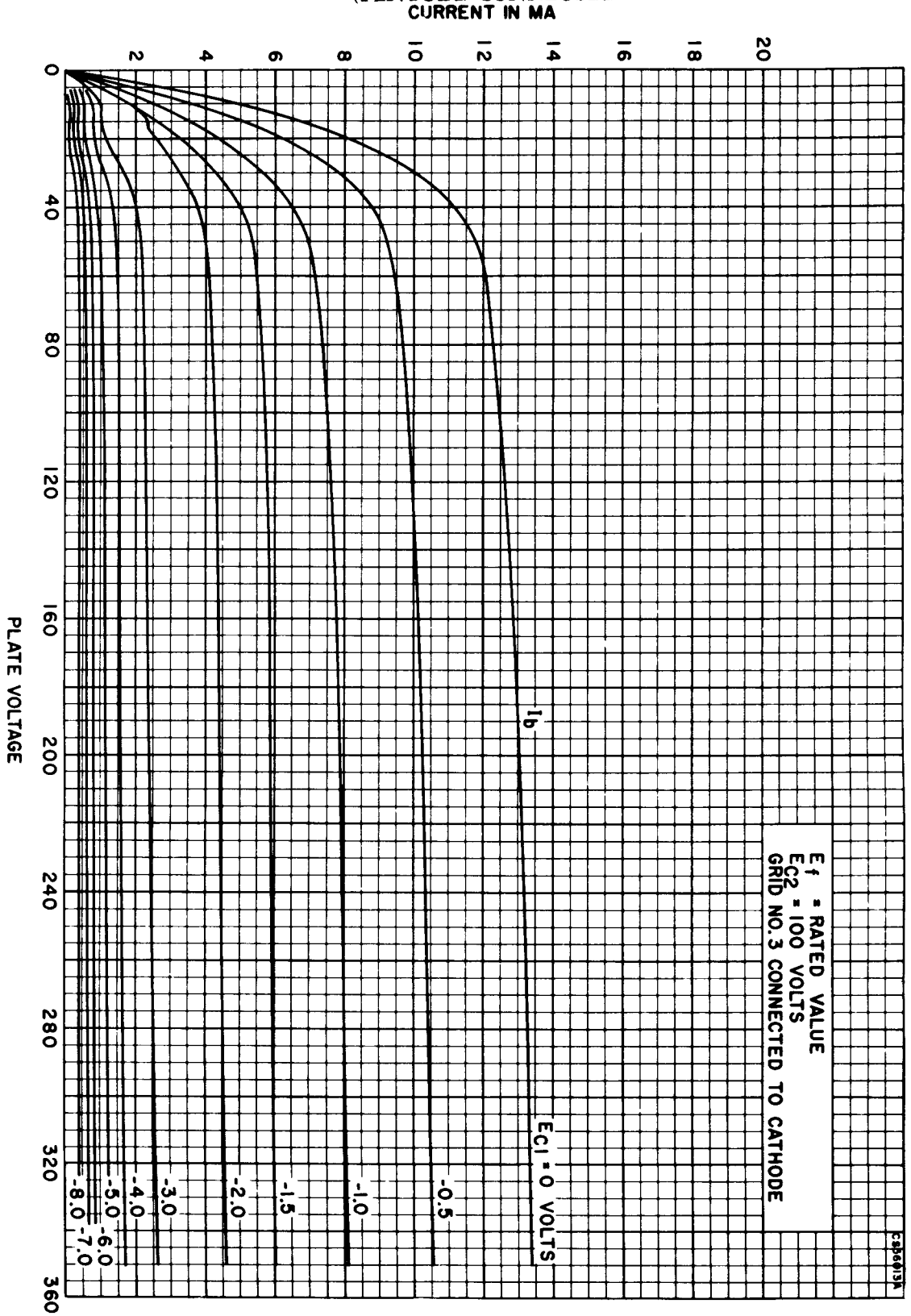


Figure 1—Input and output resistance vs frequency.

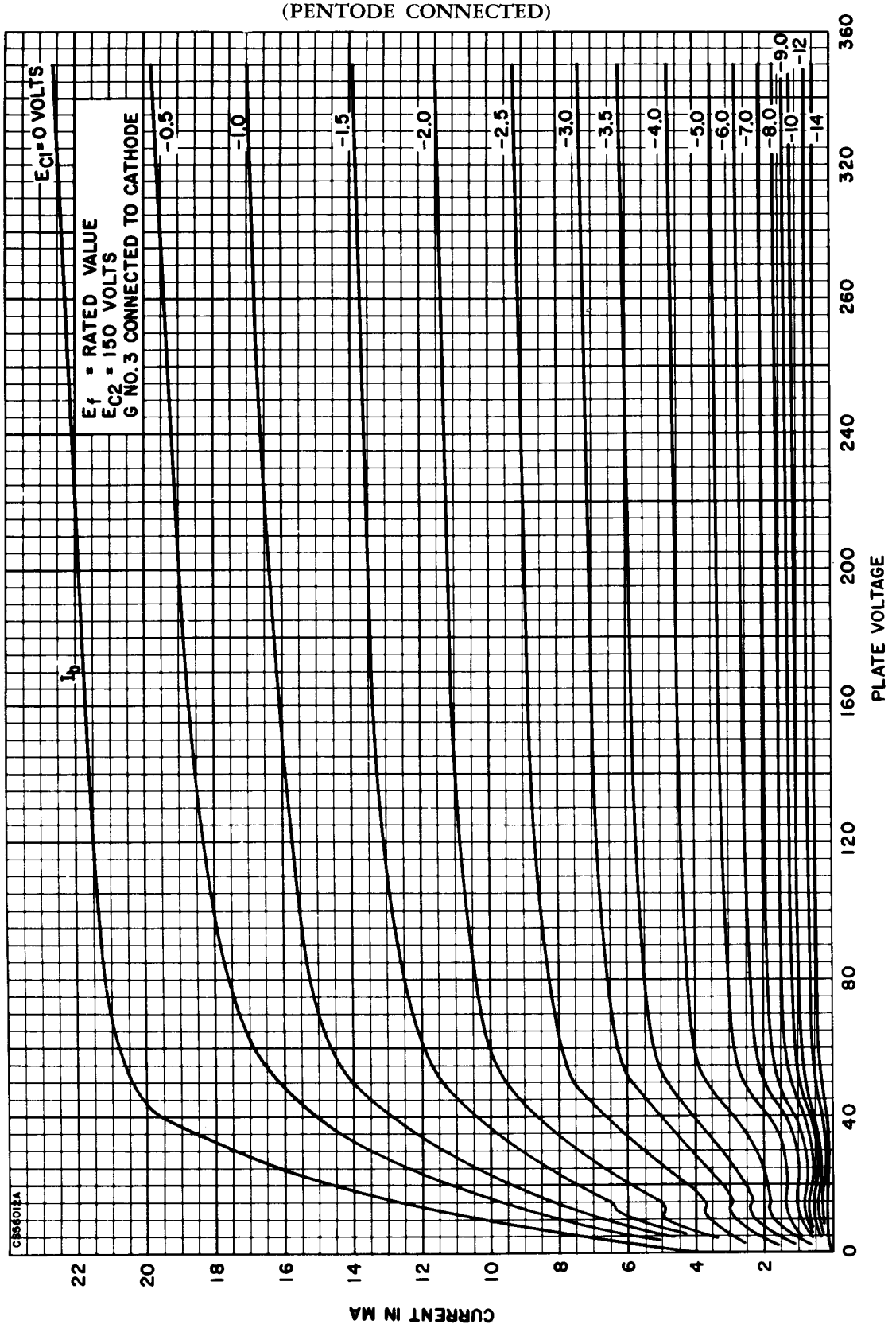
The information presented on this data sheet is furnished without assuming any obligation.

AVERAGE PLATE CHARACTERISTICS
(PENTODE CONNECTED)

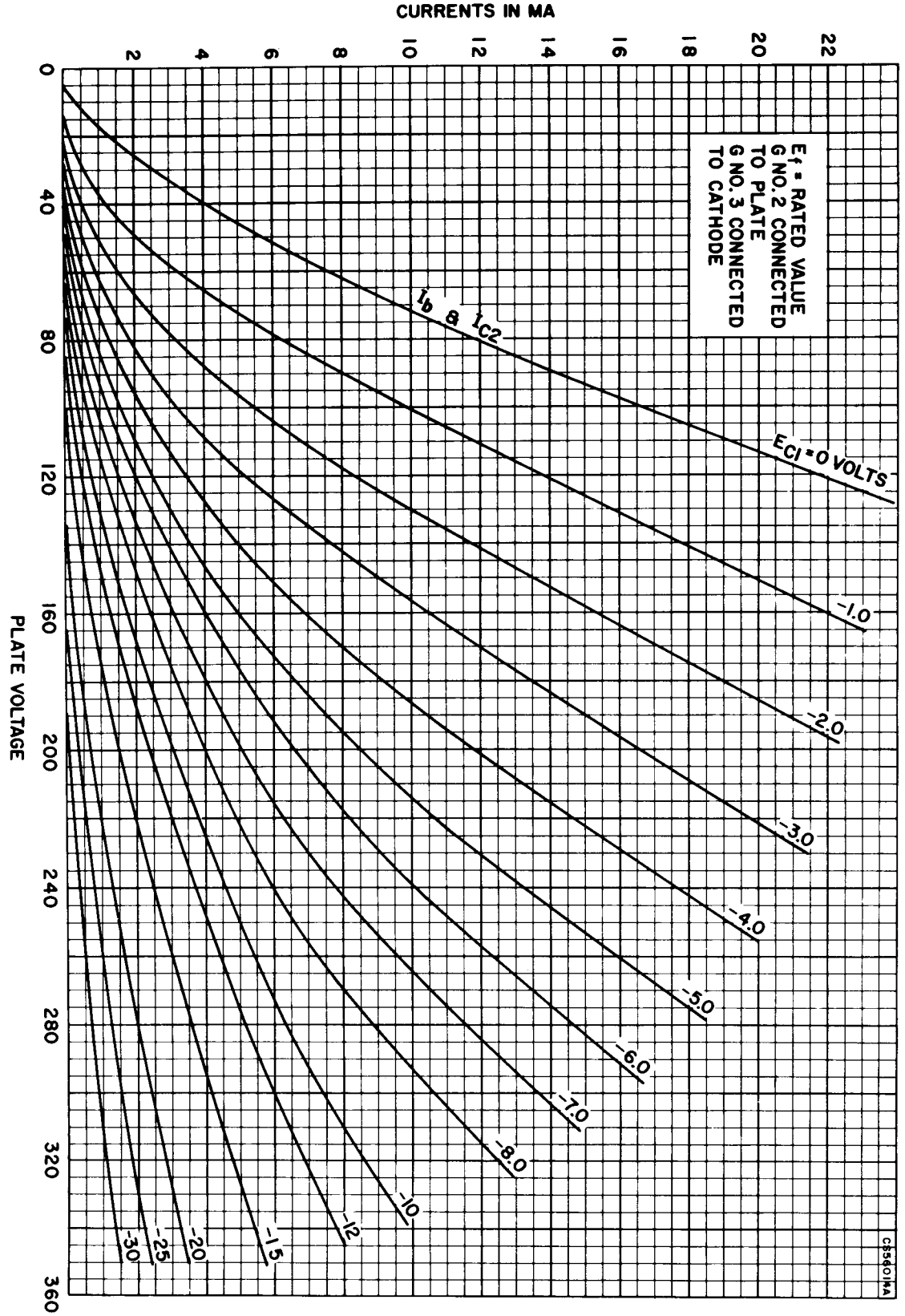


AVERAGE PLATE CHARACTERISTICS

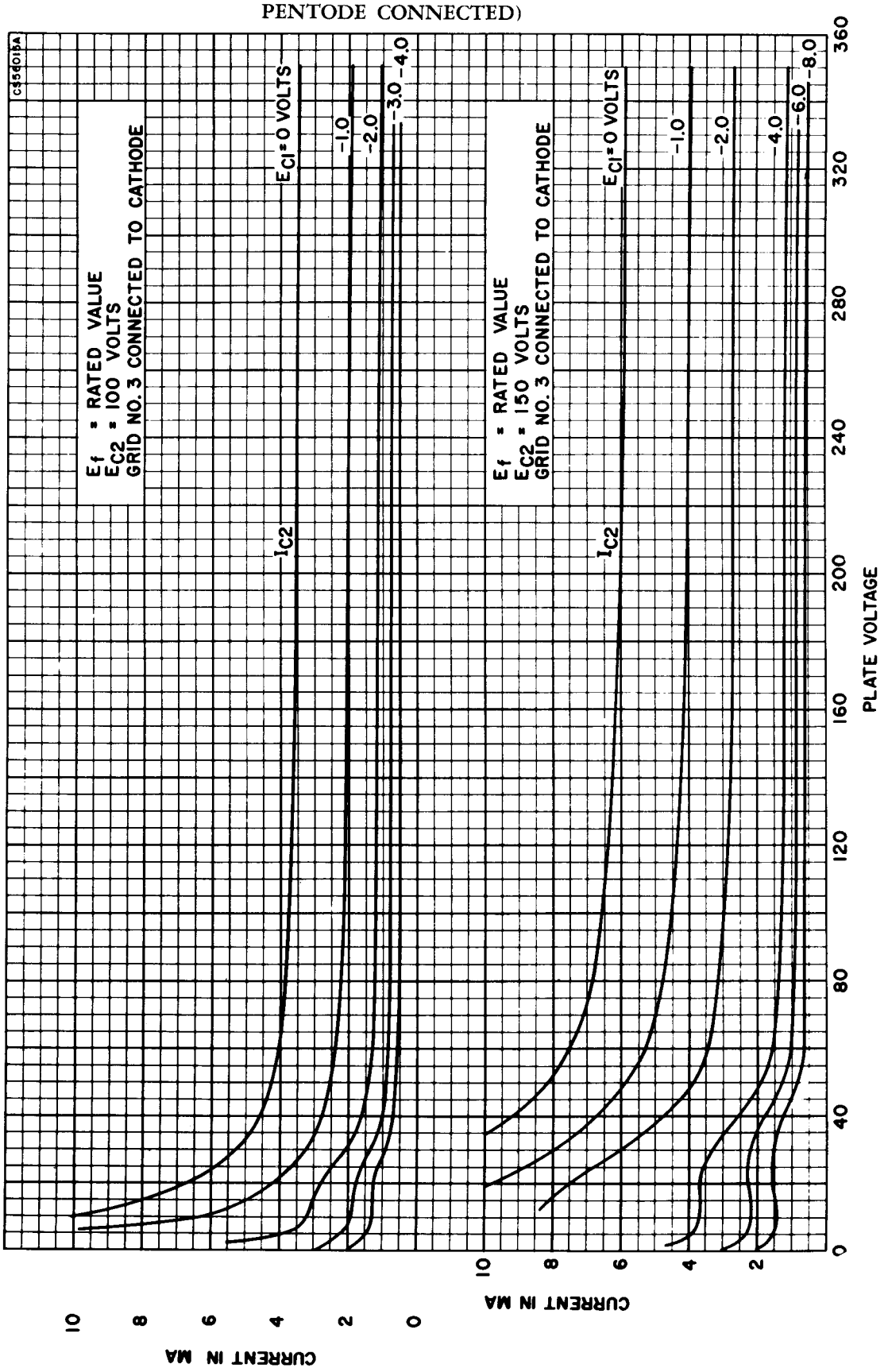
(PENTODE CONNECTED)



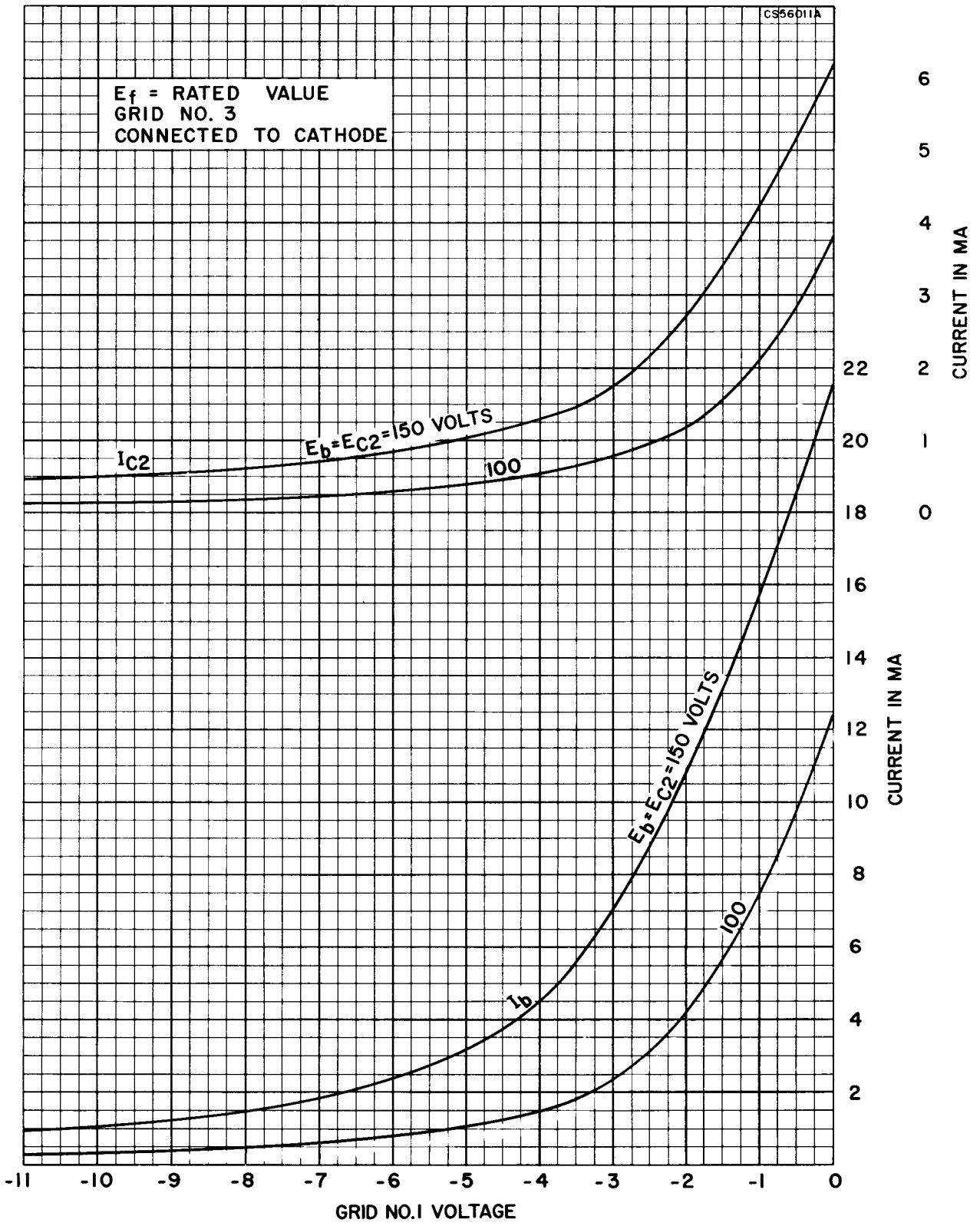
AVERAGE PLATE CHARACTERISTICS
(TRIODE CONNECTED)



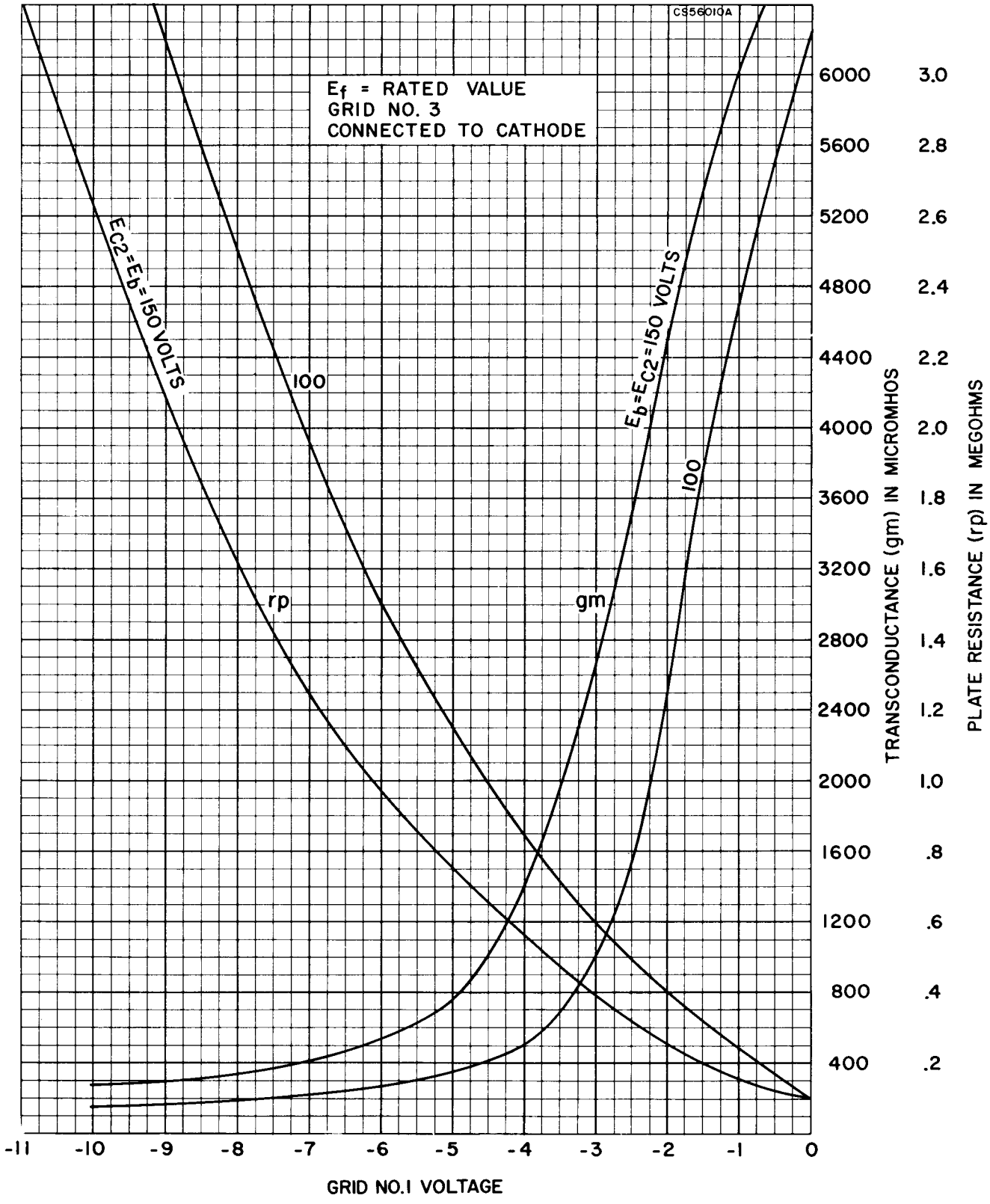
AVERAGE GRID No. 2 CHARACTERISTICS
PENTODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE CONNECTED)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE CONNECTED)



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MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9A
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (±5%)	6.3	12.6 Volts
Heater Current	300	150 Ma
Peak Heater Cathode Voltage		
Heater Positive with Respect to Cathode		90 Volts Max.
Heater Negative with Respect to Cathode		90 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate (Each Section)	2.22 μμf
Input (Each Section)	2.90 μμf
Output (Section 1)[1]	0.54 μμf
Output (Section 2)[1]	0.46 μμf
Plate to Plate	0.56 μμf
Grid to Grid	0.06 μμf Max.

RATINGS (Absolute Values — Each Section)

Plate Voltage	200 Volts Max.
Grid Voltage:	
Negative Bias Value	100 Volts Max.
Positive Bias Value	0 Volts Max.
Peak Negative Value	200 Volts Max.
Plate Dissipation	1.0 Watts Max.
Grid Input	0.1 Watt Max.
Cathode Current	14 Ma Max.
Grid Circuit Resistance	
Fixed Bias	0.1 Megohm Max.
Cathode Bias	0.5 Megohm Max.

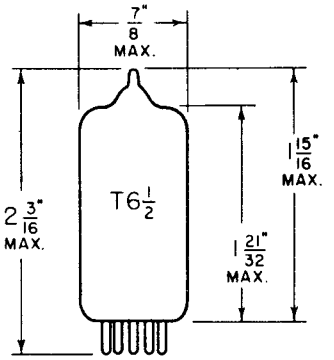
AVERAGE CHARACTERISTICS (Each Section)

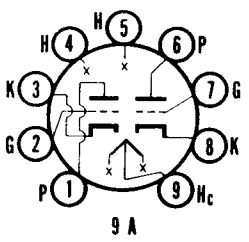
Class A Amplifier

Plate Voltage	100 Volts
Cathode Bias Resistor	470 Ohms
Plate Current	4.6 Ma
Plate Resistance, approx.	7500 Ohms
Transconductance	3600 μmhos
Amplification Factor	27

QUICK REFERENCE DATA

The Sylvania Type 6211 is a miniature, medium mu, twin triode designed for frequency divider circuits in electronic computors, and other "on-off" control applications involving long periods of operation under cutoff conditions.





9 A

SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

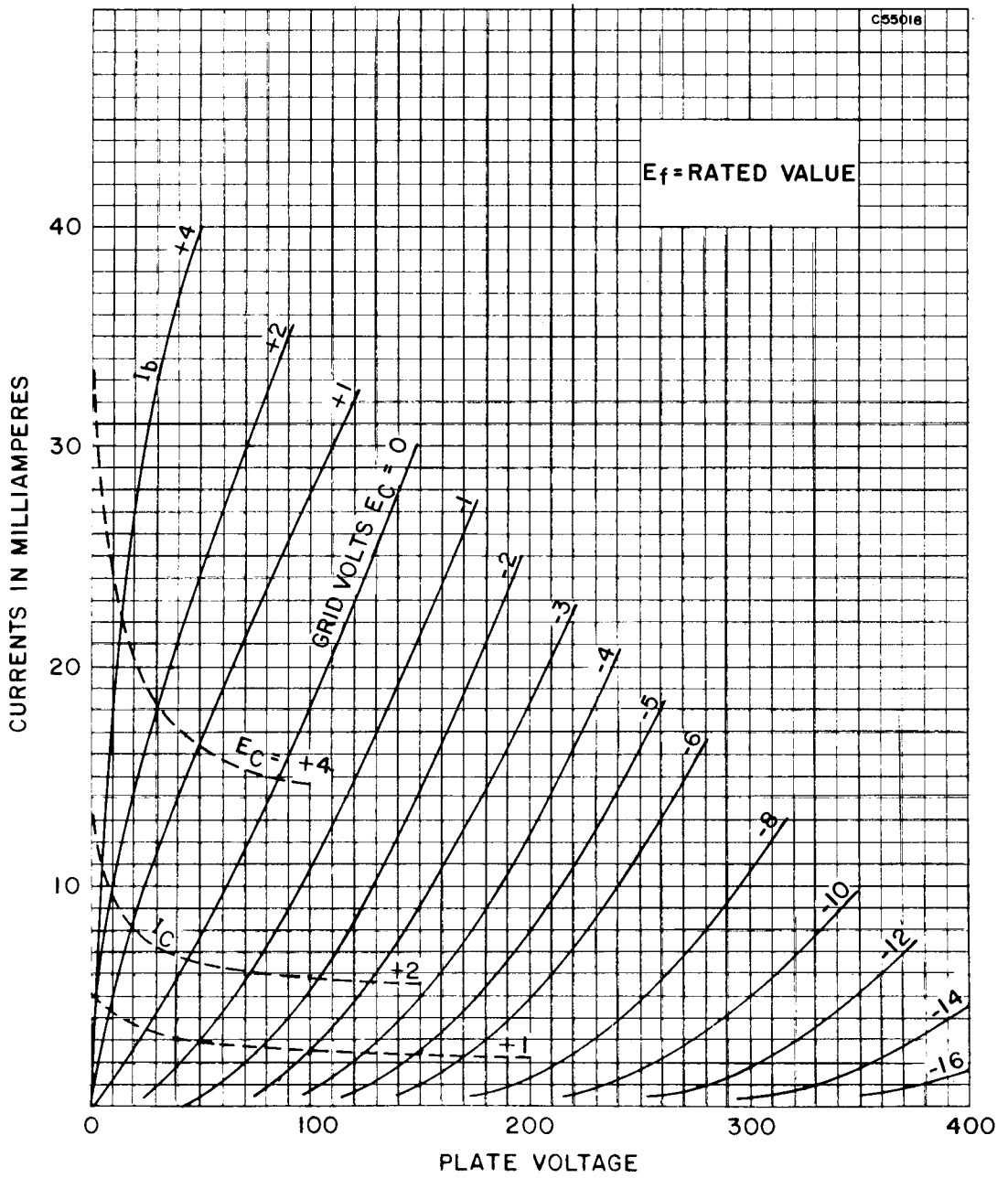
FEBRUARY, 1955

CHARACTERISTICS Cont'd	Min.	Max.
Reverse Grid Current [2,3] (Section in Parallel)		1.0 μa
Cutoff Conditions:		
Grid Bias Voltage for I_b = 100 μa [2,4]		-10 Volts
Difference in Grid Bias Voltage Between Sections		1.0 Volts
Zero Bias Conditions (Each Section):		
Plate Current [2,5]	4.8	5.5 Ma

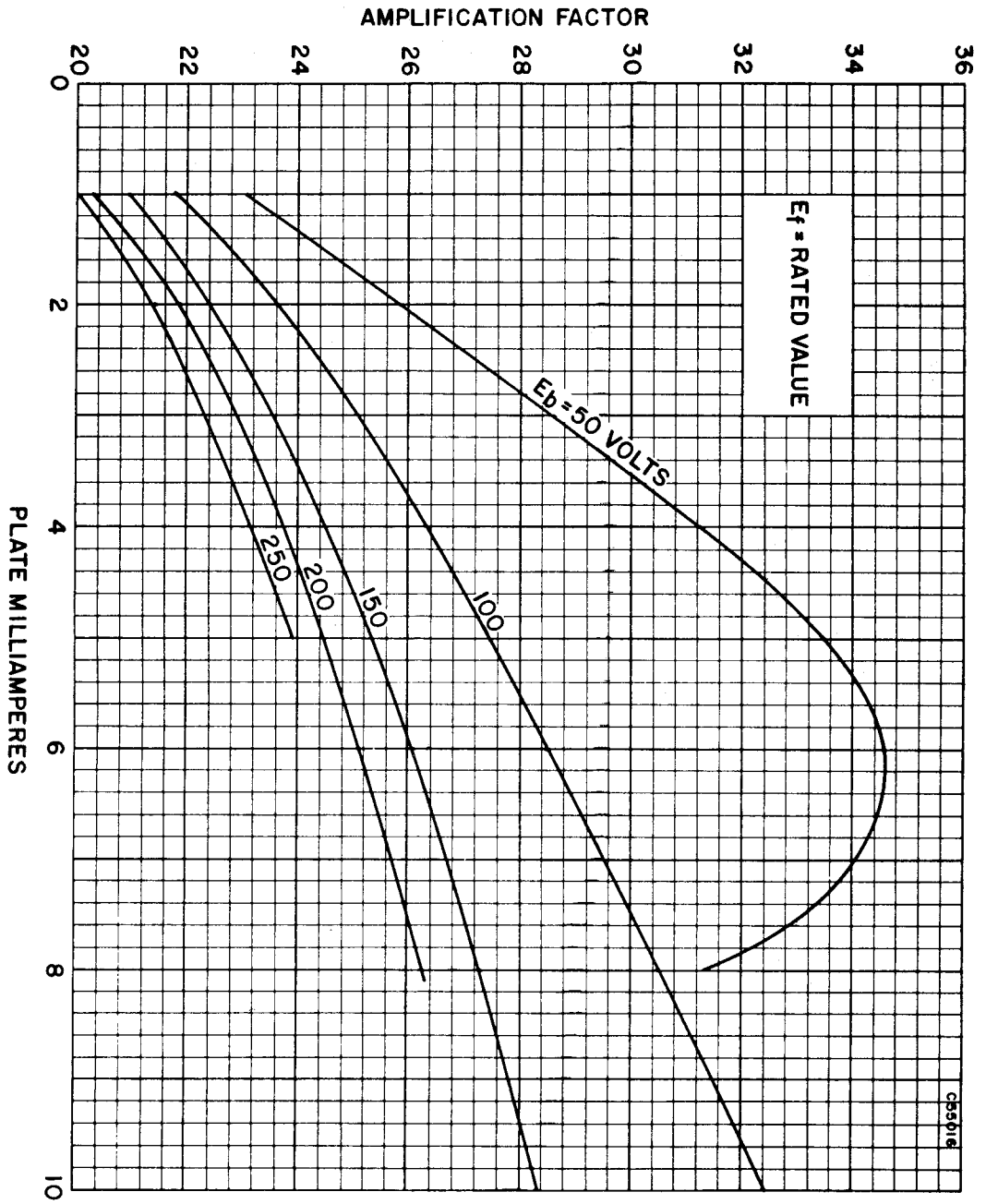
NOTES:

1. *Section 1 connects to Pins 6, 7 and 8. Section 2 connects to Pins 1, 2 and 3.*
2. *With 12.6 volts ac or dc on heater (series arrangement).*
3. *For conditions with plate supply volts = 150, cathode bias resistor (ohms) = 470, grid circuit resistance (megohm) = 0.5. Unit not under test biased to cutoff.*
4. *For conditions with plate supply volts = 150, grid supply voltage adjusted to give plate current of 100 microamperes, plate circuit resistance (ohms) = 20,000, and grid circuit resistance (ohms) = 47,000. Unit not under test biased to cutoff.*
5. *For conditions with plate supply volts = 150, plate circuit resistance (ohms) = 20,000, grid circuit resistance (ohms) = 47,000, and grid bias volts = 0. Unit not under test biased to cutoff.*

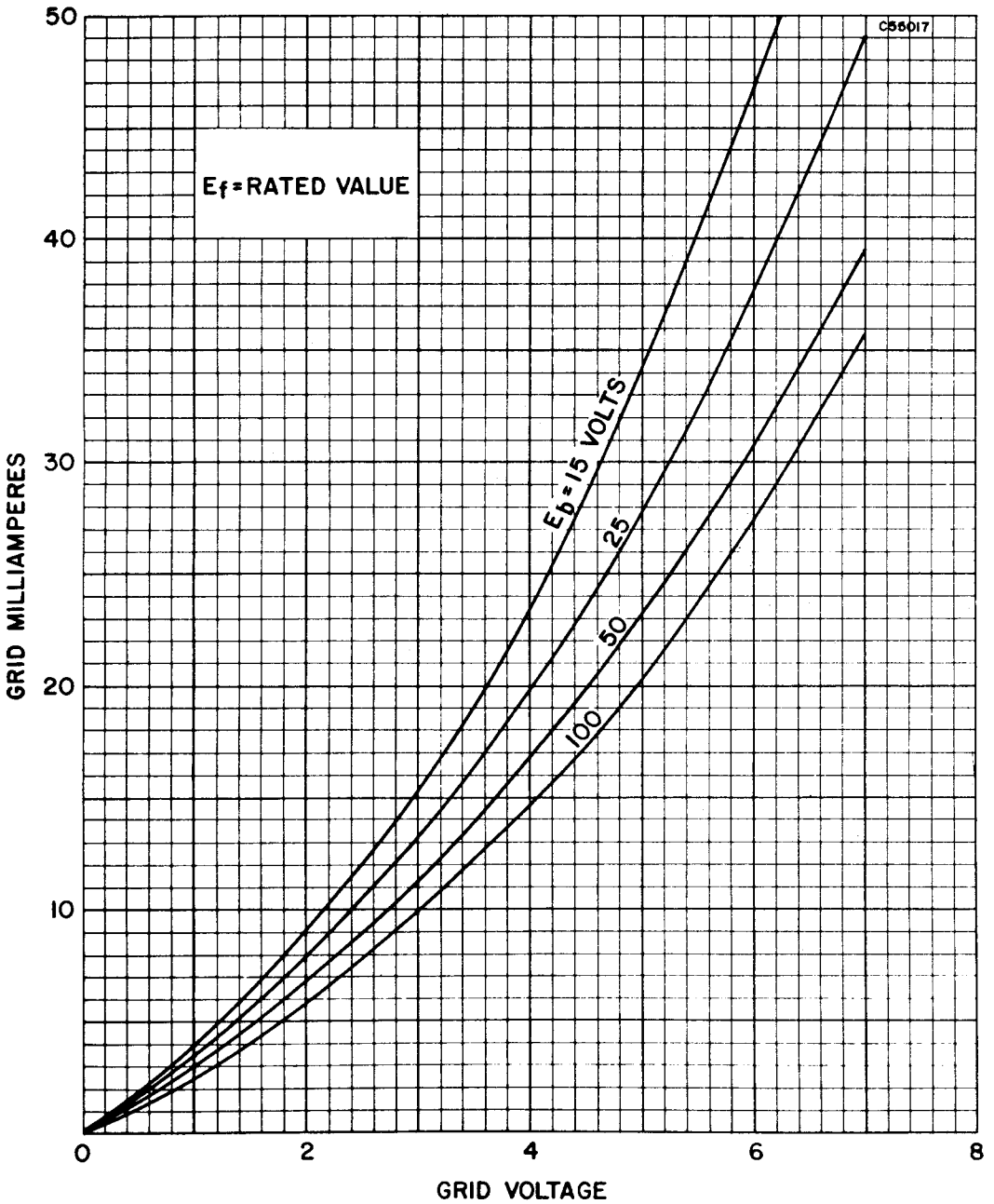
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



AVERAGE GRID CHARACTERISTICS



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MECHANICAL DATA

Ambient Temperature Range	−40 to +100	°C
Net Weight	0.13	Lb.
Mounting Position	Any	

ELECTRICAL DATA

Frequency			
Low Level	9375	mc	
High Level	9310	mc	
Transmitter Peak Power	4	KW	Min.
Tuning Susceptance (B/Yo)	±0.06		
Equivalent Conductance (G/Yo)	0.1		Max.
Arc Loss	0.8	db	Max.

APPLICATION DATA

The Sylvania Type 6214 is an instant firing ATR which has been developed to meet the special requirements of Beacon Radar systems. Conventional ATR tubes often fail to ionize immediately when the transmitter begins operation, and thus prevent proper transmission for a period of time. Since Beacon systems transmit at relatively low power and are often received at maximum range, this delayed ATR action can seriously impair the efficiency of the system. This is particularly true because Beacon transmissions often consist of coded groups which, partially lost, may be misinterpreted.

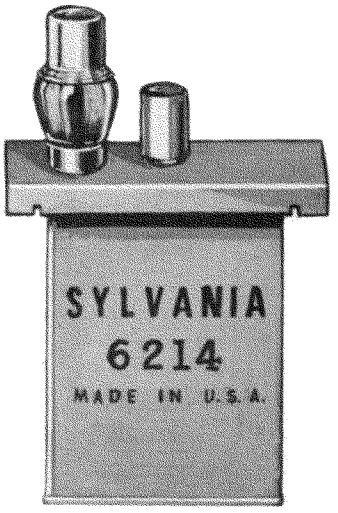
The Sylvania Type 6214 is designed to be mounted on the short side of the wave guide, i.e., shunt position. To achieve the instant starting effect, an exposed ignitor electrode has been added on the end plate of the tube. An ignitor supply is therefore required, which may be taken from the supply for the TR ignitor. This supply should be rated at −650 volts to provide for the nominal voltage drop of −300 volts d c and 100 micro-amp current drain of the 6214.

In a typical system, the Sylvania 6214 behaves as an instantaneous switching device. A series of coded pulses will ionize the tube and the resulting short across the window permits the transmitter power to travel unimpeded to the antenna. A returning echo is sufficiently weak to prevent the ATR from firing and all the energy of the signal is channeled to the receiver.

QUICK REFERENCE DATA

The Sylvania Type 6214 is an instant firing ATR which has been developed to meet the special requirements of Beacon Radar systems. The 6214 is designed to be mounted on the short side of the wave guide, i.e., shunt position.

In a typical system, the Sylvania 6214 behaves as an instantaneous switching device.



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6214

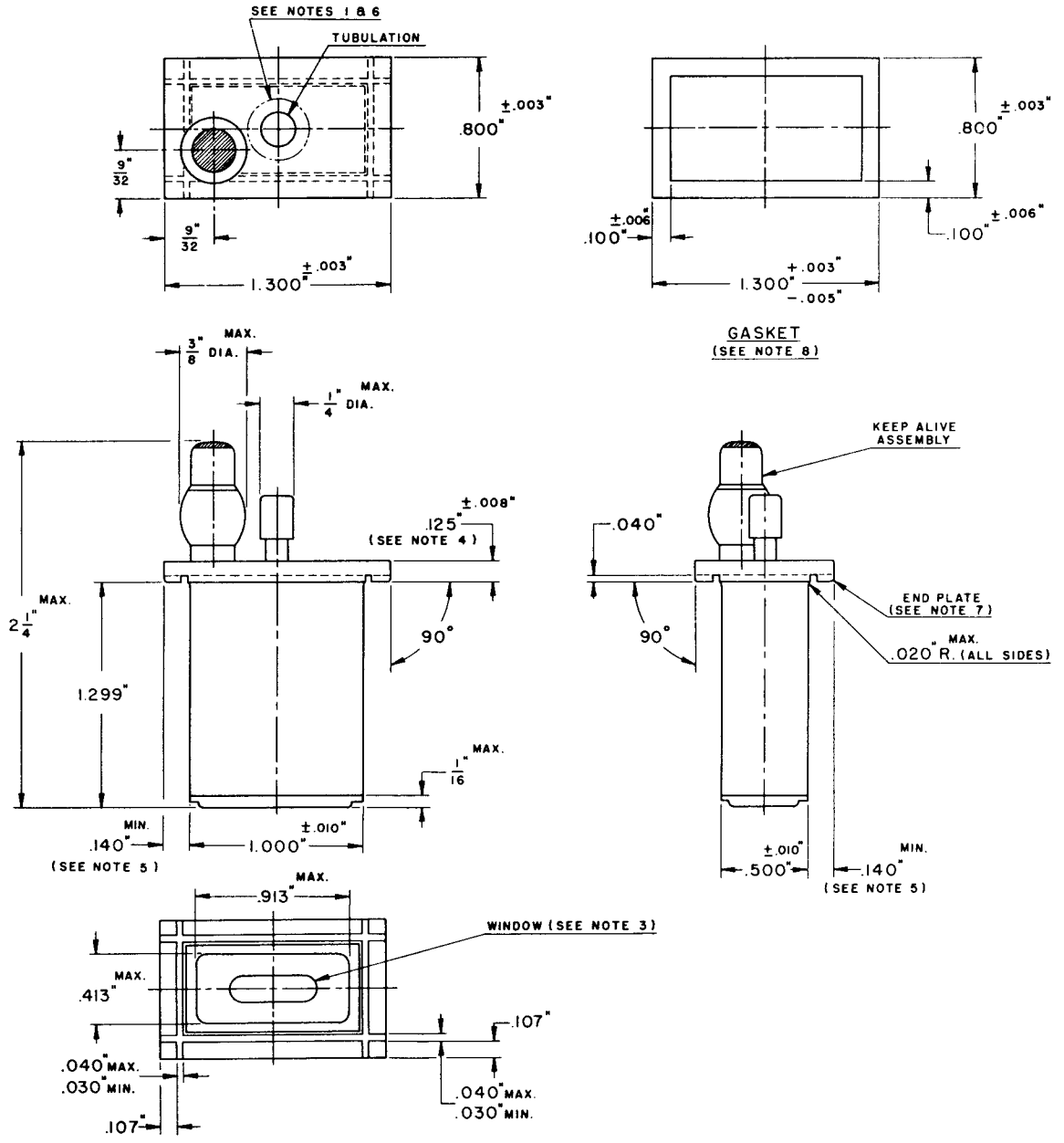


DIAGRAM NOTES:

1. *The tubulation shall fall within a circle 3/8 dia. max. located from the center lines of the flange.*
2. *Tube to be silver plated.*
3. *Center lines of window shall coincide with corresponding center lines of box within 0.015 measure in plane of window.*
4. *Bottom face shall be flat to within .003 for its entire length.*
5. *Applies at all edges of bottom face only.*
6. *Spread of solder to be held within 3/8 dia. area.*
7. *Bottom edge of plate to have a maximum radius of .020.*
8. *Two gaskets of .0030 ± .0005 thick soft-tempered sheet nickel or copper supplied with tube but not mounted.*

MECHANICAL DATA

Ambient Temperature Range	−40 to +100°C
Mounting Position	Any, RG51/U Input, RG52/U Output Waveguide

ELECTRICAL DATA

FREQUENCY RANGE 8490 to 9578 Mc

VSWR

8490 and 9578 Mc	1.9 Max.
8565 to 9487 Mc	1.4 Max.

IGNITOR CHARACTERISTICS

Open Circuit Voltage	−650 Volts dc
Current	100 μa dc
Voltage Drop	200 to 375 Volts dc

LOW POWER LEVEL UNFIRED CHARACTERISTICS

Insertion Loss	.7 db Max.
Ignitor Interaction	.2 db Max.

HIGH POWER LEVEL FIRED CHARACTERISTICS

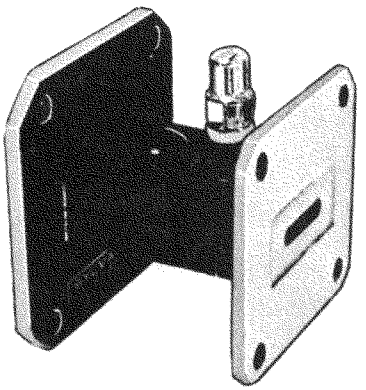
Flat Leakage Power (40 Kw)	40 Mw Max.
Spike Leakage Energy	.2 erg Max.
Recovery Time (40 Kw)	4 μsec. Max. at −3 db
Recovery Time (200 Kw)	10 μsec. Max. at −3 db
Arc Loss (4 Kw)	.8 db Max.
Position of VSW Minimum (40 Kw)	.045 ± .007 Inches

APPLICATION DATA

The Sylvania Type 6232 is a broad-band fixed tuned TR tube similar in electrical characteristics to the Sylvania Types 1B63A and 1B63B but not mechanically interchangeable. In order to effect higher power capacity and better pressurizing without breakdown, the type 6232 is designed for use between RG51/U input and RG52/U output waveguide.

QUICK REFERENCE DATA

The Sylvania Type 6232 is a broad-band, fixed tuned TR tube designed for 8490 to 9578 Mc operation. Mounting flanges are designed to accommodate RG51/U input and RG52/U output waveguide.



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OUTLINE DRAWING

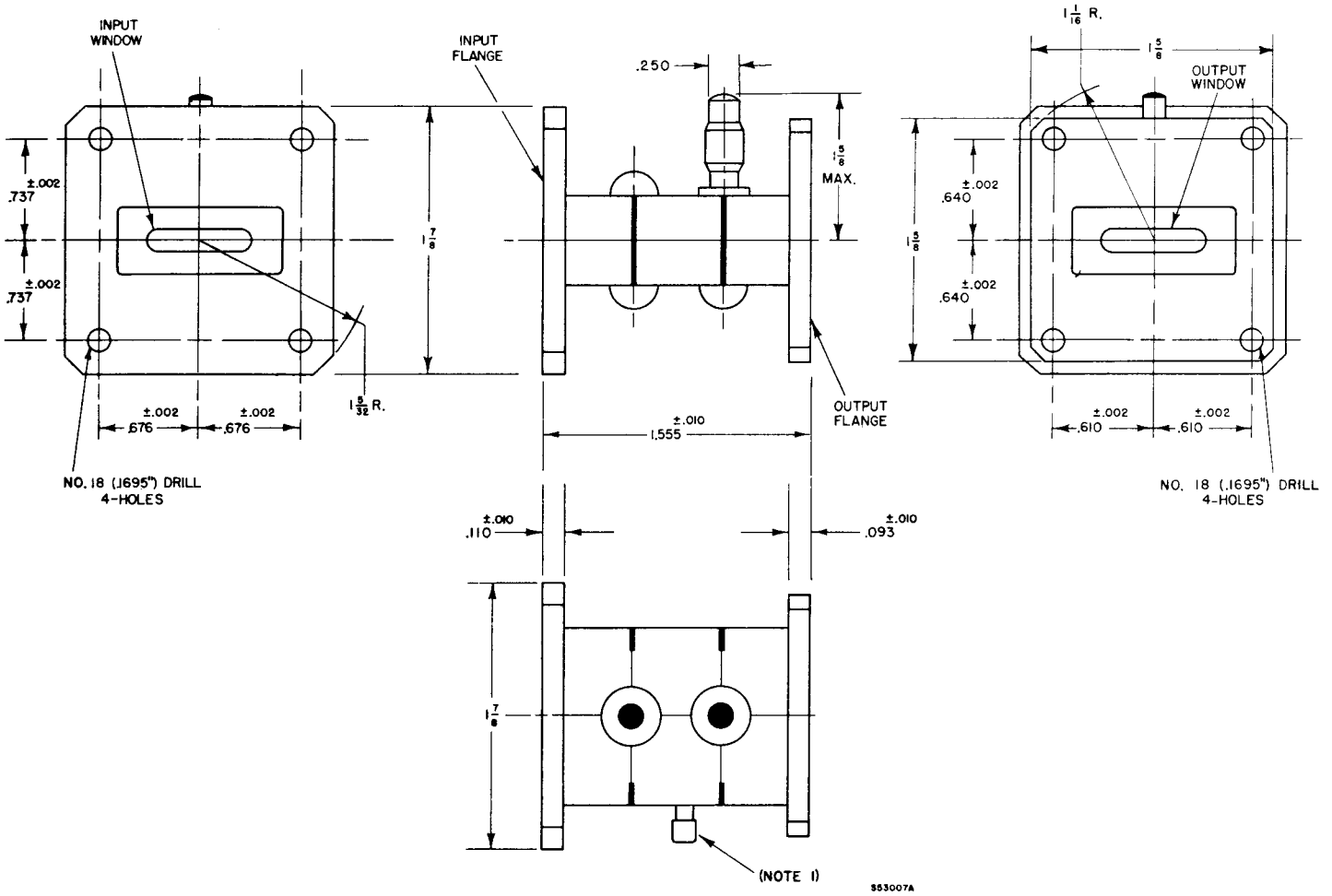

DIAGRAM NOTES:

1. Exhaust tube must not extend beyond the input flange more than ¼ inch.

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TYPE 6287

JETEC Registration Data

PENTODE

The Type 6287 is a miniature audio beam-power pentode characterized by long life and stable performance. It is suitable for service where severe conditions of mechanical shock and vibration are encountered.

MECHANICAL DATA

GENERAL

Style	miniature
Cathode	coated unipotential
Bulb	T-6 1/2
Base	E9-1, miniature button 9 pin
Basing	9CT

Connections:

Pin 1 - cathode	Pin 6 - plate
Pin 2 - grid #2	Pin 7 - grid #2
Pin 3 - plate	Pin 8 - grid #1
Pin 4 - heater	Pin 9 - plate
Pin 5 - heater	

Outline	5-4
Maximum Diameter	0.875 inch
Maximum Overall Bulb Length	2.470 inches
Mounting Position	any

RATINGS(1)

Maximum Impact Acceleration(2)	450 g
Maximum Uniform Acceleration(3)	1,000 g
Maximum Vibrational Acceleration for Extended Periods(4)	2.5 g
Maximum Bulb Temperature	300 °C

ELECTRICAL DATA

GENERAL

Heater Voltage (ac or dc)	6.3 volts
Heater Current	600 ma

Life Expectancy:

200 °C Ambient Temperature	1,000 hours
30 °C Ambient Temperature	5,000 hours

Direct Interelectrode Capacitances:

Grid #1 to Plate(max.)	1.1 μμf
Input	8.0 μμf
Output	9.0 μμf

RATINGS(1)-Absolute Values

Heater Voltage(ac or dc)(5)	6.3(±5%) volts
Maximum Plate Voltage (dc)	275 volts
Maximum Grid #2 Voltage (dc)	275 volts
Maximum Plate Dissipation	13.2 watts
Maximum Grid #2 Dissipation	3.2 watts
Maximum Cathode Current	85 ma
Maximum Negative Grid #1 Voltage	110 volts
Maximum Heater-Cathode Voltage	±200 volts

CHARACTERISTICS

Conditions:

Heater Voltage (ac or dc)	6.3 volts
Plate Voltage (dc)	250 volts
Grid #2 Voltage (dc)	250 volts
Grid #1 Voltage (dc)	-12.5 volts
Plate Current	46 ma
Grid #2 Current	5.0 ma
Transconductance	4,100 μmhos
Plate Resistance	55,000 ohms
Grid #1 Voltage for 10 μa Plate Current	-60 volts
Noise Output Voltage(6), maximum	300 mv

TYPICAL OPERATION

Audio Amplifier

Heater Voltage	6.3 volts
Plate Voltage (dc)	250 volts
Grid #2 Voltage (dc)	250 volts
Grid #1 Voltage (dc)	-12.5 volts
Plate Load Resistor	6,000 ohms
Grid #1 Signal Voltage (ac)	8.8 volts
Plate Current	48 ma
Grid #2 Current	10.5 ma
Power Output	4.5 watts
Total Harmonic Distortion	9.0 %

from RTMA release #1203, June 12, 1953

(See page 2 for Notes)

Notes

(1) Limitations beyond which normal tube performance and tube life may be impaired.

(2) Forces in any direction as applied by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices, or equivalent.

(3) Forces in any direction applied gradually, as in centrifuge.

(4) Vibrational forces in any direction at 60 cycles per second for a period exceeding 100 hours.

(5) Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts.

(6) Across plate resistor of 2,000 ohms, with applied vibrational acceleration of 2.5 g at 25 cycles per second.

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6308

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button, Flexible Leads
Outline	3-1
Basing	8EX
Cathode	Cold
Mounting Position	Any

RATINGS

Impact Acceleration[1]	450 g Max.
Fatigue (Vibrational Acceleration For Extended Periods)[2]	2.5 g Max.
Bulb Temperature (Absolute Max.)	+160° C
	−55° C

ELECTRICAL DATA

RATINGS (Absolute Values)

Minimum, Ambient Light, Starting Voltage	115 Volts
Minimum Ionization Voltage in Total Darkness[3]	140 Volts
Maximum DC Operating Current	3.5 Ma
Minimum DC Operating Current	1.5 Ma
Maximum Shunting Capacitance	0.02 μμf

CHARACTERISTICS

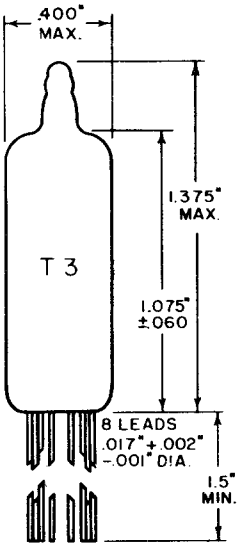
DC Operating Voltage[4]	87 Volts
Maximum Regulation	3 Volts
Drift[5]	200 Mv
Stability[6]	5 Mv
Repeatability[7]	150 Mv
Voltage Jump[8]	50 Mv
Maximum Average Temperature Coefficient of DC Operating Voltage	
−20° C to +25° C Ambient	−15 Mv/°C
+25° C to 60° C Ambient	−5 Mv/°C
Noise Output Voltage, Maximum[9]	50 Mv AC
Life Expectancy, 150° C Ambient Temperature	1000 Hours

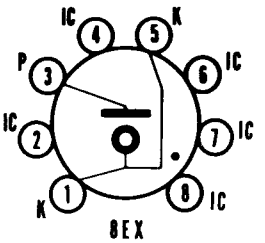
NOTES:

1. *Forces in any direction as applied by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices, or equivalent.*
2. *Vibrational forces in any direction at 60 cycles per second for a period exceeding 100 hours.*
3. *Test conducted in total darkness after tubes have been held in darkness for 24 hours.*
4. *The anode voltage drop may range from tube to tube between 82 and 92 volts.*
5. *The maximum operating voltage change, at any specific value of current within the operating range, during one hour of operation.*
6. *The maximum operating voltage fluctuation having a frequency of 10 cycles per second or greater, at any specific value of current within the operating range.*
7. *The maximum shift in operating voltage between successive firings of the tube.*
8. *The maximum sudden jump in operating voltage when operating current is varied slowly over the specified operating range.*
9. *Across plate resistor of 10,000 ohms, with applied vibrational acceleration of 2.5 g at 25 cycles per second.*
10. *Do not use pins marked "IC" as circuit tie points. Any connection to these leads may cause erratic tube performance.*

QUICK REFERENCE DATA

The Sylvania Type 6308 is a subminiature, gas filled cold cathode, glow discharge diode intended for use as a voltage reference tube in electronically regulated power supplies. The 6308 is designed for operation under conditions of severe shock, vibration and high temperature.





(Note 10)

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MARCH 1954

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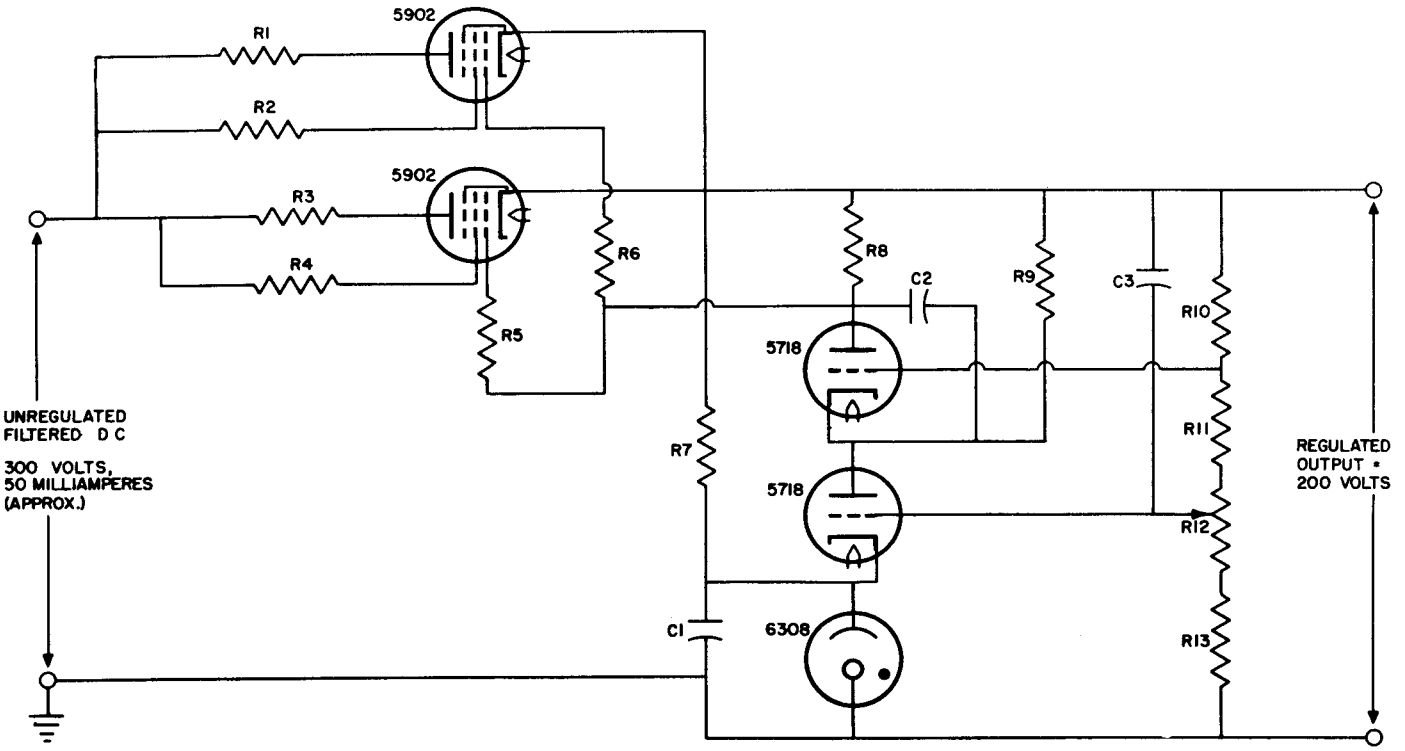
6308

APPLICATION DATA

The Sylvania Type 6308 is a subminiature, cold cathode, gas filled, glow discharge tube designed for service as a voltage reference tube in electronically regulated power supplies. It has an operating current range of 1.5 to 3.5 Ma over which a substantially constant operating voltage of 87 volts is maintained. The maximum sudden voltage jump is limited to 50 Mv when the tube is operated within the specified operating range. Two cathode leads are provided which may be used to disconnect the load when the tube is removed from its socket. The flexible leads may be soldered directly to the circuit components without the use of a socket.

The Sylvania Type 6308 features long life and stable performance and is designed for service under conditions of severe shock and vibration.

TYPICAL OPERATING CIRCUIT FOR THE TYPE 6308



R_1 = 200 Ohms
R_2 = 500 Ohms
R_3 = 200 Ohms
R_4 = 500 Ohms
R_5 = 200 Ohms
R_6 = 200 Ohms

R_7 = 50,000 Ohms
R_8 = 490,000 Ohms
R_9 = 200,000 Ohms
R_{10} = 200,000 Ohms
R_{11} = 150,000 Ohms
R_{12} = 50,000 Ohm, 1 Watt, Pot.

R_{13} = 250,000 Ohms
C_1 = 0.01 μf, 200 V
C_2 = 510 μμf, 500 V
C_3 = 0.05 μf, 200 V

All resistors are 0.5 watt, except the potentiometer.

The information presented on this data sheet is furnished without assuming any obligation.

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6334

MECHANICAL DATA

Ambient Temperature Range (Non-Operating) . . . . -40 to +100° C
Mounting Position . . . . . Any
(Use 3 db Short Slot Hybrid Couplers)

ELECTRICAL DATA

FREQUENCY RANGE 8490-9578 Mc

VSWR Presented to Antenna[1]
- 8490 Mc . . . . . 1.4 Max.
- 8655-9487 Mc . . . . . 1.2 Max.
- 9578 Mc . . . . . 1.4 Max.

VSWR Presented to Transmitter[2]
- 8490-9578 Mc . . . . . 1.2 Max.
  (po = 40 kw, Pulse Width = 1.0 μsec, prr = 1000 pps)

IGNITOR CHARACTERISTICS

Open Circuit Voltage	-700 Volts dc
Current	100 μa dc
Voltage Drop (Each Ignitor)	-200 to -375 Volts dc
Ignition Time (Each Ignitor)	5 Sec. Max.

LOW POWER LEVEL UNFIRED CHARACTERISTICS

Duplexer Loss[3] (I_i = 100 μa)

8490 Mc	1.0 db Max.
8565 Mc	0.9 db Max.
9000 Mc	0.9 db Max.
9487 Mc	0.9 db Max.
9578 Mc	1.0 db Max.

HIGH POWER LEVEL FIRED CHARACTERISTICS

Flat Leakage Power (40 KW)	20 mw Max.
Spike Leakage Energy (40 KW)	.1 erg Max.
Recovery Time (200 KW)	7 μsec Max.
Recovery Time (100 KW)	5 μsec Max.
Arc Loss[4] (4 KW)	0.8 db Max.

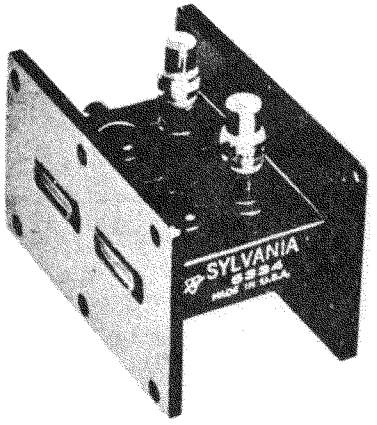
NOTES:

1. *The tube is mounted in a short slot hybrid duplexer with matched loads on the receiver, dummy load and transmitter arms. The VSWR looking into the antenna arm shall be less than the values specified.*
2. *With the circuit of Note 1, and with a high power load whose VSWR is less than 1.05 on the antenna arm, the VSWR in the magnetron arm shall be less than the value specified.*
3. *The tube is mounted on a short slot hybrid duplexer with a matched load on the dummy load arm. The movable short on the magnetron arm is shifted through all phases.*
4. *With the tube mounted as in Note 1, and with a high power load whose VSWR is less than 1.10 on the antenna arm, the power loss in the arc shall be within the limits specified.*

The above tests shall be conducted with the 6334 mounted between two short slot hybrid couplers. The VSWR of the hybrids shall not exceed 1.10 from 8490 to 9578 megacycles. Each hybrid shall split the power evenly within 0.25 db.

QUICK REFERENCE DATA

The Sylvania Type 6334 is a dual band pass TR tube consisting essentially of two Type 1B63A's with a common gas fill and joined by a common waveguide side wall. The 6334 covers a frequency range of 8500-9600 Mc.



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10-54-82

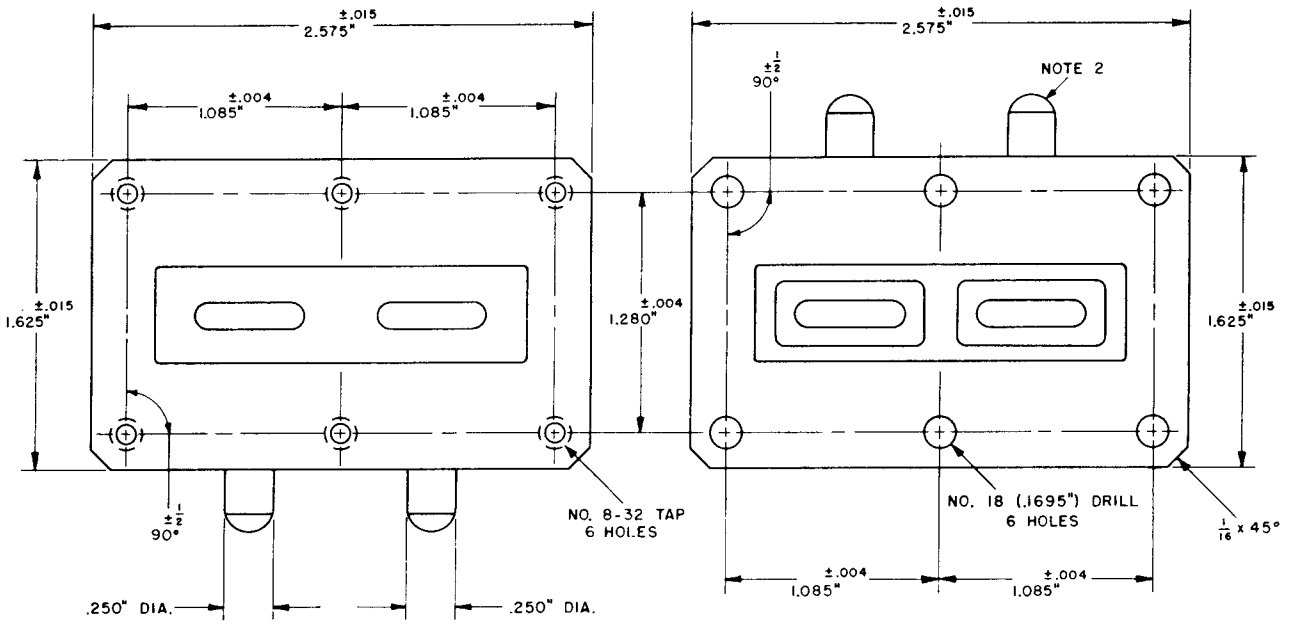
APPLICATION DATA

The Sylvania Type 6334 when used in conjunction with two short slot hybrid couplers comprises a complete X-band balanced duplexer with up to 12 percent bandwidth.

Such a balanced duplexer offers a number of advantages:

1. Simplicity of system design
2. Compactness
3. Excellent electrical performance
    a. Low insertion loss and minimum losses in matched load and magnetron arm
    b. Reliable crystal protection during transmission
    c. Requires no ATR and thus prevents reflection of high impedance to the magnetron with attendant possibility or arcing and misfiring.

OUTLINE DRAWING



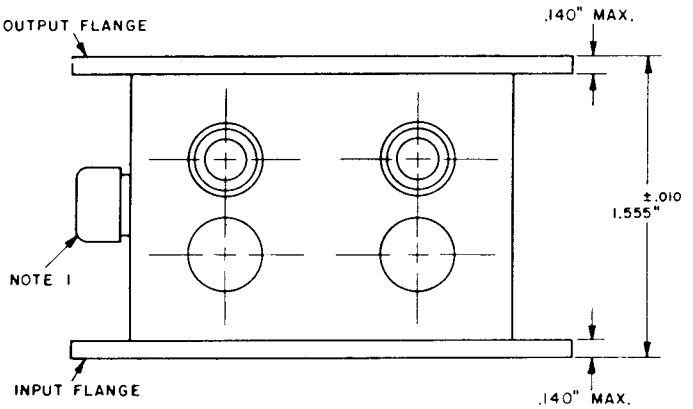


DIAGRAM NOTES

1. *Exhaust tube must not extend beyond flanges more than 1/4 inch.*
2. *Ignitor terminals must not extend beyond flanges more than 7/16 inch.*

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6350

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button, 9 Pin
Basing	9CZ
Cathode	Coated Unipotential
Mounting Position	
Preferred	Upright or with Plate Majors in Vertical Position
Permissible	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage, ±5% (Series/Parallel)	12.6/6.3 Volts
Heater Current (Series/Parallel)	300/600 Ma
Heater Power (Series/Parallel)	3.8/3.8 Watts
Heater Cathode Voltage	
Heater Negative with Respect to Cathode:	
Total DC and Peak	200 Volts Max.
Heater Positive with Respect to Cathode:[1]	
DC	100 Volts Max.
Total DC and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Each Section)

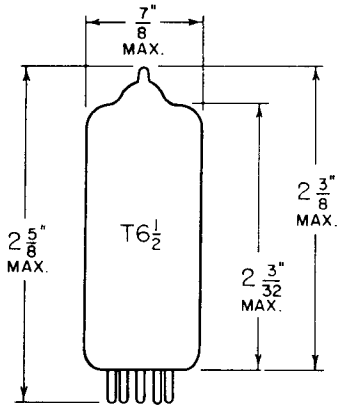
Grid to Plate	3.2 μμf
Input	3.6 μμf
Output	0.6 μμf
Grid to Grid	0.042 μμf Max.
Plate to Plate	1.0 μμf Max.
Heater to Cathode	4.6 μμf

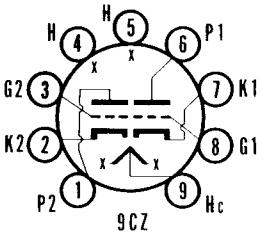
RATINGS (Design Center Values — Except as Noted)

Plate Voltage	300 Volts	Max.
Peak Positive Plate Voltage[2] (Abs. Max.)	1000 Volts	
Negative Grid Voltage	75 Volts	Max.
Positive Grid Voltage	3.5 Volts	Max.
Peak Negative Grid Voltage	400 Volts	Max.
Peak Positive Grid Voltage[2]	13 Volts	Max.
Average Positive Grid Current	5 Ma	Max.
Peak Positive Grid Current[2]	100 Ma	Max.
Average Cathode Current	25 Ma	Max.
Peak Cathode Current[2]	300 Ma	Max.
Plate Dissipation		
Each Plate	3.5 Watts	Max.
Both Plates	7.0 Watts	Max.
Bulb Temperature	120° C	Max.
Grid Circuit Resistance		
Fixed Bias	0.1 Megohm	Max.
Cathode Bias	0.5 Megohm	Max.

QUICK REFERENCE DATA

The Sylvania Type 6350 is a miniature, T-6½, twin triode designed for use in high speed digital computers. Each section of the 6350 features a high zero bias plate current, sharp cutoff and a separate cathode connection.





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JUNE 1954

CHARACTERISTICS (Each Section)[3]

Conditions:

Plate Voltage	150 Volts
Grid Voltage	-5.0 Volts
Plate Current	11 Ma
Transconductance	4600 μmhos
Amplification Factor	18
Plate Resistance	3900 Ohms
Grid Voltage for I_b=100 μa[4]	-11 Volts
Grid Voltage for I_b=1.0 ma[5]	-12 Volts

Interelectrode Resistance, Each Section[6]

Plate to All (Min.)	50 Megohms
Grid to All (Min.)	50 Megohms

Time Dependent Characteristics

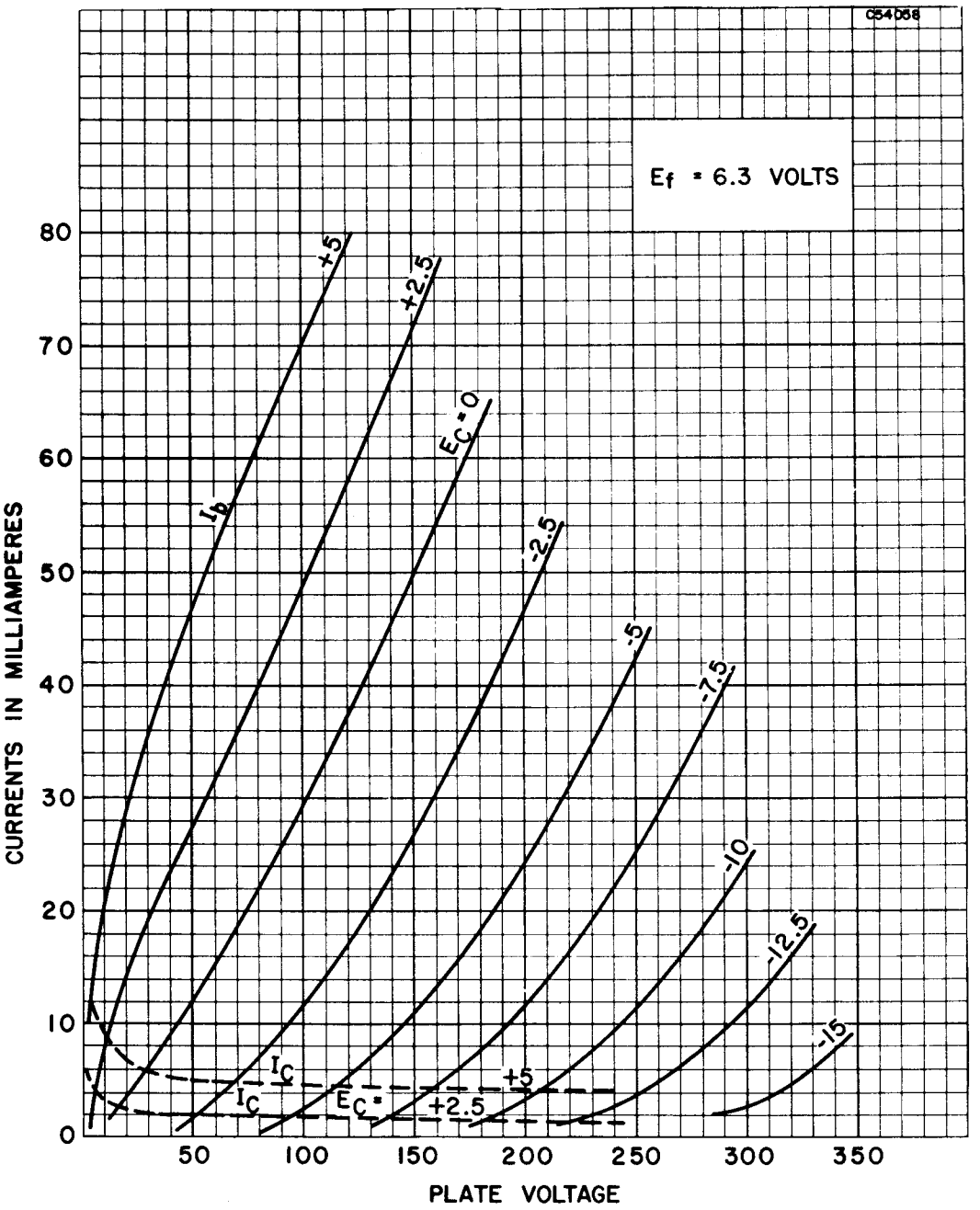
Minimum Number of Heater Cycles	2000
Regulation of Heater Supply (Max.)	4%
Heater Voltage (AC)	7.0 Volts
Heater Cathode Voltage (AC)	140 Volts

NOTES:

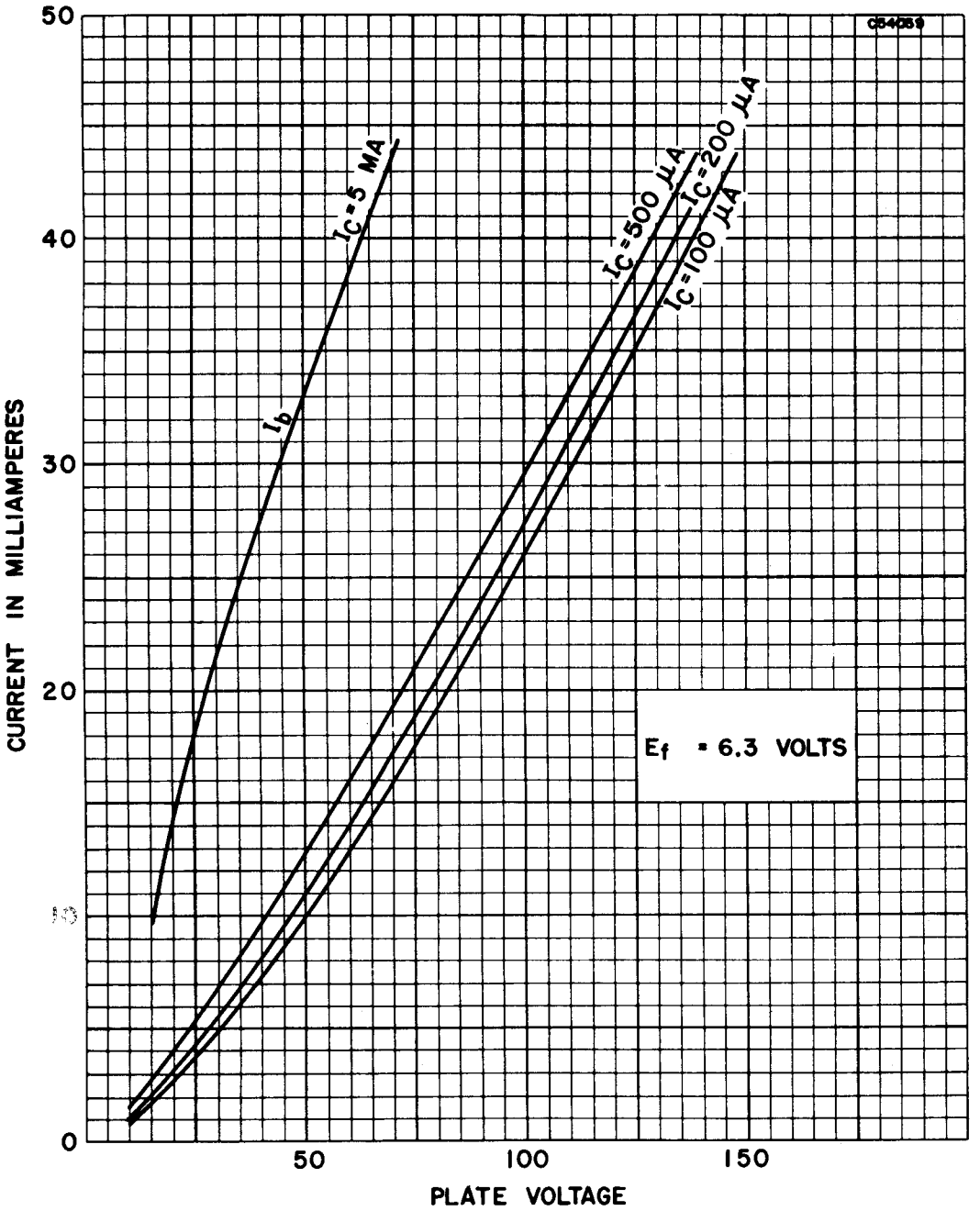
1. *Heater positive is not recommended for reliable operation.*
2. *At 8% duty cycle, 1 megacycle repetition rate.*
3. *Section not under test shall be grounded.*
4. *With plate voltage of 150 volts.*
5. *With plate voltage of 200 volts.*
6. *With applied d c voltage of 300 volts and heater voltage of 6.3 volts. Cathode Positive so that no cathode emission occurs.*

AVERAGE PLATE CHARACTERISTICS

EACH SECTION



AVERAGE CHARACTERISTICS



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JETEC Registration Data

TYPE 6352

DOUBLE DIODE

The Type 6352 is a subminiature double diode with a tungsten filament which is operated under conditions of temperature limited emission. The plate current is dependent on filament voltage.

MECHANICAL DATA

Style	subminiature
Cathode	tungsten filament
Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	3-2
Maximum Diameter	0.400 inch
Maximum Overall Bulb Length	1.500 inches
Minimum Lead Length	1.500 inches
Mounting Position:	
Vertical	base up or down
Horizontal	leads 1 and 6 in a vertical plane

Basing	8EY
Connections:	
Lead 1 -	filament
Lead 2 -	internal connection
Lead 3 -	internal connection
Lead 4 -	filament center tap
Lead 5 -	#2 plate
Lead 6 -	filament
Lead 7 -	#1 plate
Lead 8 -	filament center tap

ELECTRICAL DATA

CHARACTERISTICS(1)

Filament Voltage(series)(ac)(2)	3.0 volts
Filament Current(series)	360 ma
Plate Voltage(dc)	250 volts
Plate Load Resistor	1 megohm
Plate Current	50 μa

RATINGS-Absolute Values

Maximum Filament Voltage(series)(ac)	4.0 volts
Maximum Plate Voltage(dc)	275 volts
Maximum Plate Current(1)	1.1 ma

Notes

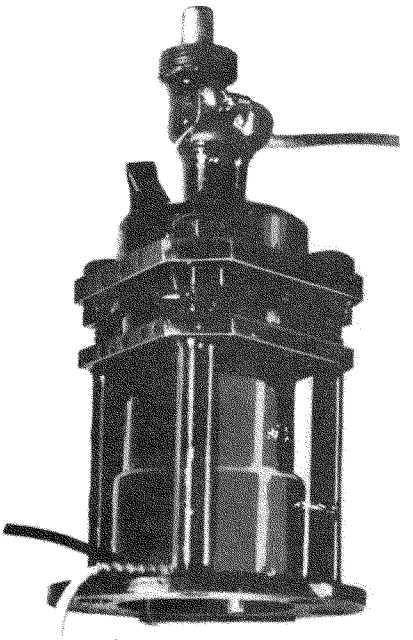
(1) Plates connected together at socket.

(2) Filament voltage is adjusted for plate current of 50 microamperes with other parameters as specified.

from RETMA release #1261, Nov. 20, 1953

DESCRIPTION:

X-Band Ruggedized Reflex Klystron. Former designation K465. Designed for local oscillator service where maximum frequency stability is required under conditions of extreme shock and vibration or sustained acceleration. Its compensated structure is designed to minimize frequency drift with time and temperature.



RATINGS AND CHARACTERISTICS

ELECTRICAL RATINGS:

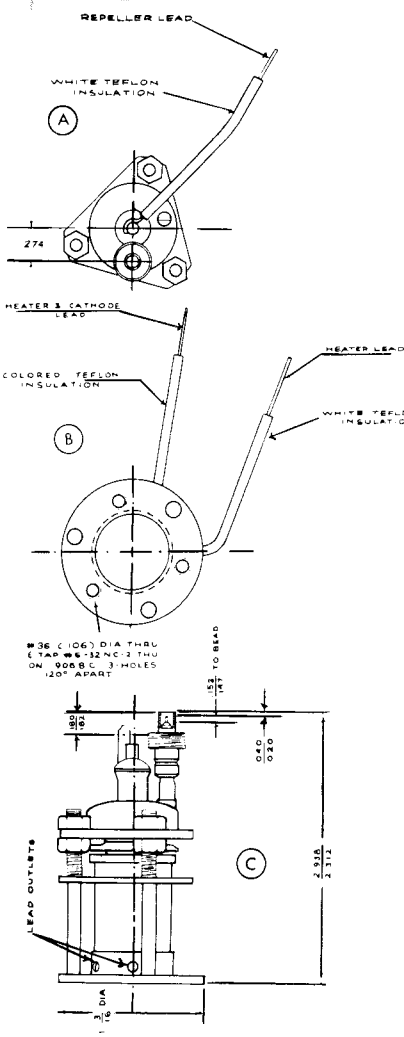
Heater Voltage	6.3V
Heater Current	0.95 amperes
D C. Resonator Voltage	350 V max.
Cathode Current	40 ma. max.
Frequency Range	8690—9410 MC
DC—Reflector Voltage	
Positive Limit	—15 Min. V
Negative Limit	—500 Max. V
Cathode to Heater Voltage	75 V Max.
Reflector Current	$< 2\ \mu$ Amperes

TUBE CHARACTERISTICS:

Cathode—Coated, Unipotential	
Life	500 Hours
Mounting Position	Any
Connections	See Mechanical
Cooling	Convection and conduction
Frequency Stability	
a. 10 G vibration 10—2000 cps	$\Delta f < 1$ MC
b. Acceleration 200 G	$\Delta f < 5$ MC
c. Slack 200 G	$\Delta f < 2$ MC
Starting Time	After 8 Min. ± 3 Mc
Temperature Compensation	< .5 Mc per degree centegrade

TYPICAL OPERATING CONDITIONS:

DC Resonator Voltage	250 Volts
DC Cathode Current	28 ma.
Power Output	25 mW
Frequency	9050 Mc
Electronic Tuning Range	40 Mc
Voltage swing for above tuning	12 Volts
DC Reflector Voltage	—98 Volts
Min. power output 6 db mismatch	10 mW



SYLVANIA ELECTRIC PRODUCTS INC. ELECTRONICS DIVISION
1740 Broadway, New York 19, New York

TENTATIVE DATA

QUICK REFERENCE DATA

The Sylvania Type 6396 is a broad-band ATR tube designed for use at a center frequency of 9300 mc. It is contact mounted at the window end of the tube and is designed to be used in pairs one opposite the other.

MECHANICAL DATA

Dimensions	Per outline
Mounting Position (one gasket is supplied with each tube)	Any
Ambient Temperature Range (non-operating)	-40 to + 100°C

ELECTRICAL DATA

RATINGS

Transmitter Peak Power (min.)	4 KW

GENERAL DATA

Center Frequency	9300 Mc
Loaded Q (Test Mount A) (max.)	6.5
Low Level Characteristics at Center Frequency	
Equivalent Conductance (Test Mount A) (max)	0.1
Tuning Susceptance (Test Mount A)	-.06 to + .06
High Level Characteristics	
Arc Loss (max.) (1)	0.8 db
High Level VSWR (max.) (2)	1.15
Recovery Time (max.) (3)	8 μsec

NOTES

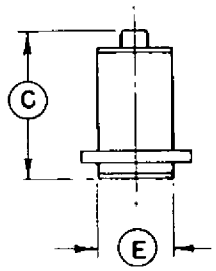
(1) Pi = 4 KW; tp = 0.5 μsec; prr = 1000 pps; f = 9025 Mc; Test Mount A or B

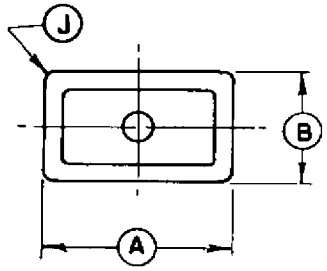
(2) Po = 20 KW; tp = 1.0 μsec; prr = 1000 pps; f = 9025 Mc; Test Mount B

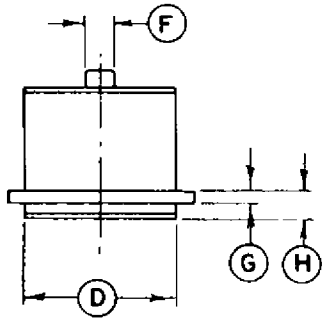
(3) Pi = 50 KW; tp = 1.0 μsec; prr = 1000 pps; f = 9300 Mc. The distance between the position of the minimum in the unfired condition and the position of the minimum after the specified time interval after the magnetron pulse shall be less than .05 λ g. The probing signal shall be 9300 Mc.

APPLICATION DATA

The Sylvania Type 6396 is an anti-transmit-receive tube for use at a center frequency of 9300 mc. It is designed to be contact mounted in the waveguide at the window end of the tube using a combination metal-rubber gasket. This makes pressurization of the waveguide easier, eliminates difficulties encountered with choke type mountings, and permits miniaturization. The Type 6396 used in pairs mounted directly opposite each other in the E-plane of the system waveguide provides broad-band protection for the receiver.





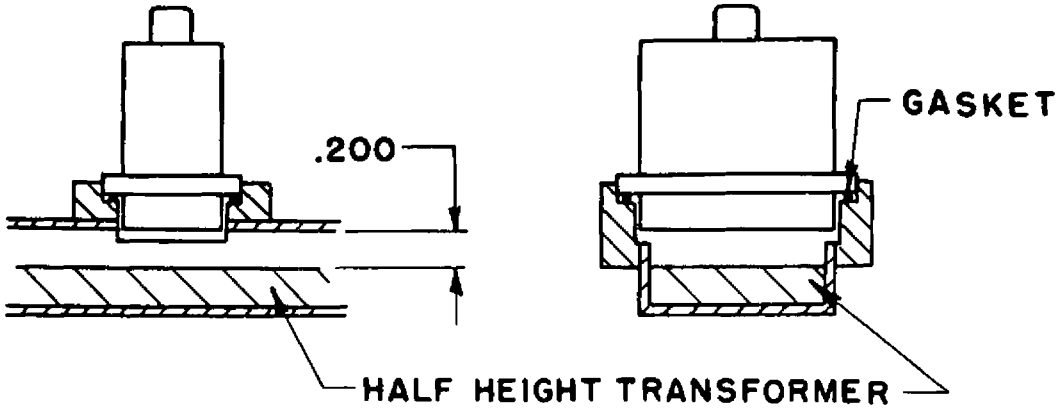


REF	DIMENSION
A	1.200
B	.700
C	1.250 MAX.
D	1.000
E	.500
F	.250 MAX. DIA.
G	.0970
H	.279
J	.075R

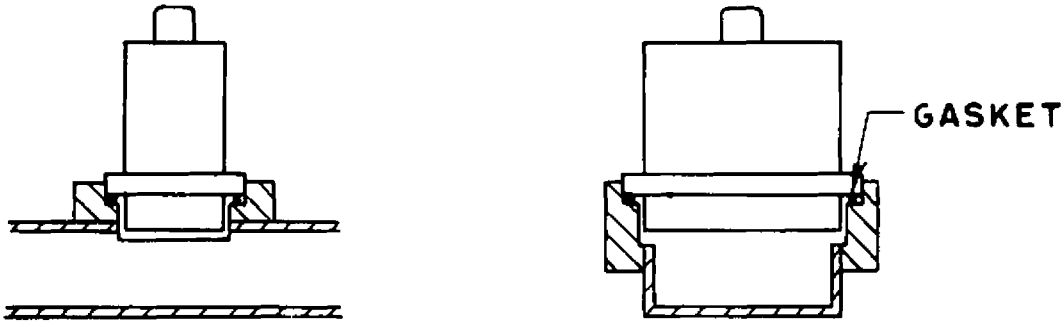
from JETEC release #1390, Dec. 27, 1954

11-54-116T

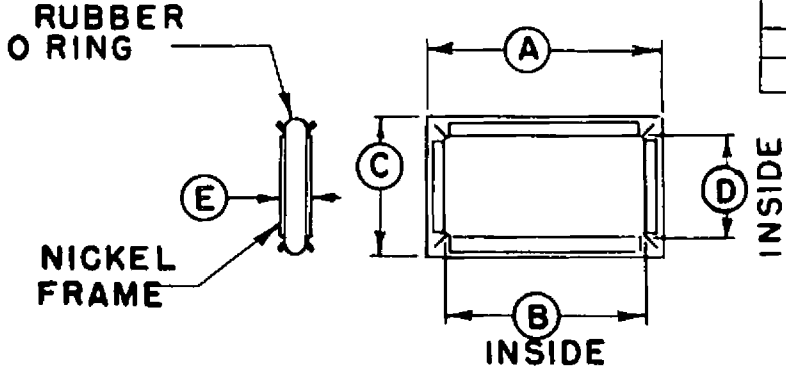
TEST MOUNT A



TEST MOUNT B



GASKET



REF.	DIMENSIONS
A	1 15-64 MAX.
B	1.000
C	23/32 MAX.
D	.500
E	.093

NOTE 1: Tube is to be held firmly in position by means of clamps.

NOTE 2: Bottom of tube is to be approx. flush with inside surface of waveguide.

NOTE 3: Waveguide size for mount is RG52/U.

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6435

QUICK REFERENCE DATA

The Sylvania Type 6435 is a hermetically sealed reference cavity constructed for waveguide mounting. It is designed for use in Beacon Radar operation as an effective method of tuning the radar local oscillator to the beacon system.

The 6435 was formally designated BRC445.



MECHANICAL DATA

Construction	Hermetically Sealed Unit Designed for Use in RG-49/U Waveguide Between UG-148B/U Choke Flanges.

ELECTRICAL DATA

RATINGS

Frequency:		
0° C	5419.8 Mc	Min.
65° C	5420.2 Mc	Max.

CHARACTERISTICS

Voltage Standing Wave Ratio:		
f_0 = 5420 Mc ± 0.2 Mc	2.5	Max.
f_1 = 5500 Mc ± 10 Mc	10.0	Min.
f_2 = 5300 Mc ± 10 Mc	10.0	Min.
Insertion Loss	5 db	Max.
Loaded Q, f_0 = 5420 ± 0.2 Mc:		
Minimum	1300	
Maximum	2500	

APPLICATION DATA

The Sylvania Type 6435 Beacon Reference Cavity was designed for use in radar systems for which beacon operation is desired and provides the means of tuning the radar local oscillator to the beacon system. The 6435 incorporates the best performance features of other existing methods of performing this function. It combines small size, low noise factor and excellent temperature compensation with improved system reliability, because of the minimum number of associated components required. Another major application is the use of the reference cavity in a circuit that essentially controls the radar transmitter frequency. This is accomplished by means of a feedback circuit and servo system in conjunction with the cavity to continuously tune the magnetron.

The 6435 tuned to the appropriate frequency will also serve as a frequency standard in microwave link systems.

SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

3-54-67

from JETEC release #1608, March 19, 1956

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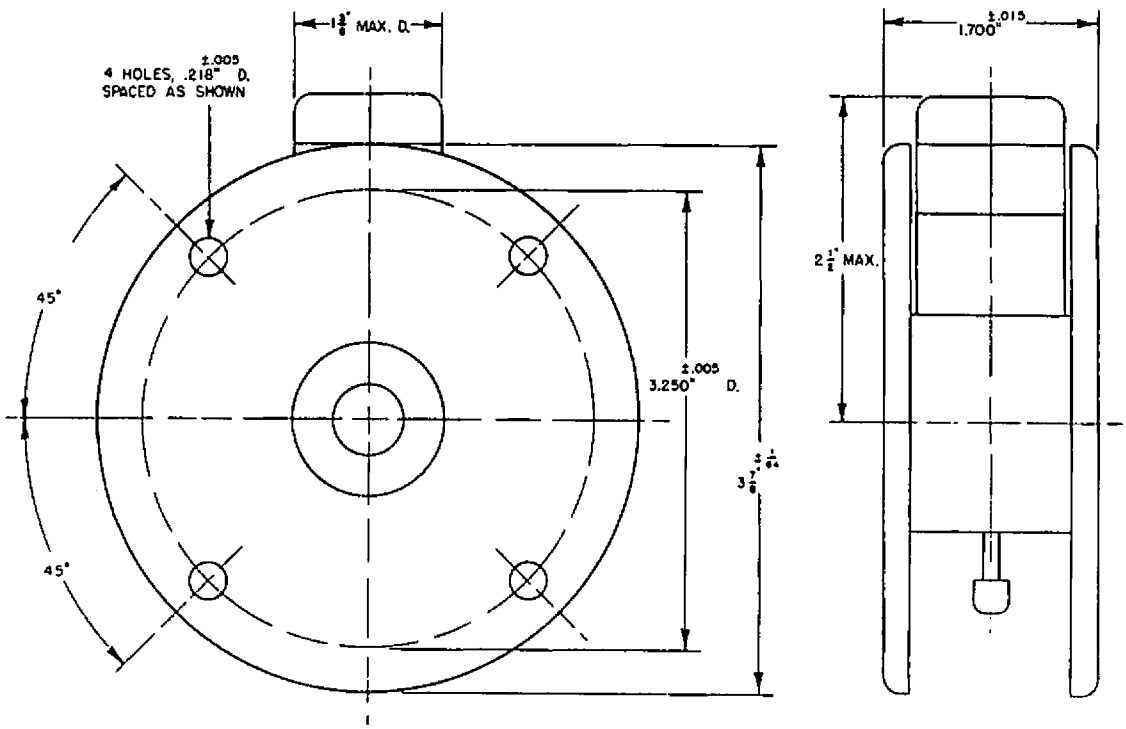
6435

OUTLINE DRAWING



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6465

MECHANICAL DATA

Base	Shortened Octal
Cathode	Coated Unipotential
Flanges	UG-344/U
Cooling	Forced Air, 20 CFM
Weight	2 Lbs.
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (±10%)	6.3 Volts
Heater Current	2.0 Amperes Nom.

DIRECT INTERELECTRODE CAPACITANCES

Gun to Shell	8 $\mu\mu$f Max.

RATINGS (Absolute Values)

Beam Voltage	625 Volts	Max.
Beam Current	150 Ma	Max.
Control Electrode Voltage (with Respect to Cathode)	0 to −50 Volts	Max.
Control Electrode Current	2.0 Ma	Max.
DC Beam Power Input	100 Watts	Max.
Operating Temperature		
Shell	100°C	Max.
Base	75°C	Max.
Tuning Range	5900 to 6450 Mc	Max.

CHARACTERISTICS

Output Resonator Bandwidth	$\geq$ 25 Mc
Output Resonator VSWR	$\leq$ 2
Buncher Resonator Bandwidth	$\geq$ 15 Mc
Buncher Resonator VSWR	$\leq$ 2
Power Output (Amplifier)	6 to 9 Watts

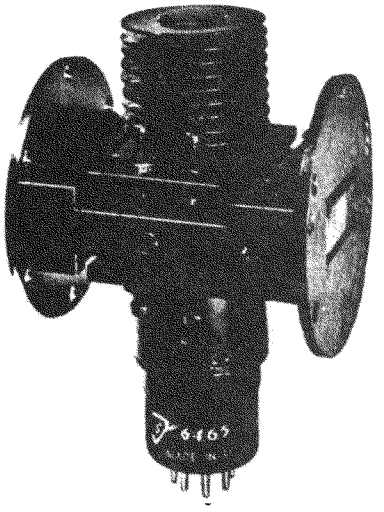
TYPICAL OPERATION

Resonator Voltage	500	600	Volts dc
Control Electrode Voltage	0	0	
Beam Current	100	130	Ma dc
Amplifier Service			
Input Drive Frequency	6175	6175	Mc
Output Frequency	6175	6175	Mc
R F Power Input	.6	1.0	Watts
R F Power Output	4.0	8.0	Watts
Synchrodyne Operation			
Input Drive Frequency		6175	Mc
Electron Gun Modulation Frequency		115	Mc
Electron Gun Modulation Voltage		55	Volts rms
Synchrodyne Output Frequency		6060 or 6290	Mc
Synchrodyne R F Power Output		1.25	Watts

QUICK REFERENCE DATA

The Sylvania Type 6465 is a 5950 to 6400 Mc klystron amplifier with two built-in cavities. It will provide 6-9 watts output over the specified operating range.

The 6465 was formally designated K-484.



SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

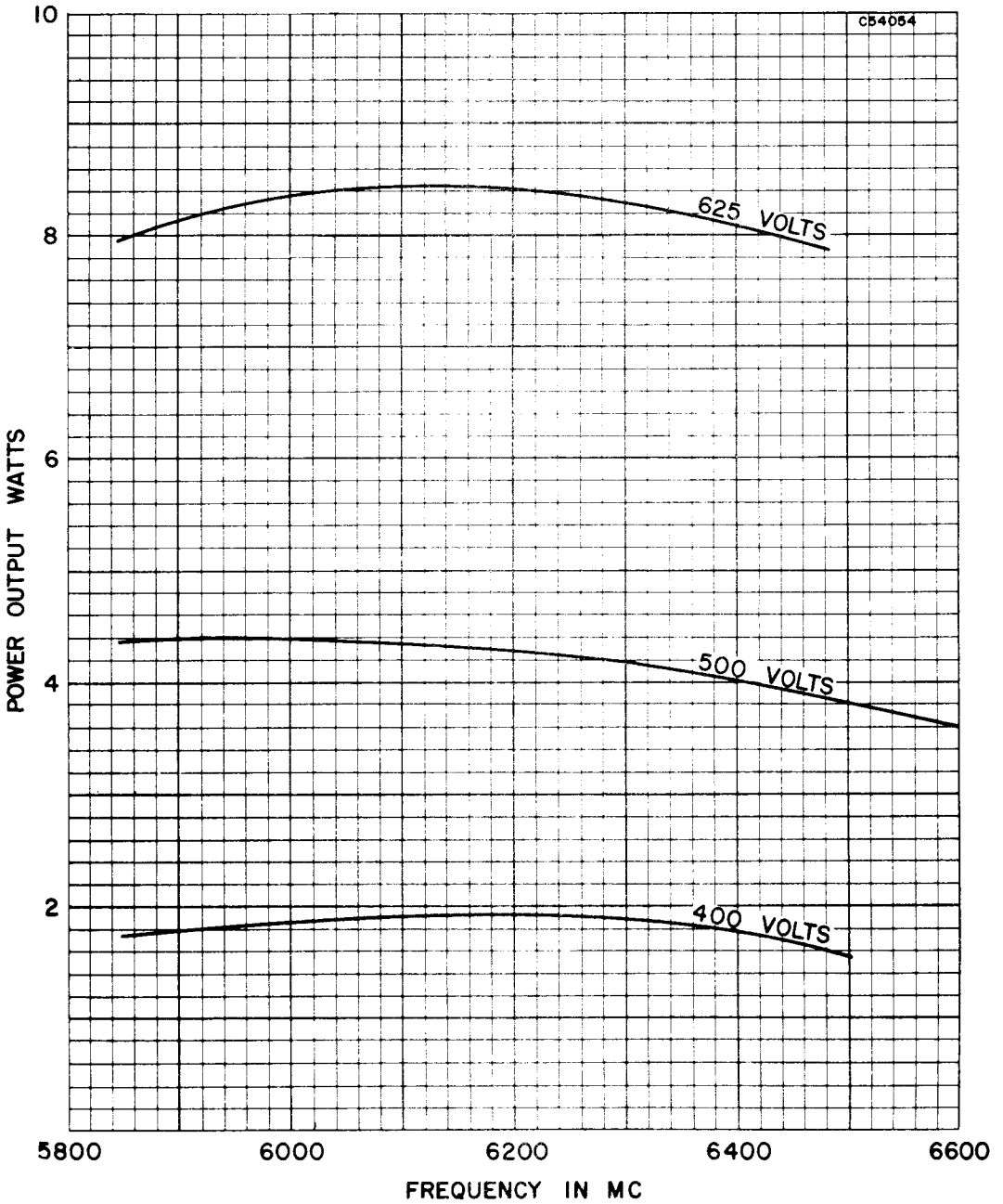
4-54-77

APPLICATION DATA

The Type 6465 klystron amplifier is designed for CW service as master oscillator, power amplifier, or synchrodyne mixer in studio television relay link or similar services. It features two independently tuned integral cavities. Usable with lower output outside the specified frequency range.

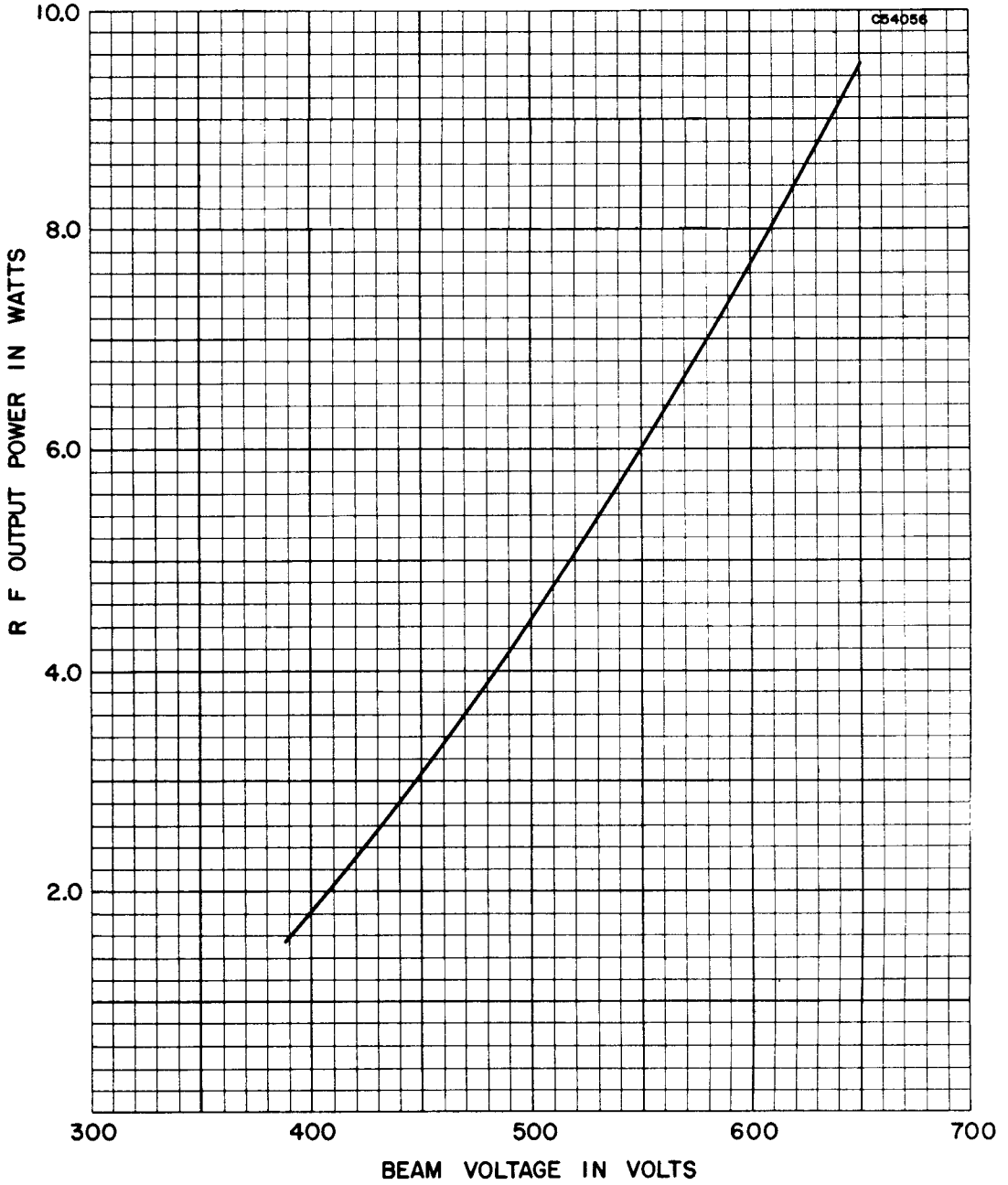
AVERAGE CHARACTERISTICS

POWER OUTPUT VS BEAM VOLTAGE



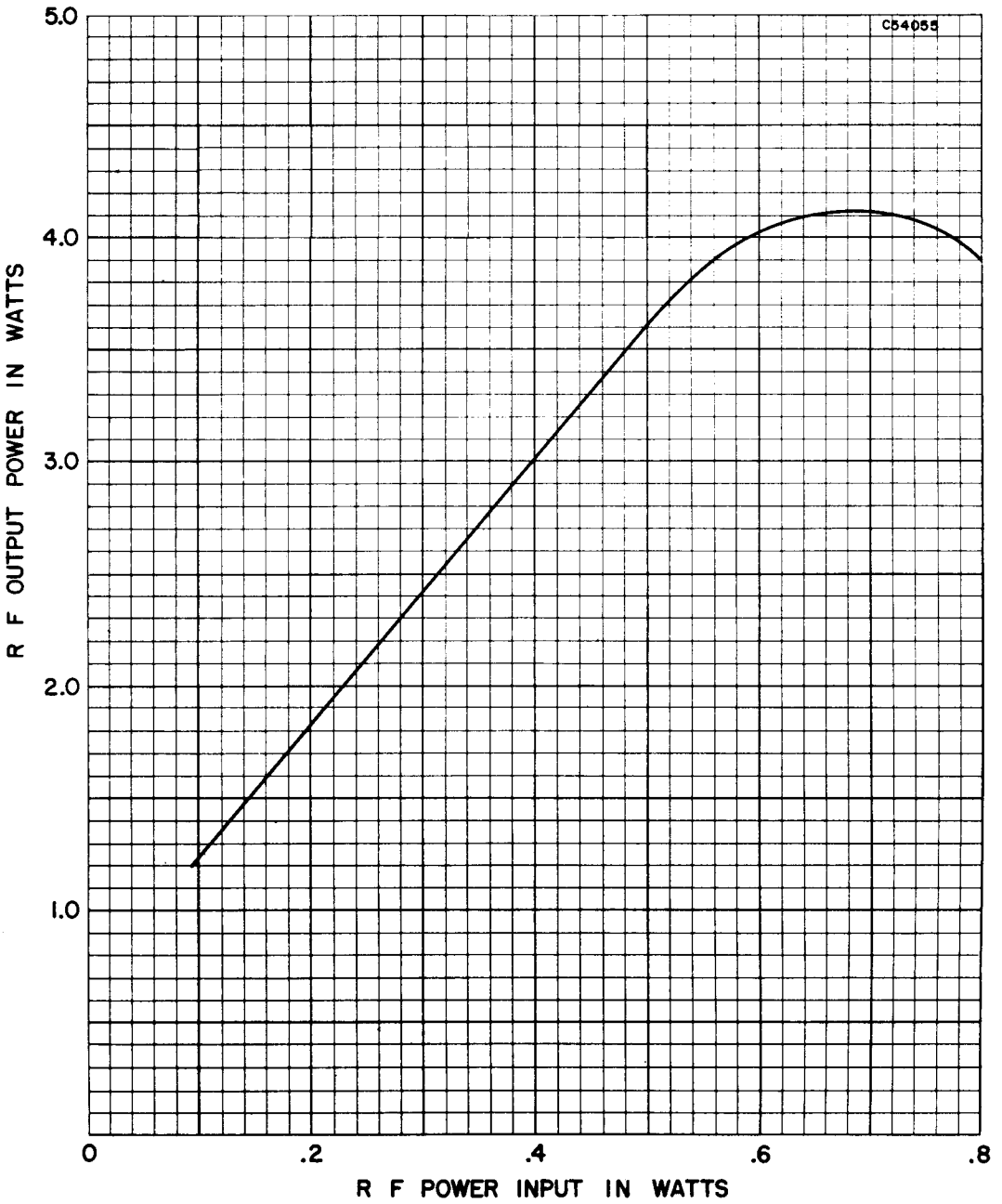
AVERAGE CHARACTERISTICS.

RF OUTPUT POWER VS BEAM VOLTAGE
(AMPLIFIER OPERATION)



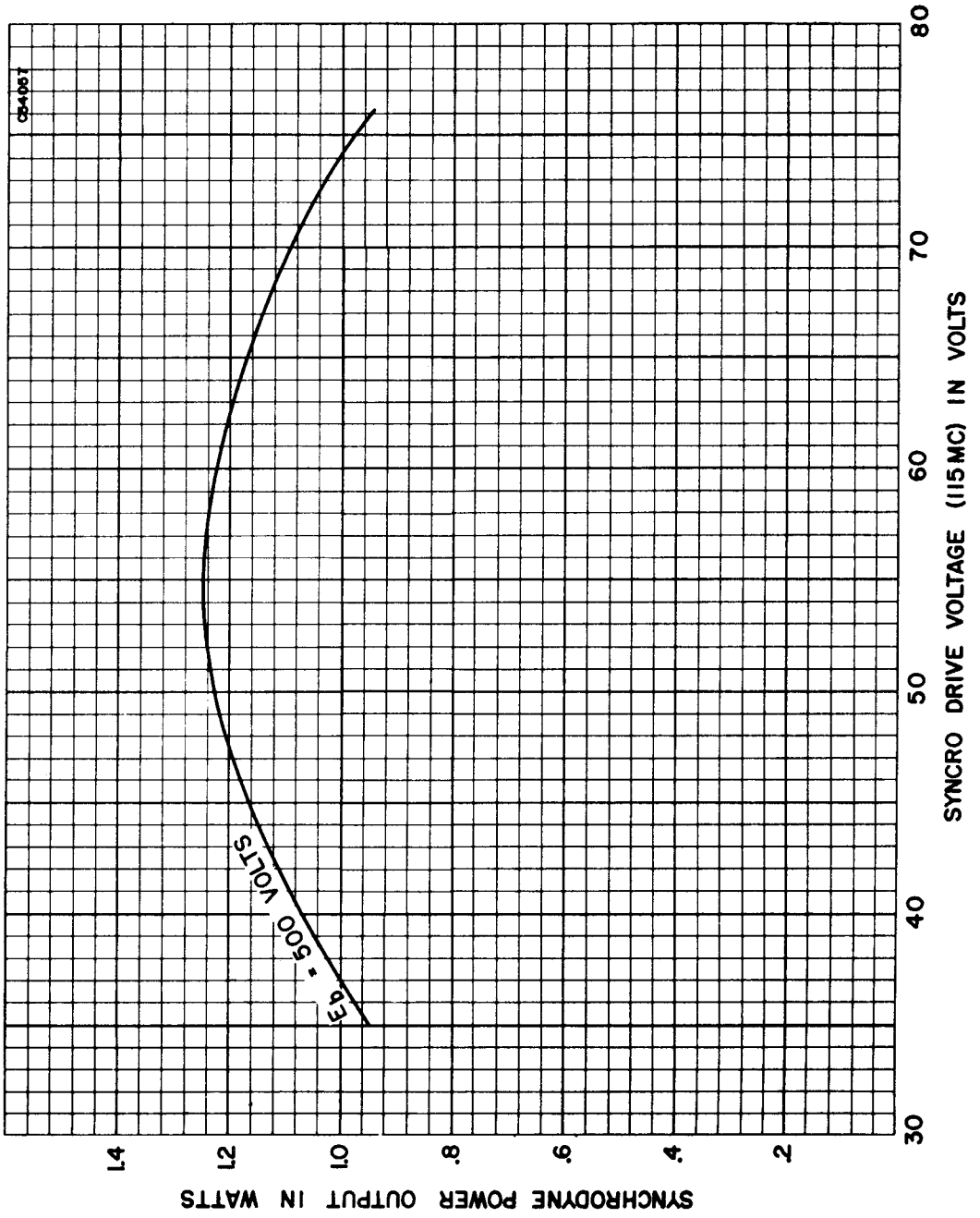
AVERAGE CHARACTERISTICS

RF POWER OUTPUT VS RF POWER INPUT

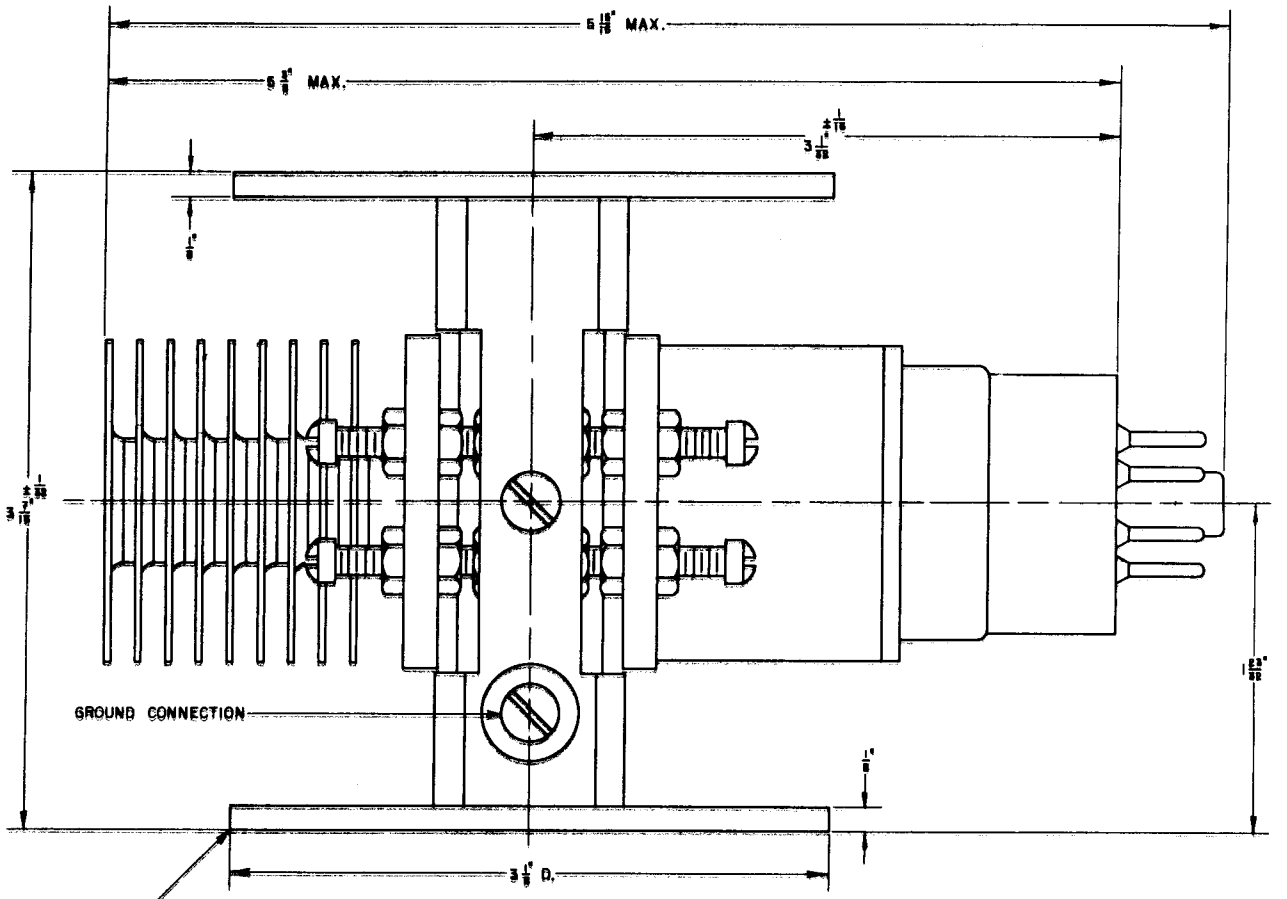


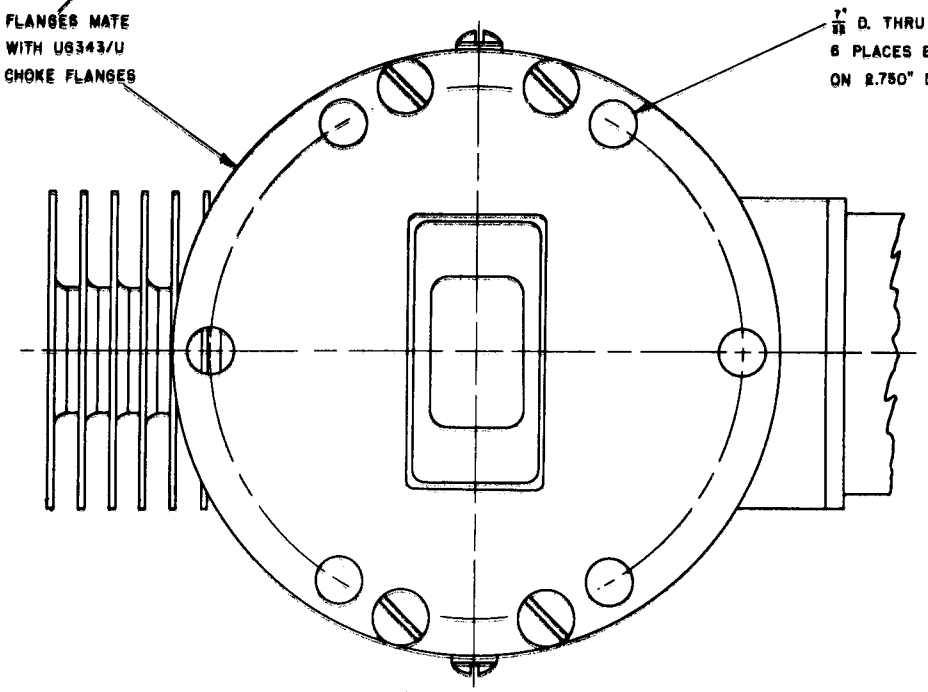
AVERAGE CHARACTERISTICS

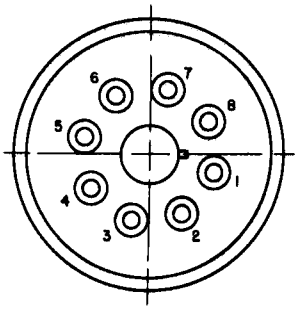
POWER OUTPUT VS SYNCRO DRIVE VOLTAGE



OUTLINE DRAWING







PIN CONNECTIONS:

PINS 1, 7, 8 – CATHODE HEATER
PIN 2 – HEATER
PINS 3, 4, 5 – FOCUS ELECTRODE
PIN 2 – INTERNAL CONNECTION

MECHANICAL DATA

Cathode:	Oxide coated, Unipotential.
Dimensions:	Per outline.
Base:	Octal.
Base Connections:	

Pin 1:	Cathode & heater.	Pin 5:	Control electrode
Pin 2:	Heater.	Pin 6:	Internal connection
Pin 3:	Control electrode.	Pin 7:	Cathode & heater.
Pin 4:	Control electrode.	Pin 8:	Cathode & heater.

Flanges:	UG-344/U
Cooling:	Forced air, 20 cfm
Mounting Position:	Any
Weight:	2 pounds.

ELECTRICAL DATA

RATINGS: (Absolute Maximum Values)

Beam voltage:	625 volts
Beam current:	140 Ma
Control electrode voltage (respect to cathode):	0 to -50 volts
Control electrode current:	2.0 ma
Beam power input (d.c.):	100 watts
Operating temperature (shell):	100 °C

CHARACTERISTICS:

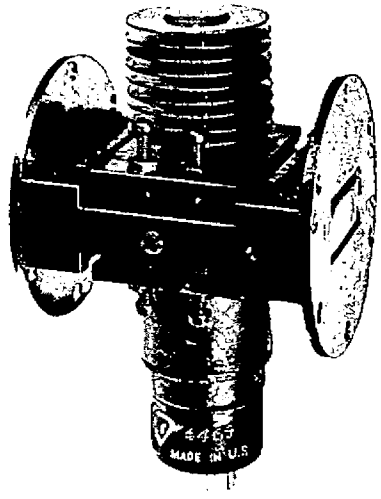
Capacity (gun to shell):	7.5 uuf
Output resonator bandwidth: (min.)	25 mc
Buncher resonator bandwidth: (min.)	20 mc
Input resonator VSWR at band center: (max.)	1.4
Tuning range:	6800 to 7175 mc
Heater voltage:	6.3 ± 10%
Heater current (nominal)	2.0 amps

APPLICATION DATA

The type 6466 Klystron amplifier is designed for CW service as master oscillator, power amplifier, or synchrodyne mixer in studio television relay link or similar services. It features two independently tuned integral cavities, usable with lower output outside the specified frequency range.

QUICK REFERENCE DATA

Former designation K485. The Sylvania Type 6466 is a 6800-7175 mc Klystron amplifier with two mechanically tuned built-in cavities. It will provide 6-9 watts output over the specified frequency range.

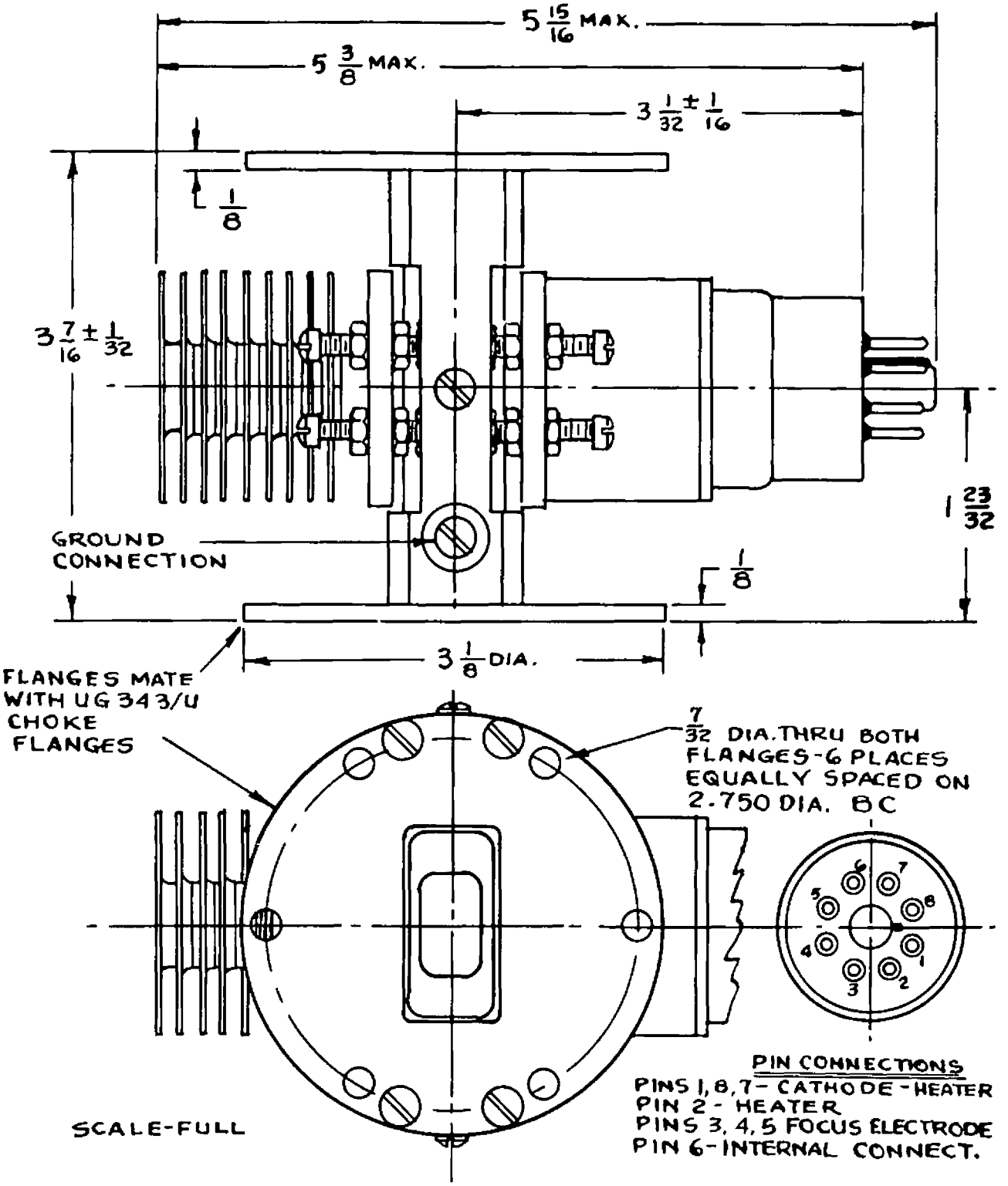


SYLVANIA ELECTRIC PRODUCTS, INC.
Electronics Division
Woburn, Mass.

AUGUST 25, 1954

from JETEC release #1370, Nov. 8, 1954

SYLVANIA
6466



ADVANCE DATA

MECHANICAL DATA

Base:	B8-32 Octal
Reflector Terminal:	C1-1 Small Cap
Mounting Position:	Any
Waveguide Output:	Mates with UG343/u

GENERAL DATA

Frequency	6125 to 6425 mc
Mechanical Tuning Range	300 mc
Output Power	0.7 to 1.7 w
Electronic Bandwidth	30 to 60 mc
Modulation Sensitivity	275 to 500 kc/volt
Beam Modulation Sensitivity	125 kc/volt
Reflector Voltage	0 to 1000 volts
Tuning (approx.)	650 mc/turn

ELECTRICAL DATA

MAXIMUM RATINGS

Heater Voltage	6.3 volts
Beam Current	80 ma
Reflector Voltage	1000 volts
Beam Voltage	750 volts

TYPICAL OPERATION CONDITIONS

Heater Voltage	6.3 volts
Heater Current	.80 amps
Beam Voltage*	750 volts
Beam Current	70 ma
Reflector Voltage	320 volts
Frequency	6125 to 6425 mc
Power Output (across band) (average)	1.0 watt
Mode	3-3/4
Bandwidth at Half Power Points	34 mc

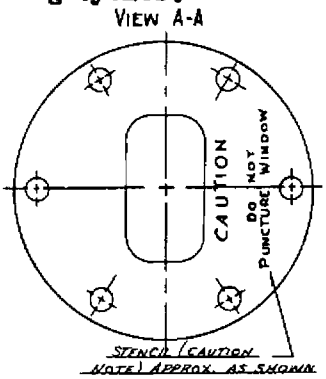
*Beam Voltage may be reduced with consequent reduction in power - information upon request.

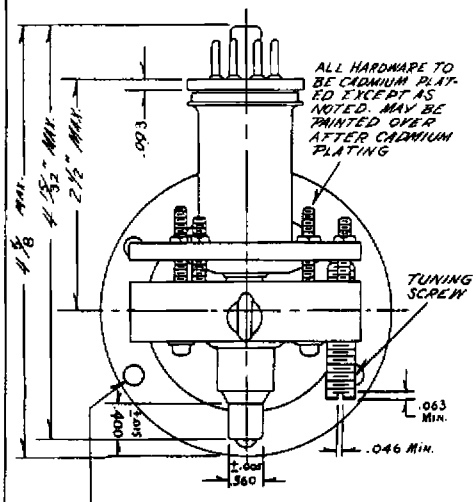
APPLICATION DATA

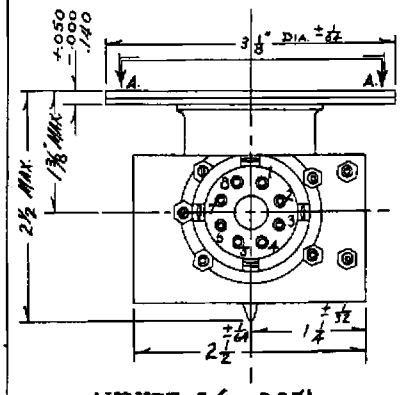
The Sylvania 6468 is designed as a CW oscillator for use in microwave relay link service or as a local oscillator with long life, good frequency temperature characteristics, controlled output impedance characteristics, and convenient tuning arrangements.

QUICK REFERENCE DATA

The Sylvania Type 6468 is an integral cavity, waveguide output, klystron covering the frequency range 6125 to 6425 megacycles.







AUGUST 16, 1954

from JETEC release #1357, Sept. 20, 1954

ADVANCE DATA

MECHANICAL DATA

Base:	B8-32 Octal
Reflector Terminal:	C1-1 Small Cap
Mounting Position:	Any
Waveguide Output:	Mates with UG343/u

GENERAL DATA

Frequency	6575 to 6875 mc
Mechanical Tuning Range	300 mc
Output Power	0.7 to 1.7 w
Electronic Bandwidth	30 to 60 mc
Modulation Sensitivity	275 to 500 kc/volt
Beam Modulation Sensitivity	125 kc/volt
Reflector Voltage	0 to 1000 volts
Tuning (approx.)	650 mc/turn

ELECTRICAL DATA

MAXIMUM RATINGS

Heater Voltage	6.3 volts
Beam Current	80 ma
Reflector Voltage	1000 volts
Beam Voltage	750 volts

TYPICAL OPERATION CONDITIONS

Heater Voltage	6.3 volts
Heater Current	.80 amps
Beam Voltage*	750
Beam Current	70 ma
Reflector Voltage	320
Frequency	6575 to 6875 mc
Power Output (across band)(average)	1.0 watt
Mode	3-3/4
Bandwidth at Half Power Points	34 mc

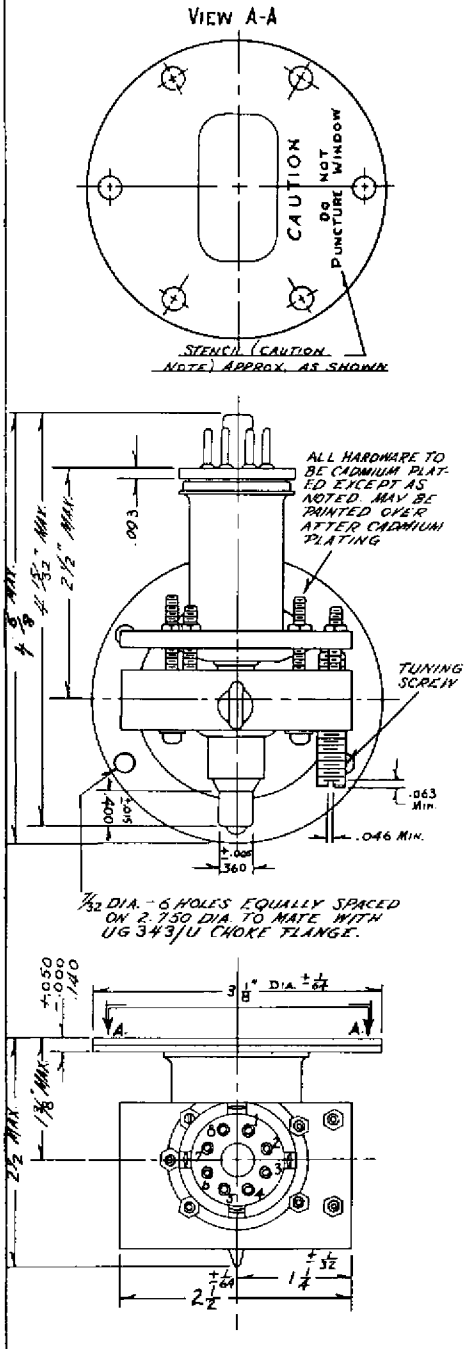
*Beam Voltage may be reduced with consequent reduction in power - information upon request.

APPLICATION DATA

The Sylvania 6469 is designed as a CW oscillator for use in microwave relay link service or as a local oscillator with long life, good frequency temperature characteristics, controlled output impedance characteristics and convenient tuning arrangements.

QUICK REFERENCE DATA

The Sylvania Type 6469 is an integral cavity, waveguide output, klystron covering the frequency range 6575 to 6875 megacycles.



AUGUST 16, 1954

from JETEC release #1357, Sept. 20, 1954

ADVANCE DATA

MECHANICAL DATA

Base:	B8-32 Octal
Reflector Terminal:	C1-1 Small Cap
Mounting Position:	Any
Waveguide Output:	Mates with UG343/u

GENERAL DATA

Frequency	7125 to 7425 mc
Mechanical Tuning Range	300 mc
Output Power	0.7 to 1.7 w
Electronic Bandwidth	30 to 60 mc
Modulation Sensitivity	275 to 500 kc/volt
Beam Bodulation Sensitivity	125 kc/volt
Reflector Voltage	0 to 1000 volts
Tuning (approx.)	650 mc/turn

ELECTRICAL DATA

MAXIMUM RATINGS

Heater Voltage	6.3 volts
Beam Current	80 ma
Reflector Voltage	1000 volts
Beam Voltage	750 volts

TYPICAL OPERATION CONDITIONS

Heater Voltage	6.3 volts
Heater Current	.80 amps
Beam Voltage*	750 volts
Beam Current	70 ma
Reflector Voltage	320 volts
Frequency	7125 to 7425 mc
Power Output (across band) (average)	1.0 watt
Mode	3-3/4
Bandwidth at Half Power Points	34 mc

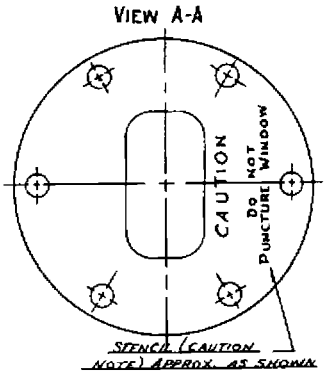
*Beam Voltage may be reduced with consequent reduction in power - information upon request.

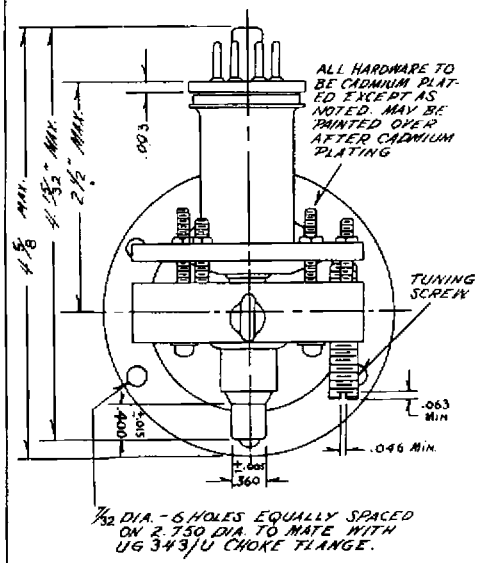
APPLICATION DATA

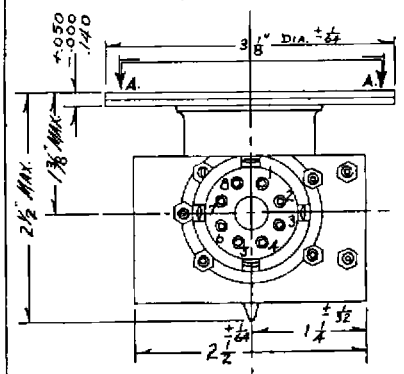
The Sylvania 6470 is designed as a CW oscillator for use in microwave relay link service or as a local oscillator with long life, good frequency temperature characteristics, controlled output impedance characteristics and convenient tuning arrangements.

QUICK REFERENCE DATA

The Sylvania Type 6470 is an integral cavity, waveguide output, klystron covering the frequency range 7125 to 7425 megacycles.







AUGUST 16, 1954

from JETEC release #1357, Sept. 20, 1954

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6476

MECHANICAL DATA

Mounting Position	Any (Count is Read from Top of Tube
Zero Position (Cathode No. 10)	Aligned with Pin 12 ±10°

ELECTRICAL DATA

RATINGS (Absolute Values)

Total Anode Current	0.60 Ma.	Max.
Voltage Between Electrodes (Other Than Anode)	140 Volts	Max.
Supply Voltage (Anode to Cathode)	350 Volts	Min.
Input Frequency	4,000 P.P.S.	Max.

TYPICAL OPERATION

DC Supply Voltage	400 Volts
Anode Resistor	0.47 Megohm
Nominal Tube Drop (Under These Conditions)	191 Volts
Cathode Resistor	68,000 Ohms
Output Voltage (Developed Across Cathode Resistor)	28 Volts

APPLICATION DATA

The Sylvania Type 6476 is a cold cathode, bidirectional decade counter tube. It is designed for use in medium speed decimal counting apparatus such as scalers, computers and dividers. The count is determined by noting the position of the glow on any one of the ten radially spaced cathodes around an axially positioned anode. The multiple output cathode arrangement allows the selection of pre-set conditions with the addition of suitable external circuitry.

PRINCIPLES OF OPERATION

General Principles

The 6476 operates on the principle that the ionization or starting voltage of gas filled tubes is lowered if ions or electrons are already present in the anode-cathode gap. Under these conditions, a glow discharge can then be made to move from one cathode to an adjacent one by means of a relatively small negative voltage pulse on the new cathode, provided that electrons or ions are able to diffuse into this new anode-cathode gap. If a series of cathodes are present about a common anode, the discharge can be made to move in succession along the cathode series by a successive application of voltage pulses to each cathode.

Details of Operation

The 6476 has 30 cathodes equally spaced on a circle about a central anode disc. The cathodes are divided into 10 main or output cathodes and 20 intermediate guide cathodes — two of which are located between every main cathode interval, see Fig. 1.

(Continued on reverse)

QUICK REFERENCE DATA

The Sylvania Type 6476 is a multiple output cold cathode, bidirectional decade counter. The 6476 is similar to the Type 6482 which has a single output cathode.



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ELECTRONICS DIVISION
WOBURN, MASS.

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PRINCIPLES OF OPERATION (cont'd.)

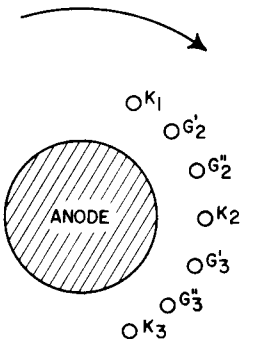


FIG. 1 — ELECTRODE ARRANGEMENT

The two guide cathodes are necessary to make certain that the glow always moves in the desired direction and does not return to the original cathode upon removal of the voltage from the new cathode. A description of the transfer mechanism from one main cathode to the next adjacent one will make this clearer. Assuming that a glow is present on K_1, a negative pulse on the G'_2 (Fig. 2) will move the glow to G'_2. At the end of this pulse, a second negative pulse is applied to G''_2 moving the glow on to G''_2. Because the guide cathodes are normally biased above the main cathodes, (Fig. 2), removal of the negative pulse from G'' means that the glow will go to a main cathode. The preferential influence of the ionization near K_2 causes the glow to settle on K_2 rather than return to K_1. The glow will remain on K_2 until the sequence is reepated for the next set of cathodes. In practice, all of the G' electrodes are connected together as are also all of the G'' electrodes, Fig. 3. Although the negative transfer pulse is applied to all ten guide cathodes simultaneously, the priming influence of the discharge moves the glow to the guide cathode which is closest to the discharge.

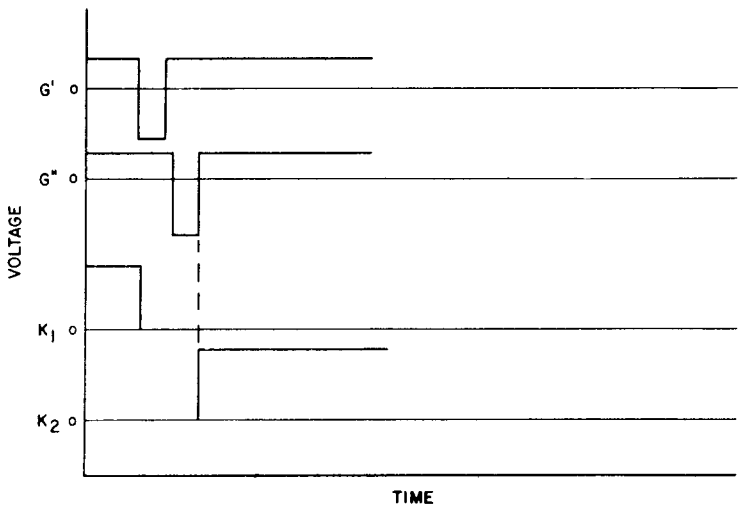


FIG. 2 — VOLTAGE-TIME CHARACTERISTICS

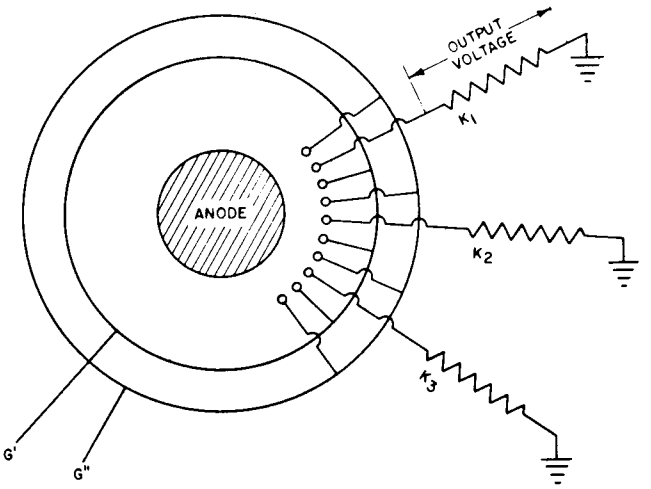


FIG. 3 — ELECTRODE ARRANGEMENT WITH CIRCUIT CONNECTIONS

An output pulse can be obtained from each main cathode as the glow moves onto it. If preferred, an output can be derived from selective cathodes only. It should also be noted that reversal of the pulse sequence applied to G′ and G″ will reverse the direction of the glow transfer.

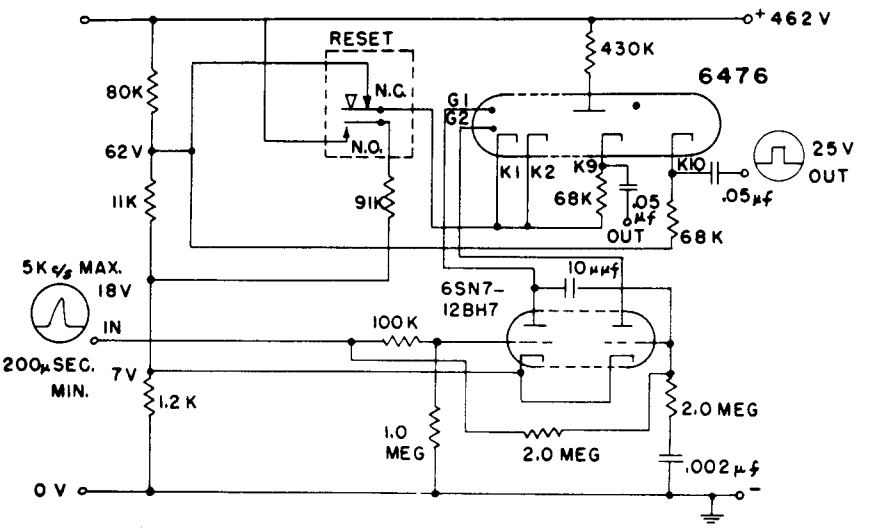
The glow is restricted to one main cathode only when the anode voltage is first applied by the action of the anode resistor (Fig. 3) which immediately lowers the voltage across the anode-cathode gap to the maintaining value. This is below the starting voltage of the other main cathodes or the transfer voltage of the guide cathodes.

The driving circuit given below offers certain advantages over the previously published circuits.

TYPICAL DRIVING CIRCUIT

The important feature of the new circuit is that it provides an essentially square wave pulse to the guide pins. A square wave driving pulse assures stable operation throughout the life of the 6476 in spite of small changes which may occur in the guide voltages.

NOTE: The B+ of the driver is obtained through the guide to anode capacity of the counter tube.



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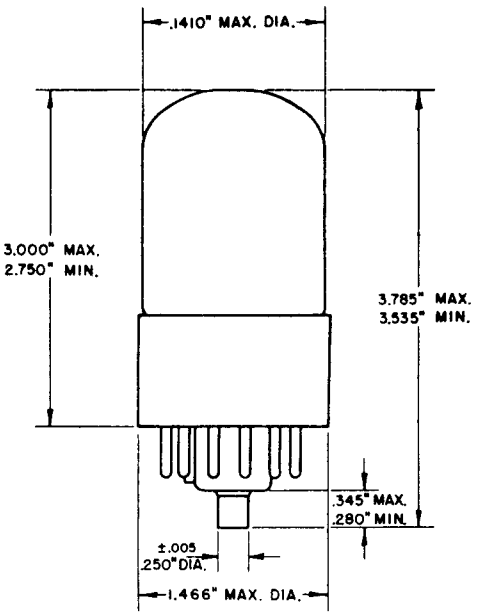
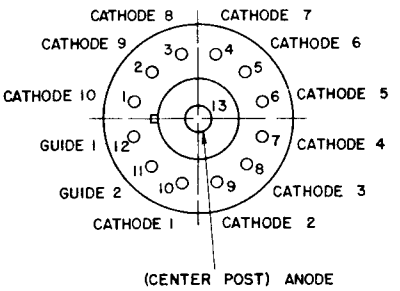
OUTLINE DRAWING



BASE CONNECTIONS



MECHANICAL DATA

Bulb	T-11
Base[1]	Modified Duodecal
Outline	See Drawing
Basing	See Drawing
Output Cathodes	No. 0 thru 9
Zero Position	No. 0 Cathode Aligned with Pin No. 12 ± 10°
Mounting Position	Any

ELECTRICAL DATA

INTERELECTRODE CAPACITANCES (Approx.)

Any Cathode to All Other Elements	4.2 pf
Guide No. 2 to All Other Elements	10 pf
Guide No. 1 to All Other Elements	11 pf

RATINGS (Absolute Values)

	Min.	Max.
Anode Supply Voltage[2]	350	800 Volts
Voltage Between Electrodes (Other than Anode)	—	200 Volts
Transfer Voltage	35	140 Volts
Anode Current	0.3	0.6 Ma
Input Frequency	0	4 Kpps
Ambient Temperature	−55	+60 °C

TYPICAL OPERATING CHARACTERISTICS

Anode Supply Voltage[2]	350 Volts	
Nominal Tube Drop	187 Volts	
Guide Bias	+35 Volts	Min.
Square Double Pulse Drive Amplitude (Each Pulse)[3]	−75 Volts	Min.
Square Double Pulse Width (Each Pulse)[3]	60 μSec.	Min.
Forced Reset Pulse Amplitude	−120 Volts	Min.
Forced Reset Pulse Width	50 μSec.	Min.
Cathode Load Resistor[4]	150 K-Ohms	Max.

NOTES:

1. *Sockets are available from Sylvania Electric Products Inc., 1035 Westminster, Williamsport, Pennsylvania. (Part No. 7460-0008)*
2. *A value for the anode resistor can be computed by subtracting the nominal tube drop from the supply voltage and dividing the remainder by the desired operating current.*
3. *Two separate pulses, back to back or with slight overlap, must be maintained.*
4. *The peak pulse output voltage can be determined by the IR drop across the chosen cathode resistor.*
5. *A counter tube brochure is available on request from Sylvania Electric Products Inc., 1100 Main Street, Buffalo 9, New York.*

QUICK REFERENCE DATA

The Type 6476A is a cold cathode, bidirectional decade counter tube with top viewed readout. It is designed to operate at inputs up to 4000 pulses per second. All 10 cathodes are brought out to individual base pins. Applications include computing, scaling, counting, frequency dividing, coding, modulating, matrixing, indexing, multiplexing, addition and subtraction. (See Note 5.)



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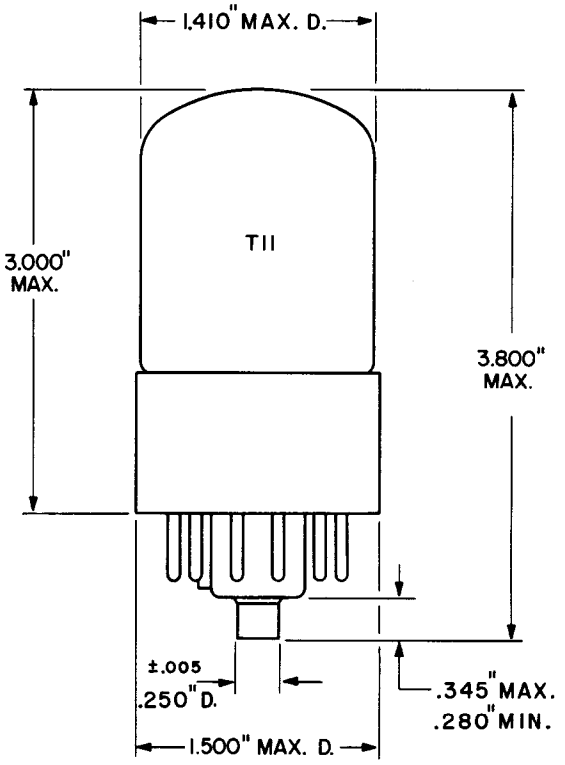
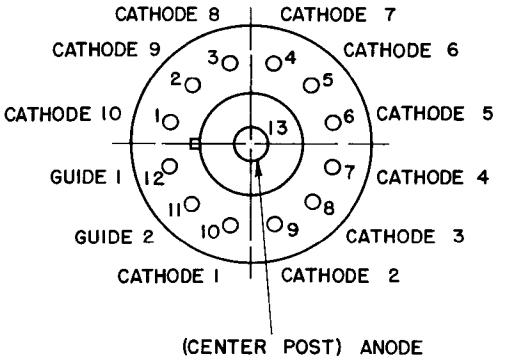
OUTLINE



BASE CONNECTIONS



MECHANICAL DATA

Mounting Position . . . . Any (Count is Read From Top of Tube)
Zero Position (Output Cathode) . . . . Aligned with Pin #6 ± 12°

ELECTRICAL DATA

RATINGS (Absolute Values)

Total Anode Current	0.60 Ma	Max.
Voltage Between Electrodes (Other Than Anode)	140 Volts	Max.
Supply Voltage (Anode to Cathode)	350 Volts	Min.
Input Frequency	4,000 P.P.S.	Max.

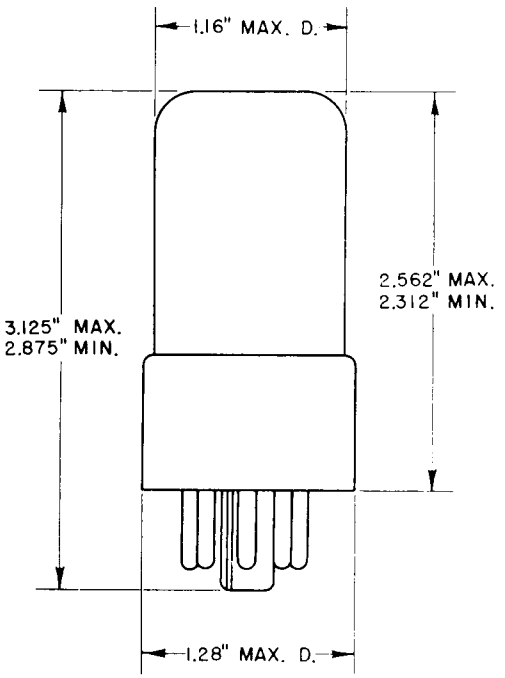
TYPICAL OPERATION

DC Supply Voltage	400 Volts
Anode Resistor	0.47 Megohm
Nominal Tube Drop (Under These Conditions)	191 Volts
Cathode Resistor	68,000 Ohms
Output Voltage (Developed Across Cathode Resistor)	15 Volts

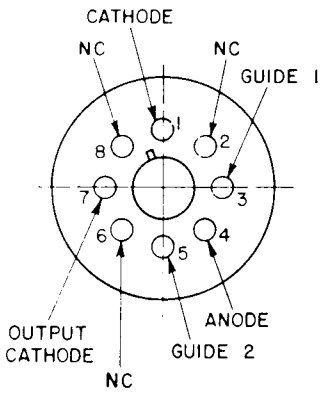
APPLICATION DATA

The Sylvania Type 6482 is a cold single output cathode, bidirectional, decade counter tube. It is designed for use in medium speed decimal counting apparatus such as scalers, computers and dividers. The count is determined by noting the position of the glow on any one of the ten radially spaced cathodes around an axially positioned anode.

OUTLINE DRAWING

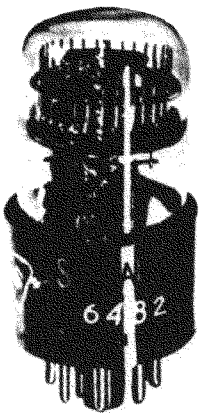


BASE CONNECTIONS



QUICK REFERENCE DATA

Cold single output cathode, bidirectional decade counter tube. The 6482 is similar to the 6476 which has a multiple output cathode.



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3-55

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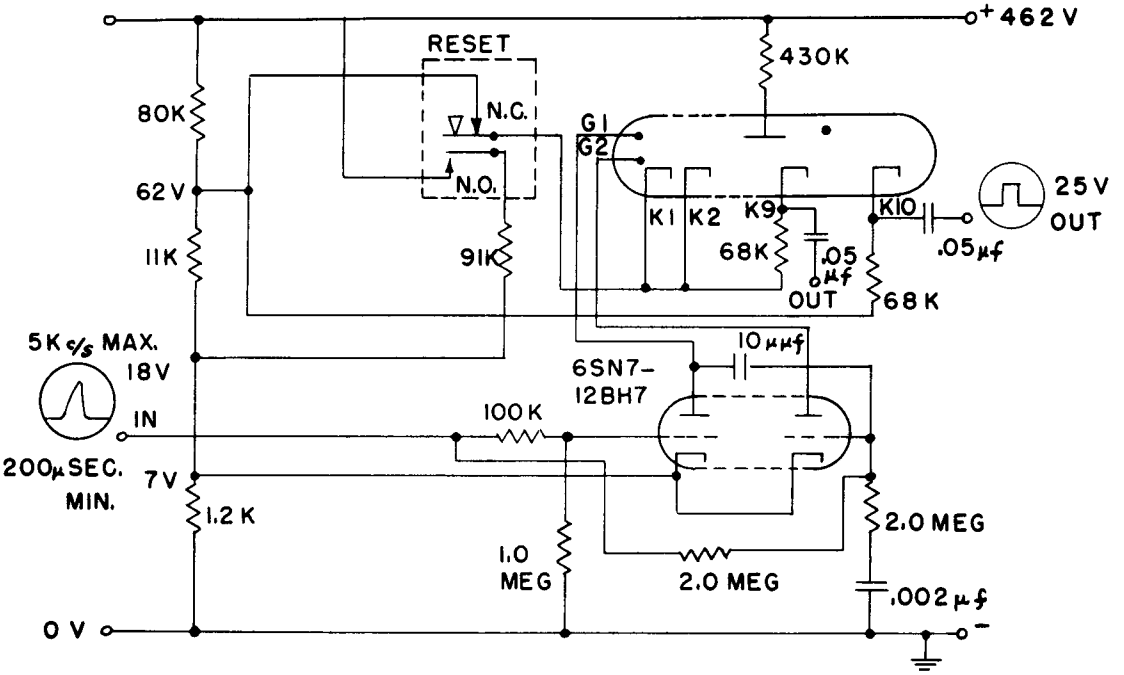
6482

The driving circuits given on this and the following page for Sylvania glow transfer counter tube types 6476 and 6482 offer certain advantages over the previously published circuits.

The important feature of the new circuits is that they provide an essentially square wave pulse to the guide pins. A square wave driving pulse assures stable operation throughout the life of the 6476 and 6482 tubes in spite of small changes which may occur in the guide voltages.

Note: The B+ of the driver is obtained through the guide to anode capacity of the counter tube.



6476 GLOW TRANSFER COUNTER TUBE DRIVER CIRCUIT

MECHANICAL DATA

Bulb	T-3
Base	Subminiature
Pin Connections	See Drawing
Outline	See Drawing
Mounting Position	Any

ELECTRICAL DATA

RATINGS (Absolute Maximum)

	Min.	Max.
Hold-Off Voltage[1]	—	500 Volts
Anode Voltage	350	500 Volts
Trigger Grid Firing Voltage	220	— Volts
Trigger Grid Bias Voltage	0	0 Volt
Power Input[2]	—	1 Watt
Peak-Cathode Current	10	— Amps

TYPICAL OPERATION

Anode Voltage	450 Volts dc
Trigger Grid Bias	0 Volt
Trigger Pulse Voltage	300 Volts
Discharge Condenser	0.25 μfd
Keep-Alive Current	45 μa
Frequency[2]	1 pps
Power Input[2]	0.025 Watt

NOTES:

1. *Hold-off voltage is defined as the greatest anode voltage at which the tube will not fire without the application of a triggering pulse to the trigger grid. It depends on the circuit design and the voltage-current conditions.*
2. *The maximum power input is given by $W = 1/2CV^2f$, where C is the discharge capacitance in microfarads, V is the anode voltage in kilovolts, and f is the number of flashes or pulses per second. This relation also determines the maximum repetition rate.*

APPLICATION DATA

The Sylvania Type 6483 has been designed to meet a long-standing need for a small, reliable and economical trigger tube.

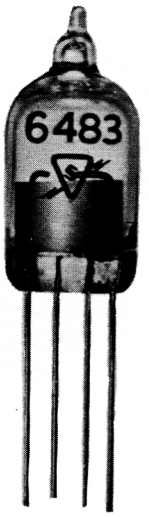
Being of the cold cathode type, the 6483 requires no filament supply. Positive and uniform firing is assured through the use of a keep-alive grid which, in typical circuits, draws only about 45 microamperes. Delay time after application of the trigger pulse is but a few microseconds. (See Figure 3.)

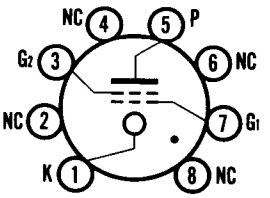
Deionization time has been reduced to a point where the tube's usefulness is extended to several hundred cycles per second in proper circuits. The low design voltage of the 6483 trigger tube immediately suggests its operation from standard dry batteries now readily available for electronic photoflash equipment. As a trigger for the flash tube in the latter type of equipment, it provides foolproof zero delay ("X") synchronization on cameras so equipped or easily modified. The very high impedance of the switch circuit reduces the current through the contacts to a minimum. This insures long switch life and virtually eliminates the "surprise" effects of inadvertent physical contact with the switch terminals. Also, since the 6483 tube may be triggered directly from a type 929 or similar vacuum phototube, it makes possible remote operation of any number of slave flash units without interconnecting wires to the camera shutter switch.

The 6483 tube is extremely useful in the general field of relay and switching circuitry where size, reliability and power requirements are of importance.

QUICK REFERENCE DATA

The Sylvania Type 6483 is a ruggedized cold cathode trigger tube for electronic relay and switching service.





6483

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CIRCUIT OPERATION

The general circuits are shown (Figures 1 and 2) for typical operation of the Type 6483 trigger tube.

Figure 1 shows a basic circuit for operation as a trigger pulse source. The pulse is derived from TR1, an ignition coil of the variety available for photoflash equipment or small model gasoline engines, having a low impedance primary.

Figure 2 shows a slightly modified circuit particularly adapted to photoflash equipment. Means are shown for triggering by use of the camera shutter or photocell activated by a master electronic flash unit.

Circuit operation in Figure 2 is as follows:

Upon closing switch S by means of the camera shutter (or photocell), the trigger grid of the 6483 receives a positive voltage pulse approximately equal to the drop across R1 under steady state conditions.

R2 is used to limit the current through the switch as well as to isolate the switch from the voltage divider.

C1 is used to couple the trigger pulse to the trigger grid. In the steady state, C1 is charged to approximately the voltage appearing across R3.

R4 is the grid return resistor across which the effective trigger voltage is developed. It returns the trigger grid to cathode potential, thereby establishing a zero bias condition.

R8 is necessary to prevent the 6483 tube from shorting C3 during the firing interval.

R6 maintains a keep-alive current of proper value.

C2 is charged to essentially the supply voltage of the system. When the 6483 fires, C2 is discharged through the trigger tube and the primary of the ignition coil, causing an extremely high secondary voltage pulse of the type required to ionize the flash tube T2.

T2, when ionized, obtains its breakdown energy from condenser C3.

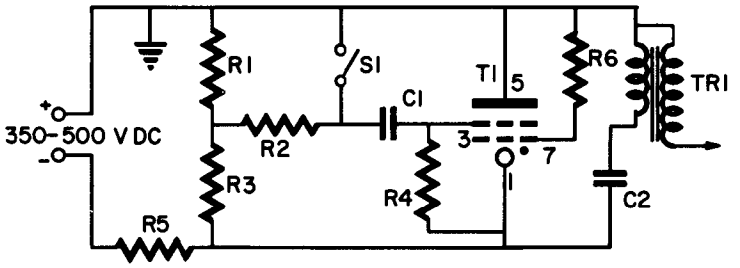

Figure 1

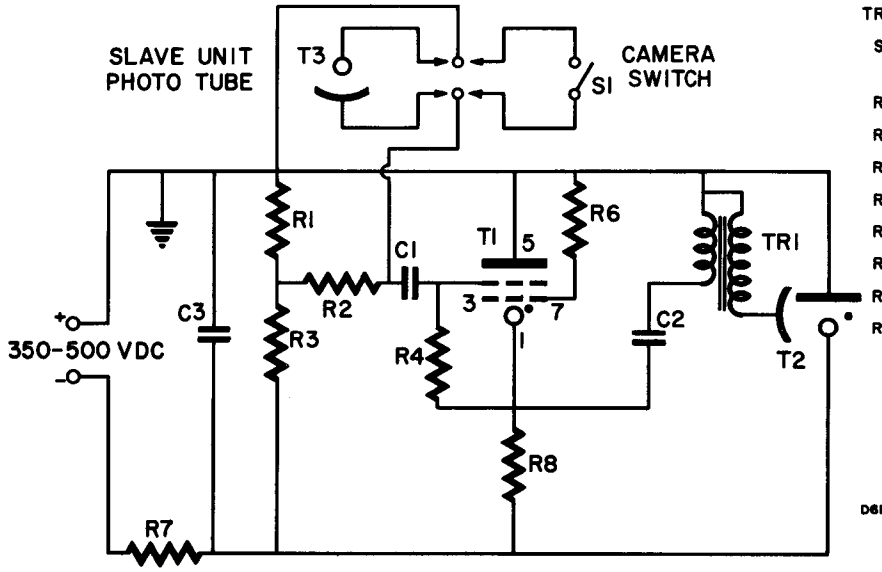

Figure 2

SUGGESTED CIRCUIT VALUES

C1 = 0.01 MFD, 600 V.
C2 = 0.1-0.25 MFD, 600 V.
C3 = SELECTED WITHIN T2 RATING
T1 = SYLVANIA 6483
T2 = 350-500 V. HIGH PRESSURE FLASH TUBE
T3 = SYLVANIA 929 PHOTOTUBE
TR1 = IGNITION COIL
S1 = SWITCH

R1 = 5.1 MEG., ½ WATT
R2 = 5.1 MEG., ½ WATT
R3 = 2.7 MEG., ½ WATT
R4 = 5.1 MEG., ½ WATT
R5 = 1.0 MEG., 2 WATTS
R6 = 10 MEG., ½ WATT
R7 = 500-1000 OHM, 10 WATTS
R8 = 0.1 MEG., 2 WATTS

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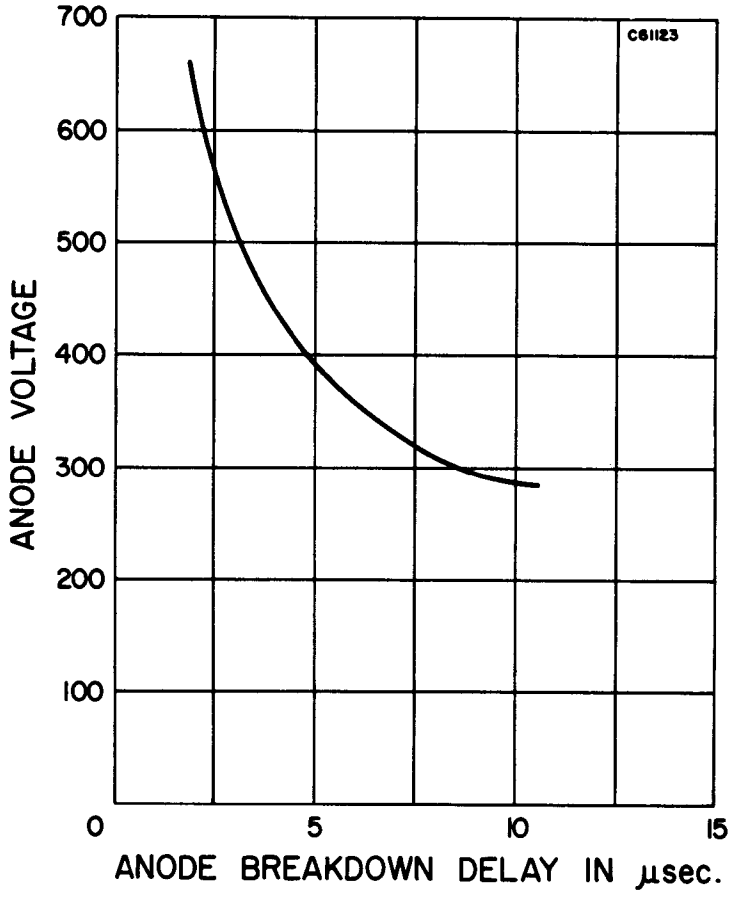
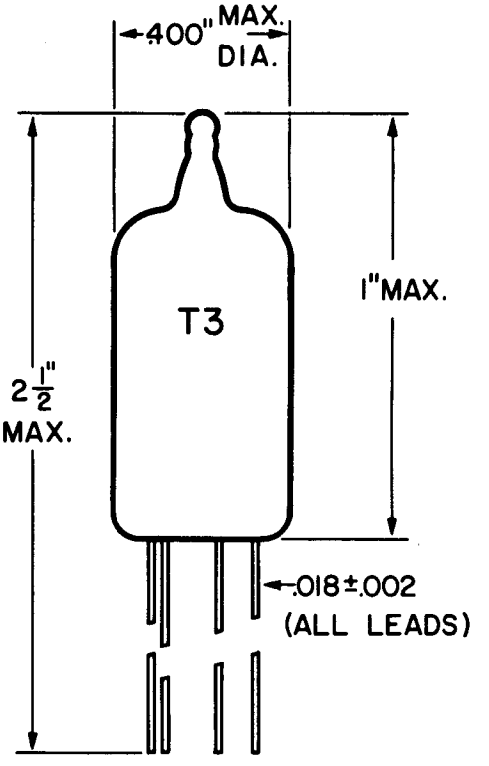
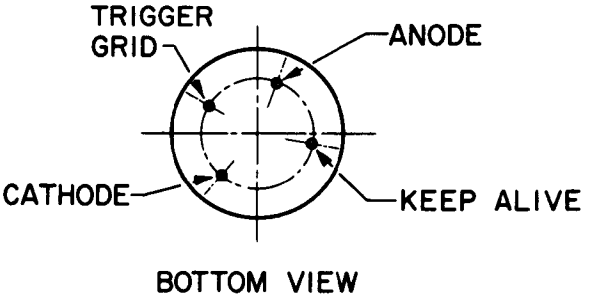
TYPICAL TIME DELAY CHARACTERISTICS



OUTLINE





BOTTOM VIEW

MECHANICAL DATA

Envelope	Metal Capsule	
Power Connector	Winchester PM6P[1]	
RF Connectors	Type N Jack[1]	
Focusing	Electromagnetic Solenoid Required	
Cooling[2]	Forced Air	
Mounting Position	Any	
Tube Weight (Approx.)	1	lb
Solenoid Weight (Approx.):		
Military (Aluminum foil-wound)	7	lbs
Non-Military (Copper wire-wound)	18	lbs

QUICK REFERENCE DATA

Traveling-wave Amplifier
Full Octave Coverage
2.0 to 4.0 Gc
Over 10 mW Power Output
Over 35 db Small Signal Gain
CW or Pulsed
Suitable for Airborne Applications

ELECTRICAL DATA[3]

HEATER CHARACTERISTICS

Voltage	6.3 ± 10%	V
Current (at 6.3 V)	0.64 - 0.96	A
Minimum Preheat Time	1	Minute

RATINGS (Absolute Maximum)

Helix, Collector Voltage	510	Vdc
Grid 1 Voltage	0 to -175	Vdc
Grid 2 Voltage	510	Vdc
Cathode Current	5	mAdc
CW RF Input	1	W

TYPICAL OPERATION[4]

Conditions

Frequency	2.0 to 4.0	Gc
Magnetic Focusing Field Density	285	Gausses
Minimum Uniform Length	11	Inches
Helix, Collector Voltage (Approx.)[5]	450	Vdc
Grid 1 Voltage	0	Vdc
Voltage to Gate-Off (55 db Insertion Loss)	-80	Vdc
Grid 2 Voltage (Approx.)[5]	300	Vdc

Characteristics	Min.	Max.	
Cathode Current	-	4.5	mAdc
Grid 1 Current	-	0.3	mAdc
Grid 2 Current	-	0.2	mAdc
Small Signal Gain (-40 dbm Input)	35	45	db
Small Signal Gain Variation	-	±3	db
Fine-Grain Variation of Gain for any 100-Mc Segment	-	±2	db
Noise Power Output[6]	-	0.03	mW
Saturation Power Output	10	-	mW

CIRCUIT DESIGN INFORMATION[7]

Helix Voltage Range	400 to 500	Vdc
Grid 1 Voltage Range	0 to -170	Vdc
Grid 2 Voltage Range[8]	190 to 500	Vdc

POWER CONNECTIONS

A. Grid 1
B. Grid 2
C. Helix
D. Heater, Cathode
E. Heater
F. Capsule, Collector

SYLVANIA ELECTRIC PRODUCTS INC.

MICROWAVE DEVICE OPERATIONS
Mountain View, California

January 10, 1961

from JEDEC release #1377A, April 10, 1961

NOTES:

1. Alternative connectors supplied on request.

2. In addition to the cooling air requirements for the solenoid used with this tube it is recommended that at least 0.04 lbs/min of less than 100°F cooling air be passed along this tube.

3. All voltages given are with respect to cathode except where specified otherwise. Any one of pins A, B, C, D, or E may be connected to pin F which, for safety, should be grounded.

4. The quoted tube performance is for operation in a Sylvania-approved solenoid. Additional information will be supplied on request.

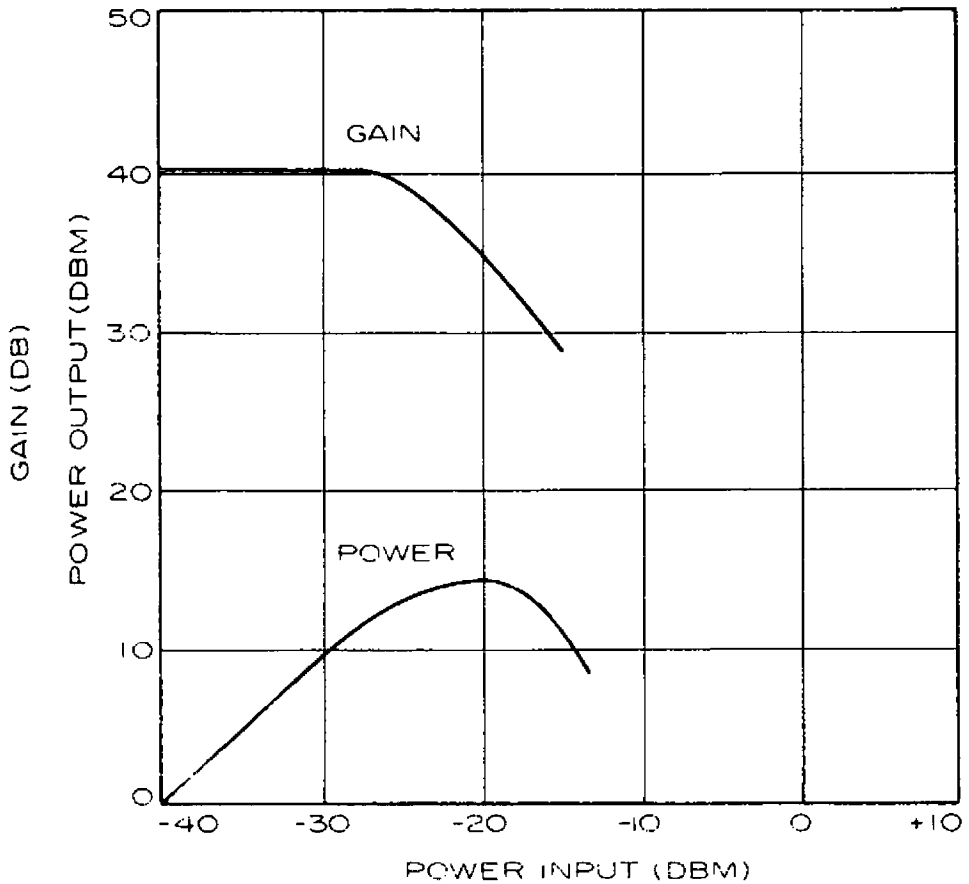
5. This voltage should be set to the value stated on the data sheet supplied with each tube.

6. As measured by a broadband bolometer with a frequency response from 0.5 to 10.0 Gc.

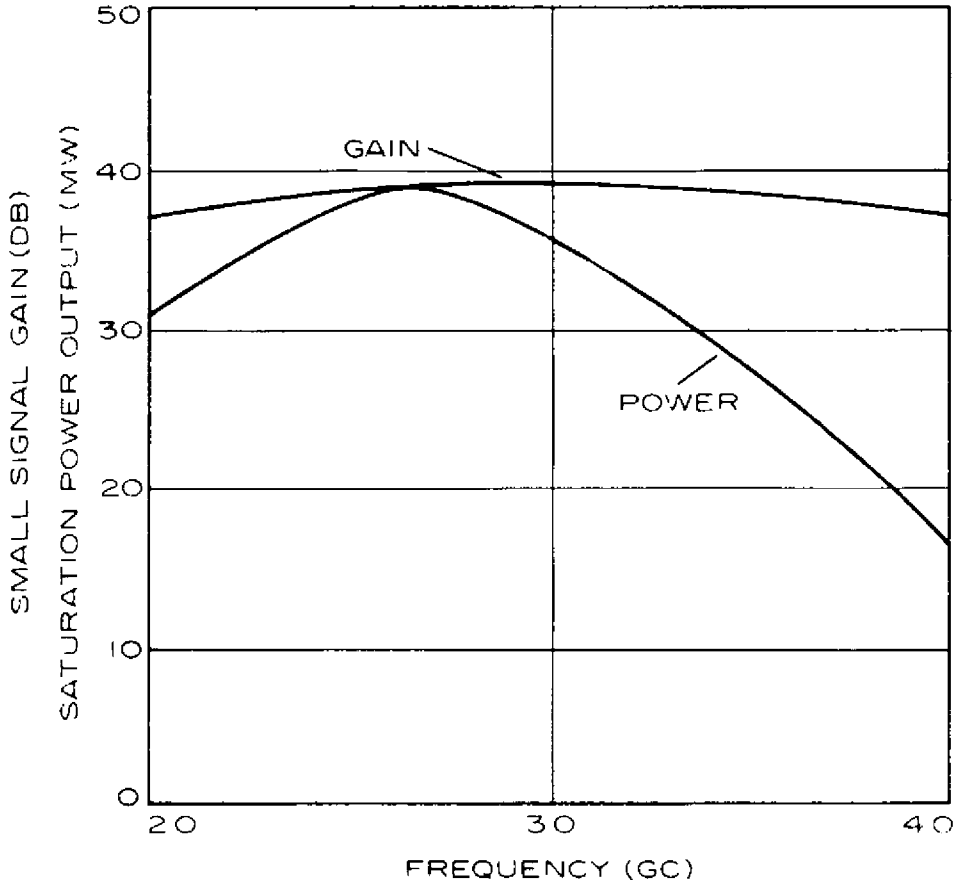
7. Ranges include values required as a result of initial spread in tube characteristics as well as those to accommodate changes throughout life.

8. For initial setup, it is desirable that grid 2 voltage be adjustable upward from zero.

TYPICAL PERFORMANCE CHARACTERISTICS


50
40
30
20
10
0
GAIN
POWER
GAIN (DB)
POWER OUTPUT (DBM)
-40
-30
-20
-10
0
+10
POWER INPUT (DBM)

Type 6493


50
40
30
20
10
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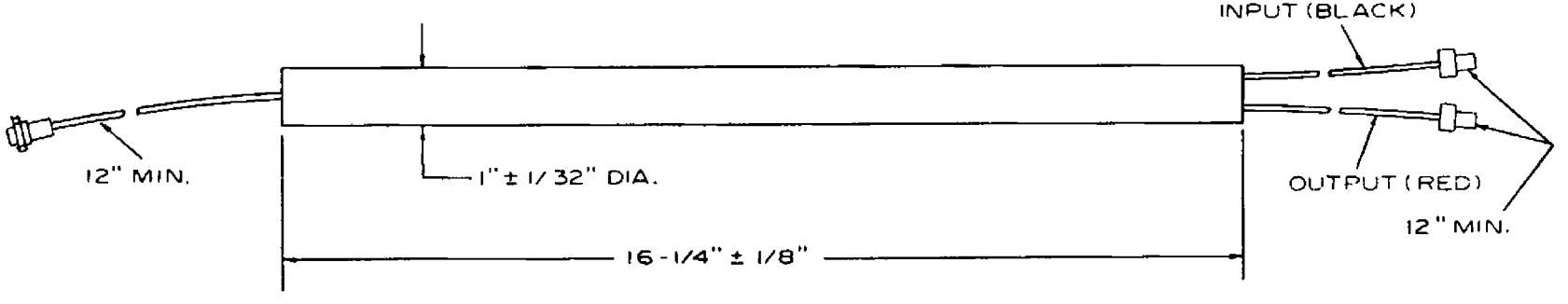
GAIN
POWER
SMALL SIGNAL GAIN (DB)
SATURATION POWER OUTPUT (MW)
20
30
40
FREQUENCY (GC)

Type 6493



Type 6493

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engineering data service

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MECHANICAL DATA

Envelope	Metal Capsule
Base	Special (Socket Supplied)
Cathode	Unipotential Oxide
Magnetic Field Strength	500 Gauss
Length of Magnetic Field	10" Uniform
Mounting Position	Any
Weight[1]	2 Lbs. Approx.
Connectors	BNC (52 Ohm)
Focusing Field[1]	Electromagnet
Cooling	Forced Air
Maximum Collector Temperature	150° C
Maximum Bulb Temperature	150° C

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (±10%)	6.3 Volts	ac
Heater Current	3.5 Amperes	

RATINGS (Absolute Values)

1st Anode Voltage	150 Volts	Max.
1st Anode Current	5 Ma	Max.
2nd Anode Voltage	Ext. Connect to Helix	Max.
2nd Anode Current	5 Ma	Max.
Helix Voltage	2000 Volts	Max.
Helix Dissipation	15 Watts	Max.
Collector Voltage	2100 Volts	Max.
Collector Dissipation	60 Watts	Max.
Focusing Electrode Voltage	−15 Volts to +5 Volts	
Helix Voltage to Ground	0	Max.

CHARACTERISTICS

Frequency	2-4 Kmc
Power Output	35 Mw Min.

TYPICAL OPERATION

	2.0 Kmc	4 Kmc
1st Anode Voltage	80	60 Volts
1st Anode Current	0.75	0.15 Ma
2nd Anode Voltage	180	1250 Volts
2nd Anode Current	0.4	1.5 Ma
Helix Voltage	180	1250 Volts
Helix Current	0.5	3 Ma
Collector Voltage	260	1330 Volts
Collector Current	18	15 Ma
Power Output	50	300 Mw

NOTE:

1. Magnet not included, information on request.

QUICK REFERENCE DATA

The Sylvania Type 6496 is a Backward Wave Oscillator designed for voltage tunable oscillator service over the frequency range 2000-4000 megacycles with a power output of 35-300 Mw.



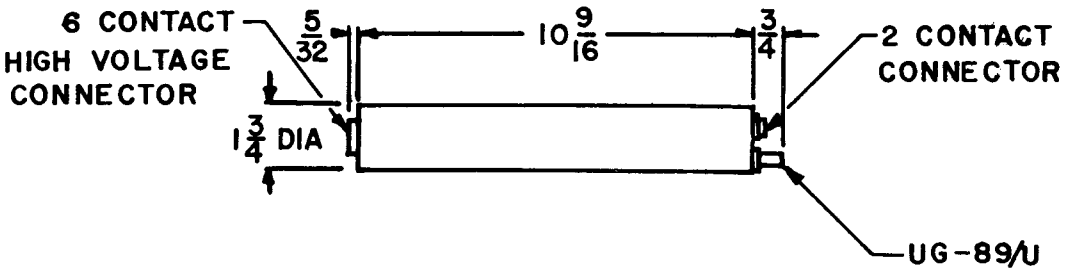
SYLVANIA ELECTRIC PRODUCTS INC.

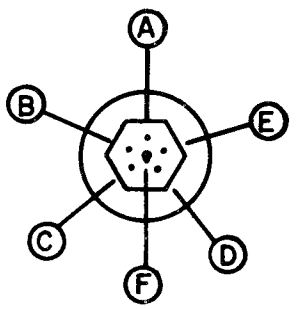
ELECTRONICS DIVISION
WOBURN, MASS.

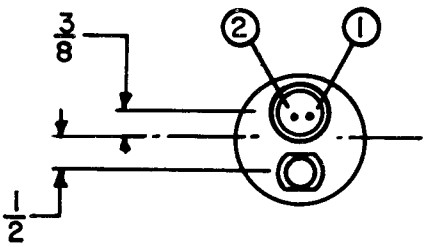
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

11-54-94-1

OUTLINE DRAWING







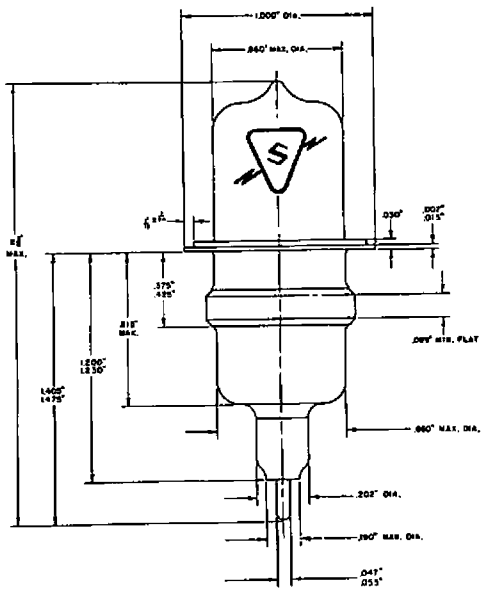
A FOCUS
B CAPSULE
C HEATER
D HEATER-CATHODE
E ANODE
F 2ND ANODE

1 HELIX
2 COLLECTOR

S54034

QUICK REFERENCE DATA

The Sylvania Type 6503 was designed primarily for use as a cw oscillator at frequencies up to 3300 mc. The ruggedized anode ring of the 6503 suits it for applications involving shock and vibration.



MECHANICAL DATA

Max. Overall Length	2 3/8 inches
Max. Diameter	1.000 inches
Grid Ring Diameter	.745 ± .005 inches

RATINGS AND CHARACTERISTICS

ELECTRICAL RATINGS

Heater Voltage (AC or DC)	6.3 Volts
Heater Current (max)	.405 amperes
Plate Voltage (max) DC	350 volts
Plate Dissipation (max)	5 watts
Seal Temperature (max)	175°C
Operating Frequency (max)	3300 megacycles
Direct Interelectrode Capacitance (max)	
Grid-plate	1.70 μμf
Grid-cathode	1.60 μμf
Plate-cathode	.030 μμf

CHARACTERISTICS (1)

Transconductance (max)	5650 micromhos
Application Factor (max)	23

TYPICAL OPERATING CONDITIONS

UHF OSCILLATOR CW

Plate Voltage	200 V dc
Plate Current	25 mA
Cathode Resistor (2)	100 ohms (approx.)
Frequency	3300 Mc
Power Output (Avg.)	450 mW

NOTES:

(1) Test Conditions

Plate Voltage	180 V dc
R_k/I_b =	12 mA

(2) Adjusted for plate current of 25 mA

APPLICATION DATA

The 6503 is designed as an CW oscillator to 3300 Mcs. It functions as an extremely stable prime signal source or local oscillator. The Amerac* 192A type cavity is recommended.

*Amerac Incorporated, Wenham, Massachusetts

from JETEC release #1416, Feb. 14, 1955

ADVANCE DATA

MECHANICAL DATA

Dimensions	Per Outline
Mounting Position	Any
Number of Ignitors	One
Ambient Temperature Range (non-operating)	-40 to +100°C

ELECTRICAL DATA

RATINGS

Ignitor Open Circuit Supply Voltage	-750 to -1000 Vdc
Ignitor Current (max)	200 μAdc

GENERAL DATA

Tuning Range	33,814 to 35,906 mc
Transmitter Peak Power	100 kw
Flat Leakage Power (max) (1)	30 mw
Insertion Loss at 34,860 mc (max)	2.5 db
Ignitor Interaction at Ignitor Current of 100 μAdc (max)	0.2 db
Ignitor Voltage Drop at Ignitor Current of 100 μAdc (max)	200 to 350 Vdc
Recovery Time (max) (2)	4 usec

NOTES

(1) F = 34,860 mc; p_o = 8 KW; Ii = 100 μAdc; tp = .25 μsec at 2000 pps or tp = .5 μsec at 1000 pps.

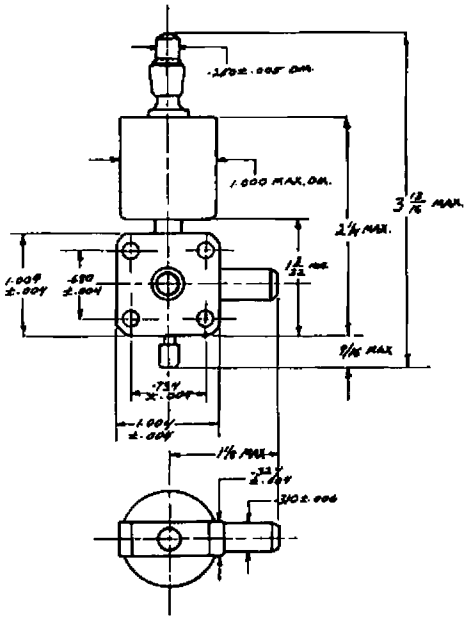
(2) F = 34,860 mc; p_o = 8 KW; Ii = 100 μAdc; tp = .25 μsec at 2000 pps or tp = .5 μsec at 1000 pps. The loss of signal in the tube at the specified time after the pulse shall not be more than 3 db in excess of the loss at 100 μsec after the pulse.

APPLICATION DATA

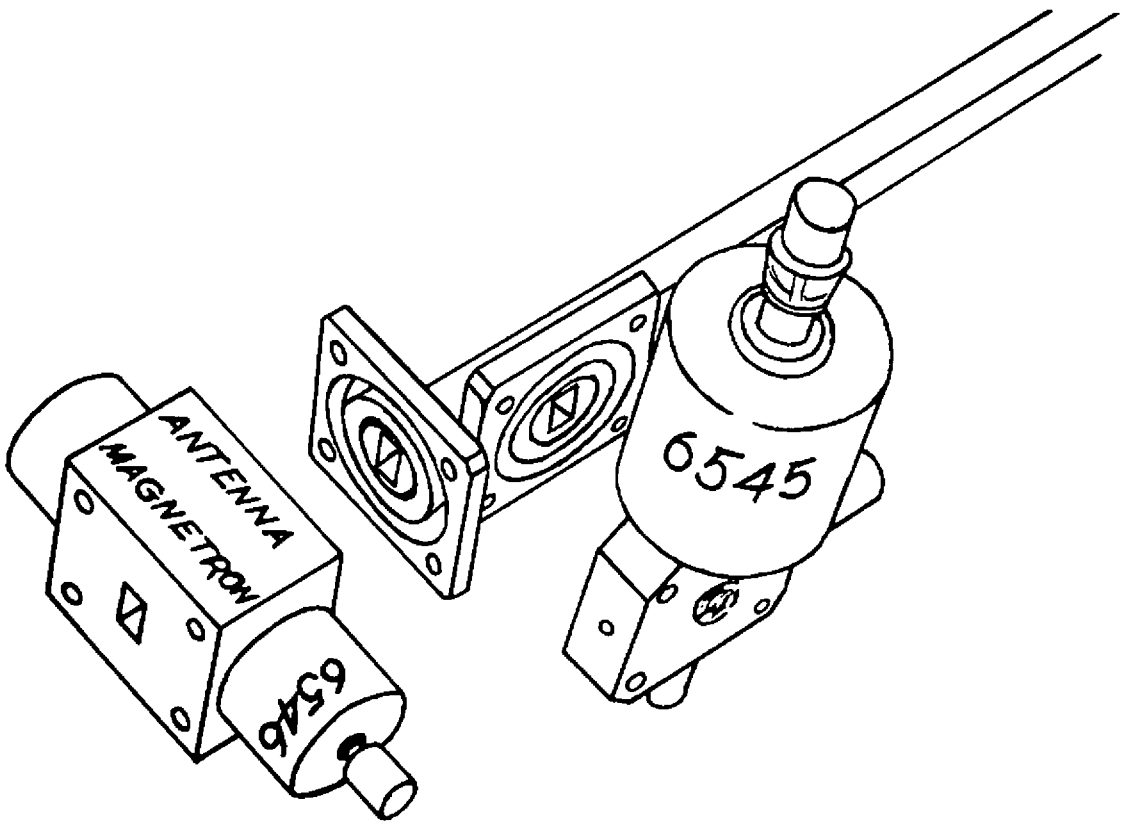
The Sylvania Types 6545 and 6546 are normally used in a branched type duplexer, in conjunction with the Mag 400 magnetron in pressurized systems. These components are recommended for application in systems requiring high definition combined with maximum range and bearing accuracy.

QUICK REFERENCE DATA

The Sylvania Type 6545 is an integral cavity tunable transmit-receive tube designed to operate at 100 KW peak power and its tuning range is from 33,814 to 35,906 megacycles.



from JETEC release #1377, Nov. 29, 1954


ANTENNA
MAGNETRON
6546
6545

ADVANCE DATA

MECHANICAL DATA

Dimensions	Per Outline
Mounting Position - Note 2	Any
Ambient Temperature Range (non-operating)	-40 to + 100°C

ELECTRICAL DATA

RATINGS

Transmitter Peak Power (min)	20 kw

GENERAL DATA

Center Frequency	34,860 mc
SWR at 34511 and 35209 mc (min)	10 db
Low Level Characteristics	
Equivalent Conductance at 34,860 mc (max)	0.15
Tuning Susceptance at 34,860 mc	±0.07
High Level Characteristics	
Arc Loss (max) (1)	0.9 db
Firing Time (max) (1)	10 sec.

NOTES

(1) F = 34,860 mc; p_o = 4 KW; tp = .30 ±.05 usec; prr = 2000 pps.

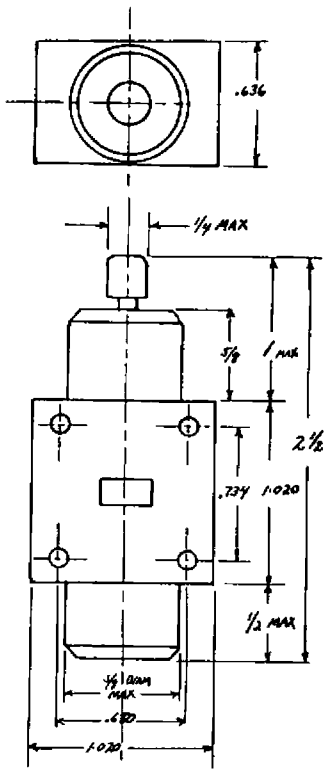
(2) Tube must be inserted in the duplexer as indicated by the external markings on tube body.

APPLICATION DATA

The Sylvania Types 6545 and 6546 are normally used in a branched type duplexer, in conjunction with the Mag 400 magnetron in pressurized systems. These components are recommended for application in systems requiring high definition combined maximum range and bearing accuracy.

QUICK REFERENCE DATA

The Sylvania Type 6546 is an anti-transmit-receive tube designed to operate at a center frequency of 34,860 megacycles and at 100 KW peak power.



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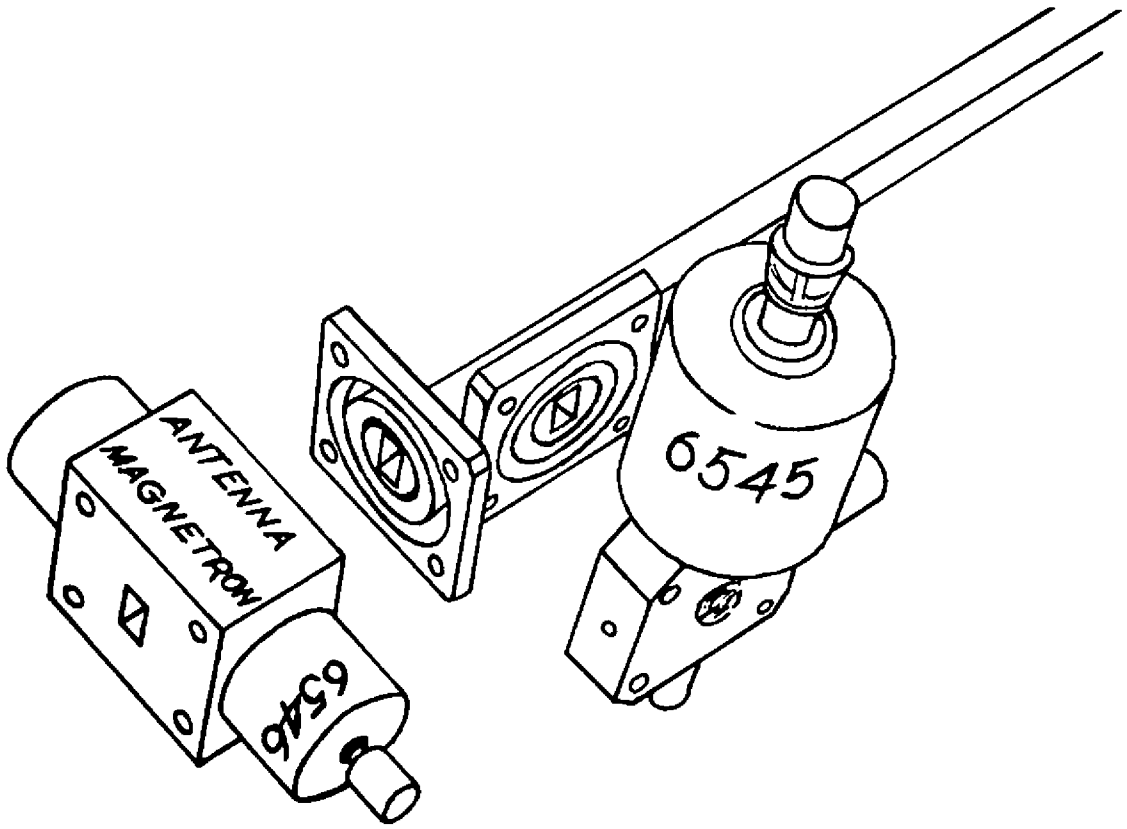

ANTENNA
MAGNETRON
6546
6545

SYLVANIA

engineering data service

SYLVANIA

6551

MECHANICAL DATA

Shock (Non-Operating)	10 G
Vibration (Non-Operating)	10-150 cps—5 G
Mounting Position	Any
Overall Dimensions	$5\frac{7}{8}$ x $3\frac{3}{16}$ x $5\frac{7}{8}$ Inches
Net Weight	7.5 Lbs. approx.
Cooling	Forced Air
Pressurization	50 psi abs.
Output Coupling	See Drawing

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage—Preheat[1]	5.0 ± 10% Volts
Heater Current at 5.0 Volts	2.6 — 3.2 Amps
Minimum Preheat Time	3 Minutes

RATINGS (Absolute Maximum)[2]

Heater Voltage	6.0 Volts
Peak Current	18 Amps
Peak Anode Voltage	16 kv
Peak Power Input	270 kw
Frequency Pulling at VSWR 1.5/1	30 mc
Anode Temperature	130° C
Pulse Duration	0.5 μsecond
Duty Cycle	0.0007
Minimum Pulse Voltage Rise Time	0.08—0.1 μsecond
VSWR	1.5/1
R F Bandwidth	15 mc

TYPICAL OPERATION

	Oscillation 1	
Pulse Recurrence Frequency	4000 pps	
Pulse Duration	0.150 μsecond	
Peak Anode Voltage	14 kv	
Peak Anode Current	15 Amps	
Average Anode Current	9 Ma	
Useful Range of Average Current	6-11 Ma	
Average Power Output	24 Watts	Min.
Input Capacitance	8 μμf	

NOTES:

1. *Heater voltage must be reduced to zero after the application of high voltage.*
2. *The values specified are based on the "absolute system" and are not to be exceeded under any service conditions. The ratings are limiting values above which serviceability of any individual tube may be impaired. It does not necessarily follow that combinations of absolute maximum ratings can be attained simultaneously.*

QUICK REFERENCE DATA

The Sylvania Type 6551 is a medium power, pulsed fixed frequency (23800—24270 mc) magnetron.

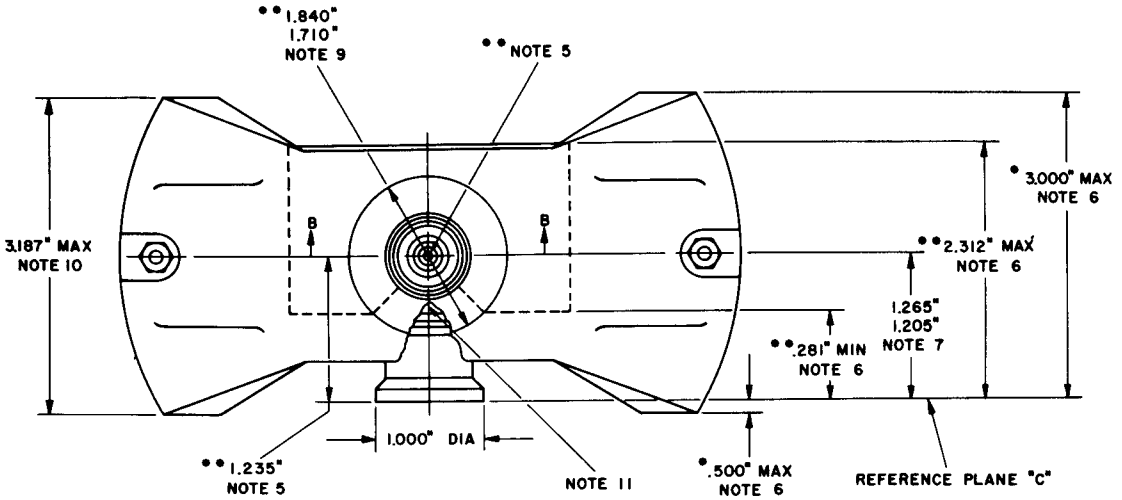
The unit is supplied with magnet in place.

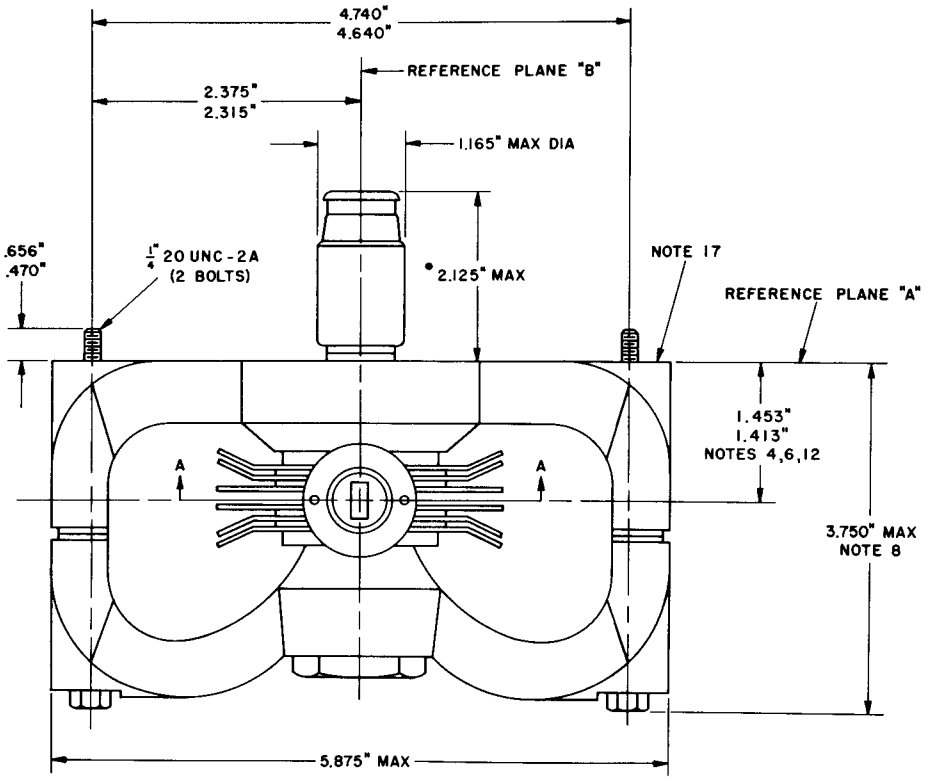
SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JULY 1956





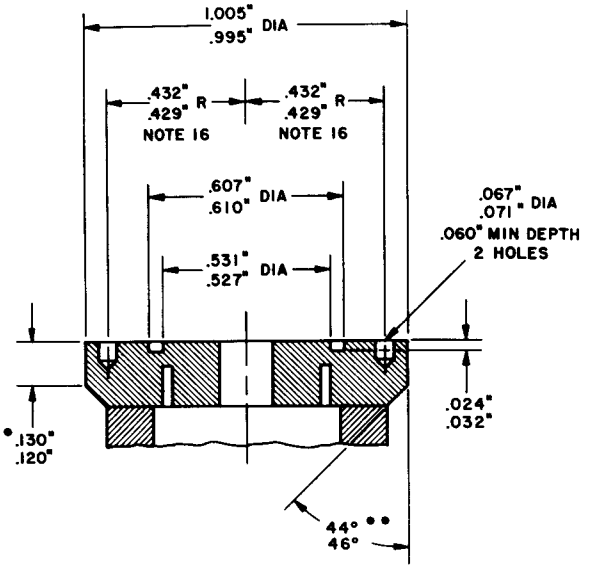
**Qualification approval measurements.

*Design test measurements.

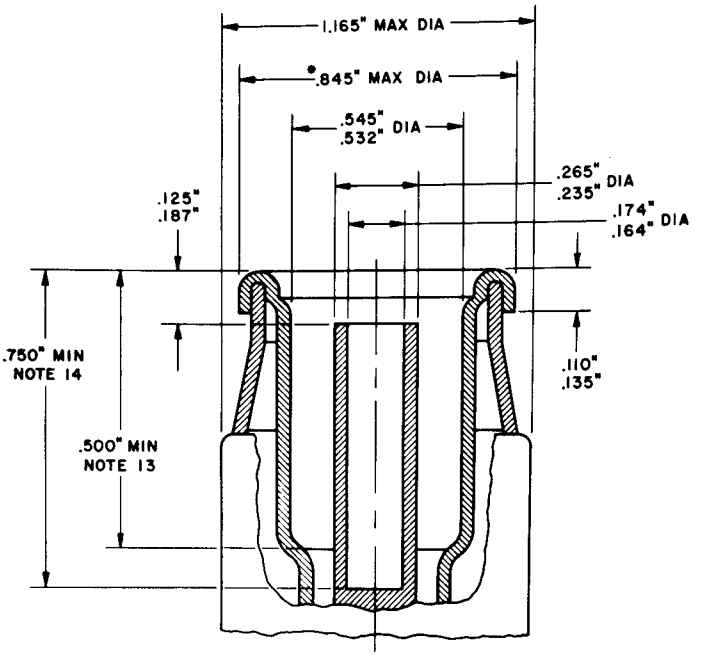
Production—all other dimensions and notes.

FOR SECTION "A-A" & B-B
SEE PAGE 3

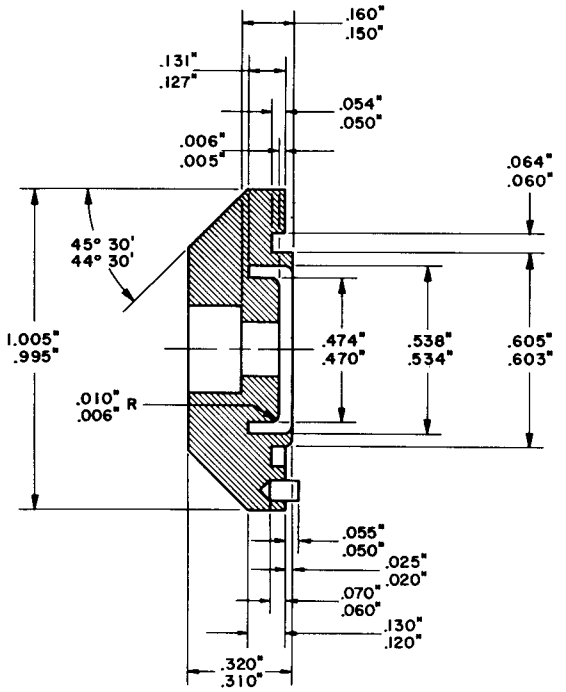
All dim's in inches

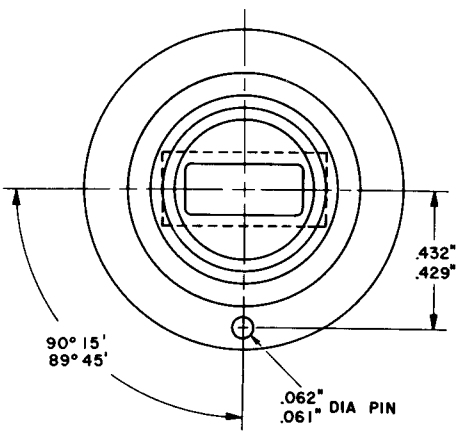


PARTIAL SECTION A-A



PARTIAL SECTION B-B





MATING CONNECTION FOR OUTPUT TERMINAL

DRAWING NOTES:

1. Ref. plane "A" is defined as a plane passing through the finished surface of the magnet as shown.
2. Ref. plane "B" is defined as a plane passing through the center of the output and perpendicular to ref. plane A.
3. Ref. plane "C" is defined as a plane perpendicular to planes "A" and "B" at the face of the output.
4. This dimension refers to centerline of tube.
5. Center of cathode bushing may vary from true location by .125 (See Note 7).
6. Includes angular as well as lateral deviations.
7. This dimension applies to location of mounting bolts with respect to ref. plane C.
8. This dimension applies either to head of magnet bolt or top of exhaust cap or magnet coating.
9. Applies to flat on top of magnet.
10. Refers to size of coated magnet only.
11. Temperature is measured at this point.
12. Centerline of drilled holes in output flange may vary from true location by .007.
13. This dimension refers to .532–.545 dia.
14. This dimension refers to .164–.174 dia.
15. Alignment of the electric vector shall be perpendicular to Ref. plane "B".
16. Refers to centerline of .607–.610 dia.
17. This surface to be flat within .010.

engineering data service

MECHANICAL DATA

Envelope	Metal Capsule	
Power Connector	Winchester PM6P[1]	
RF Connectors	Type N Jack[1]	
Focusing	Electromagnetic Solenoid Required	
Cooling[2]	Forced Air	
Mounting Position	Any	
Tube Weight (Approx.)	1	lb
Solenoid Weight (Approx.):		
Military (Aluminum foil-wound)	13	lbs
Non-Military (Copper wire-wound)	39	lbs

QUICK REFERENCE DATA

Traveling-wave Amplifier
Full Octave Coverage
Over 2 W CW Power Output from 2.0 to 4.0 Gc
Over 1 W CW Power Output from 1.7 to 4.3 Gc
Suitable for Airborne Applications

ELECTRICAL DATA[3]

HEATER CHARACTERISTICS

Voltage	6.3 ± 10%	V
Current (at 6.3 V)	1.1 - 1.5	A
Minimum Preheat Time	1	Minute

RATINGS (Absolute Maximum)

Collector Voltage with Respect to Helix	250	Vdc
Helix Voltage	1000	Vdc
Grid Voltage	800	Vdc
Cathode Current	65	mAdc
Helix Current	11	mAdc
Grid Current	5	mAdc
CW RF Input[4]	1	W
Collector Seal Temperature	150	°C

TYPICAL OPERATION[5]

Conditions

Frequency	2.0 to 4.0	Gc
Magnetic Focusing Field Density	885	Gausses
Minimum Uniform Length	10.6	Inches
Collector Voltage with Respect to Helix	150	Vdc
Helix Voltage (Approx.)[6]	825	Vdc
Grid Voltage (Approx.)[6]	475	Vdc

Characteristics	Min.	Max.	
Cathode Current	-	60	mAdc
Helix Current	-	8	mAdc
Grid Current	-	0.8	mAdc
Saturation Power Output	2	-	W
Small Signal Gain (-30 dbm Input)	37	-	db

CIRCUIT DESIGN INFORMATION[7]

Helix Voltage Range	700 to 900	Vdc
Grid Voltage Range[8]	350 to 650	Vdc

POWER CONNECTIONS

A. NC
B. Grid
C. Helix
D. Heater, Cathode
E. Heater
F. Capsule, Collector

SYLVANIA ELECTRIC PRODUCTS INC.

MICROWAVE DEVICE OPERATIONS

Mountain View, California

February 15, 1961

NOTES:

1. Alternative connectors supplied on request. Length of power and RF leads can be made to fit customer requirements.

2. In addition to the cooling air requirements for the solenoid used with this tube it is recommended that at least 0.2 lbs/min of less than 26°C cooling air be directed at the collector end of this tube.

3. All voltages given are with respect to the cathode except where specified otherwise. For safety, pin F and the solenoid case should be grounded.

4. When RF is applied to the input of this tube the RF output should be connected to a load.

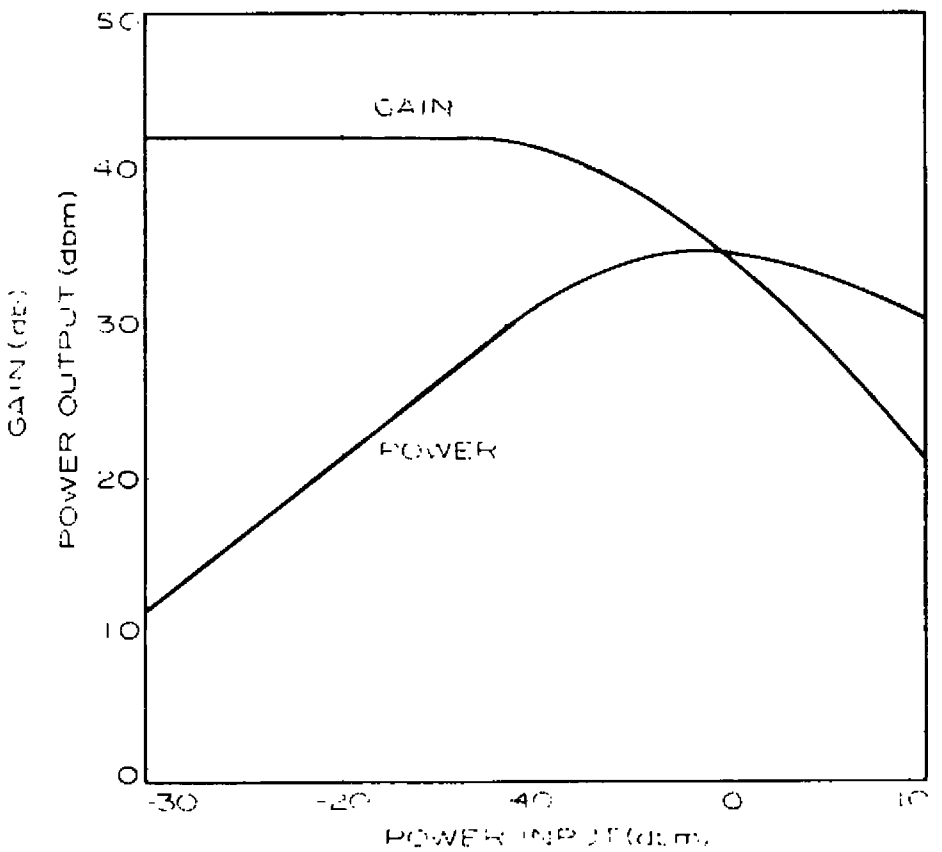
5. The quoted tube performance is for operation in a Sylvania-approved solenoid. Additional information will be supplied on request.

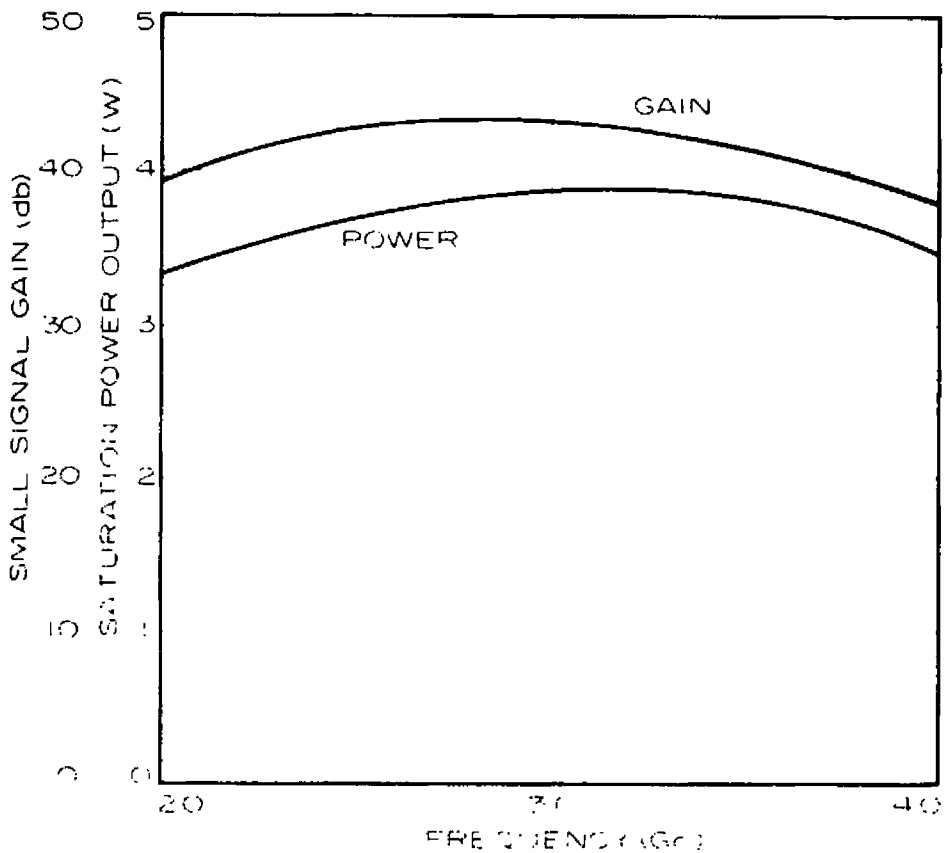
6. Specific recommended operating voltage values supplied with each tube.

7. Ranges include values required as a result of initial spread in tube characteristics as well as those to accommodate changes throughout life.

8. For initial setup only, this voltage should be adjustable from zero upward.

TYPICAL PERFORMANCE CHARACTERISTICS


GAIN
POWER
POWER OUTPUT (dbm)
0
10
20
30
40
50
-30
-20
-40
0
10


50
40
30
20
10
0
SMALL SIGNAL GAIN (db)
5
4
3
2
1
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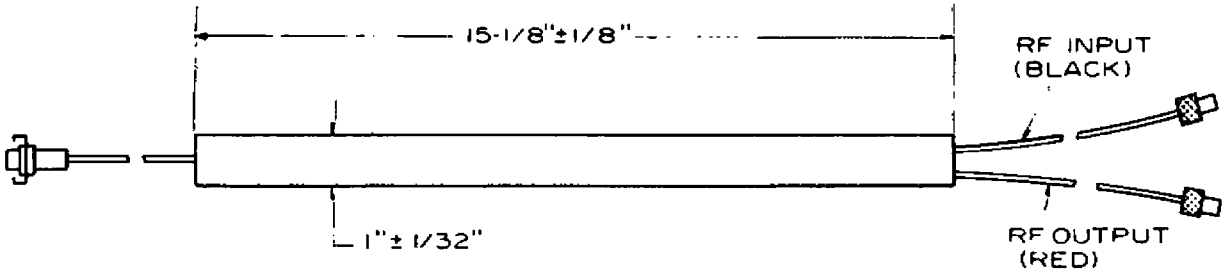
SATURATION POWER OUTPUT (W)
GAIN
POWER
20
30
40

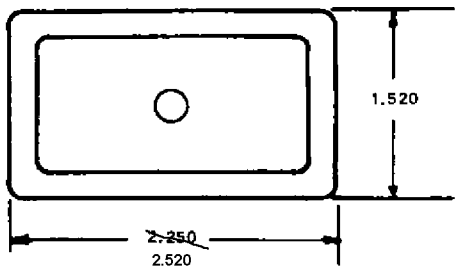

15-1/8"±1/8"
RF INPUT
(BLACK)
1"± 1/32"
RF OUTPUT
(RED)

QUICK REFERENCE DATA

The Sylvania Type 6591 is a broad-band ATR tube designed for use at a center frequency of 5400 mc. It is contact mounted at the window end of the tube.

MECHANICAL DATA

Dimensions	Per Outline
Mounting Position	Any (one gasket is supplied with each tube)
Ambient Temperature Range (non-operating)	-40 to +100°C



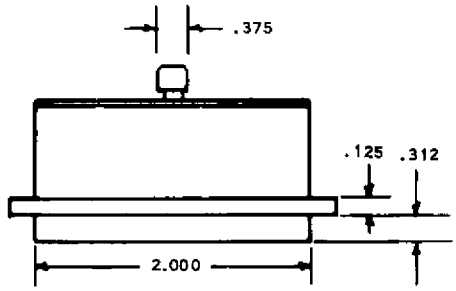
ELECTRICAL DATA

Ratings

Transmitter Peak Power (min.)	4 KW

General Data

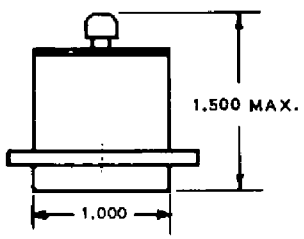
Center Frequency	5400 mc
Low Level Characteristics at Center Frequency	
Equivalent Conductance (max.)	0.1
Tuning Susceptance	-.06 to +.06
High Level Characteristics at Center Frequency	
Arc Loss (max.) (1)	0.8 db
Recovery Time (max.) (2)	25 μsec
Firing Time (max.)	10 sec.



Notes:

(1) pi= 10 KW; tp= 1.0 μsec; prr= 1000 pps; F= 5400 mc

(2) The distance between the position of the minimum in the unfired condition and the position of the minimum after the specified time interval after the magnetron pulse shall be less than .05 λg. The probing signal shall be 5400 mc.



APPLICATION DATA

The 6591 is a contact-mounted, C-band, ATR tube developed for application in branched duplexers in conjunction with the 6624 TR tube. Other than center frequency electrical performance is equivalent to type 6081. The contact-mount, however, decreases overall size and weight. In addition, better system performance is assured by elimination of the conventional ATR "castle", and the ever-present possibility of arcing in this type of mount

from JETEC release #1457, May 2, 1955

TENTATIVE DATA

MECHANICAL DATA

Dimensions	Per Outline
Mounting position	Any
Ambient temperature range (non-operating)	-40 to +100°C

ELECTRICAL DATA

Center frequency	5400 mc
Operational band for VSWR of 1.4 max.	5370 to 5430 mc
Ignitor supply voltage (min.)	-700 volts
Ignitor voltage drop; Ii = 100 μAdc	-200 to -400 volts
Spike leakage energy (max.) (1)	0.30 ergs
Flat leakage power (max.) (1)	50 mw
Insertion loss; Ii = 0	0.7 db
Ignitor interaction; Ii = 100 μAdc	0.3 db
Recovery time at 30 KW peak 3 db down	10 μsec
Arc loss at 4 KW peak	0.8 db
Transmitter peak power (min.)	4 KW

Notes:

(1) po= 30 KW; prr= 1000 pps; tp= 1.0 and 0.5 μsec.; Ii= 100 μAdc; F= 5400 mc

APPLICATION DATA

The 6624 TR tube was developed specifically for a commercial airborne radar application. It is recommended for any branched duplexer design, commercial or military, if any of three factors - size, weight, cost, is the primary objective.

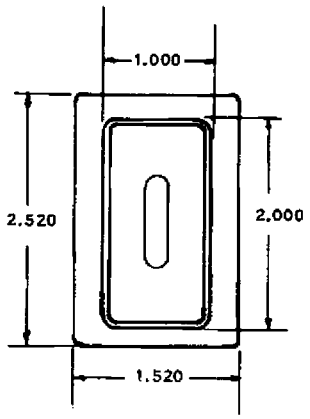
Size and weight are reduced approximately 50% from the 5925, while maintaining equivalent performance.

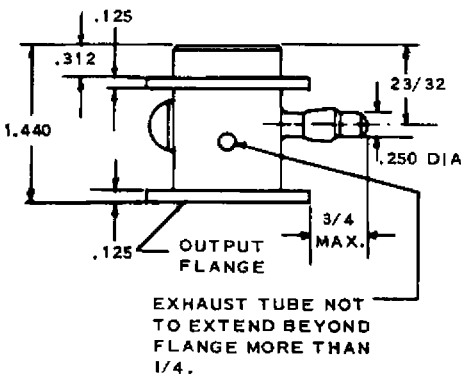
The method of mounting is unique, fast and simple. By incorporating a "slip-in" type of design, it becomes possible to obtain precise location of the TR by using only four mounting bolts between wavequide flanges.

from JETEC release #1457, May 2, 1955

QUICK REFERENCE DATA

The Sylvania Type 6624 is a fixed tuned integral cavity TR tube. Its operational band is from 5370 to 5430 mc. It is designed to be contact mounted at the input end of the tube.





Type 6660/6BA6 is designed specifically for use in mobile communications equipment. The 6660/6BA6 may be operated without serious degradation under normal variations in supply voltage as encountered with automotive electrical systems. Also consistent with the requirements of the equipment, the tube is capable of withstanding appreciable on-off cycling.

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7BK
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	6.3 Volts	
Heater Current	300 Ma	
Heater-Cathode Voltage (Design Center Values)		
Heater Negative with Respect to Cathode	100 Volts	Max.
Heater Positive with Respect to Cathode	100 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded	Unshielded	
Grid No. 1 to Plate	.0035	.0035 μμf	Max.
Input	5.5	5.5 μμf	
Output	5.5	5.0 μμf	

RATINGS (Design Center Values)

Plate Voltage	330 Volts	Max.
Grid No. 2 Supply Voltage	330 Volts	Max.
Grid No. 2 Voltage	See Rating Chart	
Plate Dissipation	3.3 Watts	Max.
Grid No. 2 Dissipation	0.65 Watts	Max.
Negative Grid No. 1 Voltage	55 Volts	Max.
Positive Grid No. 1 Voltage	0 Volts	Max.

CHARACTERISTICS AND TYPICAL OPERATION

Plate Voltage	100	250 Volts	
Grid No. 3 Voltage	Connected to Cathode at Socket		
Grid No. 2 Voltage	100	100 Volts	
Cathode Bias Resistor	68	68 Ohms	
Plate Resistance (Approx.)	0.25	1.0 Megohm	
Transconductance	4300	4400 μmhos	
Plate Current	10.8	11.0 Ma	
Grid No. 2 Current	4.4	4.2 Ma	
Ec[1] for Gm = 40 μmhos (Approx.)	−20	−20 Volts	

SPECIAL TESTS AND RATINGS

Heater-Cycling Rating

Cycles of Intermittent Operation (Minimum) . . . . 2000 Cycles

Ef = 7.5 volts cycled for one minute on and one minute off.
Eb + Ec3 + Ec2 + Ec1 = 0 volts.
Ehk = 135 volts with heater positive with respect to cathode.

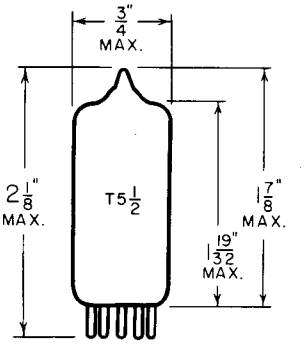
Average Transconductance at Reduced Heater Voltage . . 3500 μmhos

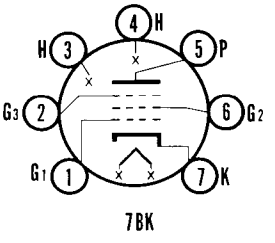
Ef = 5.0 volts, Eb = 250 volts, Ec3 = 0 volts, Ec2 = 100 volts and Rk = 68 ohms (bypassed).

QUICK REFERENCE DATA

Sylvania Type 6660/6BA6 is designed specifically for mobile operation. It is a T-5½ semi-remote cutoff pentode intended for use as an R-F or I-F amplifier.

Type 6660/6BA6 possesses electrical characteristics essentially equivalent to Type 6BA6.





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AUGUST, 1960

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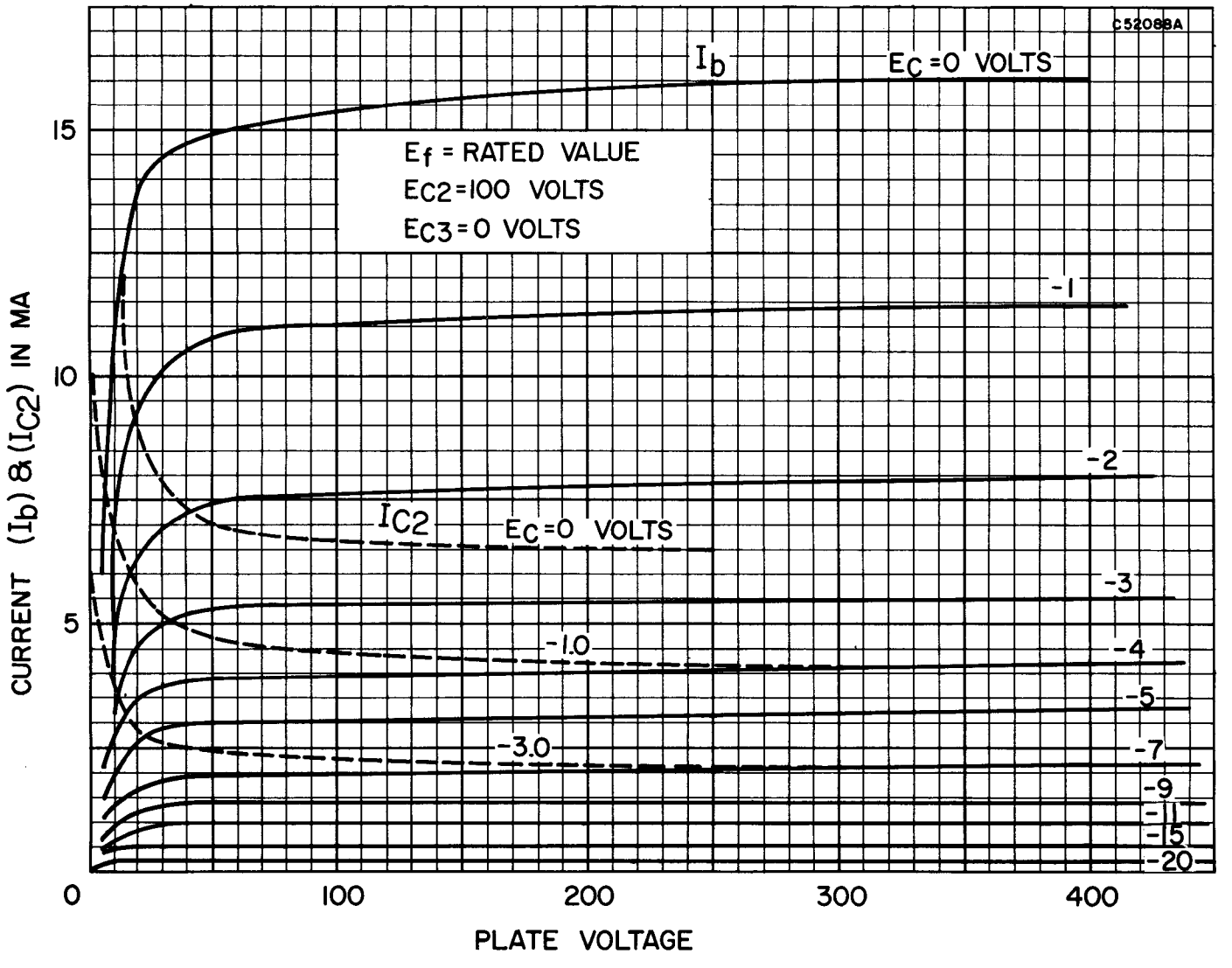
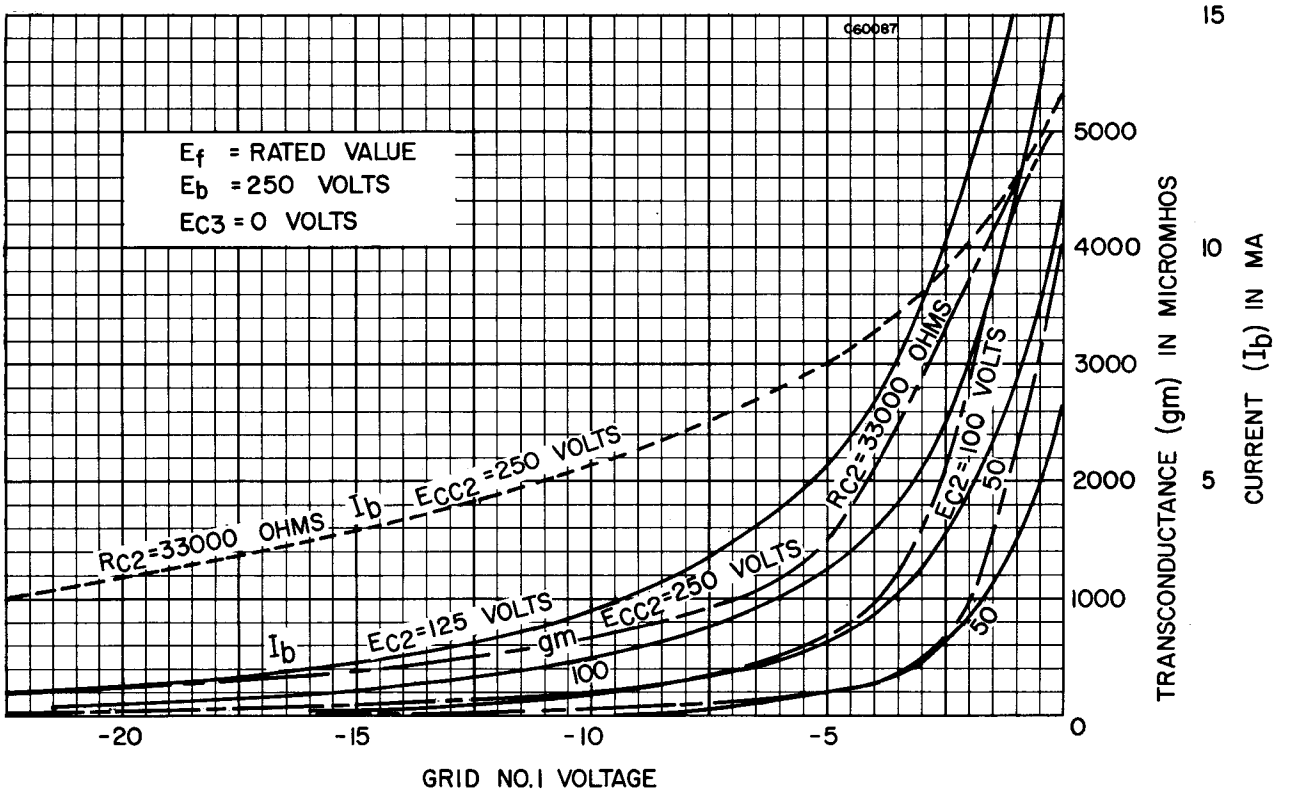
NOTE:

1. *When operated from automotive electrical systems, the heater may be subjected to voltage variations as great as ± 20 percent. Although such extremes in heater voltage may be tolerated for short periods, increased equipment reliability can be achieved with improved supply voltage regulation.*

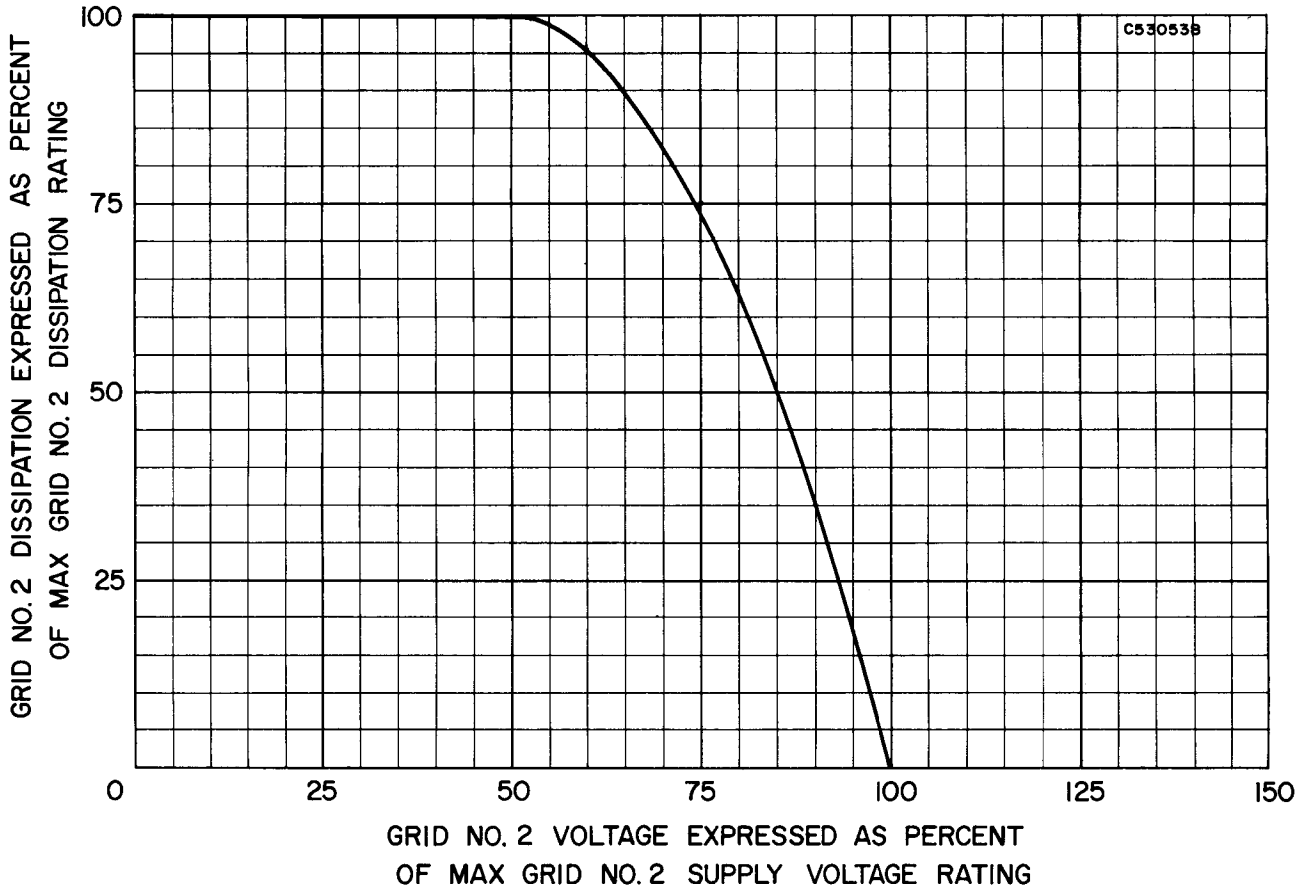
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



RATING CHART



Type 6661/6BH6 is designed specifically for use in mobile communications equipment. The 6661/6BH6 may be operated without serious degradation under normal variations in supply voltage as encountered with automotive electrical systems. Also consistent with the requirements of the equipment the tube is capable of withstanding appreciable on-off cycling.

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7CM
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	6.3 Volts	
Heater Current	150 Ma	
Heater-Cathode Voltage (Design Center Values)		
Heater Negative with Respect to Cathode	100 Volts	Max.
Heater Positive with Respect to Cathode	100 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded	Unshielded		
Grid to Plate	0.0035	0.0035	μμf	Max.
Input	5.4	5.4	μμf	
Output	4.4	4.4	μμf	

RATINGS (Design Center Values)

Plate Voltage	330 Volts	Max.
Grid No. 2 Supply Voltage	330 Volts	Max.
Grid No. 2 Voltage	See Rating Chart	
Plate Dissipation	3.3 Watts	Max.
Grid No. 2 Dissipation	0.55 Watt	Max.
Negative Grid No. 1 Voltage	55 Volts	Max.
Positive Grid No. 1 Voltage	0 Volts	Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

Plate Voltage	100	250	Volts
Grid No. 3 Voltage	Connected to Cathode at Socket		
Grid No. 2 Voltage	100	150	Volts
Cathode Bias Resistor	200	100	Ohms
Plate Current	3.6	7.4	Ma
Grid No. 2 Current	1.4	2.6	Ma
Transconductance	3400	4600	μmhos
Plate Resistance (Approx.)	0.7	1.4	Megohm
Ec1 for Ib = 10 μa (Approx.)	−5.0	−7.7	Volts

SPECIAL TESTS AND RATINGS

Heater-Cycling Ratings

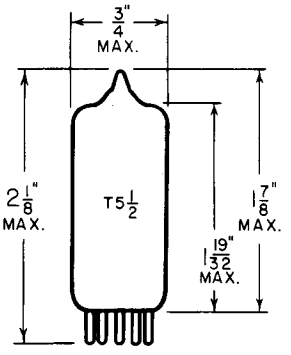
Cycles of Intermittent Operation (Minimum) . . . . 2000 Cycles
Ef = 7.5 volts cycled for one minute on and one minute off.
Eb + Ec2 + Ec3 + Ec1 = 0 Volts.
Ehk = 135 volts with heater positive with respect to cathode.

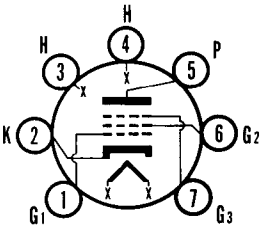
Average Transconductance at Reduced Heater Voltage . . 3600 μmhos
Ef = 5.0 volts, Eb = 250 volts, Ec3 = 0 volts, Ec2 = 150 volts and Rk = 100 ohms (bypassed)

QUICK REFERENCE DATA

Sylvania Type 6661/6BH6 is designed specifically for mobile operation. It is a T-5½ sharp cut-off pentode intended for use as a R-F or I-F amplifier.

Type 6661/6BH6 possesses electrical characteristics essentially equivalent to Type 6BH6.





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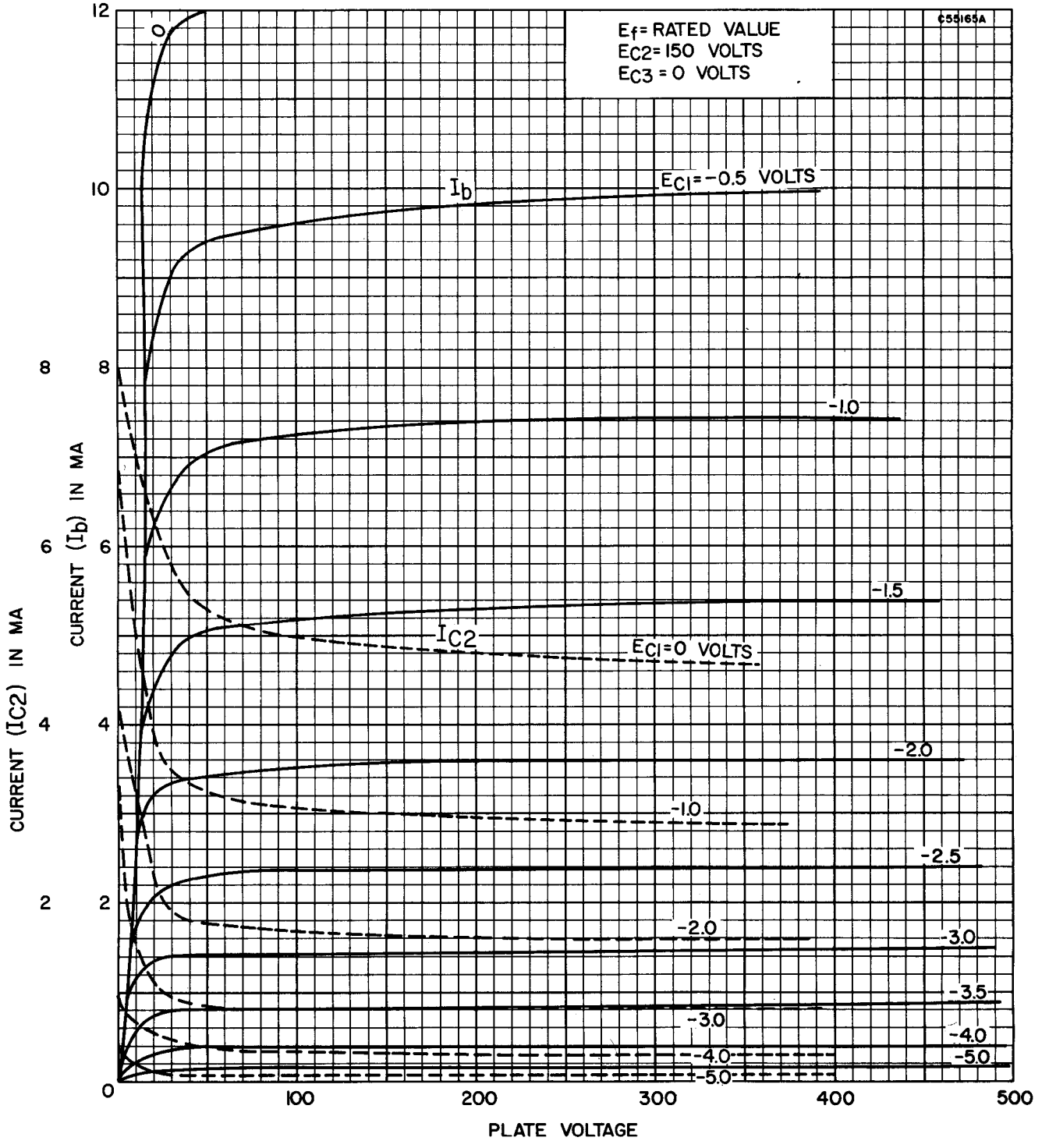
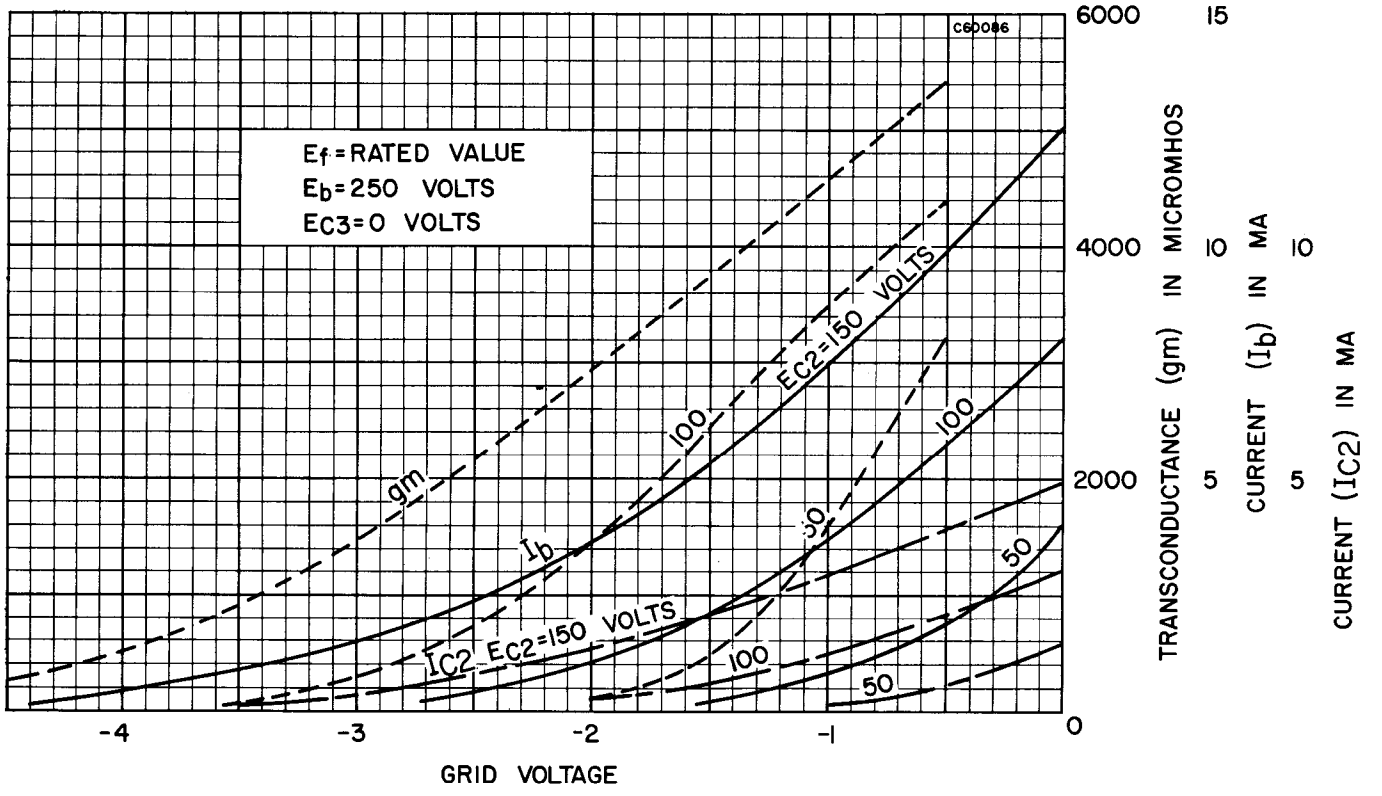
NOTE:

1. *When operated from automotive electrical systems, the heater may be subjected to voltage variations as great as ± 20 percent. Although such extremes in heater voltage may be tolerated for short periods, increased equipment reliability can be achieved with improved supply-voltage regulation.*

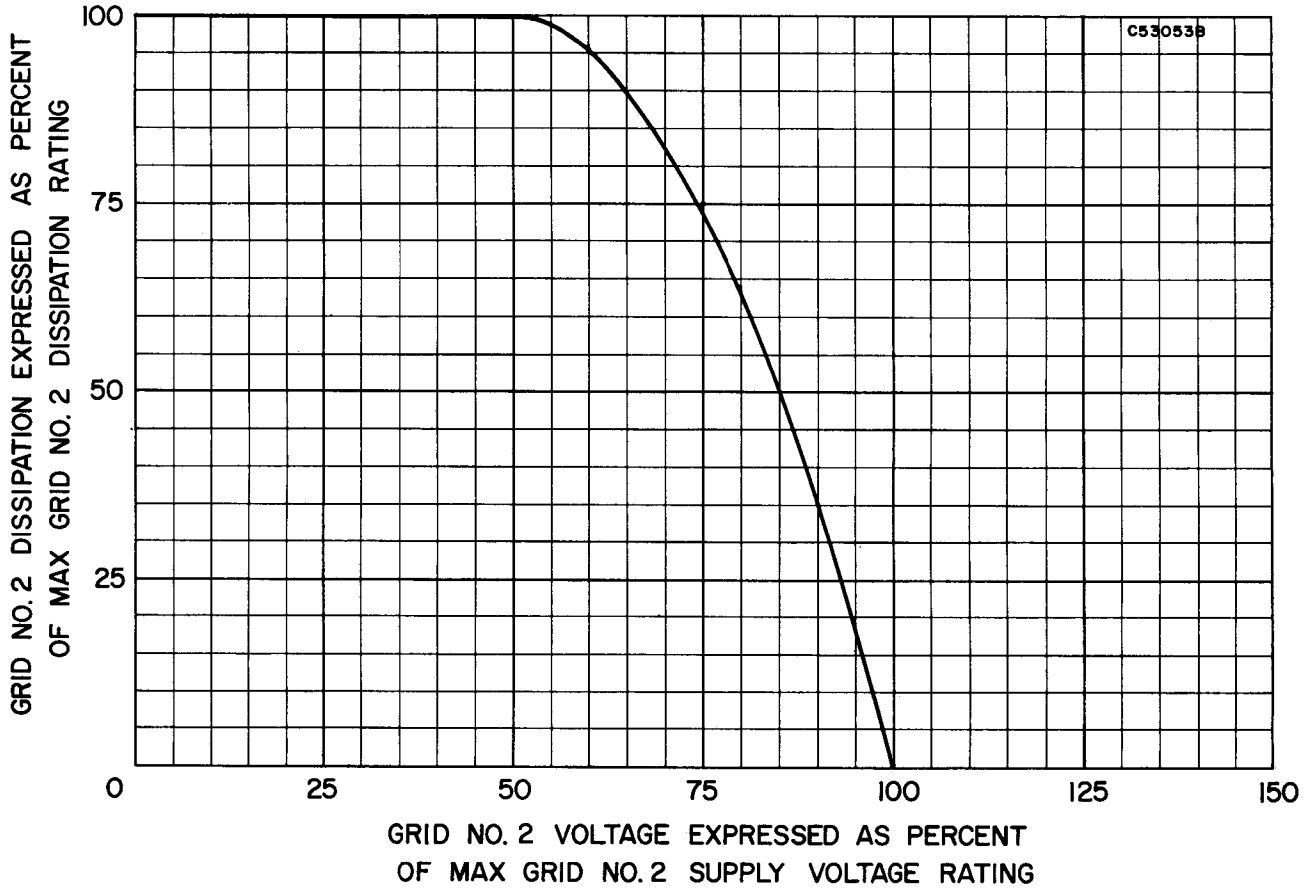
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



RATING CHART



Type 6662/6BJ6 is designed specifically for use in mobile communications equipment. The 6662/6BJ6 may be operated without serious degradation under normal variations in supply voltage as encountered with automotive electrical systems. Also consistent with the requirements of the equipment the tube is capable of withstanding appreciable on-off cycling.

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button, 7-Pin
Outline	5-2
Basing	7CM
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	6.3 Volts	
Heater Current	150 Ma	
Heater-Cathode Voltage (Design Center Values)		
Heater Positive with Respect to Cathode	100 Volts	Max.
Heater Negative with Respect to Cathode	100 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded	Unshielded		
Grid No. 1 to Plate	0.0035	0.0035	μμf	Max.
Input: g1 to (h+k+g2+g3+I.S.)	4.5	4.5	μμf	
Output: p to (h+k+g2+g3+I.S.)	5.5	5.5	μμf	

RATINGS (Design Center Values)

Plate Voltage	330 Volts	Max.
Grid No. 2 Supply Voltage	330 Volts	Max.
Grid No. 2 Voltage	See Rating Chart	
Positive Grid No. 1 Voltage	0 Volts	Max.
Negative Grid No. 1 Voltage	55 Volts	Max.
Plate Dissipation	3.3 Watts	Max.
Grid No. 2 Dissipation	0.65 Watt	Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

Plate Voltage	100	250	Volts
Grid No. 2 Voltage	100	100	Volts
Grid No. 3 Voltage	Connect to Cathode at Socket		
Cathode Bias Resistor	80	80	Ohms
Plate Current	9	9.2	Ma
Grid No. 2 Current	3.5	3.3	Ma
Transconductance	3650	3600	μmhos
Plate Resistance	0.25	1.3	Megohms
Ec1 for gm = 10 μmhos (Approx.)	−20	−20	Volts

SPECIAL TESTS AND RATINGS

Heater Cycling Ratings

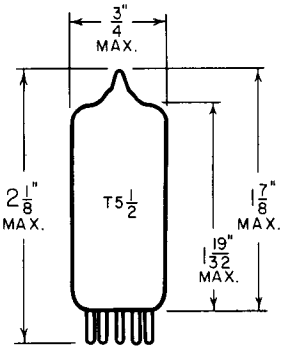
Cycles of Intermittent Operation (Minimum) . . . . 2000 Cycles
Ef = 7.5 volts cycled for one minute on and one minute off.
Eb + Ec3 + Ec2 + Ec1 = 0 volts.
Ehk = 135 volts with heater positive with respect to cathode.

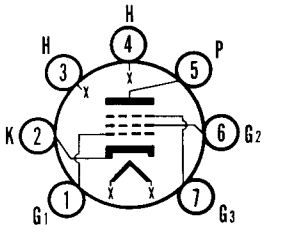
Average Transconductance at Reduced Heater Voltage . . 2900 μmhos
Ef = 5.0 volts, Eb = 250 volts, Ec3 = 0 volts, Ec2 = 100 volts,
Rk = 80 ohms (bypassed)

QUICK REFERENCE DATA

Sylvania Type 6662/6BJ6 is designed specifically for mobile operation. It is a T-5½ semi-remote cutoff pentode designed for use as a R-F or I-F amplifier.

Type 6662/6BJ6 possesses electrical characteristics essentially equivalent to Type 6BJ6.





7CM

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AUGUST, 1960

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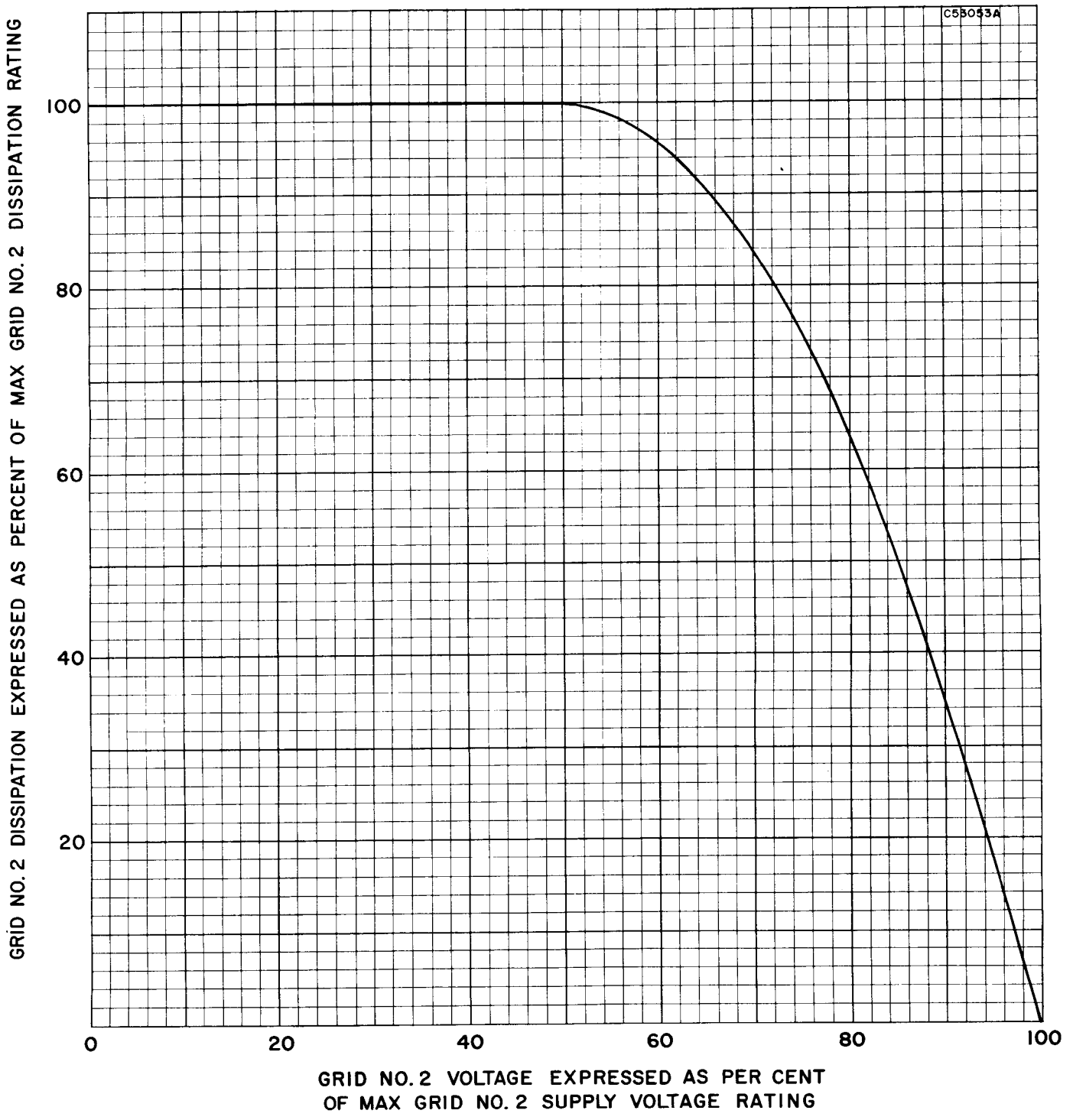
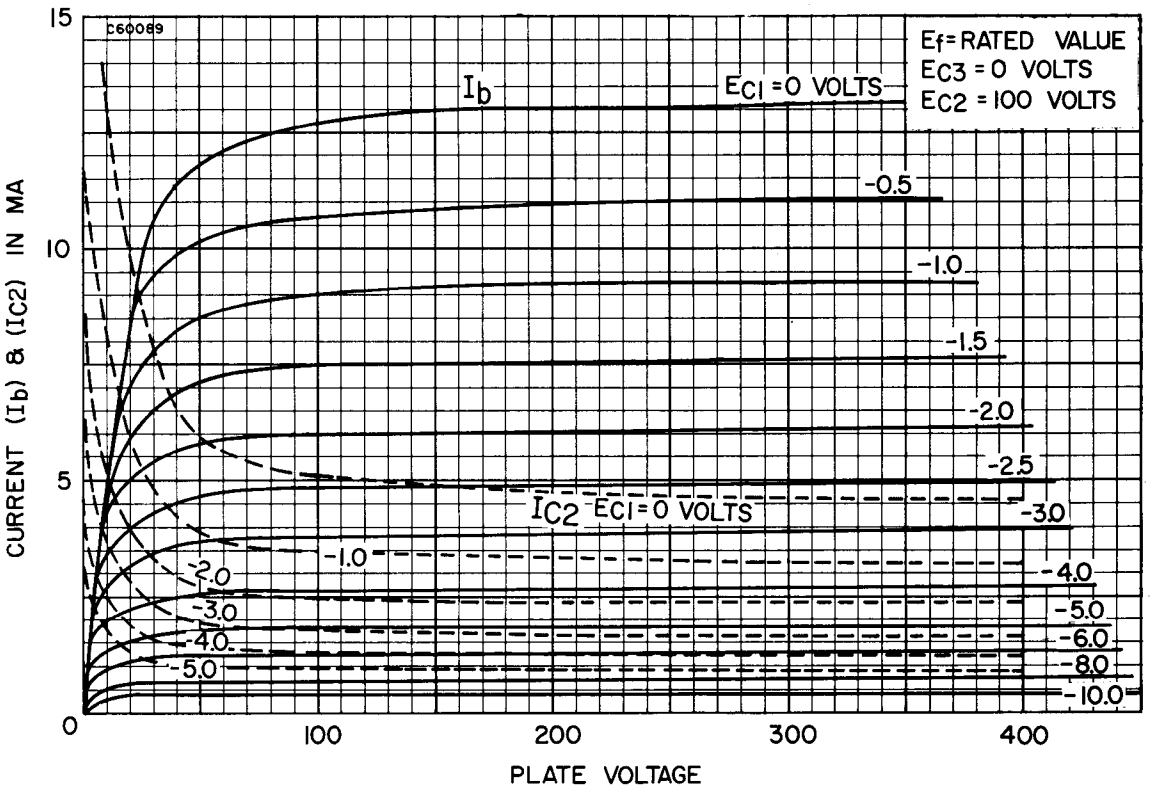
NOTE:

1. *When operated from automotive electrical systems, the heater may be subjected to voltage variations as great as ± 20 percent. Although such extremes in heater voltage may be tolerated for short periods, increased equipment reliability can be achieved with improved supply-voltage regulation.*

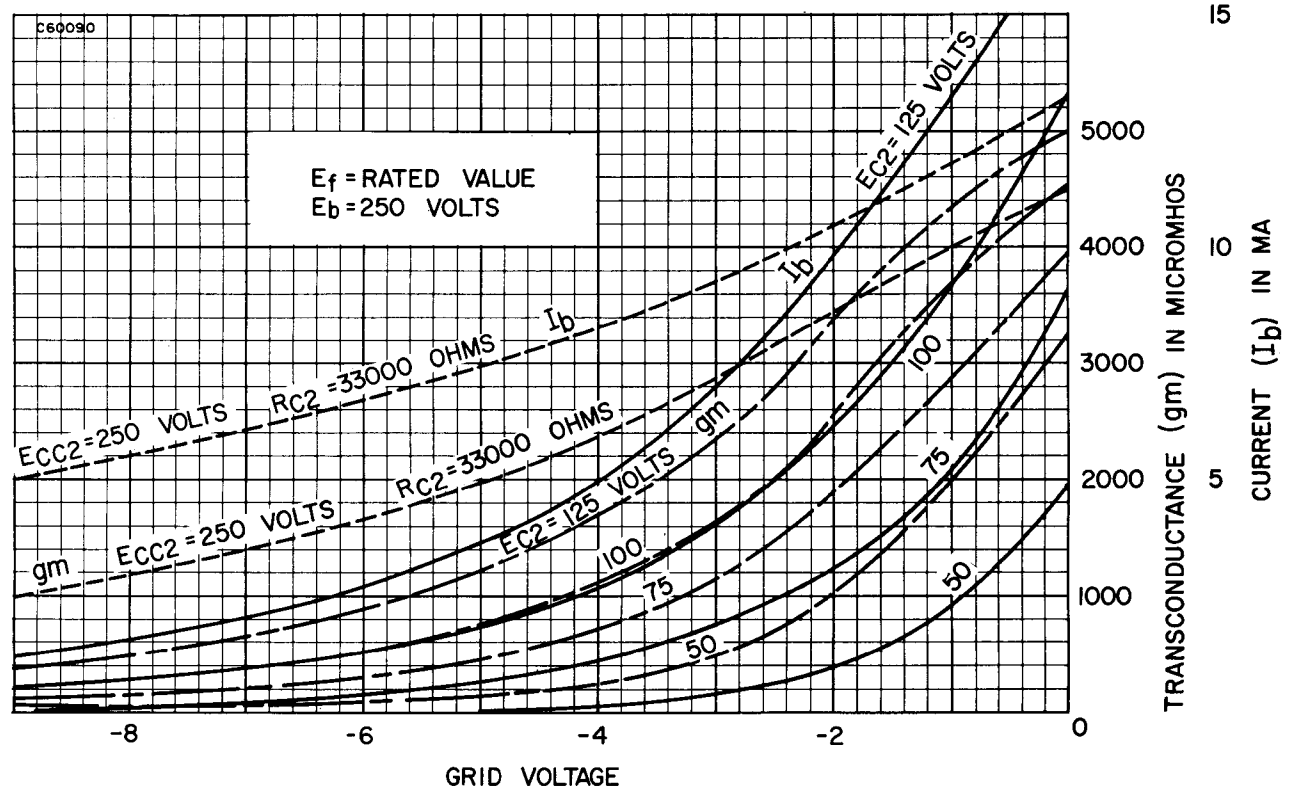
RATING CHART



AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



Type 6663/6AL5 is designed specifically for use in mobile communications equipment. The 6663/6AL5 may be operated without serious degradation under normal variations in supply voltage as encountered with automotive electrical systems. Also consistent with the requirements of the equipment, the tube is capable of withstanding appreciable on-off cycling.

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-1
Basing	6BT
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	6.3 Volts	
Heater Current	300 Ma	
Heater-Cathode Voltage (Design Center Values)		
Heater Negative with Respect to Cathode	275 Volts	Max.
Heater Positive with Respect to Cathode	100 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded	Unshielded
Plate Input (Each Section)	3.2	2.5 μμf
Plate to Plate	.026	.068 μμf
Cathode Input (Each Section)	3.6	3.4 μμf

RATINGS (Design Center Values)

Peak Inverse Plate Voltage	275 Volts	Max.
Peak Plate Current Per Plate[2]	350 Ma	Max.
DC Output Current Per Plate	10 Ma	Max.
Steady State Peak Plate Current Per Plate	60 Ma	Max.

CHARACTERISTICS

Voltage Drop at Ib = 60 Ma Per Plate	10 Volts

TYPICAL OPERATION

AC Plate Voltage Per Plate	117 Volts	
Effective Plate Supply Impedance Per Plate	300 Ohms	Max.
DC Output Current Per Plate	9.0 Ma	

SPECIAL TESTS AND RATINGS

Heater Cycling Rating

Cycles of Intermittent Operation (Minimum) . . . . 2000 Cycles

Ef = 7.5 volts cycled for one minute on and one minute off.
Eb = 0 volts, Ehk = 135 volts with heater positive with respect to cathode.

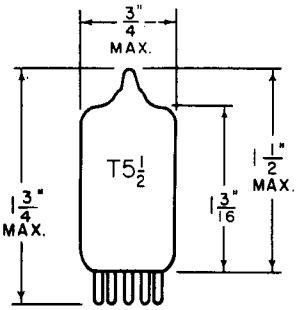
NOTES:

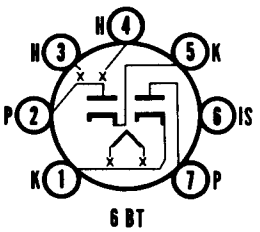
1. *When operated from automotive electrical systems, the heater may be subjected to voltage variations as great as ± 20 percent. Although such extremes in heater voltage may be tolerated for short periods, increased equipment reliability can be achieved with improved supply-voltage regulation.*
2. *Maximum duration 0.1 second.*

QUICK REFERENCE DATA

Sylvania Type 6663/6AL5 is designed specifically for mobile operation. It is a T-5½ duo diode intended for use in circuits as a clipper, clamper, isolator, switching device, detector, or FM discriminator.

Type 6663/6AL5 possesses electrical characteristics essentially equivalent to Type 6AL5.





6 BT

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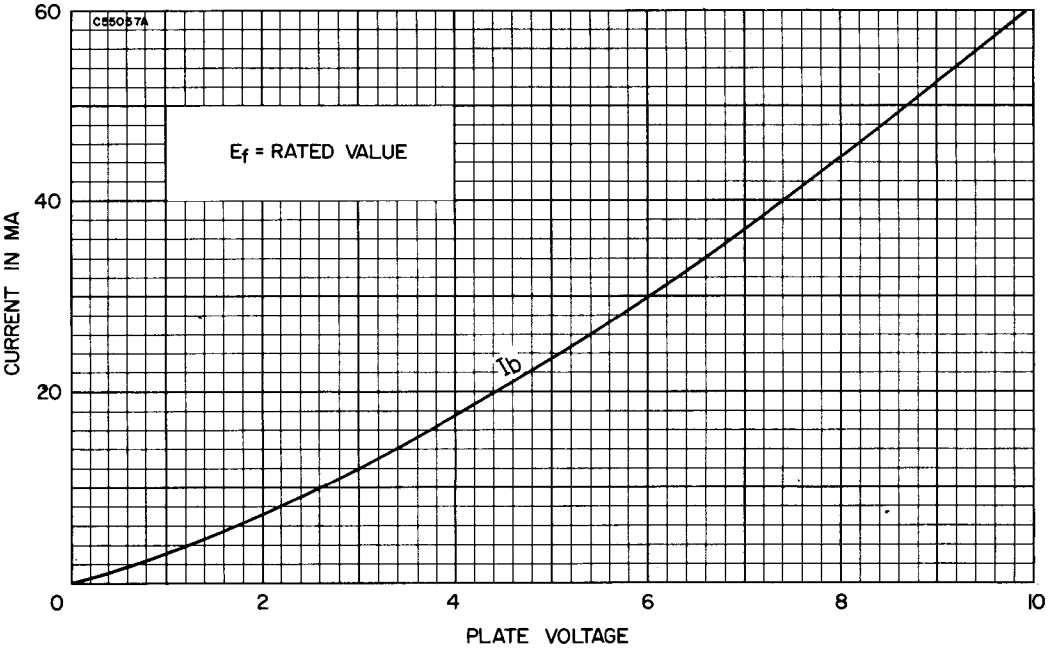
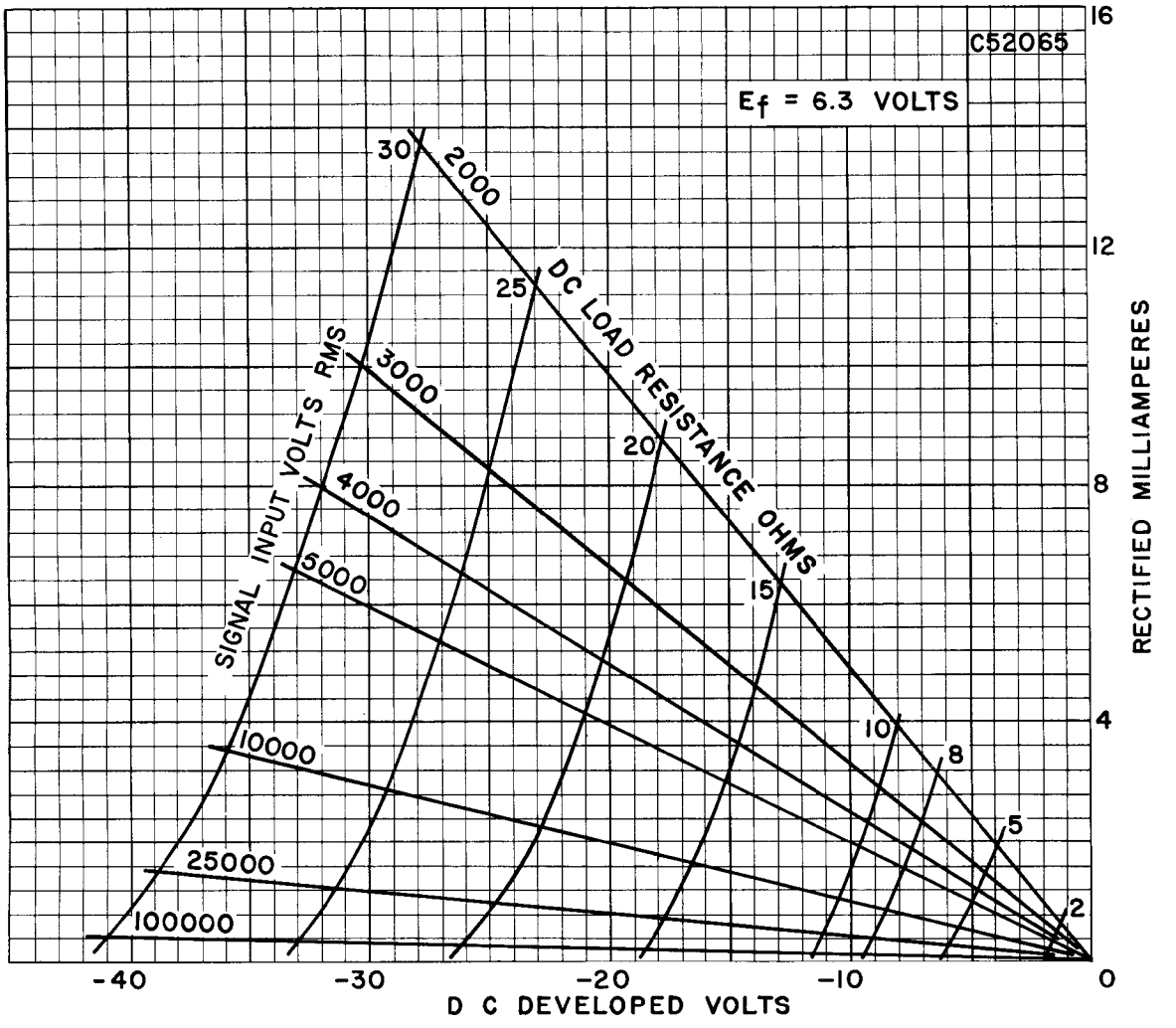
AVERAGE PLATE CHARACTERISTICS



AVERAGE OPERATION CHARACTERISTICS

Half-Wave Rectification — Single Diode



Type 6669/6AQ5 is designed specifically for use in mobile communications equipment. The 6669/6AQ5 may be operated without serious degradation under normal variations in supply voltage as encountered with automotive electrical systems. Also consistent with the requirements of the equipment, the tube is capable of withstanding appreciable on-off cycling.

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-3
Basing	7BZ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	6.3 Volts	
Heater Current	450 Ma	
Heater-Cathode Voltage (Design Maximum Values)		
Heater Negative with Respect to Cathode	100 Volts	Max.
Heater Positive with Respect to Cathode	100 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	0.4 μμf
Input: g1 to (h+k+g2+g3)	8.0 μμf
Output: p to (h+k+g2+g3)	8.5 μμf

RATINGS (Design Maximum Values)

Class A1 Amplifier

Plate Voltage	250 Volts	Max.
Grid No. 2 Voltage	250 Volts	Max.
Plate Dissipation	12 Watts	Max.
Grid No. 2 Dissipation	2 Watts	Max.
Grid No. 1 Circuit Resistance		
Fixed Bias	0.1 Megohm	Max.
Cathode Bias	0.5 Megohm	Max.
Bulb Temperature (At Hottest Point)	225 °C	Max.

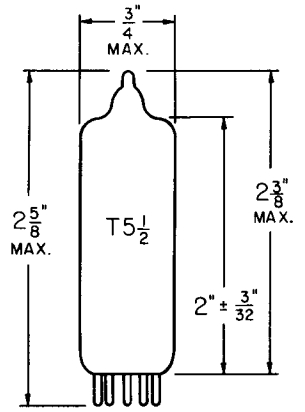
CHARACTERISTICS AND TYPICAL OPERATION

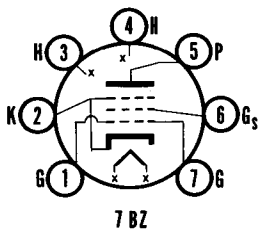
	Single Tube Class A1		Push-Pull Class AB1	
Plate Voltage	180	250	250	Volts
Grid No. 2 Voltage	180	250	250	Volts
Grid No. 1 Voltage	−8.5	−12.5	−15	Volts
Peak AF Grid No. 1 Voltage	8.5	12.5	15	Volts
Zero—Signal Plate Current	29	45	70	Ma
Maximum Signal Plate Current	30	47	79	Ma
Zero—Signal Grid No. 2 Current	3	4.5	5	Ma
Maximum—Signal Grid No. 2 Current	4	7.0	13	Ma
Plate Resistance (Approx.)	58,000	52,000	—	Ohms
Transconductance	3700	4100	—	μmhos
Load Resistance	5500	5000	—	Ohms
Load Resistance (P1 to P1)	—	—	10,000	Ohms
Maximum Signal Power Output	2.0	4.5	10	Watts
Total Harmonic Distortion (Approx.)	8	8	5	Percent

QUICK REFERENCE DATA

Sylvania Type 6669/6AQ5 is designed specifically for mobile operation. It is a T-5½ beam power pentode intended for use as an audio power amplifier.

Type 6669/6AQ5 possesses electrical characteristics essentially equivalent to Type 6AQ5.





7BZ

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MAY, 1961

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SPECIAL TESTS AND RATINGS

Heater-Cycling Life Test

Statistical sample operated for 2000 cycles to evaluate and control heater-cathode defects. Condition of test include Ef = 7.5 volts cycled for one minute on and one minute off, Eb + Ec2 + Ec1 = 0 volts and Ehk = 135 volts with heater positive with respect to cathode.

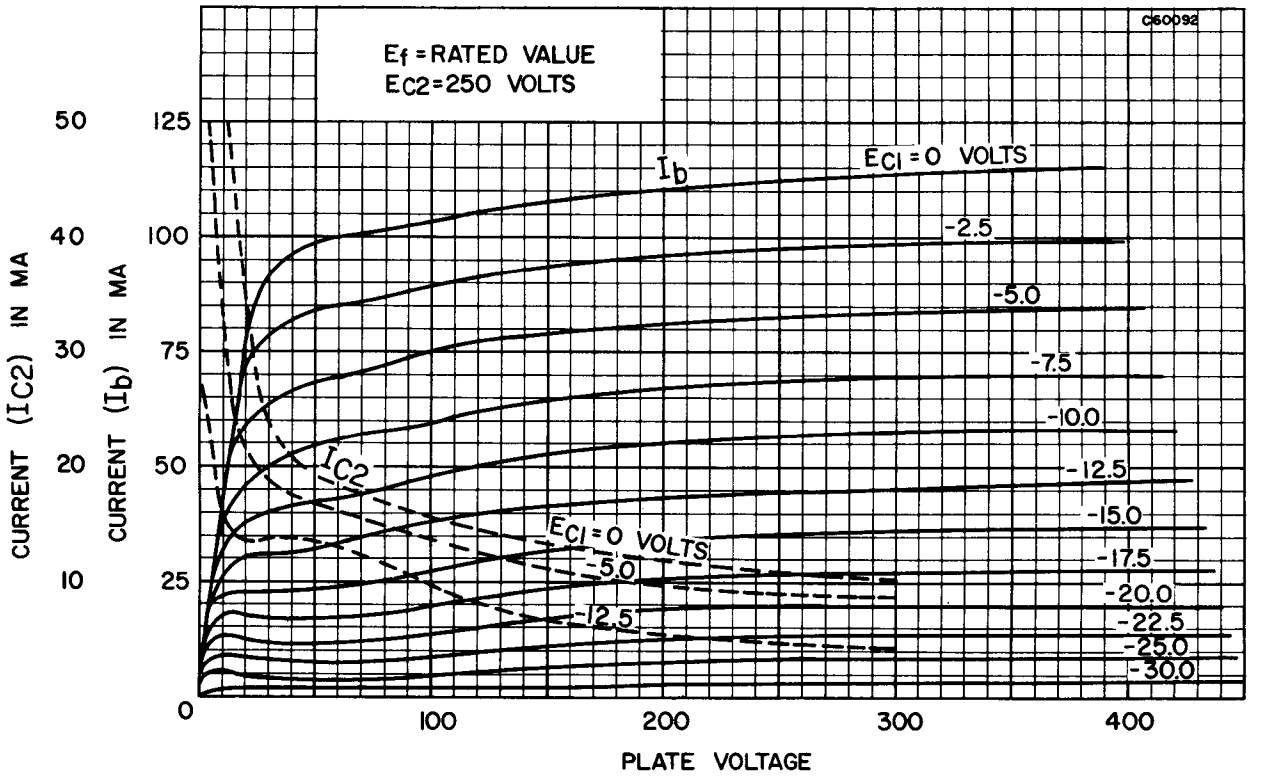
Average Power Output at Reduced Heater Voltage . . . . . 4.1 Watts

Ef = 5.0 volts, Eb = 250 volts, Ec2 = 250 volts, Ec1 = −12.5 volts, R1 = 5000 ohms, Esig = 8.8 volts (RMS).

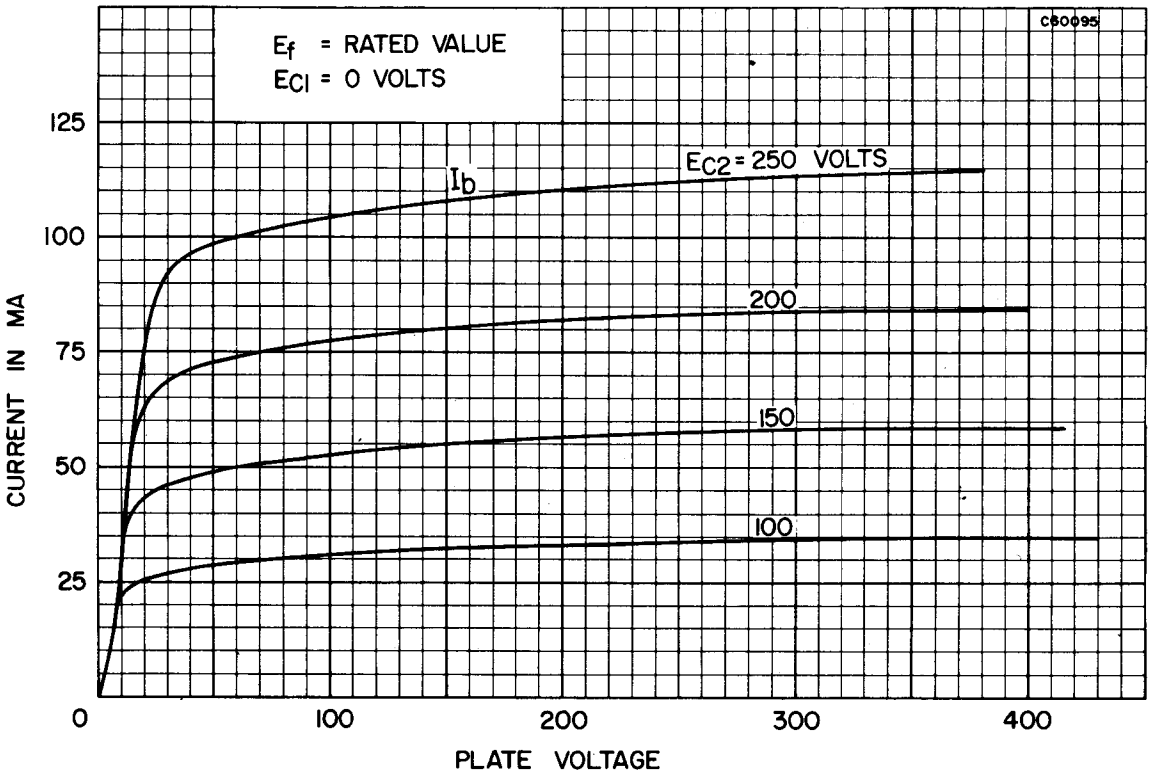
NOTES:

1. *When operated from automotive electrical systems, the heater may be subjected to voltage variations as great as ±2(percent. Although such extremes in heater-voltage may be tolerated for short periods, increased equipment reliability ca be achieved with improved supply-voltage regulation.*

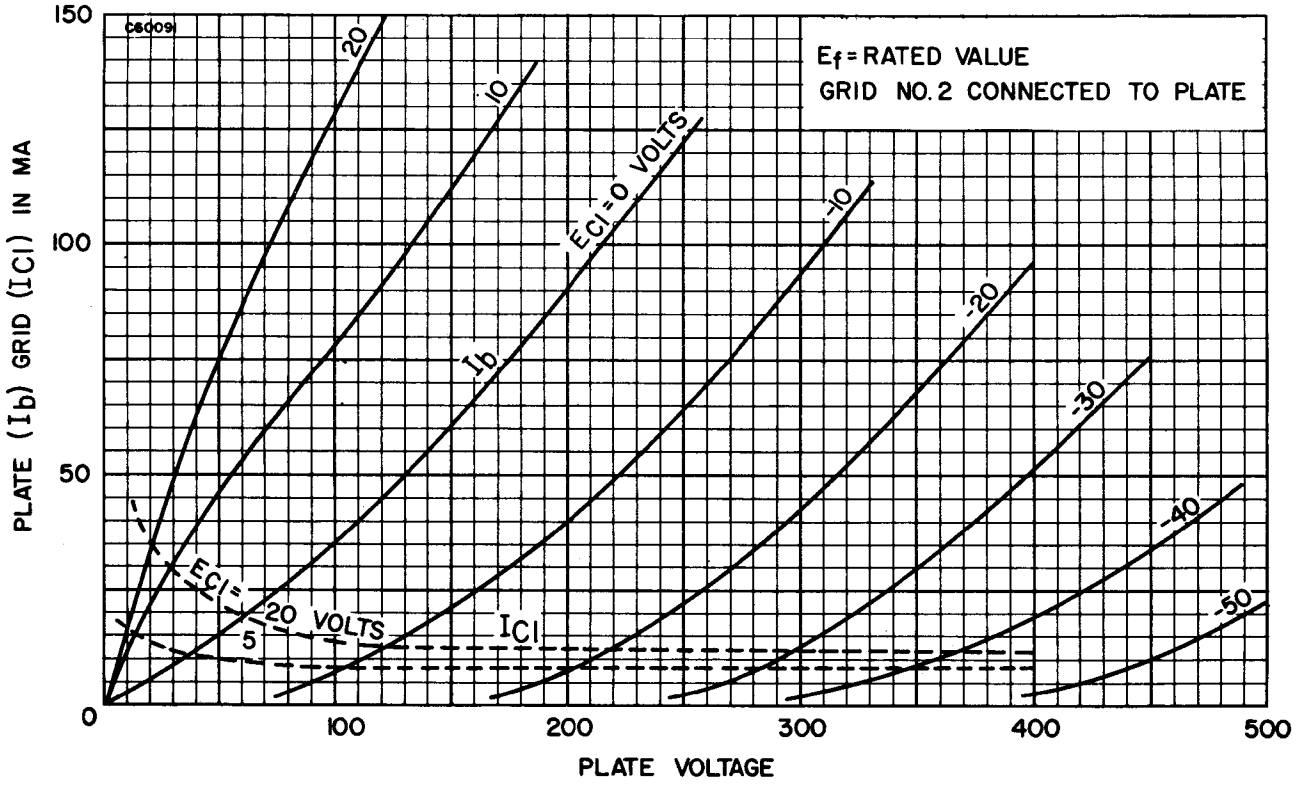
AVERAGE PLATE CHARACTERISTICS



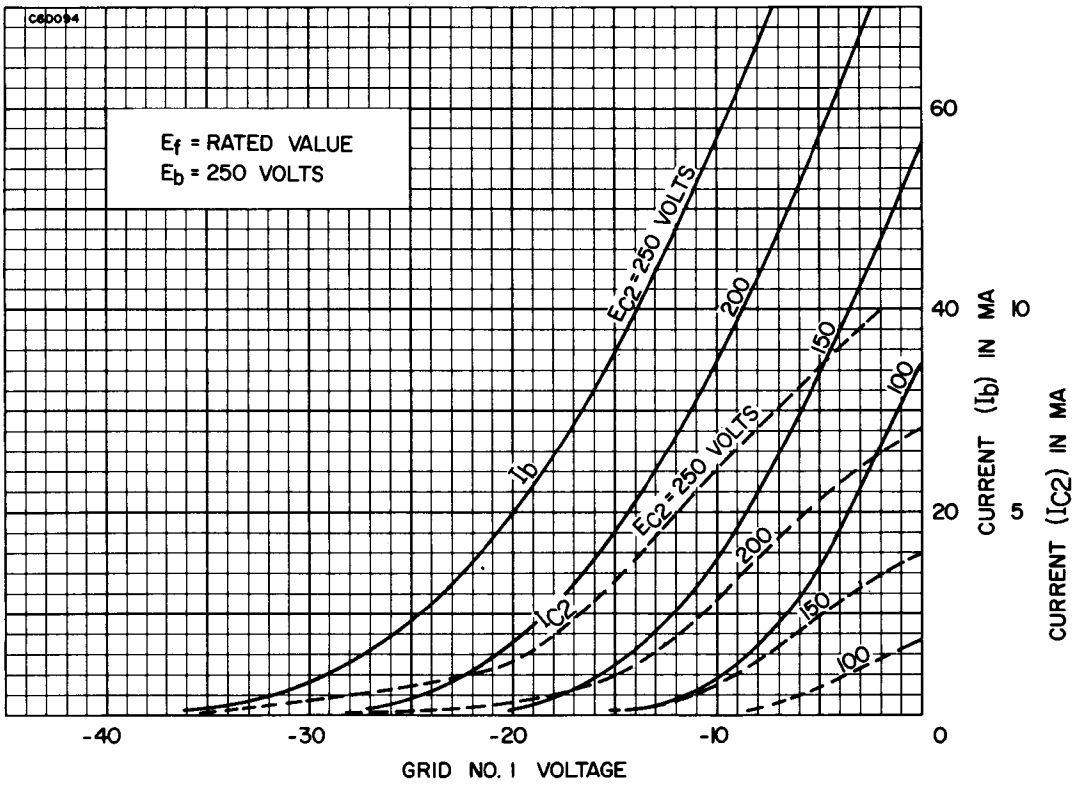
AVERAGE PLATE CHARACTERISTICS



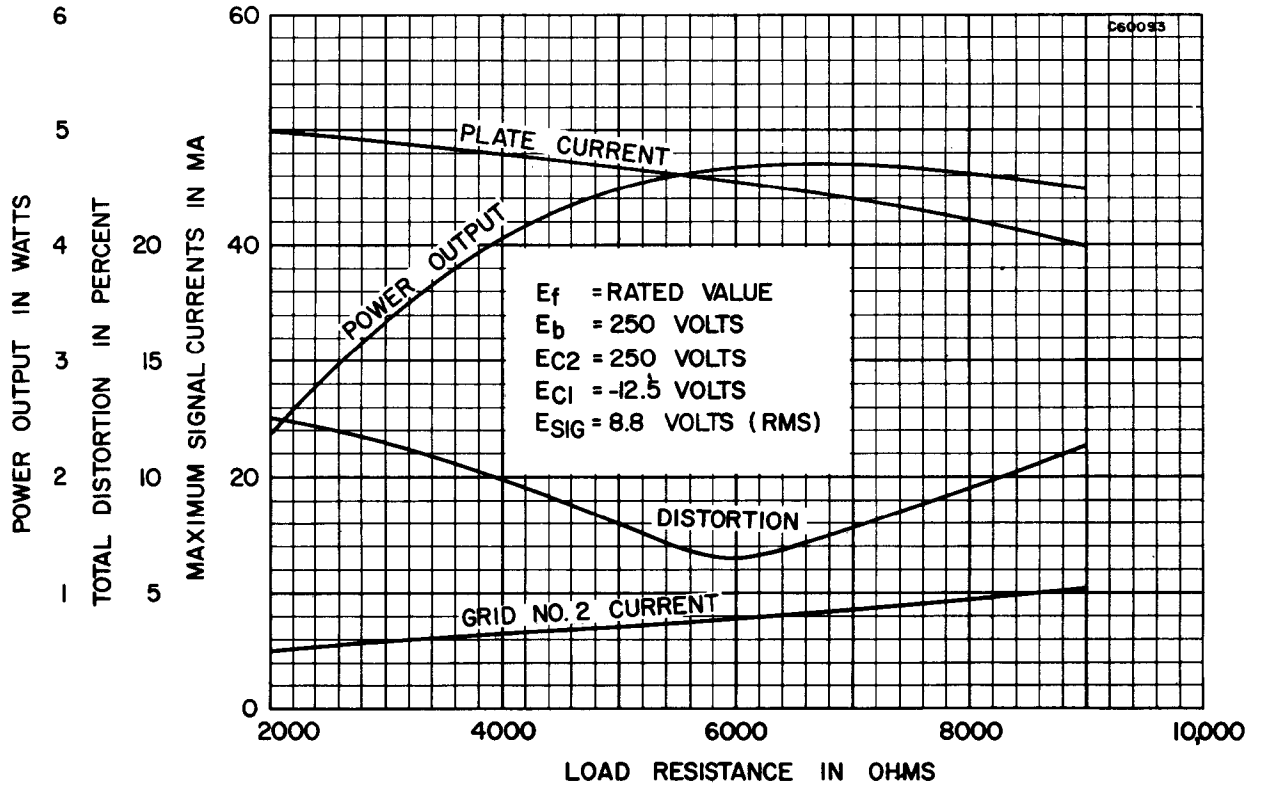
AVERAGE PLATE CHARACTERISTICS
(Triode Connected)



AVERAGE TRANSFER CHARACTERISTICS



OPERATION CHARACTERISTICS



Type 6677/6CL6 is designed specifically for use in mobile communications equipment. The 6677/6CL6 may be operated without serious degradation under normal variations in supply voltage as encountered with automotive electrical systems. Also consistent with the requirements of the equipment, the tube is capable of withstanding appreciable on-off cycling.

MECHANICAL DATA

Bulb	T-6½
Base	Small Button Noval 9-Pin
Outline	6-3
Basing	9BV
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	6.3 Volts	
Heater Current	650 Ma	
Heater-Cathode Voltage (Design Maximum Values)		
Heater Negative with Respect to Cathode	100 Volts	Max.
Heater Positive with Respect to Cathode	100 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.12 $\mu\mu$f
Input	11 $\mu\mu$f
Output	5.5 $\mu\mu$f

RATINGS (Design Maximum Values)

Plate Voltage	330 Volts	Max.
Grid No. 2 Voltage	See Rating Chart	
Grid No. 2 Voltage Supply	330 Volts	Max.
Grid No. 3 Voltage	0 Volts	Max.
Grid No. 1 Voltage		
Negative Bias Value	50 Volts	Max.
Positive Bias Value	0 Volts	Max.
Plate Dissipation	8.5 Watts	Max.
Grid No. 2 Input	2.0 Watts	Max.
Grid No. 1 Circuit Resistance		
Fixed Bias	0.1 Megohm	Max.
Cathode Bias	0.5 Megohm	Max.
Bulb Temperature (At Hottest Point)	210 °C	Max.

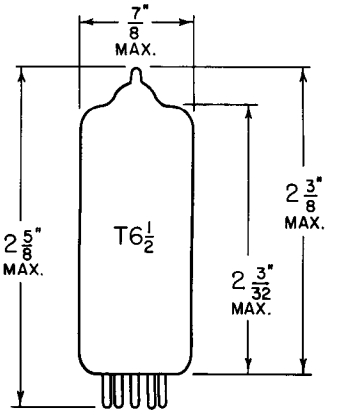
CHARACTERISTICS

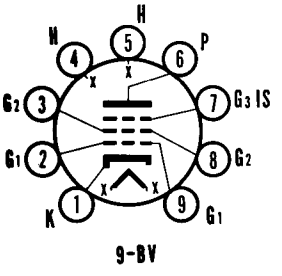
Plate Voltage	250 Volts
Grid No. 2 Voltage	150 Volts
Grid No. 3 Voltage — Connected to Cathode at Socket	
Grid No. 1 Bias Voltage	−3 Volts
Peak AF Grid No. 1 Signal Voltage	3 Volts
Zero Signal Plate Current	30 Ma
Maximum Signal Plate Current	31 Ma
Zero Signal Grid No. 2 Current	7 Ma
Maximum Signal Grid No. 2 Current	7.2 Ma
Transconductance	11,000 μmhos
Plate Resistance (Approx.)	0.15 Megohm
Load Resistance	7500 Ohms
Total Harmonic Distortion	8 Percent
Maximum Signal Power Output	2.8 Watts
Ec1 for Ib = 10 μa (Approx.)	−14 Volts

QUICK REFERENCE DATA

Sylvania Type 6677/6CL6 is designed specifically for mobile operation. It is a T-6½ beam power pentode intended for use as an R-F power oscillator or amplifier.

Type 6677/6CL6 possesses electrical characteristics essentially equivalent to Type 6CL6.





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

MAY, 1961

File Under
RECEIVING TUBES

SPECIAL TESTS AND RATINGS

Heater-Cycling Life Tests

Statistical sample operated for 2000 cycles to evaluate and control heater-cathode defects. Conditions of test include Ef = 7.5 volts cycled for one minute on and one minute off. Eb + Ec3 + Ec2 + Ec1 = 0 volts and Ehk = 135 volts with heater positive with respect to cathode.

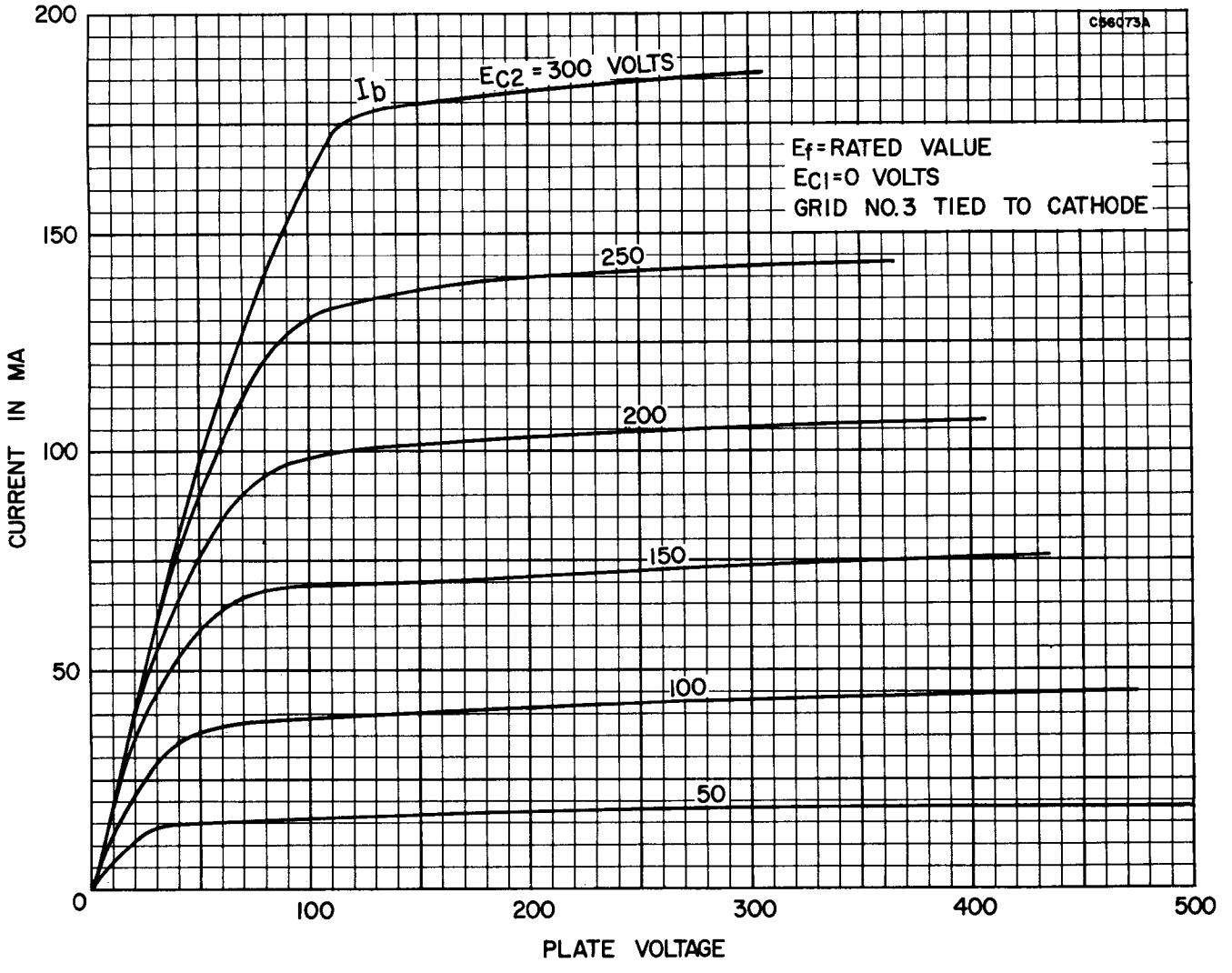
Average Transconductance at Reduced Heater Voltage . . . . . 8800 μmhos

Ef = 5.0 volts, Eb = 250 volts, Ec3 = 0 volts, Ec2 = 150 volts and Ec1 = −3.0 volts.

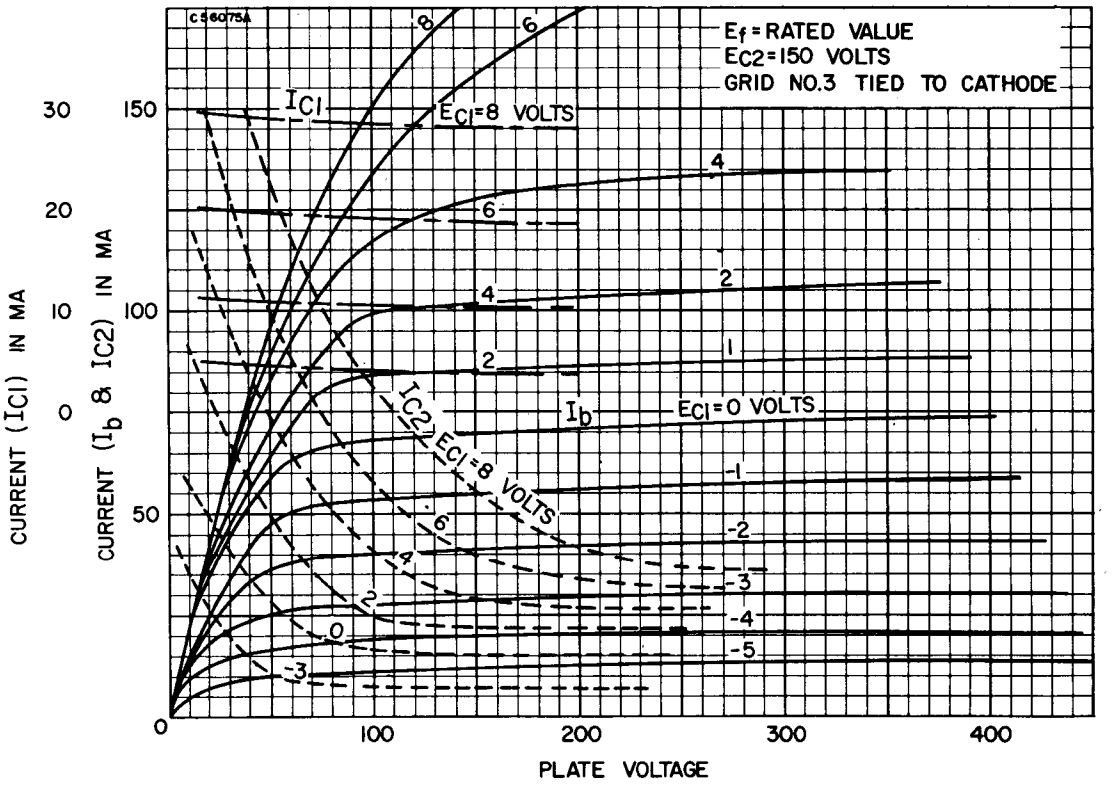
NOTES:

1. *When operated from automotive electrical systems, the heater may be subjected to voltage variations as great as ±20 percent. Although such extremes in heater-voltage may be tolerated for short periods, increased equipment reliability can be achieved with improved supply-voltage regulation.*

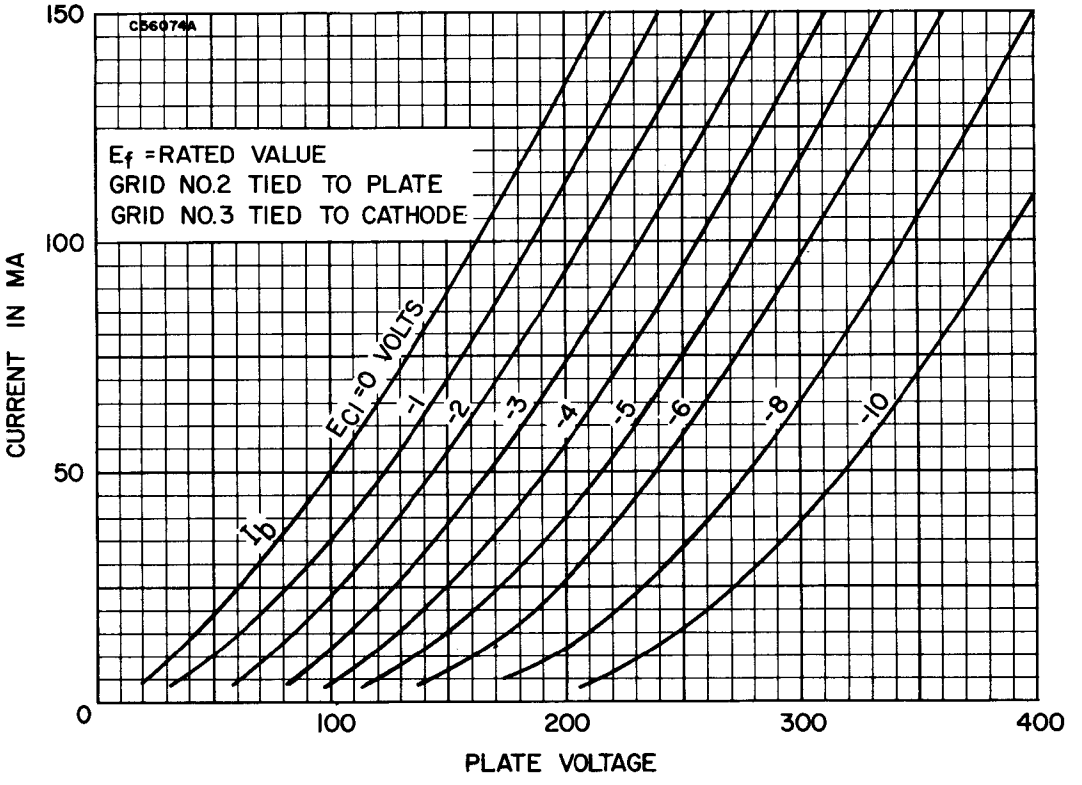
AVERAGE PLATE CHARACTERISTICS



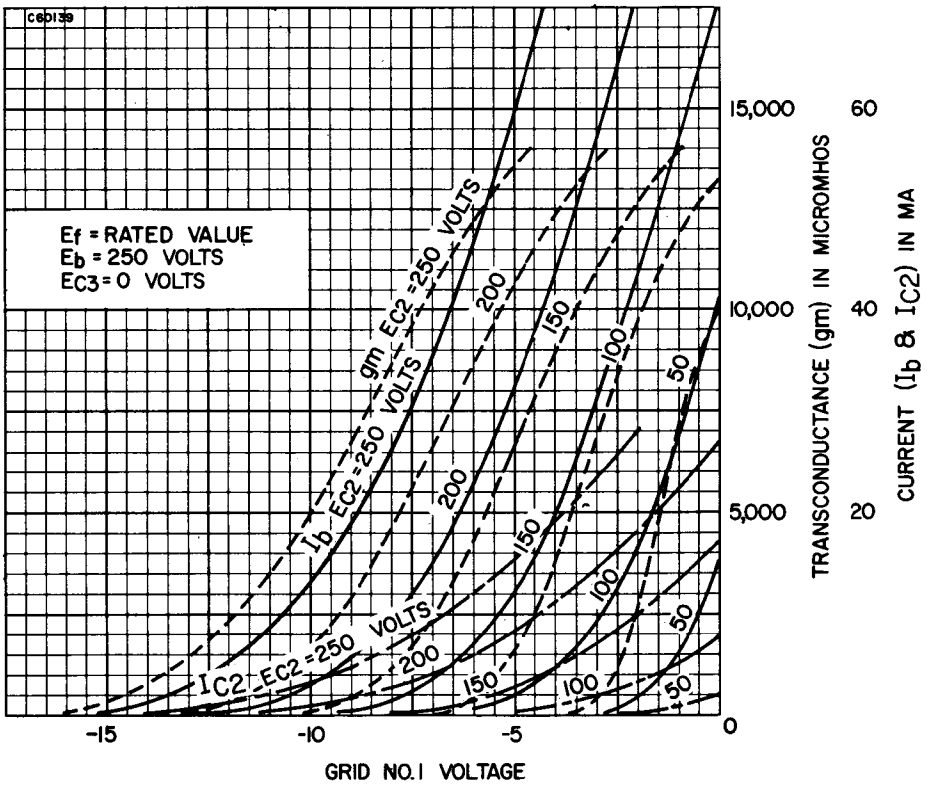
AVERAGE PLATE CHARACTERISTICS



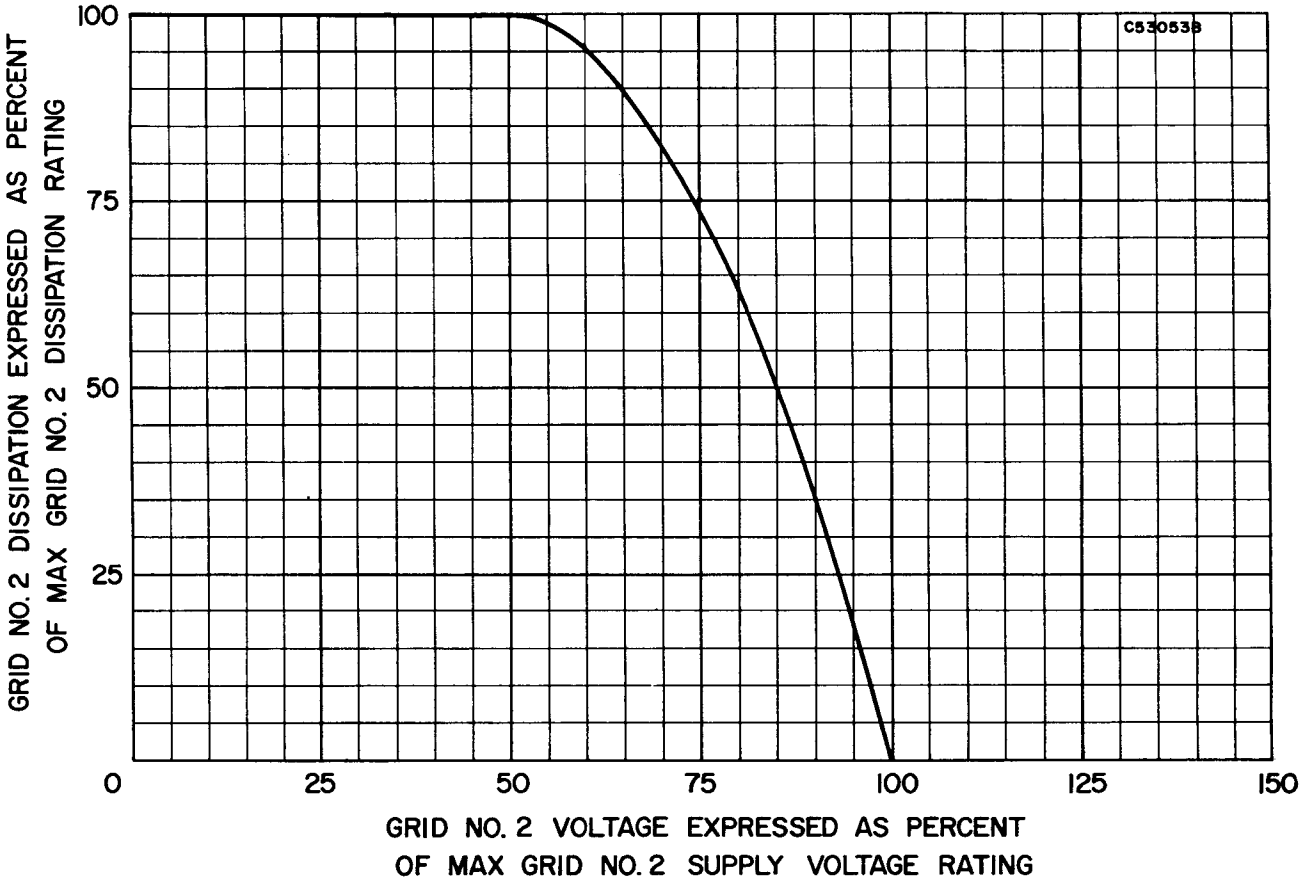
AVERAGE PLATE CHARACTERISTICS
(Triode Connected)



AVERAGE TRANSFER CHARACTERISTICS



RATING CHART



Type 6678/6U8 is designed specifically for use in mobile communications equipment. The 6678/6U8 may be operated without serious degradation under normal variations in supply voltage as encountered with automotive electrical systems. Also consistent with the requirements of the equipment the tube is capable of withstanding appreciable on-off cycling.

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9AE
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	6.3 Volts	
Heater Current	450 Ma	
Heater-Cathode Voltage (Design Maximum Values)		
Heater Negative with Respect to Cathode		
Total DC and Peak	200 Volts	Max.
Heater Positive with Respect to Cathode		
DC	100 Volts	Max.
Total DC and Peak	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded	Unshielded	
Pentode Section			
Grid No. 1 to Plate	.006	.01 μμf	Max.
Input: g1 to (h+k+g2+g3+I.S.)	5.0	5.0 μμf	
Output: p to (h+k+g2+g3+I.S.)	3.5	2.6 μμf	
Cathode to Heater	3.0	3.0 μμf	
Triode Section			
Grid to Plate	1.8	1.8 μμf	
Input: g to (h+Pk+Tk+g3+I.S.)	2.5	2.5 μμf	
Output: p to (h+Pk+Tk+g3+I.S.)	1.0	0.4 μμf	
Cathode to Heater	3.0	3.0 μμf	
Coupling			
Pentode Grid No. 1 to Triode Plate	0.2	0.2 μμf	Max.
Pentode Plate to Triode Plate	.02	0.1 μμf	Max.

RATINGS (Design Maximum System)

	Triode Section	Pentode Section	
Plate Voltage	330	330 Volts	Max.
Grid No. 2 Supply Voltage		330 Volts	Max.
Grid No. 2 Voltage	See Rating Chart		
Positive DC Grid No. 1 Voltage	0	0 Volts	Max.
Plate Dissipation	3.0	3.0 Watts	Max.
Grid No. 2 Dissipation		0.55 Watt	Max.

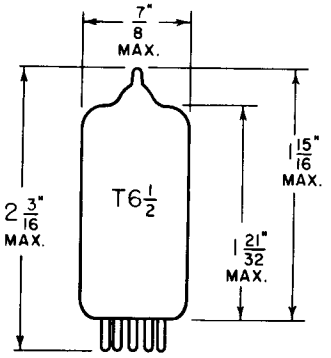
CHARACTERISTICS AND TYPICAL OPERATION

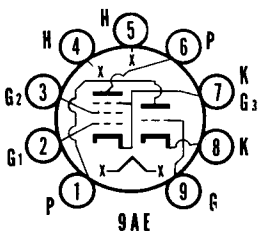
	Triode Section	Pentode Section
Plate Voltage	150	250 Volts
Grid No. 2 Voltage		110 Volts
Cathode Bias Resistor	56	68 Ohms
Plate Current	18	10 Ma
Grid No. 2 Current		3.5 Ma
Transconductance	8500	5200 μmhos
Amplification Factor	40	
Plate Resistance (Approx.)	5000	400K Ohms
Ec1 for Ib = 10 μa (Approx.)	−10	−12 Volts

QUICK REFERENCE DATA

Sylvania Type 6678/6U8 is designed specifically for mobile operation. It is a T-6½ triode-pentode intended for VHF OSC/MIXER service.

Type 6678/6U8 possesses electrical characteristics essentially equivalent to Type 6U8.





SYLVANIA ELECTRONIC TUBES

A Division of Sylvania Electric Products Inc.

RECEIVING TUBE OPERATIONS EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

AUGUST, 1960

File Under
RECEIVING TUBES

SPECIAL TESTS AND RATINGS

Heater Cycling Ratings

Cycles of Intermittent Operation (Minimum) . . . . . 2000 Cycles
Ef = 7.5 volts cycled for one minute on and one minute off.
Eb + Ec2 + Ec1 = 0 volts.
Ehk = 135 volts with heater positive with respect to cathode.

Average Transconductance at Reduced Heater Voltage

Pentode Section . . . . . 4100 μmhos
Ef = 5.0 volts, Eb = 250 volts, Ec2 = 110 volts,
Rk = 68 ohms (bypassed)

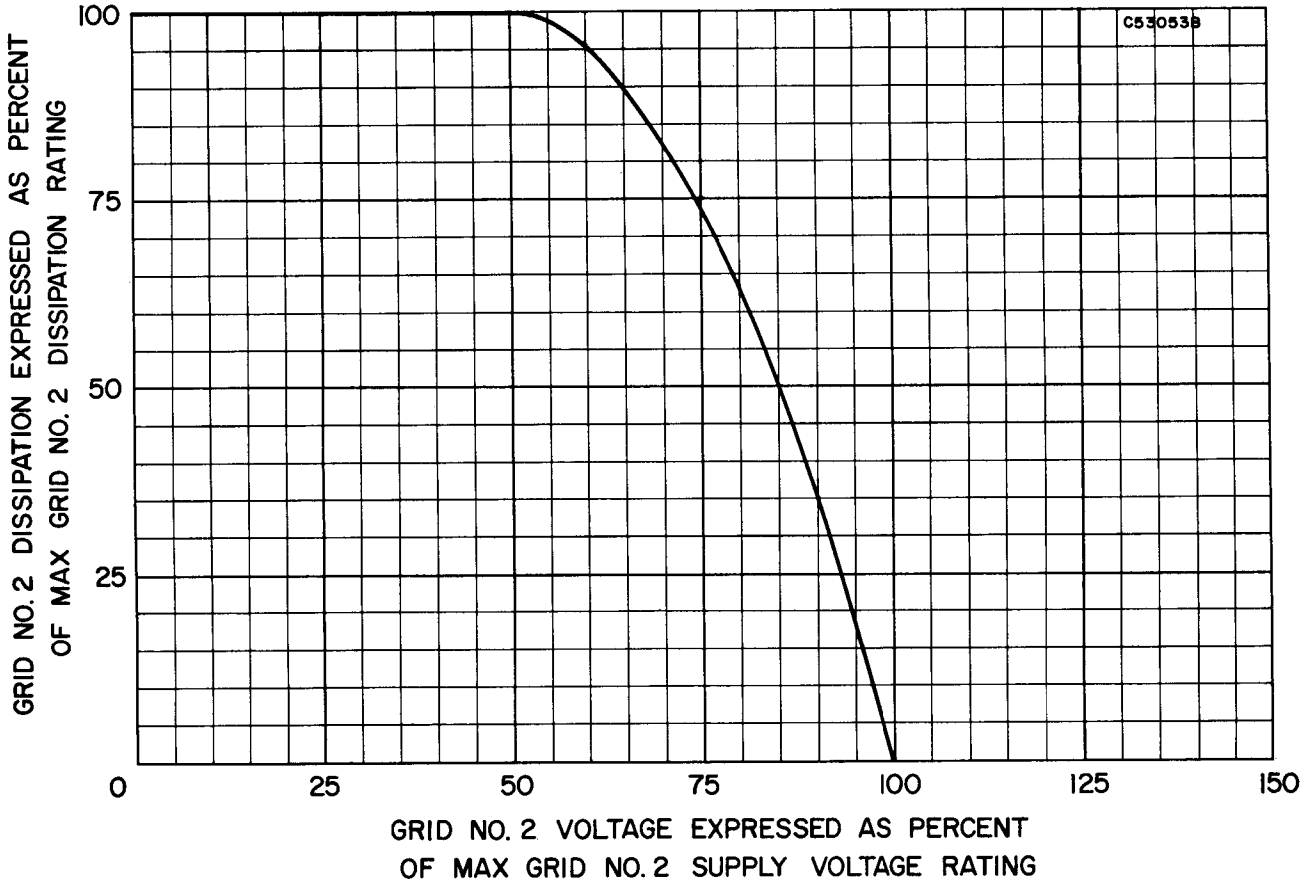
Average Transconductance at Reduced Heater Voltage

Triode Section . . . . . 6800 μmhos
Ef = 5.0 volts, Eb = 150 volts,
Rk = 56 ohms (bypassed)

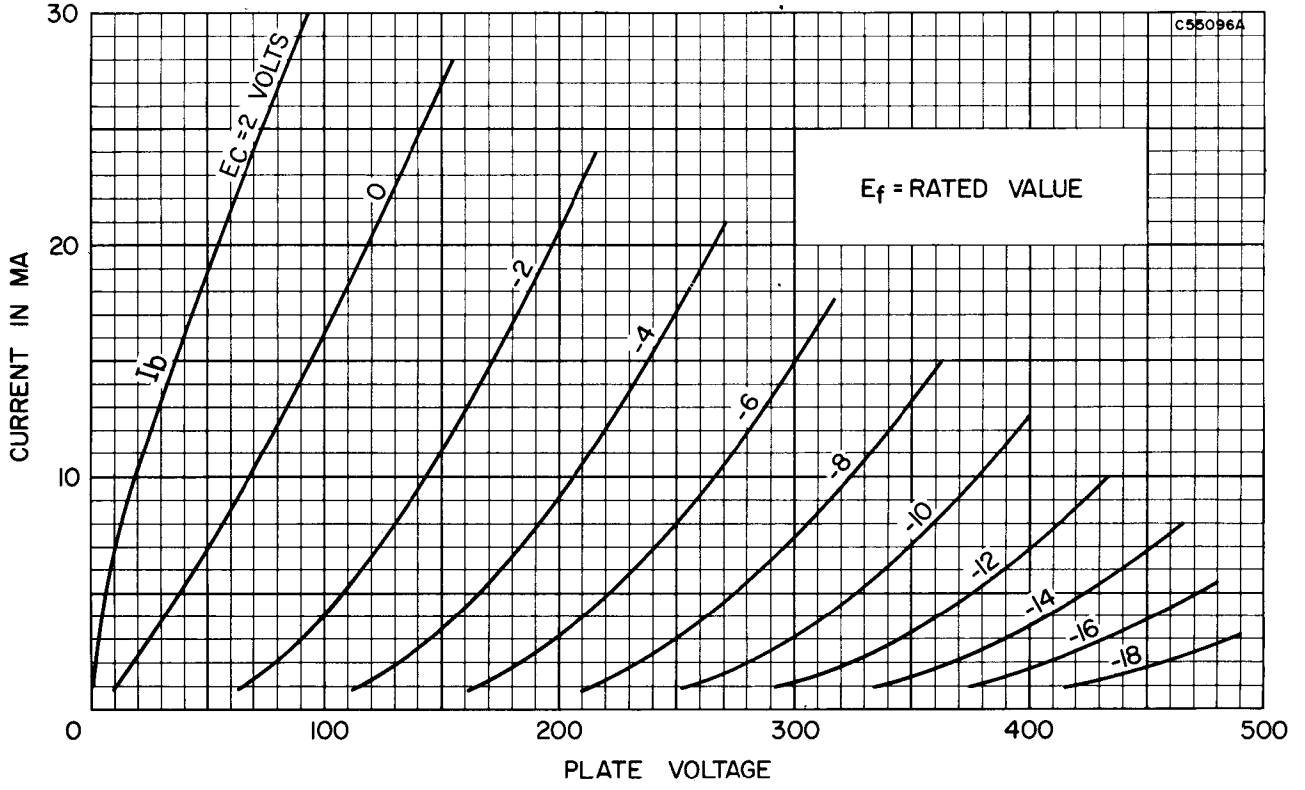
NOTE:

1. *When operated from automotive electrical systems, the heater may be subjected to voltage variations as great as ± 20 percent. Although such extremes in heater voltage may be tolerated for short periods, increased equipment reliability can be achieved with improved supply-voltage regulation.*

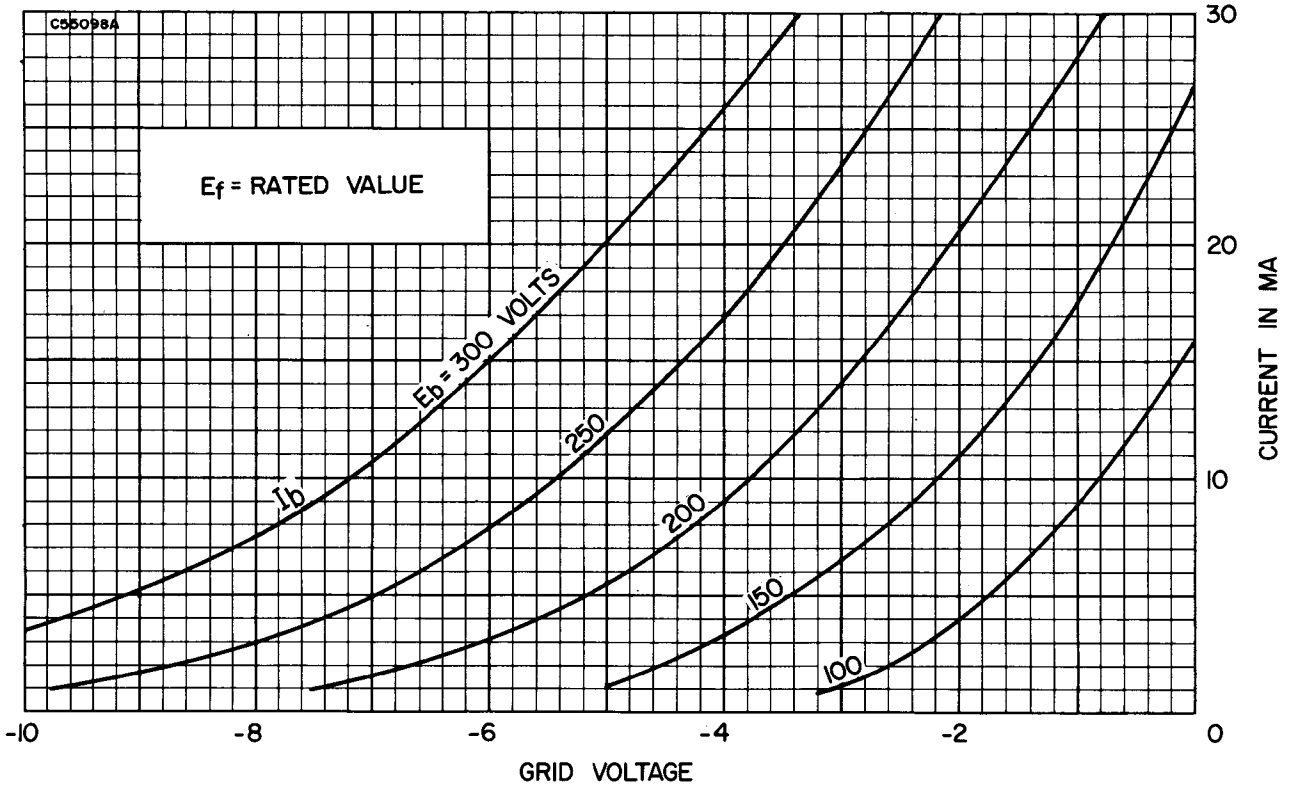
RATING CHART



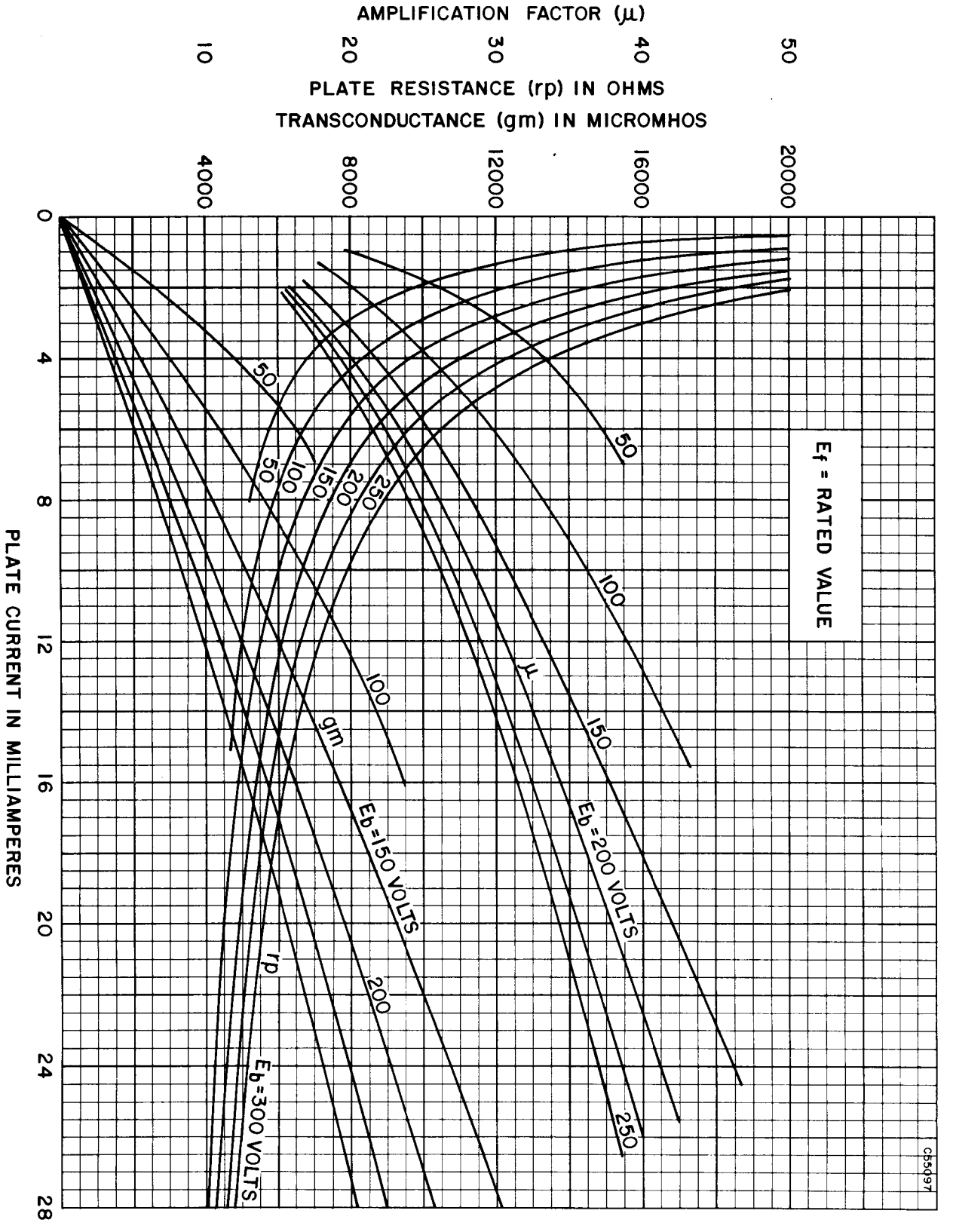
AVERAGE PLATE CHARACTERISTICS
(Triode Section)



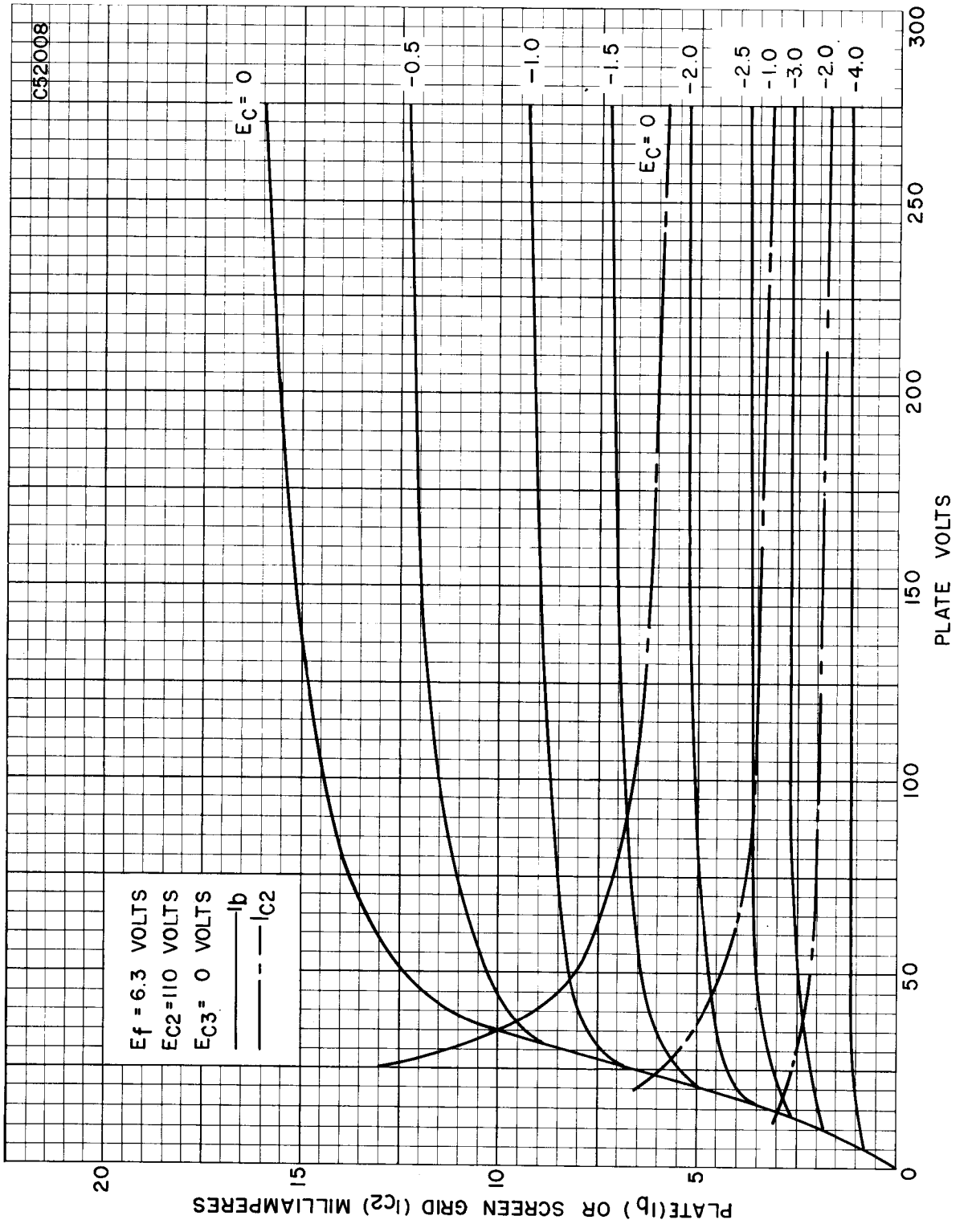
AVERAGE TRANSFER CHARACTERISTICS
(Triode Section)



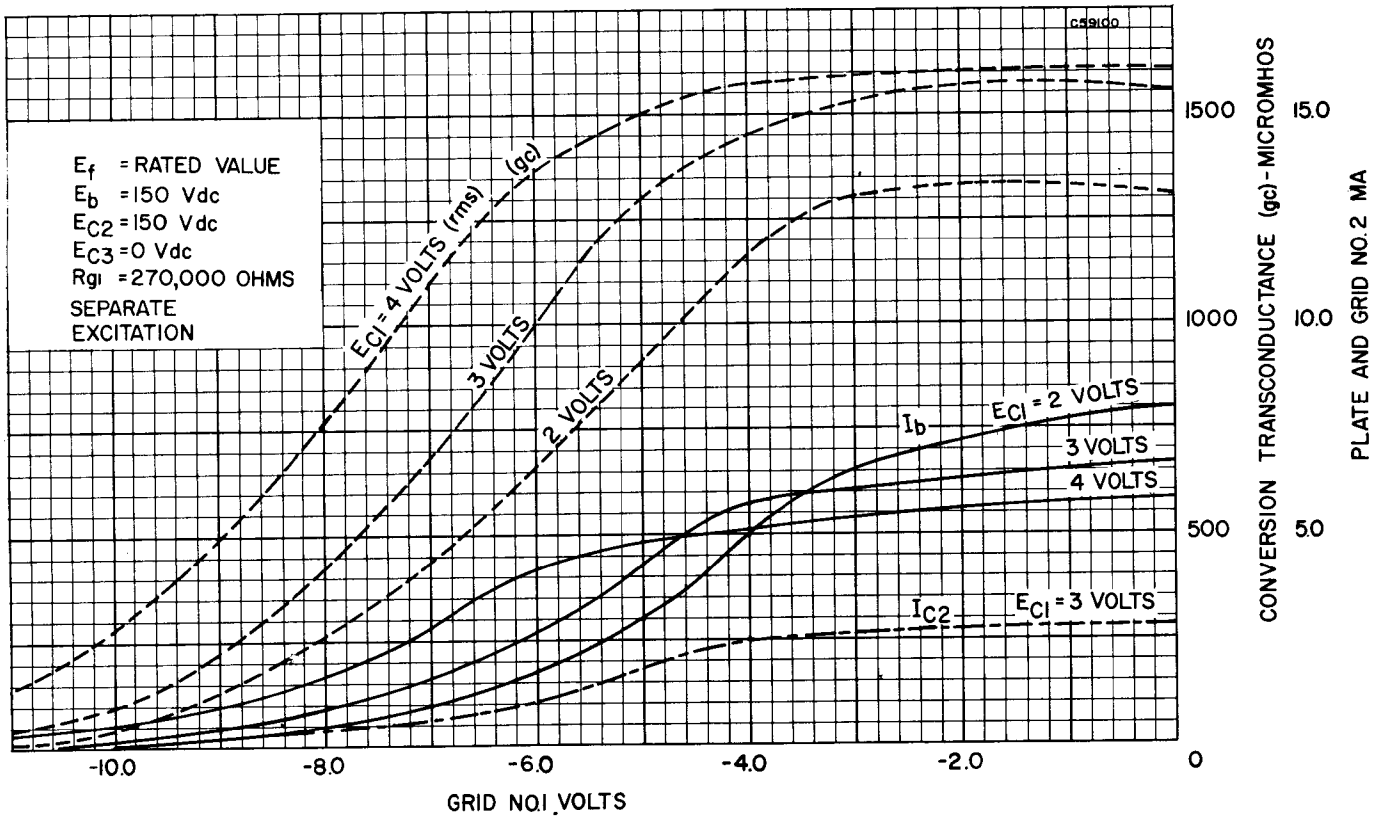
AVERAGE TRANSFER CHARACTERISTICS
(Triode Section)

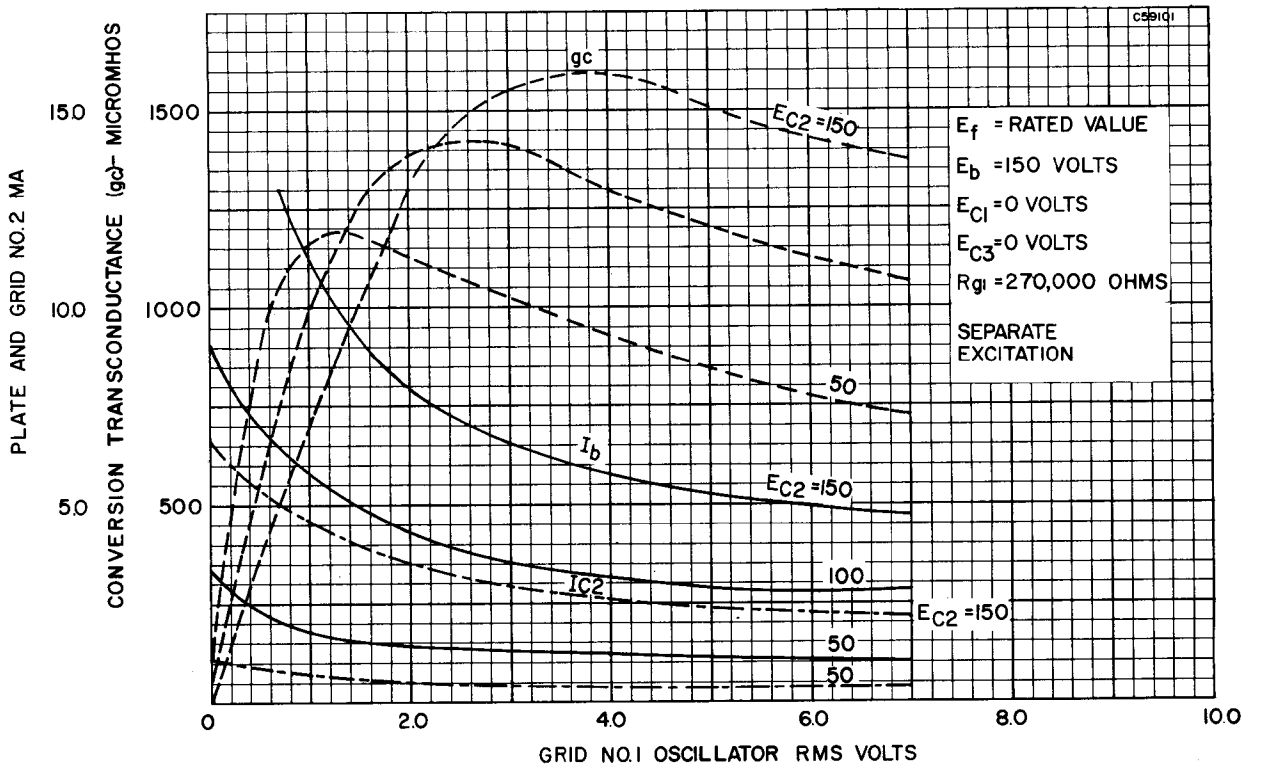


AVERAGE PLATE CHARACTERISTICS
(Pentode Section)



AVERAGE TRANSFER CHARACTERISTICS
(Pentode Section)





Type 6679/12AT7 is designed specifically for use in mobile communications equipment. The 6679/12AT7 may be operated without serious degradation under normal variations in supply voltage as encountered with automotive electrical systems. Also consistent with the requirements of the equipment, the tube is capable of withstanding appreciable on-off cycling.

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9A
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Series/Parallel	
Heater Voltage[1]	12.6/6.3 Volts	
Heater Current	150/300 Ma	
Heater-Cathode Voltage (Design Maximum Values)		
Heater Positive with Respect to Cathode	100 Volts	Max.
Heater Negative with Respect to Cathode	100 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section 1[2]		Section 2[2]	
Grid to Plate	1.5		1.5 μμf	
Input	2.2		2.2 μμf	
Output	0.5		0.4 μμf	
Grid to Grid		.005	μμf	Max.
Plate to Plate		0.4	μμf	Max.
Heater to Cathode	2.4		2.4 μμf	

Grounded Grid Operation

Plate to Cathode	0.2	0.2 μμf	
Input	4.6	4.6 μμf	
Output	1.8	1.8 μμf	

RATINGS (Design Maximum Values) Each Section

Plate Voltage	330 Volts	Max.
Positive Grid Voltage	0 Volts	Max.
Negative Grid Voltage	55 Volts	Max.
Plate Dissipation	2.8 Watts	Max.

CHARACTERISTICS AND TYPICAL OPERATION

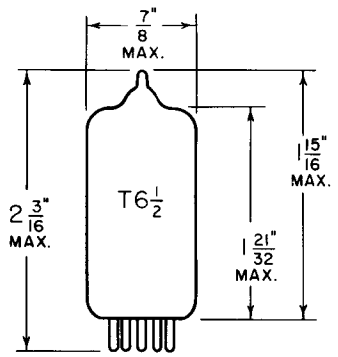
Class A1 Amplifier — Each Section

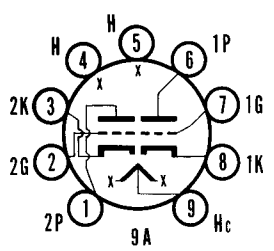
Plate Voltage	100	250 Volts
Cathode Bias Resistor	270	200 Ohms
Plate Current	3.7	10.0 Ma
Plate Resistance	15,000	10,900 Ohms
Transconductance	4000	5500 μmhos
Amplification Factor	60	60
Ec for Ib = 10 μa (Approx.)	−5	−12 Volts

QUICK REFERENCE DATA

Sylvania Type 6679/12AT7 is designed specifically for mobile operation. It is a T-6½ high mu duo triode intended for use as a grounded grid amplifier or a frequency converter at frequencies below 300 Mc.

Type 6679/12AT7 possesses electrical characteristics essentially equivalent to Type 12AT7.





SYLVANIA ELECTRONIC TUBES

A Division of Sylvania Electric Products Inc.

RECEIVING TUBE OPERATIONS EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

MAY, 1961

File Under
RECEIVING TUBES

SPECIAL TESTS AND RATINGS

Heater-Cycling Life Test

Statistical sample operated for 2000 cycles minimum to evaluate and control heater-cathode defects. Conditions of test include Ef = 15 volts (series-heater connection) cycled for one minute on and one minute off. Eb + Ec = 0 volts and Ehk = 135 volts with heater positive with respect to cathode.

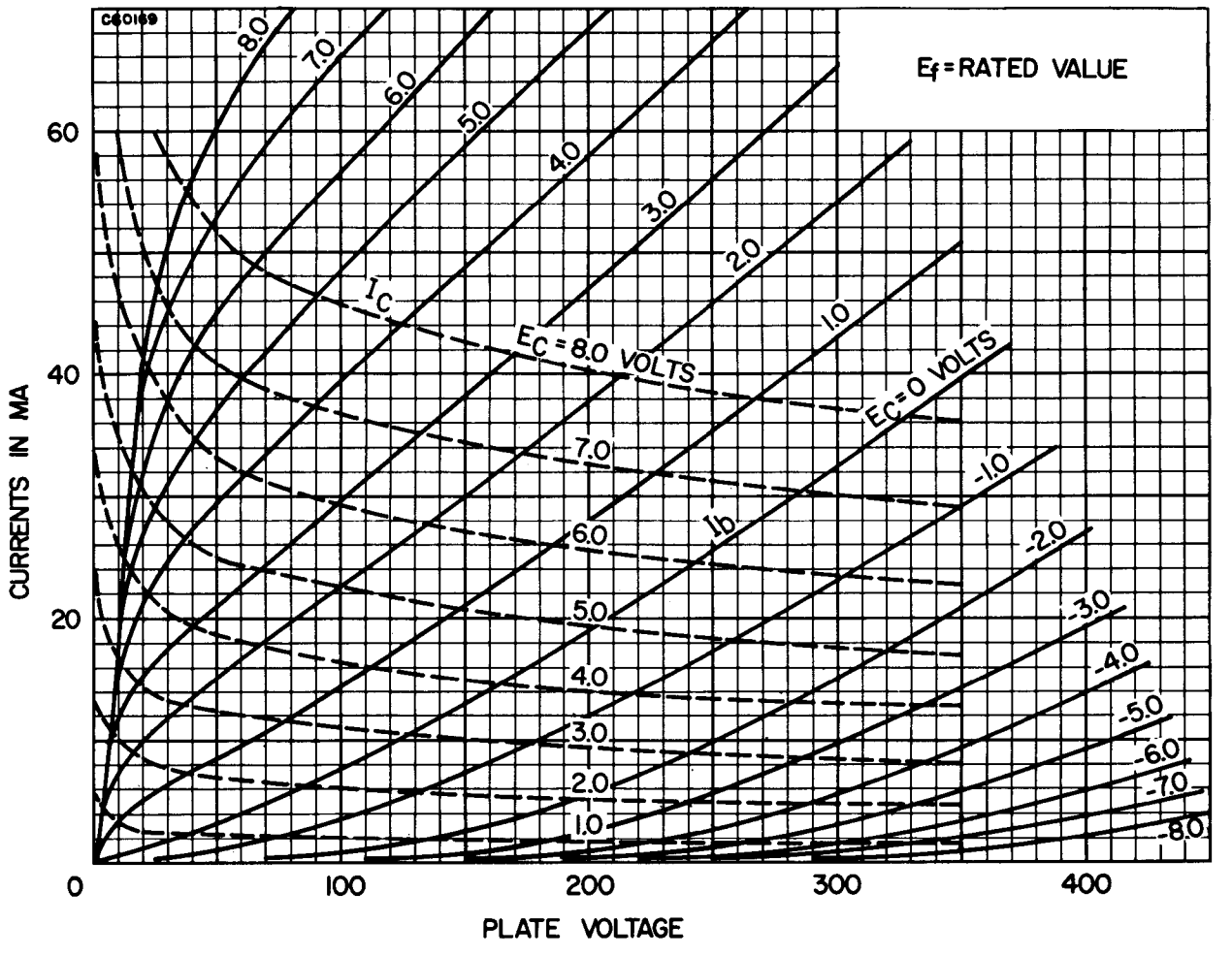
Average Transconductance at Reduced Heater Voltage, Each Section . . . . . 4400 μmhos

Ef = 10.0 volts, Eb = 250 volts, Rk = 200 ohms (bypassed).

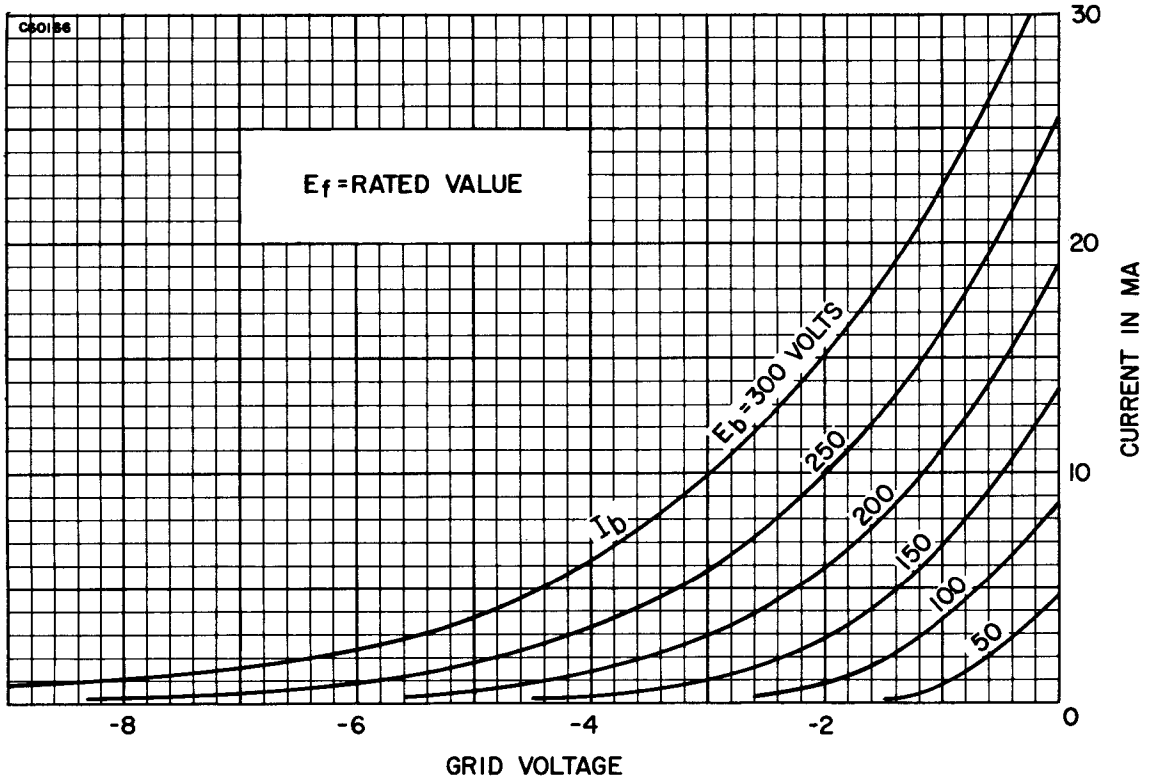
NOTES:

1. *When operated from automotive electrical systems, the heater may be subjected to voltage variations as great as ±20 percent. Although such extremes in heater voltage may be tolerated for short periods, increased equipment reliability can be achieved with improved supply-voltage regulation.*
2. *Section No. 1 connects to Pins 6, 7 and 8. Section No. 2 connects to Pins 1, 2 and 3.*

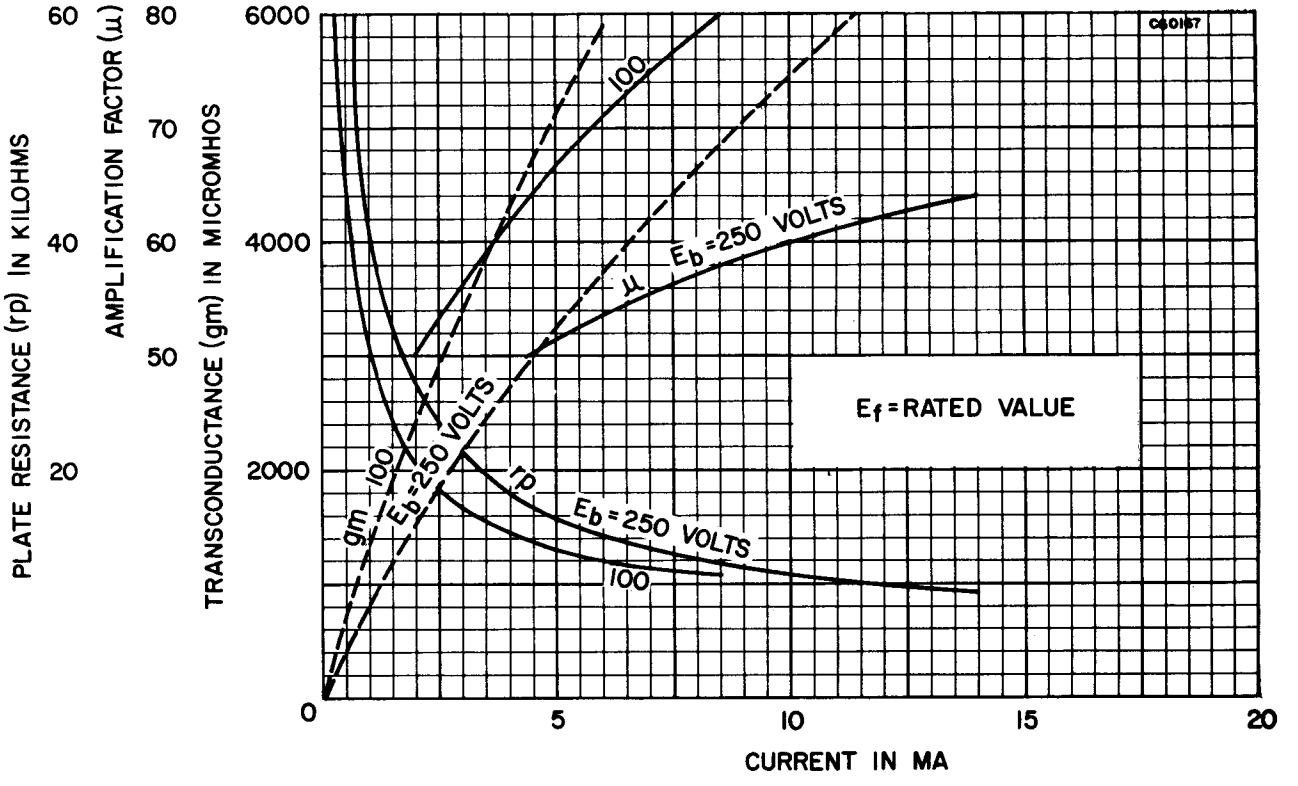
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA engineering data service

Type 6680/12AU7 is designed specifically for use in mobile communications equipment. The 6680/12AU7 may be operated without serious degradation under normal variations in supply voltage as encountered with automotive electrical systems. Also consistent with the requirements of the equipment, the tube is capable of withstanding appreciable on-off cycling.

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button, 9-Pin
Outline	6-2
Basing	9A
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Series/Parallel	
Heater Voltage[1]	12.6/6.3 Volts	
Heater Current	150/300 Ma	
Heater-Cathode Voltage (Design Maximum Values)		
Heater Negative with Respect to Cathode		
Total DC and Peak	200 Volts	Max.
Heater Positive with Respect to Cathode		
DC	100 Volts	Max.
Total DC and Peak	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section 1[2]	Section 2[2]
Grid to Plate	1.5	1.5 μμf
Input: (g to h+k)	1.6	1.6 μμf
Output: (p to h+k)	0.4	0.32 μμf

RATINGS (Design Maximum Values) Each Section

Class A1 Amplifier

Plate Voltage	330 Volts	Max.
Plate Dissipation	3 Watts	Max.
Grid Circuit Resistance		
Fixed Bias	0.25 Megohm	Max.
Cathode Bias	1.0 Megohm	Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier (Each Section)

Plate Voltage	100	250 Volts
Grid Voltage	0	−8.5 Volts
Plate Current	11.8	10.5 Ma
Transconductance	3100	2200 μmhos
Amplification Factor	20	17
Plate Resistance (Approx.)	6500	7700 Ohms
Grid Voltage for Ib = 10 μa (Approx.)		−24 Volts

SPECIAL TESTS AND RATINGS

Heater-Cycling Life Test

Statistical sample operated for 2000 cycles minimum to evaluate and control heater-cathode defects. Condition of test include Ef = 15.0 volts (series heater connection) cycle for one minute on and one minute off, Eb + Ec = 0 volts and Ehk = 135 volts with heater positive with respect to cathode.

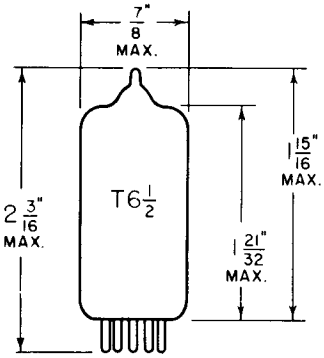
Average Transconductance at Reduced Heater Voltage, Each Section . . . . . 1750 μmhos

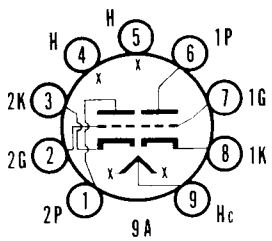
Ef = 10.0 volts, Eb = 250 volts and Ec = −8.5 volts

QUICK REFERENCE DATA

Sylvania Type 6680/12AU7 is designed specifically for mobile operation. It is a T-6½ medium mu triode intended for use as a general purpose amplifier, phase inverter or oscillator.

Type 6680/12AU7 possesses electrical characteristics essentially equivalent to Type 12AU7.





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

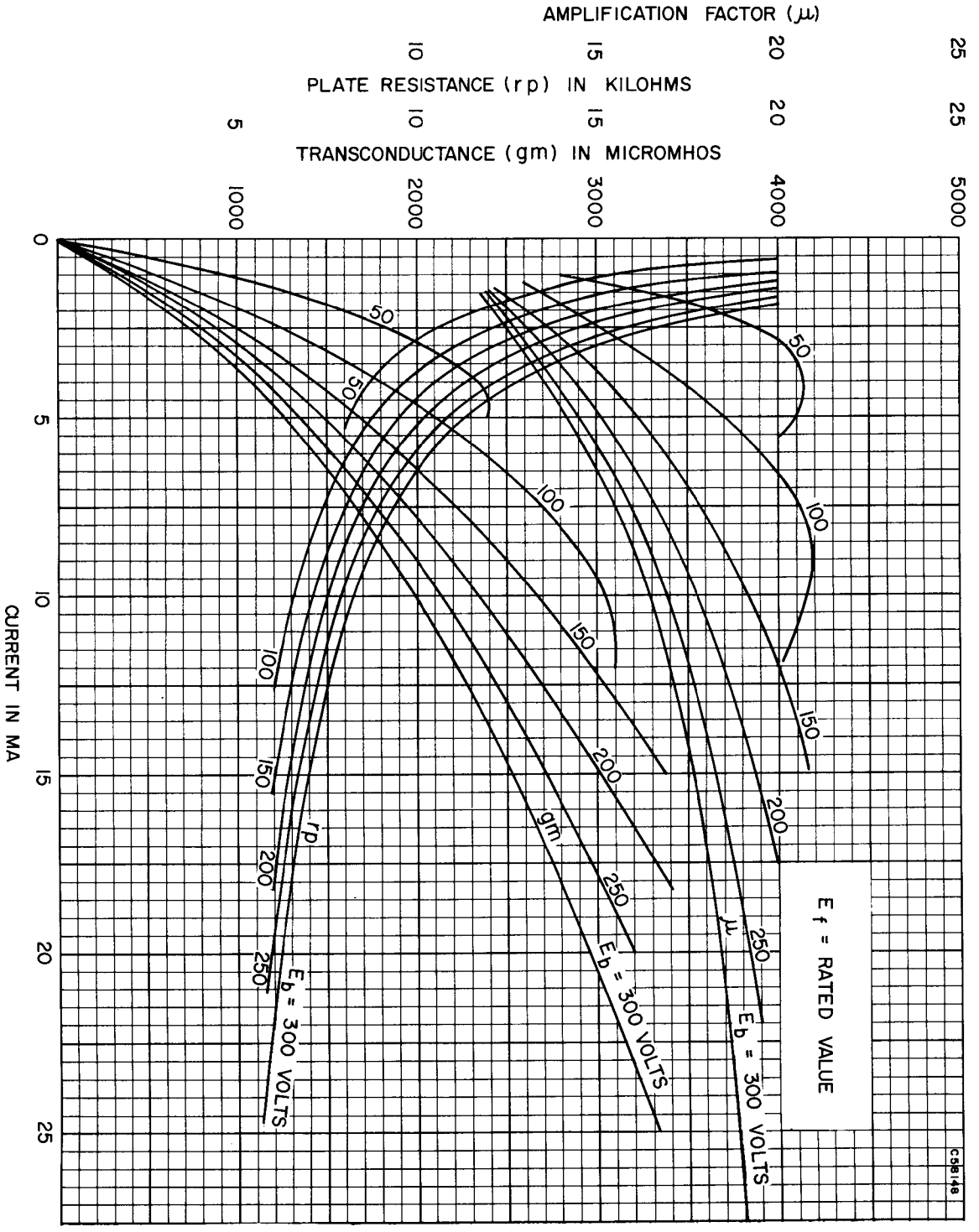
AUGUST, 1960

File Under
RECEIVING TUBES

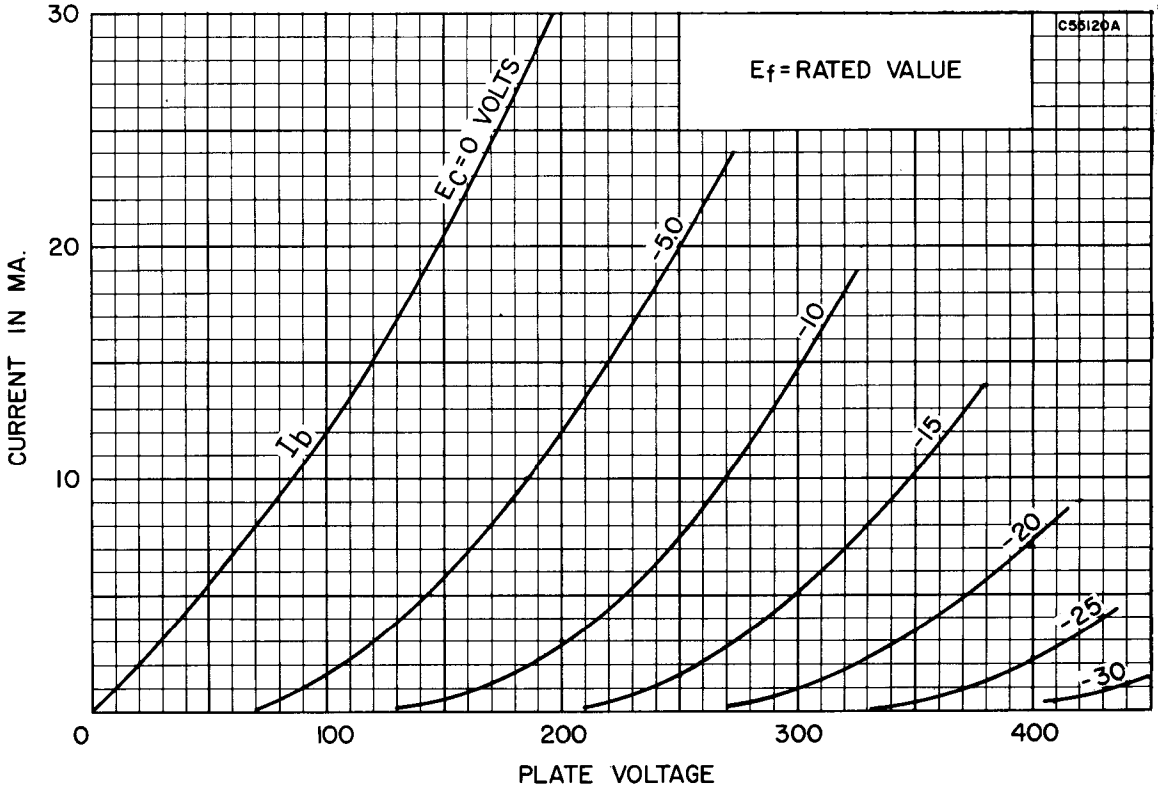
NOTES:

1. *When operated from automotive electrical systems the heater may be subjected to voltage variations as great as ± 20 percent. Although such extremes in heater voltage may be tolerated for short periods, increased equipment reliability can be achieved with improved supply-voltage regulation.*
2. *Section No. 1 connects to Pins 6, 7 and 8. Section No. 2 connects to Pins No. 1, 2 and 3.*

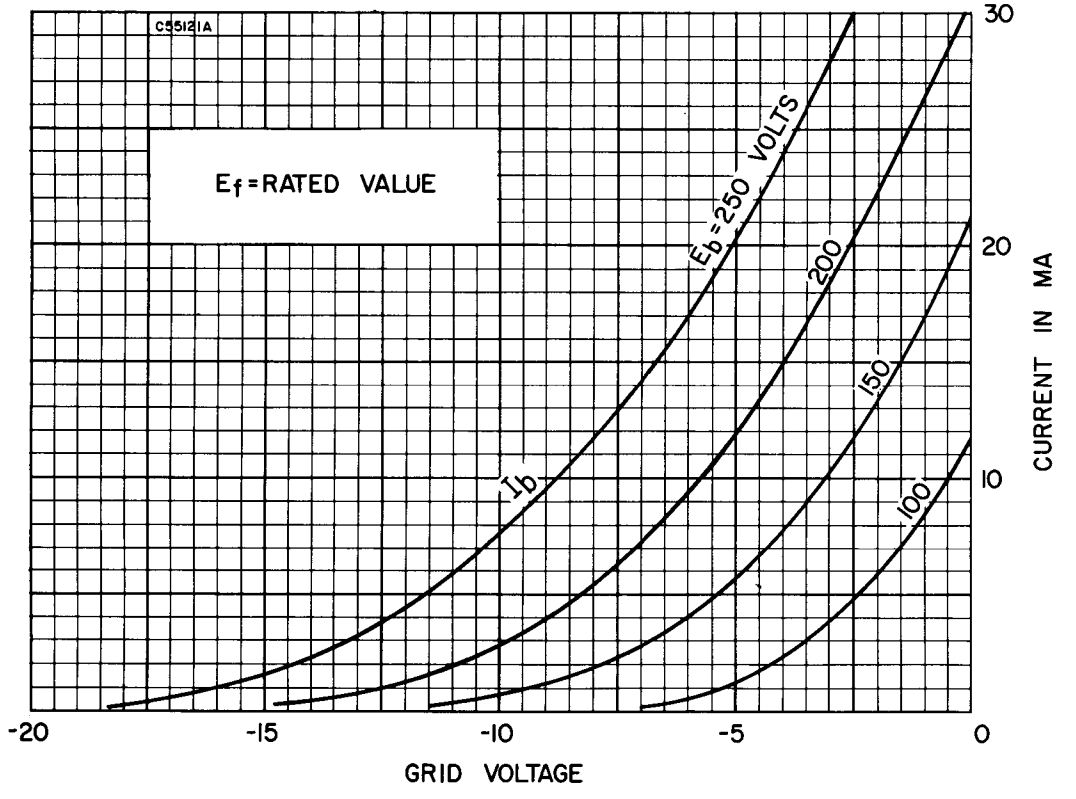
AVERAGE TRANSFER CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA engineering data service

Type 6681/12AX7 is designed specifically for use in mobile communications equipment. The 6681/12AX7 may be operated without serious degradation under normal variations in supply voltage as encountered with automotive electrical systems. Also consistent with the requirements of the equipment the tube is capable of withstanding appreciable on-off cycling.

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-2
Basing	9A
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Series/Parallel	
Heater Voltage[1]	12.6/6.3 Volts	
Heater Current	150/300 Ma	
Heater-Cathode Voltage (Design Maximum Values)		
Heater Negative with Respect to Cathode		
Total DC and Peak	200 Volts	Max.
Heater Positive with Respect to Cathode		
DC	100 Volts	Max.
Total DC and Peak	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section 1[2]	Section 2[2]
Grid to Plate	1.7	1.7 μμf
Input (g to h+k)	1.6	1.6 μμf
Output (p to h+k)	0.46	0.34 μμf

RATINGS (Design Maximum Values) Each Section

Plate Voltage	330 Volts	Max.
Plate Dissipation	1.1 Watt	Max.
Positive Grid Voltage	0 Volts	Max.
Negative Grid Voltage	55 Volts	Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier — Each Section

Plate Voltage	100	250 Volts
Grid Voltage	−1	−2 Volts
Plate Current	0.5	1.2 Ma
Plate Resistance	80,000	62,500 Ohms
Transconductance	1250	1600 μmhos
Amplification Factor	100	100

SPECIAL TESTS AND RATINGS

Heater-Cycling Life Test

Statistical sample operated for 2000 cycles minimum to evaluate and control heater-cathode defects. Conditions of test include Ef = 15.0 volts (series-heater connection) cycled for one minute on and one minute off, Eb + Ec = 0 volts and Ehk = 135 volts with heater positive with respect to cathode.

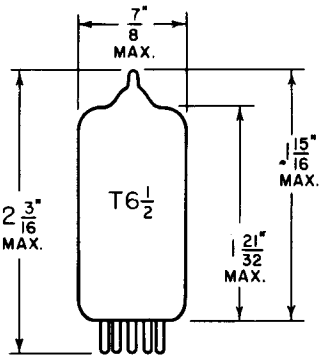
NOTES:

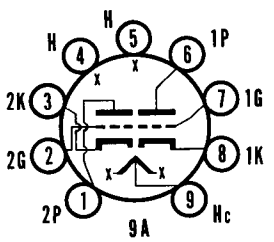
1. *When operated from automotive electrical systems the heater may be subjected to voltage variations as great as ± 20 percent. Although such extremes in heater voltage may be tolerated for short periods, increased equipment reliability can be achieved with improved supply-voltage regulation.*
2. *Section No. 1 connects to Pins 6, 7 and 8. Section No. 2 connects to Pins 1, 2 and 3.*

QUICK REFERENCE DATA

Sylvania Type 6681/12AX7 is designed specifically for mobile operation. It is a T-6½ high mu duo triode intended primarily for use as an audio amplifier or phase inverter.

Type 6681/12AX7 possesses electrical characteristics essentially equivalent to Type 12AX7.





SYLVANIA
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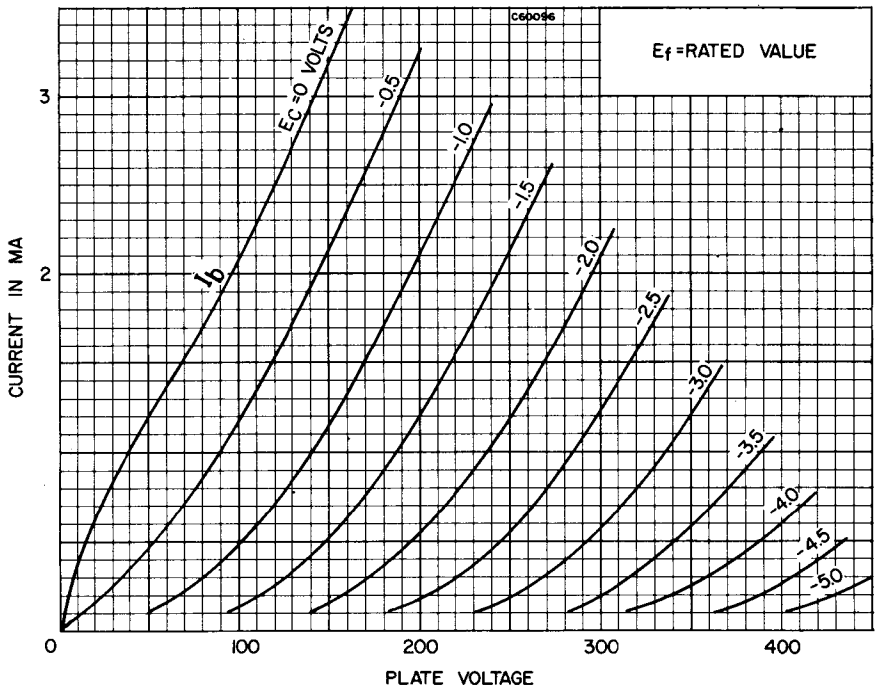
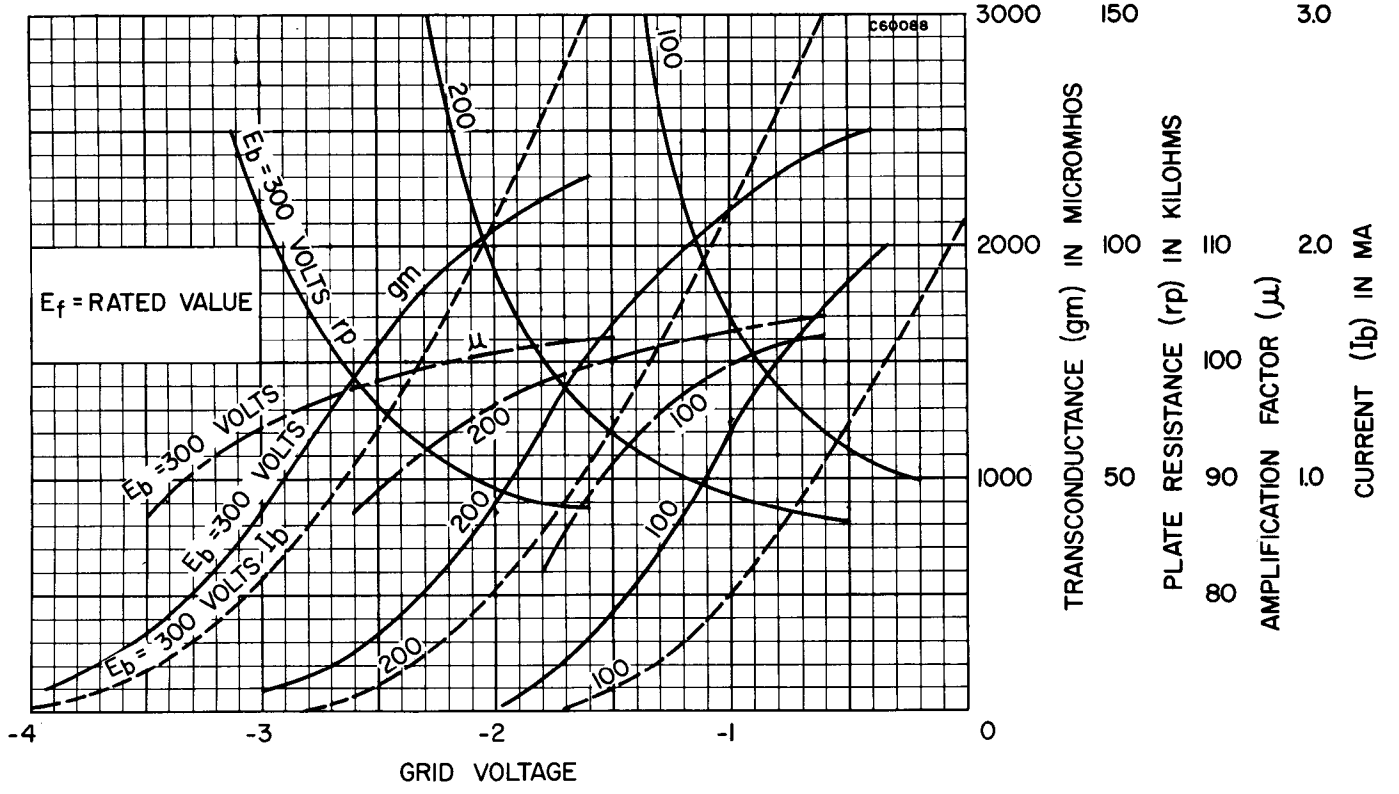
AUGUST, 1960

File Under
RECEIVING TUBES

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



MECHANICAL DATA

Envelope	Metal Capsule	
Power Connectors	Birnbach # 4041	
RF Connectors	Type TNC Plug[1]	
Focusing	Electromagnetic	
Cooling[2]	Forced Air	
Mounting Position	Any	
Tube Weight (Approx.)	2	lbs
Solenoid Weight (Approx.):		
Military (Aluminum foil-wound)	29	lbs
Non-Military (Copper wire-wound)	46	lbs

QUICK REFERENCE DATA

Traveling-wave Amplifier
Full Octave Coverage
2.0 to 4.0 Gc
Over 1 kw Peak Power Output
Suitable for Airborne Applications

ELECTRICAL DATA[3]

HEATER CHARACTERISTICS

Voltage	6.3 ± 10%	V
Current (at 6.3 V)	1.7 - 2.7	A
Minimum Preheat Time	2	Minutes

RATINGS (Absolute Maximum)

Peak Positive Grid 1 Voltage	500	v
Grid 1 Bias Voltage (Absolute Minimum)	-40	Vdc
Collector, Helix, and Grid 2 Voltage	10,000	Vdc
Peak Cathode Current	2.2	a
Peak Helix Current	250	ma
Peak Grid 1 Current	300	ma
Peak Grid 2 Current	150	ma
Collector Dissipation	225	W
Duty Factor	0.016	
Pulse Width	12	µs
CW RF Input[4]	10	W
Collector Seal Temperature	250	°C

TYPICAL OPERATION[5]

Conditions

Frequency	2.0 to 4.0	Gc
Magnetic Focusing Field Density	1160	Gausses
Minimum Uniform Length	6	Inches
Peak Grid 1 Voltage (Approx.)[6]	300	v
Grid 1 Bias Voltage	-60	Vdc
Collector, Helix, and Grid 2 Voltage (Approx.)[6]	8000	Vdc
Duty Factor	0.01	
Pulse Width	10	µs

Characteristics

	Min.	Max.	
Peak Cathode Current	-	2	a
Peak Helix Current	-	200	ma
Peak Grid 1 Current	-	250	ma
Peak Grid 2 Current	-	100	ma
Saturation Power Output	1000	-	w

POWER CONNECTIONS

Heater	Brown
Heater, Cathode	Yellow
Grid 1	Green
Grid 2	Blue
Collector	Red
Helix	Center Conductor of RF Cables

SYLVANIA ELECTRIC PRODUCTS INC.

MICROWAVE DEVICE OPERATIONS

Mountain View, California

January 31, 1961

from JEDEC release #3221, April 10, 1961

ELECTRICAL DATA (Cont'd)

Characteristics	Min.	Max.	
Small Signal Gain (+13 dbm Input)	35	-	db
Saturation Gain	25	-	db
Insertion Loss (Grid 1 at -60 Vdc)	45	-	db

CIRCUIT DESIGN INFORMATION[7,8]

Peak Grid 1 Voltage Range[9]	240 to 420	v
Collector, Helix, and Grid 2 Voltage Range	6500 to 9000	Vdc

When this tube is operated with grid pulsing, the effective impedance of the grid 1 circuit between pulses must be less than 1000 ohms.

NOTES:

1. Alternative connectors supplied on request.

2. In addition to the cooling air requirements for the solenoid used with this tube it is recommended that at least 0.6 lbs/min of less than 100°C cooling air be directed along this tube.

3. All voltages are with respect to cathode. For personnel safety, the collector, helix, center conductor of RF cables, and grid 2 should be operated at ground potential and the solenoid case and other equipment associated with the operation of the tube should be heavily bonded to ground. Good grounding to the outer conductors of the tube RF cables should be provided by the associated equipment. The tube RF connectors should NOT be disconnected while lethal potentials are present. In addition, all conventional high voltage safety precautions in circuit design and use should be exercised to safeguard personnel, circuitry, and the tube.

4. When RF is applied to the input of this tube the output should be connected to a load.

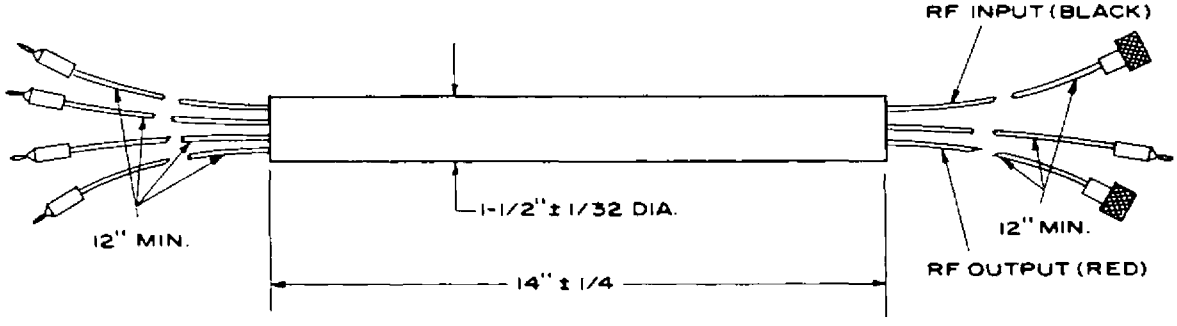
5. The quoted tube performance is for operation in a Sylvania-approved solenoid. Additional information will be supplied on request.

6. Specific recommended operating voltage values supplied with each tube.

7. Ranges include values required as a result of initial spread of tube characteristics as well as those to accommodate changes throughout life.

8. For initial setup only, these voltages should be adjustable from zero upward. Suggested turn-on sequence is as follows:
   1. Solenoid current.
   2. Heater voltage. Wait 2 minutes before proceeding.
   3. Grid 1 bias voltage.
   4. Collector, helix, and grid 2 voltage.
   5. Grid 1 pulse voltage.

9. Peak grid 1 voltage range specified is with respect to cathode. Total output voltage from pulser should be greater by the amount of bias (60 Vdc).


RF INPUT (BLACK)
12" MIN.
1-1/2" ± 1/32 DIA.
14" ± 1/4
12" MIN.
RF OUTPUT (RED)

MECHANICAL DATA

Envelope	Metal Capsule	
Power Connector	Winchester PM6P[1]	
RF Connector	Type N Jack[1]	
Focusing	Electromagnetic	
Cooling[2]	Forced Air	
Mounting Position	Any	
Tube Weight (Approx.)	1.5	lbs
Solenoid Weight (Approx.):		
Military (Aluminum foil-wound)	18.5	lbs
Non-Military (Copper wire-wound)	45	lbs

QUICK REFERENCE DATA

Backward-wave Oscillator
Full Octave Coverage
1.0 to 2.0 Gc
Over 10 mW Power Output
Voltage Tunable
Suitable for Airborne Applications

ELECTRICAL DATA[3]

HEATER CHARACTERISTICS

Voltage	6.3 ± 10%	V
Current (at 6.3 V)	2.2 - 3.9	A
Minimum Preheat Time	3	Minutes

RATINGS (Absolute Maximum)

Collector Voltage with Respect to Helix	300	Vdc
Grid 1 Voltage	±125	Vdc
Grid 2 Voltage	135	Vdc
Helix, Grid 3 Voltage	875	Vdc
Anode Current	5.5	mAdc
Cathode Current	45	mAdc
Collector Seal Temperature	200	°C

TYPICAL OPERATION[4]

Conditions

Magnetic Focusing Field Density	600	Gausses
Minimum Uniform Length	7	Inches
Grid 1 Voltage	0	Vdc
Voltage to Gate-Off Oscillation	-100	Vdc
Collector Voltage with Respect to Helix	150	Vdc
Grid 2 Voltage (Approx.)[5]	60	Vdc
Helix, Grid 3 Voltage (Approx.)[8]	90 - 660	Vdc

Characteristics	Min.	Max.	
Frequency[8]	1	2	Gc
Grid 2 Current	-	5	mAdc
Helix, Grid 3 Current	-	20	mAdc
Cathode Current	-	42	mAdc
Collector Current	-	35	mAdc
RF Power Output[8]	10	1400	mW

CIRCUIT DESIGN INFORMATION[7]

Grid 2 Voltage Range	0 to 125	Vdc
Helix, Grid 3 Voltage Range	45 to 800	Vdc

POWER CONNECTIONS

A. Grid 1
B. Grid 2
C. Collector
D. Heater, Cathode
E. Heater
F. Grid 3, Helix,[6] Capsule, Outer Conductor of RF Cable

SYLVANIA ELECTRIC PRODUCTS INC.

MICROWAVE DEVICE OPERATIONS

Mountain View, California

January 31, 1961

from JEDEC release #3221, April 10, 1961

NOTES:

1. Alternative connectors supplied on request.

2. In addition to the cooling requirements for the solenoid used with this tube it is recommended that at least 0.15 lbs/min of less than 100°F cooling air be directed into the collector end of the tube.

3. All voltages given are with respect to cathode except where otherwise specified. For safety, pin F should be operated at ground potential (see Note 6).

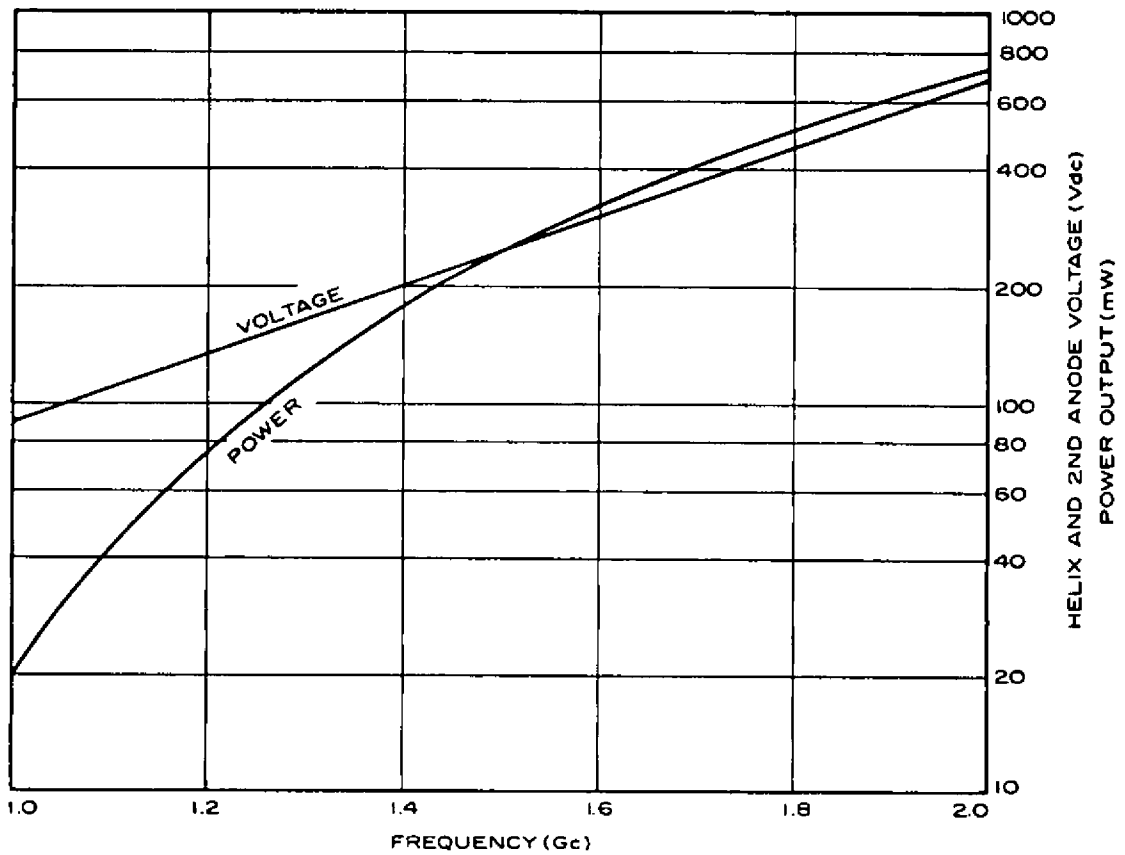
4. The quoted tube performance is for operation in a Sylvania-approved solenoid. Additional information will be supplied on request.

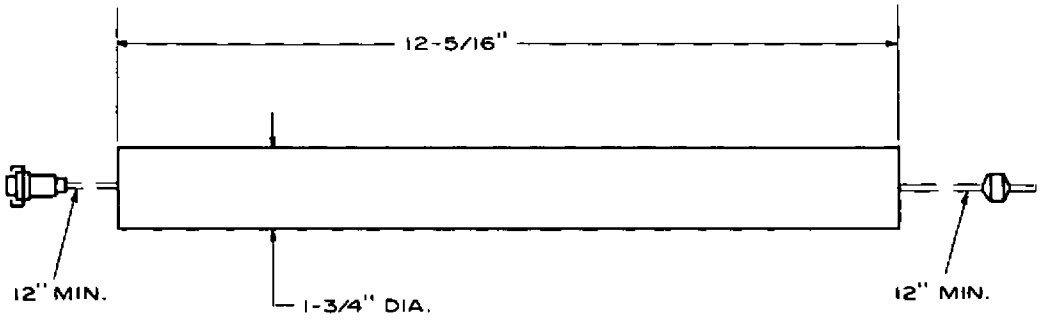
5. In typical operation the grid 2 voltage, with respect to cathode, remains fixed as a function of frequency. The appropriate value for an individual tube may be found by adjusting the grid 2 voltage to provide a specified value of cathode current when the tube is oscillating at 1 Gc. The specified value for cathode current, at 1 Gc, is supplied with each tube.

6. The inner conductor of the RF cable connects to the helix and hence has d-c continuity to pin F.

7. Ranges include values required as a result of initial spread in tube characteristics as well as those to accommodate changes throughout life.

8. Typical curves.




12-5/16"
12" MIN.
1-3/4" DIA.
12" MIN.

SYLVANIA

engineering data service

SYLVANIA
6752

MECHANICAL DATA

Envelope	Metal Capsule	
Power Connector	Winchester PM6P[1]	
RF Connectors	Type N Jack[1]	
Focusing	Electromagnetic Solenoid Required	
Cooling[2]	Forced Air	
Mounting Position	Any	
Tube Weight (Approx.)	1.5	lbs
Solenoid Weight (Approx.):		
Military (Aluminum foil-wound)	12	lbs
Non-Military (Copper wire-wound)	35	lbs

QUICK REFERENCE DATA

Traveling-wave Amplifier
Full Octave Coverage
1.0 to 2.0 Gc
Over 2 W CW Power Output
Suitable for Airborne Applications

ELECTRICAL DATA[3]

HEATER CHARACTERISTICS

Voltage	6.3 ± 10%	V
Current (at 6.3 V)	1.1 - 1.5	A
Minimum Preheat Time	1	Minute

RATINGS (Absolute Maximum)

Collector Voltage with Respect to Helix	250	Vdc
Helix Voltage	1000	Vdc
Grid Voltage	800	Vdc
Cathode Current	65	mAdc
Helix Current	11	mAdc
Grid Current	5	mAdc
CW RF Input[4]	1	W
Collector Seal Temperature	150	°C

TYPICAL OPERATION[5]

Conditions

Frequency	1.0 to 2.0	Gc
Magnetic Focusing Field Density	615	Gausses
Minimum Uniform Length	9.5	Inches
Collector Voltage with Respect to Helix	150	Vdc
Helix Voltage (Approx.)[6]	600	Vdc
Grid Voltage (Approx.)[6]	500	Vdc

Characteristics

	Min.	Max.	
Cathode Current	-	60	mAdc
Helix Current	-	8	mAdc
Grid Current	-	0.8	mAdc
Saturation Power Output	2	-	W
Small Signal Gain (-30 dbm Input)	37	-	db

CIRCUIT DESIGN INFORMATION[7]

Helix Voltage Range	520 to 680	Vdc
Grid Voltage Range[8]	350 to 700	Vdc

POWER CONNECTIONS

A. NC
B. Grid
C. Helix
D. Heater, Cathode
E. Heater
F. Capsule, Collector

SYLVANIA ELECTRIC PRODUCTS INC.
MICROWAVE DEVICE OPERATIONS
Mountain View, California

February 15, 1961

NOTES:

1. Alternative connectors supplied on request. Length of power and RF leads can be made to fit customer requirements.

2. In addition to the cooling air requirements for the solenoid used with this tube it is recommended that at least 0.2 lbs/min of less than 26°C cooling air be directed at the collector end of this tube.

3. All voltages given are with respect to the cathode except where specified otherwise. For safety, pin F and the solenoid case should be grounded.

4. When RF is applied to the input of this tube the RF output should be connected to a load.

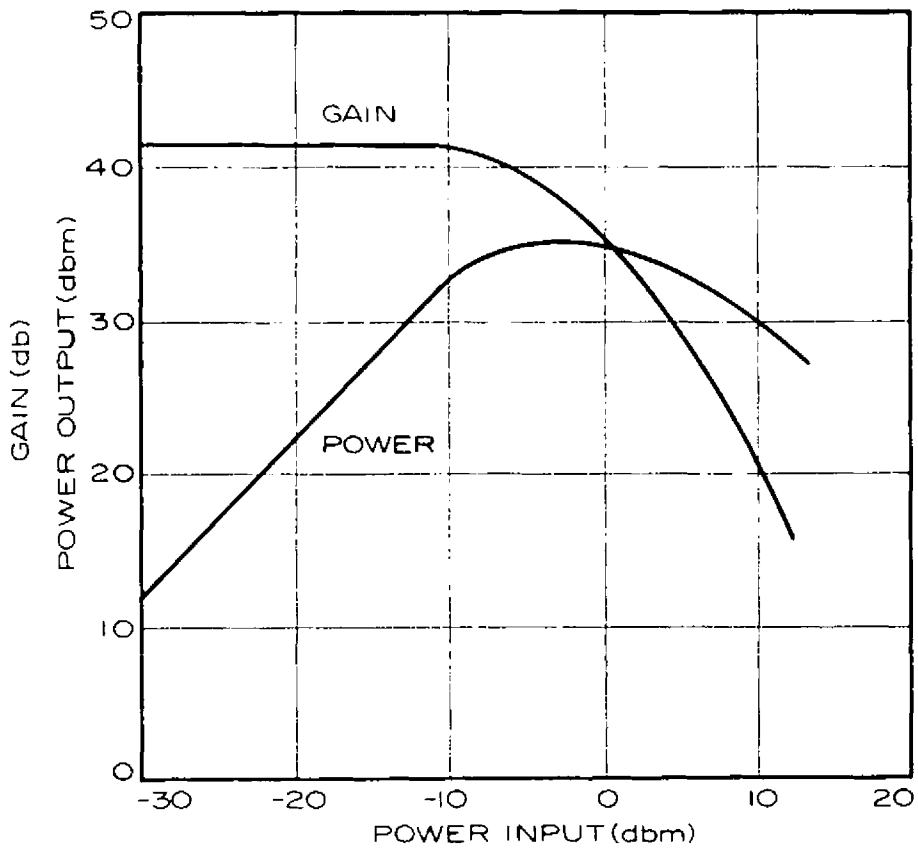
5. The quoted tube performance is for operation in a Sylvania-approved solenoid. Additional information will be supplied on request.

6. Specific recommended operating voltage values supplied with each tube.

7. Ranges include values required as a result of initial spread in tube characteristics as well as those to accommodate changes throughout life.

8. For initial setup only, this voltage should be adjustable from zero upward.

TYPICAL PERFORMANCE CHARACTERISTICS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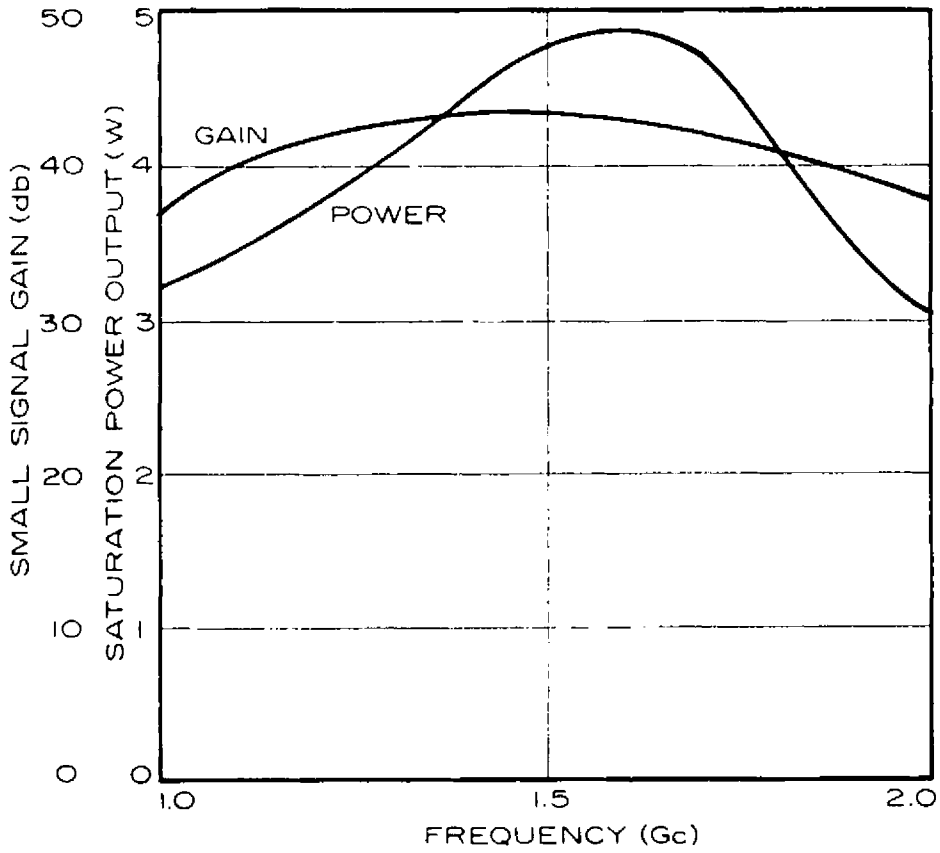
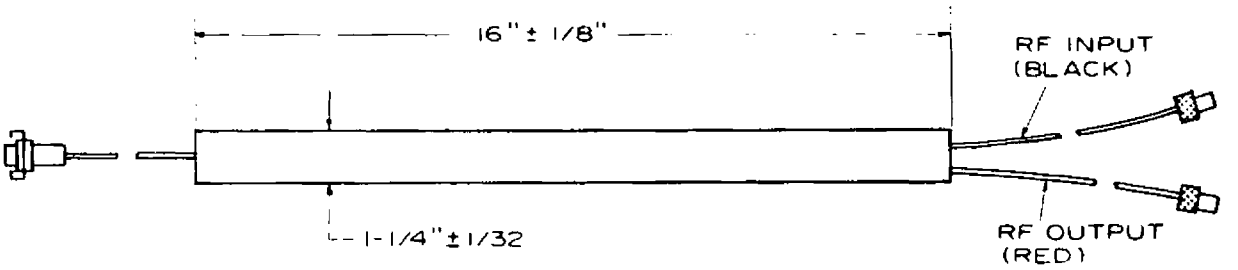
40
30
20
10
0
GAIN
POWER
GAIN (db)
POWER OUTPUT (dbm)
-30
-20
-10
0
10
20
POWER INPUT (dbm)


50
40
30
20
10
0
SMALL SIGNAL GAIN (db)
5
4
3
2
1
0
SATURATION POWER OUTPUT (W)
GAIN
POWER
1.0
1.5
2.0
FREQUENCY (Gc)


16" ± 1/8"
RF INPUT
(BLACK)
1-1/4" ± 1/32
RF OUTPUT
(RED)

SYLVANIA

6753

MECHANICAL DATA

Envelope	Metal Capsule	
Power Connector	Winchester PM6P[1]	
RF Connectors	Type N Jack[1]	
Focusing	Electromagnetic Solenoid Required	
Cooling[2]	Forced Air	
Mounting Position	Any	
Tube Weight (Approx.)	1	lb
Solenoid Weight (Approx.):		
Military (Aluminum foil-wound)	8	lbs
Non-Military (Copper wire-wound)	18	lbs

QUICK REFERENCE DATA

Traveling-wave Amplifier
Full Octave Coverage
1.0 to 2.0 Gc
Over 15 mW Power Output
Over 35 db Small Signal Gain
CW or Pulsed
Suitable for Airborne Applications

ELECTRICAL DATA [3]

HEATER CHARACTERISTICS

Voltage	6.3 ± 10%	V
Current (at 6.3 V)	0.64 - 0.96	A
Minimum Preheat Time	1	Minute

RATINGS (Absolute Maximum)

Collector Voltage with Respect to Helix	250	Vdc
Helix Voltage	400	Vdc
Grid 1 Voltage	0 to -175	Vdc
Grid 2 Voltage	400	Vdc
Cathode Current	10	mAdc
CW RF Input	1	W

TYPICAL OPERATION [4]

Conditions

Frequency	1.0 to 2.0	Gc
Magnetic Focusing Field Density	285	Gausses
Minimum Uniform Length	11	Inches
Collector Voltage with Respect to Helix	150	Vdc
Helix Voltage (Approx.)[5]	250	Vdc
Grid 1 Voltage	0	Vdc
Voltage to Gate-Off (55 db Insertion Loss)	-120	Vdc
Grid 2 Voltage (Approx.)[5]	200	Vdc

Characteristics	Min.	Max.	
Cathode Current	-	9	mAdc
Grid 1 Current	-	0.3	mAdc
Grid 2 Current	-	0.2	mAdc
Small Signal Gain (-40 dbm Input)	35	45	db
Small Signal Gain Variation	-	±3	db
Fine-Grain Variation of Gain for any 100-Mc Segment	-	±2	db
Noise Power Output[6]	-	0.15	mW
Saturation Power Output	15	-	mW

CIRCUIT DESIGN INFORMATION [7]

Grid 1 Voltage Range	0 to -170	Vdc
Grid 2 Voltage Range[8]	100 to 350	Vdc
Helix Voltage Range	150 to 350	Vdc

POWER CONNECTIONS

A. Grid 1
B. Grid 2
C. Helix
D. Heater, Cathode
E. Heater
F. Capsule
Collector - Red Wire

SYLVANIA ELECTRIC PRODUCTS INC.
MICROWAVE DEVICE OPERATIONS
Mountain View, California

January 10, 1961

from JEDEC release #3221, April 10, 1961

NOTES:

1. Alternative connectors supplied on request.

2. In addition to the cooling air requirements for the solenoid used with this tube it is recommended that at least 0.04 lbs/min of less than 100°F cooling air be passed along this tube.

3. All voltages given are with respect to cathode except where specified otherwise. Any one of pins A, B, C, D, E, or the collector may be connected to pin F which, for safety, should be grounded.

4. The quoted tube performance is for operation in a Sylvania-approved solenoid. Additional information will be supplied on request.

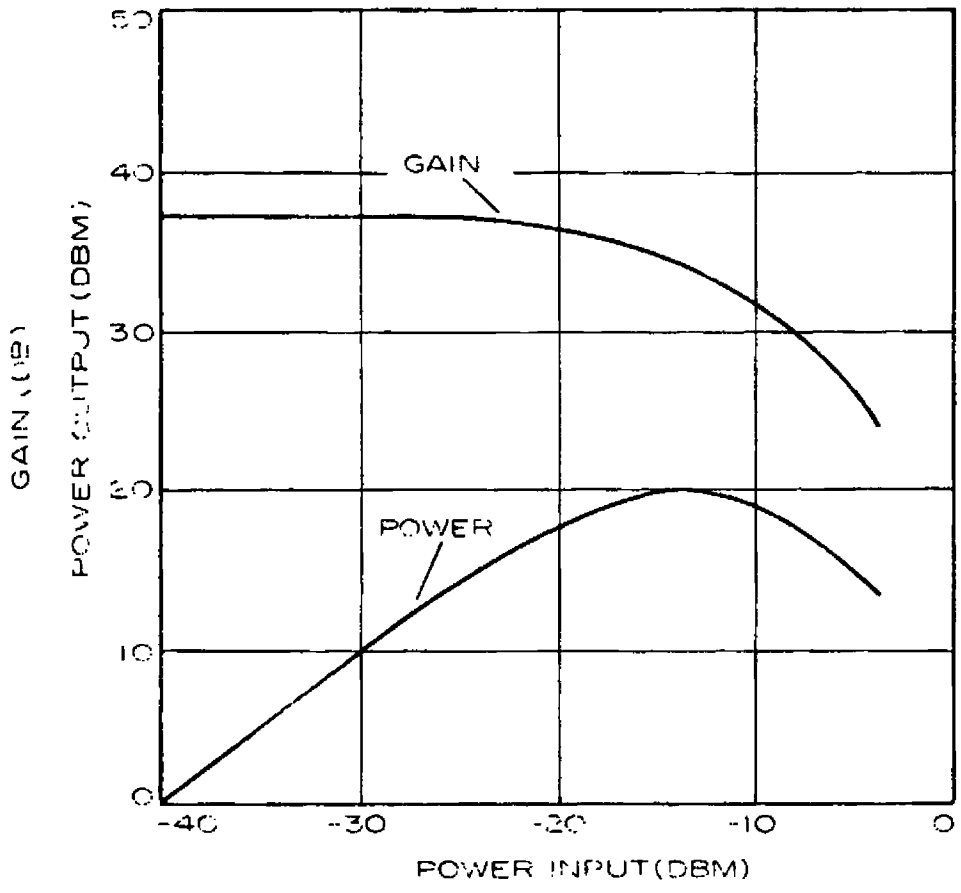
5. This voltage should be set to the value stated on the data sheet supplied with each tube.

6. As measured by a broadband bolometer with a frequency response from 0.5 to 10.0 Gc.

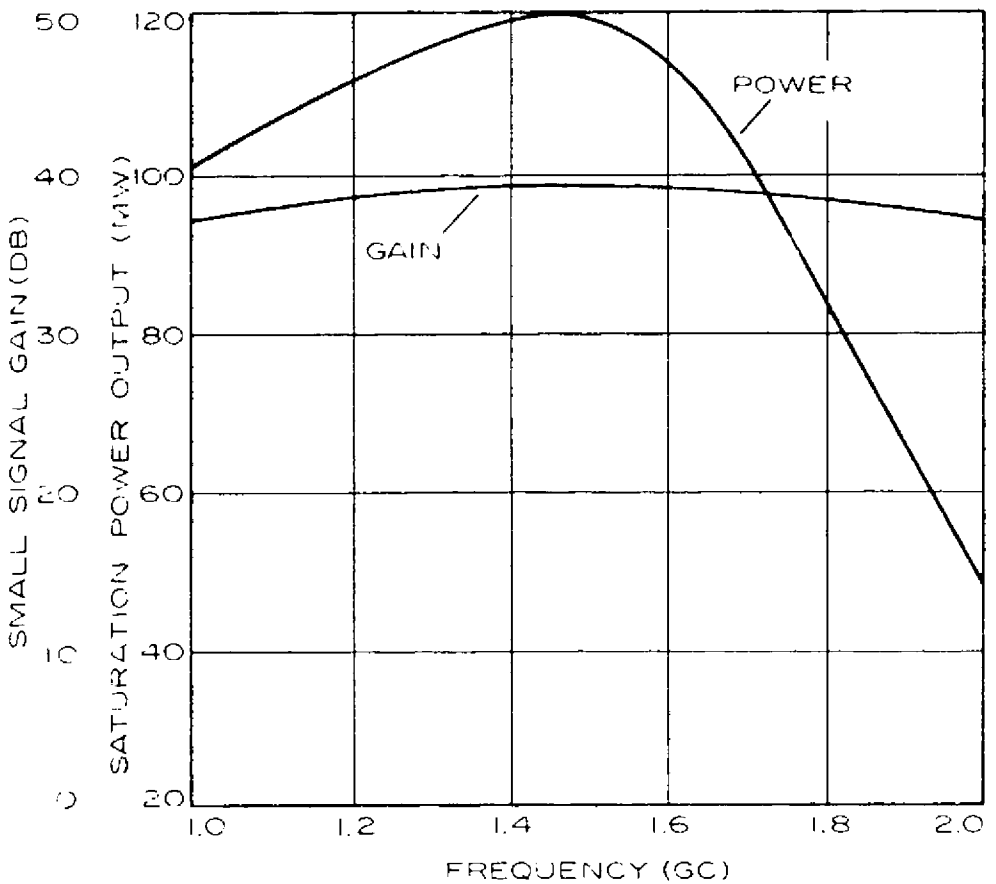
7. Ranges include values required as a result of initial spread in tube characteristics as well as those to accommodate changes throughout life.

8. For initial setup, it is desirable that grid 2 voltage be adjustable upward from zero.

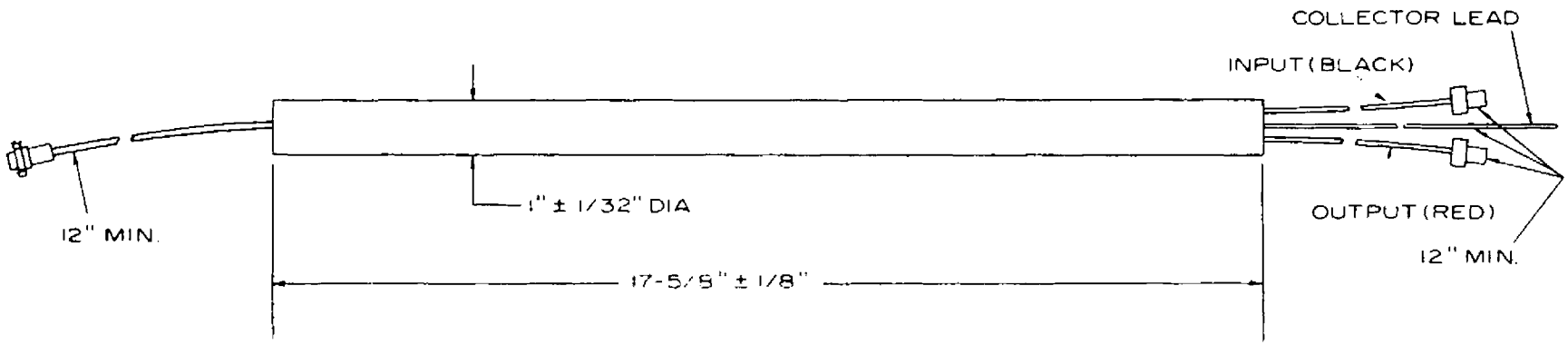
TYPICAL PERFORMANCE CHARACTERISTICS



Type 6753


SMALL SIGNAL GAIN (DB)
50
40
30
20
10
0
SATURATION POWER OUTPUT (MW)
120
100
80
60
40
20
POWER
GAIN
1.0
1.2
1.4
1.6
1.8
2.0
FREQUENCY (GC)

Type 6753


COLLECTOR LEAD
INPUT (BLACK)
1" ± 1/32" DIA
12" MIN.
OUTPUT (RED)
12" MIN.
17-5/8" ± 1/8"

Type 6753

SYLVANIA

engineering data service

6762

ADVANCE DATA

GENERAL DATA

Focusing Method	Magnetic	
Deflection Method	Magnetic	
Deflection Angle (approx.)	53	Degrees
Phosphor	P7	
Fluorescence	Blue-white	
Phosphorescence	Yellow	
Persistence of Phosphorescence	Long	

MECHANICAL DATA

Dimensions	Per Outline	
Envelope	Glass	
Base (Small Shell Duodecal 12 pin)	B12-43	
Basing	Per Outline	
Bulb Contact (Recessed Small Cavity Cap)	J1-22	
Cathode	Unipotential Oxide	
Mounting Position	Any	
Connectors	UG 88/U with 52 ohm RG 58/U Cable	
Minimum Useful Screen Diameter	4 1/4	Inches

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES (Approx.)

Focus Electrode to All Other Electrodes	7.5	μμf
Gate Electrode to All Other Electrodes	6.0	μμf
Cathode to All Other Electrodes	7.5	μμf

RATINGS (Absolute Values) [1]

Anode Voltage	25000	Volts dc Max.
Focus Electrode Voltage	+20	Volts dc Max.
Gun Anode Voltage	150	Volts dc Max.
Accelerator Voltage	2,000	Volts dc Max.
Gate Electrode Voltage	1,000	Volts dc Max.
Heater Voltage	6.3 ± 10%	Volts
Heater Cathode Voltage	±125	Volts Max.

QUICK REFERENCE DATA

The Sylvania Type 6762 Wamoscope is a new cathode ray device which incorporates most of the essential features of a microwave receiver in a single envelope. It is intended for use as a display tube in S-Band microwave receivers.

SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

January 17, 1957

from JETEC release #1875, March 18, 1957

TYPICAL OPERATING CONDITIONS [1] & [2]

Heater Voltage	6.3	Volts	
Heater Current	900	Ma	
Anode Voltage	15K	Volts	dc
Gun Anode Voltage	70	Volts	dc
Accelerator Voltage	650	Volts	dc
Gate Electrode Voltage	-3 to +10	Volts	dc
Helix Voltage	670	Volts	dc
Deflection Plates Voltage for centering	540 to 740	Volts	dc
Helix Focusing Solenoid Field Strength	110	Gauss	
Screen Focusing Magnet Field Strength	250	Gauss	
Cathode Current	0.5	Ma	
Center Frequency	3000	Mc	
Bandwidth [3]	300	Mc	
Sensitivity [4]	-40	dbm	
Maximum Gain [5]	10	db	

SOLENOID DATA [6]

Maximum Length	12 1/8	Inches	
Outside Diameter	3 1/2	Inches	
Inside Diameter	2 1/16	Inches	
Weight	9 1/8	lbs.	
Gauss per milliampere	0.85		
Maximum Voltage	250	Volts	dc

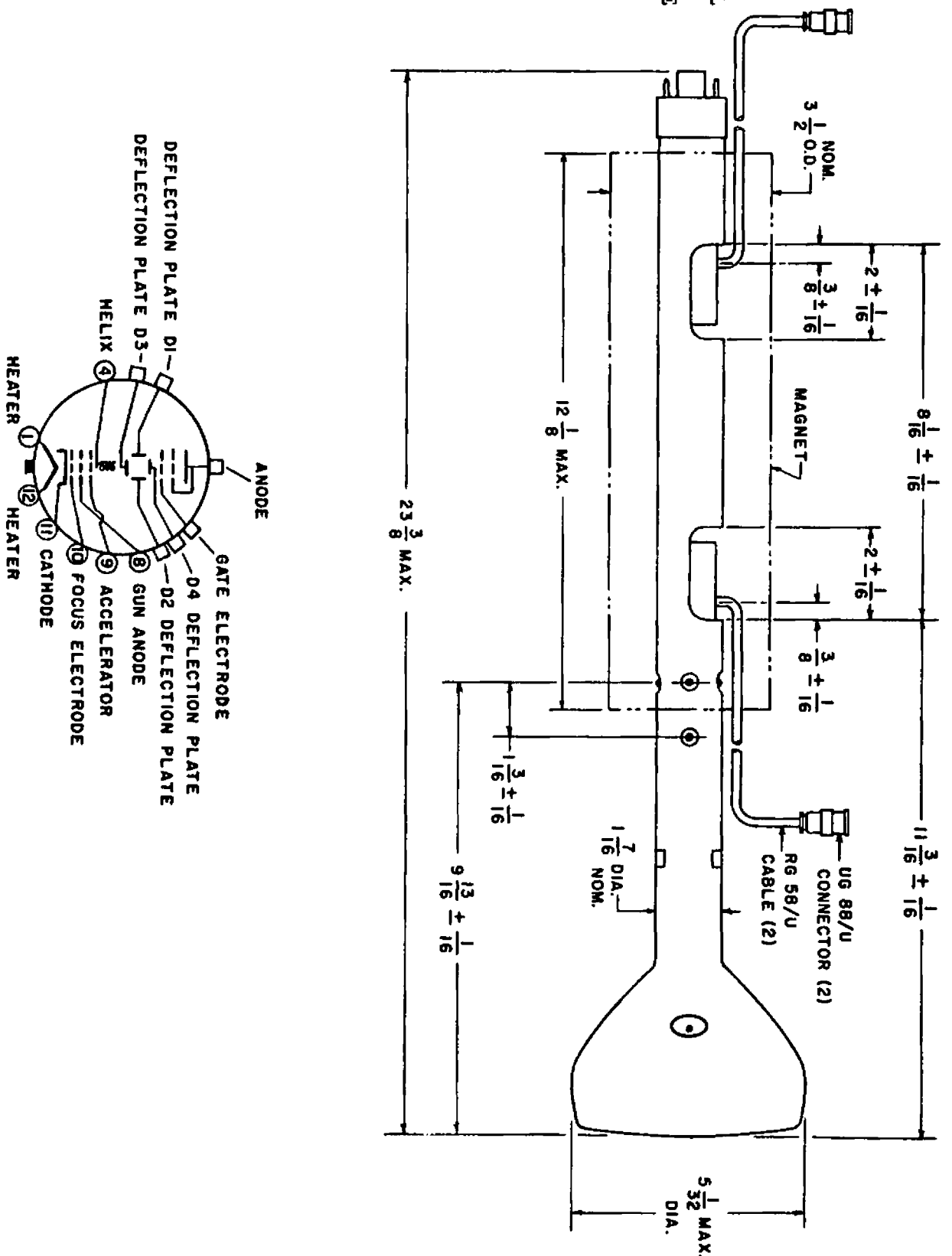
NOTES:

1. Voltage given with respect to cathode.
2. Focus electrode tied to cathode.
3. Using couplers supplied.
4. Minimum detectable signal, visual.
5. Gain of amplifier section at 3000 mc, using couplers supplied.
6. Solenoid #H4-SK860A supplied with tube. Focusing coil and deflection yoke are not furnished since they are dependent upon the specific applications.

APPLICATION

The 6762 Wamoscope consists of a traveling wave tube and a cathode ray tube separated by a gate region. The traveling wave tube section contains the gun and the helical slow-waveguiding structure; the gate region includes an apertured disc; and the cathode ray tube section provides the fluorescent screen for the display.

The operation of the Wamoscope is based upon velocity-sorting the electrons which emerge from the end of the helix of the traveling wave tube section. A dc beam of voltage is passed down the helix. With an rf input, the beam interacts with the rf fields on the helix so that the beam is velocity and current modulated in accordance with the amplitude of the rf signals. The velocity modulated beam enters the region where the aperture (gate electrode) is located. By applying a suitable bias voltage to this electrode, the electrons are decelerated to approximately cathode potential and those electrons whose velocity is greater than the dc velocity pass through the aperture and impinge upon the screen of the cathode ray tube, while the slower electrons are reflected.



OUTLINE & BASING OF THE 6762 WAVOSCOPE

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-11
Basing	8DL
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature	250 °C	
Altitude[2]	80,000 Ft.	
Radiation		
Total Dosage (*S* neutrons/sq. cm/sec.)	10^{16} nvt	
Dose Rate (neutrons/sq. cm/sec.)	10^{12} nv	

DURABILITY CHARACTERISTICS

Impact Acceleration (¾ msec Duration)	450 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)	10 G	Max.

FAILURE RATE RATING

Class (1) — Inoperatives	1.3%/200 Hours
Class (2) — All end points	5.4%/200 Hours
Class (3) — All end points	2.7%/200 Hours

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	6.3 V
Heater Current	175 mA

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.032 μμf	Max.
Input	2.4 μμf	
Output	3.3 μμf	

RATINGS[1] (Absolute Maximum)

Heater Voltage [3]	6.3 (−12, + 10%) V
Plate Voltage	250 Vdc
Peak Plate Forward Voltage[4]	360 v
Grid No. 2 Voltage	150 Vdc
Plate Dissipation	0.5 W
Grid No. 2 Dissipation	0.15 W
Average Cathode Current	5.5 mAdc
Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid No. 1 Circuit Resistance	4.0 Meg

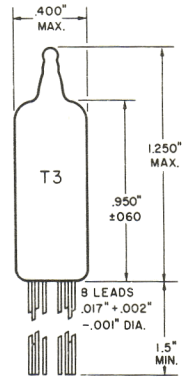
CHARACTERISTICS

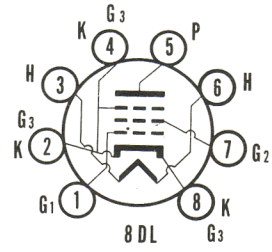
Plate Voltage	100 Vdc
Grid No. 2 Voltage	100 Vdc
Cathode Resistor	1500 Ohms
Plate Current	0.7 mAdc
Grid No. 2 Current	0.10 mAdc
Transconductance	1100 μmhos
Plate Resistance	1.2 Meg
Grid No. 1 Voltage for Ib = 50 μAdc Max.	−3.0 Vdc

QUICK REFERENCE DATA

The Premium Subminiature Type 6788 is a sharp-cutoff pentode designed for guided missile service. It is intended for use as a high gain audio amplifier or regulator amplifier where high plate loads are desired at low plate currents. The 6788 is characterized by extraordinary freedom from interelement shorts of short duration, by high resistance to interelement leakage.

The 6788 is designed to provide dependable service under conditions of severe mechanical shock, vibration, high temperature and high altitude, and is manufactured and inspected to meet the applicable specification for reliable operation.





sylvania electronic tubes

A Division of
Sylvania Electric Products Inc.

NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts. The Min. and Max. values are 5.5 and 6.9 volts respectively.*
4. *MIL-E-1D, Par. 6.5.1.1 does not apply. Peak voltage shown should not be exceeded.*

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage . . . . . 6.3 V
Plate Voltage . . . . . 100 Vdc
Grid No. 1 Voltage . . . . . 0 V
Grid No. 2 Voltage . . . . . 100 Vdc
Heater-Cathode Voltage MIL-E-1 Par. 3.2.26.1 . 0 V
Cathode Resistor . . . . . 1500 Ohms

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1.

MIL-E-1 Ref.	Test	AQL (%)	Limits — Note 2 Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 1, Note 1								
4.10.8	Heater Current	0.65	165	—	175	—	185	mA
4.10.15	Heater-Cathode Leakage	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid Current: Ic1 Eb = Ec2 = 125 Vdc; Ec1 = −1.8 Vdc; Rk = 0; Rg1 = 1.0 Meg	0.65	0	—	—	—	−0.1	μAdc
4.10.4.1	Plate Current (1): Ib ALD = 0.17	—	—	0.62	0.7	0.78	—	mAdc
4.10.4.1	Plate Current (1):	0.65	0.5	—	—	—	0.9	mAdc
4.10.4.1	Plate Current (2): E1 = −3.0 Vdc; Rk = 0 Ohms	0.65	—	—	10	—	50	μAdc
4.10.4.3	Screen Grid Current: Ic2	0.65	—	—	0.10	—	0.20	mAdc
4.10.9	Transconductance (1): ALD = 175 Sm	0.65	—	1025	1100	1175	—	μmhos
4.10.9	Transconductance (1): Sm	—	900	—	—	—	1300	μmhos
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1.1	Mechanical: Envelope JEDEC 3-11	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes	2.5	—	—	—	—	—	
	Eg1-all = −100 V	—	500	—	—	—	—	Meg
	Ep-all = −300 V	—	500	—	—	—	—	Meg
	Eg2-all = −200 V	—	500	—	—	—	—	Meg
4.10.9.1	Transconductance (2): △ Sm Ef = 5.5 V	2.5	—	—	—	—	15	%
4.10.4.1	Plate Current (3): Ec1 = −2.5; Rk = 0	2.5	5.0	—	50	—	—	μAdc
4.10.6.2	Grid Emission: Notes 3 and 4; Ic1 Ef = 7.5 V; Rg1 = 4.0 Meg; Rk = 0 Ohms Ec1 = −3.0 Vdc	2.5	0	—	—	—	−0.5	μAdc
4.10.3.2	AF Noise: Note 5 Esig. (Cal.) = 70 mVac; Ec2 = 19 Vdc; Rg1 = 0.1 Meg; Rg2 = 1000 Ohms; Rp = 0.2 Meg; Ck = 1000 μf	2.5	—	—	—	—	—	
----	Hum: Note 6 Ef = 6.3 Vac @ 400 cps; Eb = Ec1 = Ec2 = 0; Rk = 10,000 Ohms	2.5	—	—	—	—	15	mv pk-pk
----	Operation Time: Note 7	6.5	—	—	—	—	20	secs
4.10.10	Plate Resistance:	6.5	0.8	—	1.2	—	—	Meg
4.10.14	Capacitance: Shield No. 318	6.5	—	—	—	—	—	
	Cg1p	—	—	—	—	—	0.032	μμf
	Cin	—	1.8	—	2.4	—	3.0	μμf
	Cout	—	2.5	—	3.3	—	4.1	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Note 8 Pressure = 21 ± 2 mm Hg; Voltage = 300 Vac	6.5	—	—	—	—	—	
4.9.19.1	Vibration (1): RP = 10,000 Ohms; Ck = 1000 μf; F = 40 cps; G = 10	1.0	—	—	—	—	5	mVac
----	White Noise Vibration: Notes 9 and 10 Rp = 10,000 Ohms; Ck = 1000 μf	2.5	—	—	—	20	50	mv pk-pk
	Peak Acceleration = 15 G	2.5	—	—	—	3	5	mVac

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits — Note 2 Min.	LAL	Bogey	UAL	Max.	Units
	Degradation Rate Acceptance Tests, Note 4							
4.9.5.3	Subminiature Lead Fatigue	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Note 11 Hammer Angle = 30°;	20	—	—	—	—	—	
4.9.20.6	Fatigue: Notes 8 and 12 G = 10; Variable Frequency	6.5	6	—	—	—	—	Hours
----	Post Shock and Fatigue Test End Points:							
	Vibration (1) :	—	—	—	—	—	15	mVac
	Heater-Cathode Leakage							
	Ehk = +100 Vdc	—	—	—	—	—	15.0	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	15.0	μAdc
	Change in Transconductance (1) of Individual Tubes △ Sm	—	—	—	—	—	15	%
4.9.6.3	Glass Strain	4.0	—	—	—	—	—	
	Acceptance Life Tests, Note 4							
4.11.7	Heater Cycling Life Test (1): (2000 Cycles Min.) Note 13 Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec1 = Ec2 = Eb = 0 V	2.5	—	—	—	—	—	
4.11.7	Heater Cycling Life Test (2): (300 Cycles Min.) Note 13 Ef = 10 V; Ehk = +200 Vdc; 10 secs. on, 4 min. off; Eb = Ec1 = Ec2 = 0	10.0	—	—	—	—	—	
4.11.3.1	Stability Life Test: Note 14 Eb = 250 Vdc; Ec2 = 150 Vdc; Rk = 680 Ohms; Ehk = +200 Vdc; Rg1 = 4.0 Meg; TA = Room	—	—	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes △ Sm	1.0	—	—	—	—	15	%
4.11.3.1	Survival Rate Life Test: (100 Hours) Note 15 Ebb = 250 Vdc; Tie Grid No. 2 to Plate; Rk = 110 ohms; Rp = .03 Meg; Rg1 = 4.0 Meg; TA = Room	—	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points:							
	Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	—	
	Transconductance (1) Sm	1.0	800	—	—	—	—	μmhos
	Grid Current	2.5	0	—	—	—	−0.1	μAdc
	Heater-Cathode Current: Ihk	0.65	—	—	—	—	10	μAdc
	Electrode Insulation:	6.5	—	—	—	—	—	
	Rg1-all	—	200	—	—	—	—	Meg
	Rg2-all	—	200	—	—	—	—	Meg
	Rp-all	—	200	—	—	—	—	Meg

MIL-E-1 Ref.	Test	LOT ACCEPTANCE LIMITS (1) MIN.	MAX.	FAILURE RATE CLASS (3) LIMITS MIN.	MAX.	Units
4.11.5	Intermittent Life Test: Notes 16 and 17; Survival Rate life conditions; T Envelope = 250°C Min.	—	—	—	—	
4.11.4	Intermittent Life Test End Points: (200 Hours)					
	Inoperatives: Note 18	—	—	—	—	
	Grid Current	0	−0.5	0	−1.0	μAdc
	Heater Current	165	190	160	195	mA
	Change in Transconductance (1) of Individual Tubes; △ Sm/t	—	20	0	25	%
	Transconductance (2): △ Sm/Ef	—	15	—	25	%
	Heater-Cathode Leakage Ehk = ±100 Vdc	—	10	—	15	μAdc
	Insulation of Electrodes					
	g1-all	200	—	25	—	Meg
	p-all	200	—	25	—	Meg
	g2-all	200	—	25	—	Meg
	Transconductance (1) Average change Avg. △ Sm/t	—	15	—	—	%

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	ALLOWABLE DEFECTIVES
Acceptance Life Tests, Note 4 (Cont'd.)		
----	Individual Lot Acceptance:	
	Total Inoperatives	2
	Total Defectives	5
----	Failure Rate Tests: Note 17	
	Failure Rate Class 1	
	Inoperatives:	5
	Failure Rate Class 2	
	Combined defectives to Limits (1)	
	Including Inoperatives:	16
	Failure Rate Class 3	
	Combined defectives to Limits (3)	
	Including Inoperatives:	8

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding Inoperatives and Mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: For Variables Sampling Procedure, see MIL-E-1, Appendix C, Paragraph 20.2.4.

3: Prior to this test, tubes shall be preheated for 5 minutes at the conditions indicated below. Test within three seconds after preheating. Three minute test is not permitted. Grid Emission is a destructive test so tubes subjected to it are not to be accepted under this specification, nor are subsequent tests to be performed on the same tubes.

Ef	Eb	Ec1	Ec2	Ec3	Rk/k	Rg1
V	Vdc	Vdc	Vdc	Vdc	ohms	Meg
7.5	250	0	150	—	680	4.0

4: Destructive Tests: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature Lead Fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater Cycling Life Tests (1) & (2)
4.11.5	Intermittent Life Test
4.10.6.2	Grid Emission

5: The rejection level shall be set at the VU meter reading obtained during calibration.

6: Maximum total distortion of the filament supply voltage shall be 5%. The frequency response of the peak-to-peak measuring device from 20 cps to 5000 cps must be within 0.5 db of its response at 400 cps. Ground all leads except those for the cathodes and heater lead #3. Measure Hum voltage across specified Rk in each cathode separately.

7: Insert a cold tube into the test socket having all Plate Current (1) conditions applied and record Ib continuously for three minutes. Plate Current must reach 85% of the three minute figure within the time indicated.

8: This test shall be conducted on the initial lot and thereafter on a lot approximately every 30 days. In the event of lot failure, the lot shall be rejected and the succeeding lot shall be subjected to this test. Once a lot has passed, the 30-day rule shall apply. MIL-STD-105, Sample Size Code Letter F shall apply.

9: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "WHITE NOISE" spectrum which is free from discontinuities from 100 cps to 5000 cps and such that the RMS value of acceleration for frequencies outside this band shall constitute no more than five percent of the total RMS acceleration. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 ± 0.2 G's RMS acceleration. With this the case, the RMS value of acceleration for any bandwidth within the specified spectrum is equal to:

$$Grms = 2.3 \sqrt{3.32 \log_{10} (f2/f1)}$$

where f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

Half the tubes in the sample shall be vibrated in position X1, the other half in position X2.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (250 Kohms or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 30 db to 13,000 cps. For reading the peak-to-peak value of output voltage, the filter output shall be fed directly to the input of a Ballantine Model 305 peak-to-peak electronic voltmeter or equal, while the RMS value shall be measured with a Hewlett Packard Model 400 C or equal. The impedance of the plate and screen voltage supplies shall not exceed that of a 40 μf capacitor at 10 cps.

10: For variables sampling procedure, use MIL-E-1, Appendix C, par. 20.2.4.2.2.

11: A grid resistor of 0.1 meg shall be added; however, this resistor will not be used when a thyratron type short indicator is employed.

12: The tubes shall be rigidly mounted on a table vibrating at a constant acceleration level of 10 G. The frequency of vibration shall be varied from 30 cps to 3000 cps and back to 30 cps, with the period of the sweep cycle being three minutes. The rate of change of frequency with time shall be such that the frequency varies logarithmically with time. The tubes shall be vibrated for a total of six hours, that is, two hours in each of the three positions X1, X2 and Y1. Filament voltage only shall be applied to the tube under test.

13: The no load to steady state full load regulation of the heater voltage supply shall be not more than 3.0%.

14: The sampling and testing procedure for the Stability Life Test shall be in accordance with MIL-E-1, Appendix C, Section 20.2.5.1.

15: For Survival Rate Life Test, the sampling and testing procedure shall be as defined in Sections 20.2.5.2 to 20.2.5.2.5 inclusive of MIL-E-1, Appendix C.

16: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of No. 40B and S, or small diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. The envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5 percent) under normal conditions, is determined to operate at or above the minimum specified temperature in any socket of the life-test rack.

17: **1.0 Intermittent Life Test Evaluation:** The life test conducted in accordance with this specification shall be evaluated in two separate procedures. The first will be an evaluation on an individual lot basis in a similar manner to the one normally specified for reliable tubes. The second evaluation is the determination of a failure rate and its compliance to this specification.

ACCEPTANCE CRITERIA NOTES (Continued)

The life test will be conducted in accordance with MIL-E-1 procedures for reliable tubes except that the sampling plan will be changed from the presently specified double sampling plan to a single sampling plan with n = 40. Individual lot acceptance will be based on this sample size and the conformance of the lot to the maximum allowable defectives for inoperatives and also for combined defectives as specified.

2.0 The Failure Rate Control:

a. Purpose: It is the purpose of this specification to establish a means by which the Military may monitor and evaluate the failure rate of this tube type in order to provide a statistically valid description of this parameter that may be utilized in computing the reliability of equipments in which this type is used.

b. Description: The failure rates on this type shall be evaluated using the life test information gathered on individual lots. Only those lots that pass the life test criteria for individual lots shall be used in the calculations for failure rates. The failure rate shall be based on a 5 lot moving average with the cumulative number of failures for each failure rate class plotted on their respective failure rate charts (See Charts 1, 2, and 3). Non-conformance of a tube to the 200 hour end points shall be considered a failure.

The failure rate charts consist of a plot of consecutive lots manufactured with each point indicating the cumulative number of failures in the last five lots as evaluated against the specified criteria. In the operation of this procedure, each time a new lot is added, the number of defects from the earliest lot is dropped from the accumulation of defectives so that each plotted point on the chart will represent a total sample size of 200 tubes.

Any lot which fails the individual lot acceptance criteria shall not be included in the cumulations for failure rate and the defectives shall not be added into the cumulative number of defectives as plotted on the failure rate charts. However, the number of defectives for such a failing lot should be plotted on the failure rate chart in its chronological order with the other lots. This point is plotted for information only.

c. Qualification: In order to become a qualified source to this specification, it is mandatory that the manufacturer supply data on charts 1, 2, and 3 indicating that his failure rate is within the acceptable limits. A total quantity of 200 tubes life tested for 200 hours is required and this should be representative of two or more consecutively manufactured lots (e.g., 100 tubes from each of 2 lots or 40 from each of 5 lots). In the event more than 40 tubes per lot are used in the life test sample in order to accelerate qualification for failure rate, only the first 40 tubes life tested per lot shall be evaluated for the individual lot acceptance criteria.

d. Maintenance of Failure Rate: When the manufacturer has become a qualified source to this specification and has received proper approval from the Military, those lots utilized for qualification and subsequent lots where the 5 lot moving evaluation failure rate continues within the specification, are to be considered acceptable to this specification and may be marked and shipped accordingly.

e. Non-conformance of Failure Rate: The failure rate will be considered non-conforming when the total number of defectives (for the particular failure rate under evaluation) accumulated from the past 5 lot life test exceeds the number permissible as contained in the specification and on the failure rate chart. The lot of tubes which caused the failure rate limit to be violated shall be considered as acceptable and can be marked and shipped in accordance with this specification. When a failure rate criteria has been violated, the manufacturer has lost qualification to this specification and cannot mark and ship any subsequent lots to this specification without being requalified.

f. Requalification for Failure Rate: Since all three failure rates specified in this specification are computed from the same life test data, a violation of 1 failure rate requires requalification for all three failure rates. Requalification shall follow the same procedure as for original qualification. Starting after the last lot which rendered disqualification, a life test sample of 200 tubes from the next two new consecutive lots will be required to conform to this specification before qualification is reinstated to the manufacturer.

g. Charts: Each manufacturer intending or planning to supply tubes to this specification must forward his qualification data in the form of the three failure rate charts to the Military. These charts must be duly approved and signed by the Resident Government Inspector as representing the factual results of the life tests which were conducted in complete accordance with MIL-E-1 and this specification.

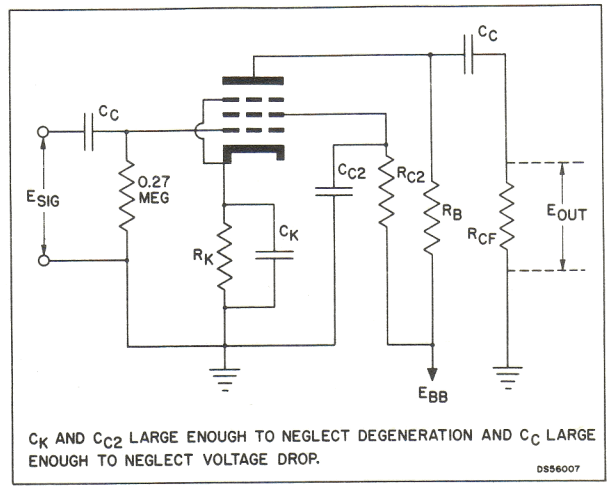
18: An inoperative as referenced in Life Tests shall be defined as a tube having one (1) or more of the following defects: Discontinuity (Ref. 4.7.1), Permanent Shorts (Ref. 4.7.2), Air Leaks (Ref. 4.7.6).

APPLICATION DATA

The Type 6788 is a Premium Subminiature sharp cut-off pentode designed for audio amplifier service. It has particular advantage as a high gain audio amplifier or regulator amplifier where high plate loads are desired at low plate current.

This type is characterized by extraordinary freedom from interelement short circuits of short term duration, by high resistance to interelement leakage, and by stable performance. In addition, vibrational output when the tube is subjected to wide band (White Noise) vibration is held to a very low value. It is designed for service at high altitudes and where severe conditions of mechanical shock, vibration and high temperature are encountered. These characteristics give the type special value in guided missile applications.

Tube durability under extreme vibration for extended periods is assured by more stringent fatigue testing techniques. Excitation for the fatigue test varies in frequency from 30 cps to 3,000 cps and back to 30 cps. Three minutes are required to sweep through one complete cycle. The sweep frequency vibration has a constant acceleration level of 10 G in contrast to the 2.5 G level used on most reliable receiving tube types. The sweep frequency cycle is repeated continuously for two hours in each of three positions, totalling six hours.



Resistance Coupled Amplifier Data

described by the life tests, specified on the attached pages. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental

APPLICATION DATA (Continued)

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

The 6788 is manufactured and inspected to meet the applicable specification for reliability. Life expectancy is conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

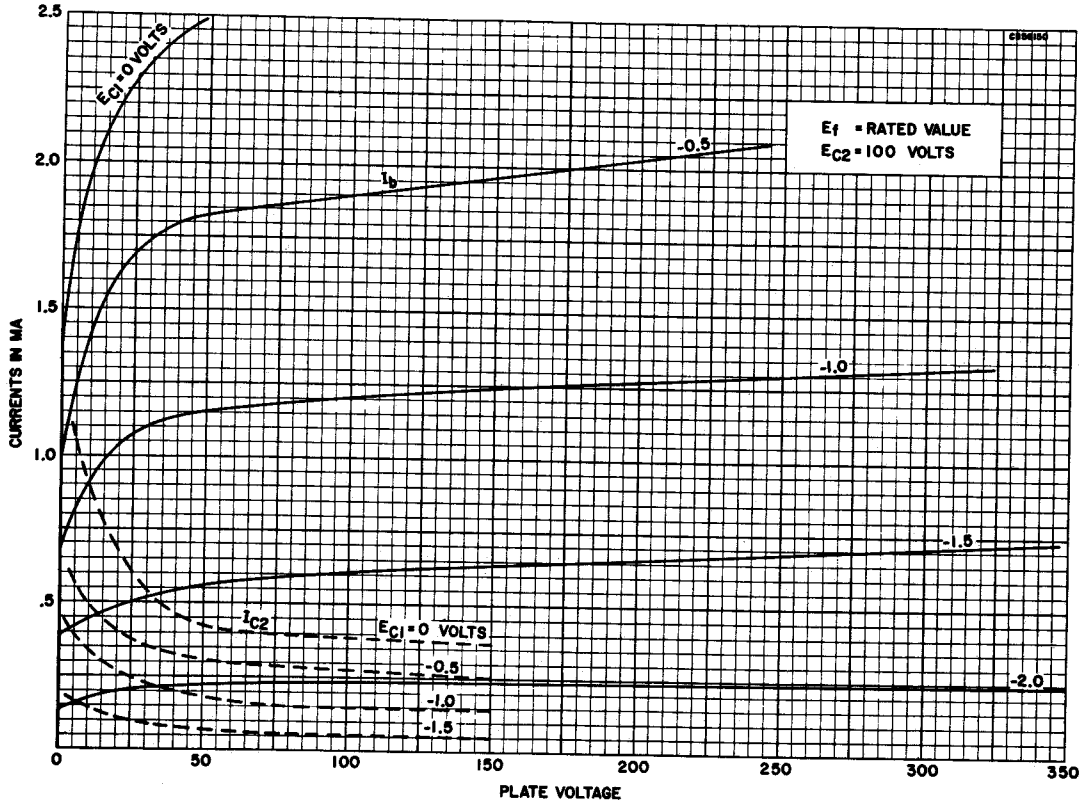
When operated under conditions common to on-off control applications, the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

RESISTANCE COUPLED AMPLIFIER DATA

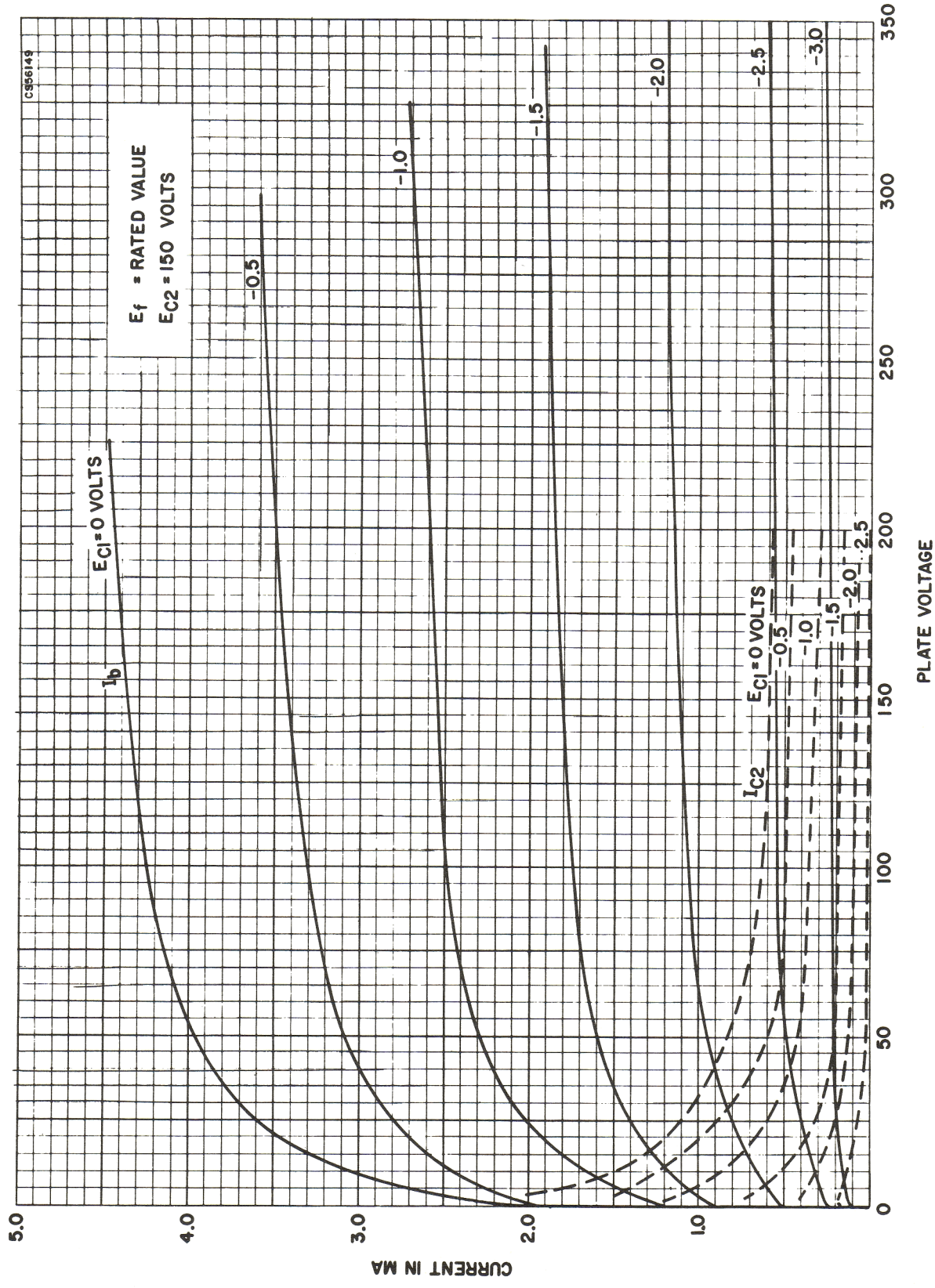
	Ebb = 100 Volts						Ebb = 250 Volts					
Rb (megohms)	0.1		0.27		0.47		0.1		0.27		0.47	
Rc2 (megohms)	.82		2.2		3.9		0.82		2.2		3.9	
Rcf (megohms)	0.27	0.47	0.47	1.0	0.47	1.0	0.27	0.47	0.47	1.0	0.47	1.0
Rk (ohms)	1800	1800	4700	3900	6800	6800	560	1000	1500	1200	2200	2200
Ib (ma)	.400	.400	.177	.187	.118	.116	1.36	1.16	.575	.61	.365	.367
Ic2 (ma)	.055	.054	.024	.026	.016	.016	.19	.17	.082	.083	.050	.050
Ec1 (volts)	−.82	−.82	−.95	−.83	−.91	−.89	−.87	−1.36	−1.02	−.83	−.92	−.92
Ec2 (volts)	54.1	55.0	46.2	46.4	38.7	38.7	96.	113	72.	66.	56	56
Eb (volts)	59.2	59.2	51.2	49.1	44.6	44.6	113.	129	87.	85.	76	76
Esig (volts, rms)	0.05	0.05	0.05	0.05	0.05	0.05	0.10	0.10	0.10	0.10	0.10	0.10
Eout (volts, rms)	3.3	3.65	4.5	5.9	4.7	6.2	9.3	10.1	16.2	19.8	18.2	23.6
Gain	66.	73.	90.	118.	94.	124.	93.	101	162.	198.	182.	236.
% Distortion	2.0	2.0	3.9	3.75	4.6	4.25	0.9	1.0	1.8	1.17	3.7	3.2
Esig* (volts, rms)	0.09	0.10	0.07	0.07	0.06	0.06	0.18	0.47	0.25	0.13	0.14	0.17
Eout (volts, rms)	5.9	7.28	6.3	8.2	5.6	7.35	16.6	45.	39.	25.7	25.3	38.
Gain	65.5	72.8	90.	117.	93.	122.	92.	96.	156.	198.	181.	224.
% Distortion	3.4	3.8	5.0	5.0	5.0	5.0	1.4	5.0	4.8	1.70	5.0	5.0

*Maximum signal for 5% distortion or 1/8 microampere grid current.

AVERAGE PLATE CHARACTERISTICS

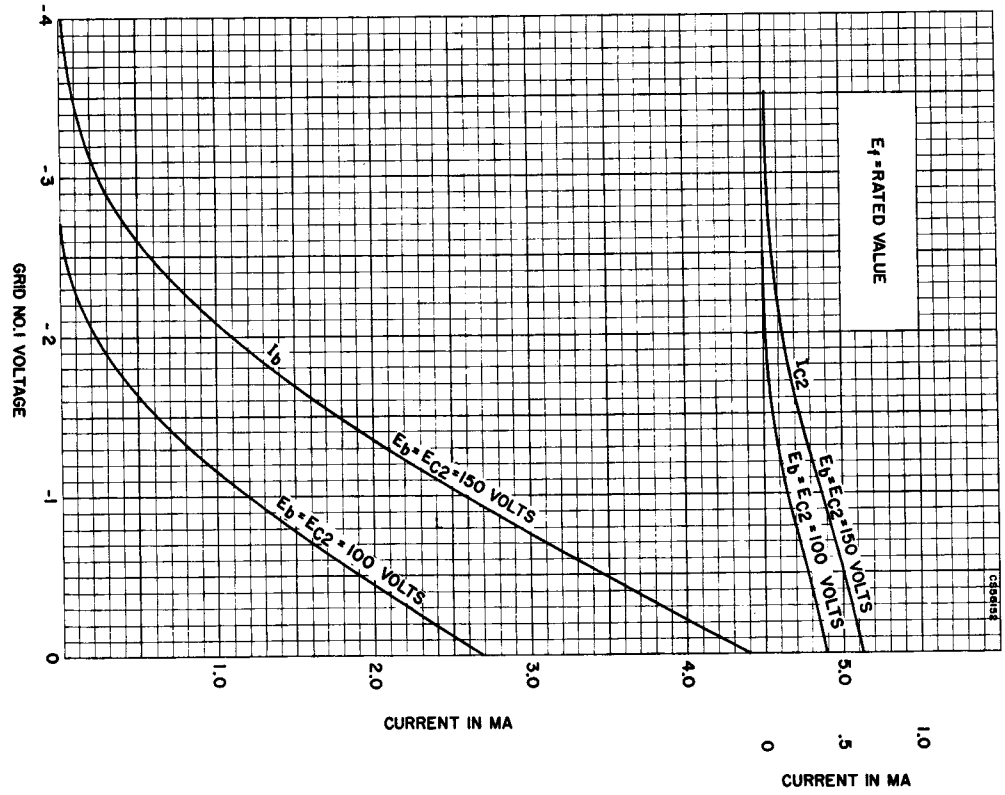


AVERAGE PLATE CHARACTERISTICS

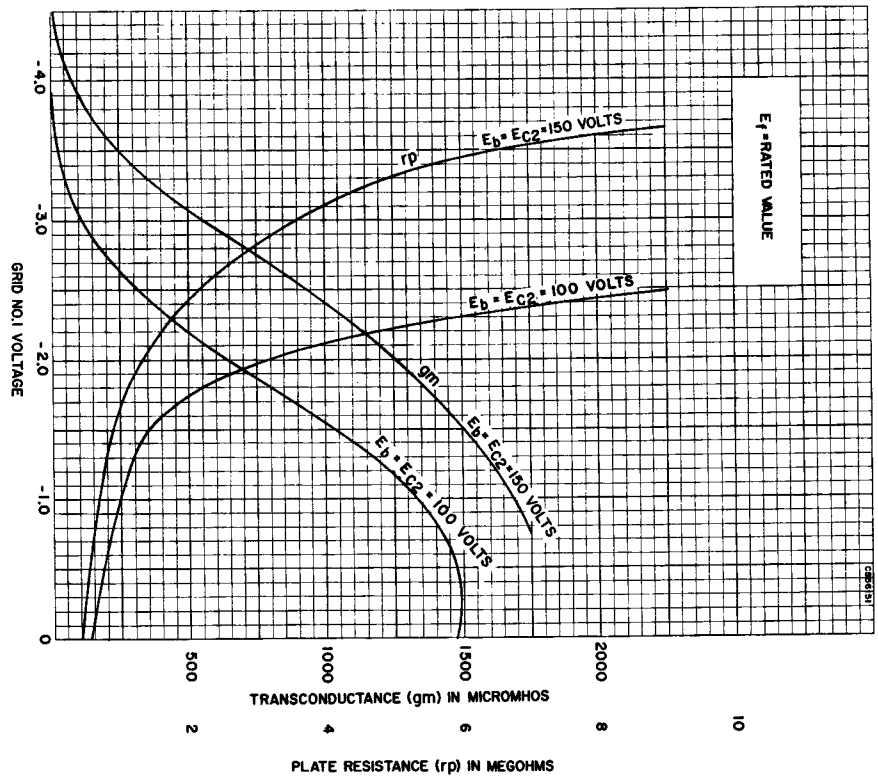


6788

AVERAGE TRANSFER CHARACTERISTICS
(Pentode Connected)



AVERAGE TRANSFER CHARACTERISTICS
(Pentode Connected)



from JETEC release #1591, Feb. 20, 1956

ADVANCE DATA

MECHANICAL DATA

Base	Ceramic button with central pin
Envelope	Metal
Connections	
Pin	Anode
Metal Envelope	Cathode
Cathode	Cold
Mounting Position	Any

RATINGS

Impact Acceleration	1000 g Max.
Fatigue (Vibrational Acceleration for Extended Periods)	10 g Max.
Maximum Bulb Temperature	160 °C

ELECTRICAL DATA

RATINGS (Absolute Values)

Maximum DC Operating Current	3.5 Ma
Minimum DC Operating Current	1.5 Ma

CHARACTERISTICS

Minimum DC Starting Voltage	150 Volts
DC Operating Voltage (1)	84.5 Volts
Maximum Regulation	1.8 Volts
Drift (2)	35 Mv
Repeatability (3)	5 Mv
Voltage Jump (4)	1 Mv
Maximum Leakage Current (5)	85 uua
Maximum Vibration Noise (6)	0.3 Mvac
Average Temperature Coefficient of DC Operating Voltage +30°C to +70°C	-5 Mv/°C
Life Expectancy	
at 160°C Ambient Temperature	500 hours
at 30°C Ambient Temperature	1000 hours

APPLICATION DATA

The Sylvania Type 6789 is a cold cathode, gas filled, glow discharge tube designed for service as a voltage reference tube in electronically regulated power supplies. It has an operating current range of 1.5 to 3.5 Ma over which a substantially constant operating voltage is maintained. This type has superior drift, repeatability, oscillation and noise characteristics. The maximum sudden voltage

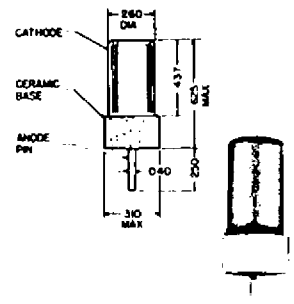
Continued on Reverse

QUICK REFERENCE DATA

The Sylvania Tube Type 6789 is a glow discharge voltage reference tube designed and processed for extreme ruggedness and unusual stability.

The construction is simple and rigid, consisting of three parts: an external cathode (metal envelope), an anode rod (center pin), and a ceramic insulator button - all refractory materials. Thus, the entire tube can be outgassed at unusually high temperatures for improved life stability.

The external cathode design permits minimum size and insures that a minimum amount of insulation material be exposed to the glow discharge, further enhancing stability of operation.



Actual size

SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION
Prepared and Released by The
PRODUCT DEVELOPMENT LABS.
KEW GARDENS, N. Y.
FEBRUARY 1956

APPLICATION DATA: CONT'D

jump is limited to 1 Mv at any point within the specified current range. It is recommended that the tube always be operated at the same current level for maximum performance.

The type features long life and stable performance and is designed for service under severe conditions of temperature, shock and vibration.

NOTES:

1. The anode voltage drop may range from tube to tube between 83 volts and 87 volts.

2. The maximum operating voltage change during one hour of operation at 2.5 Ma following a one-hour warmup.

3. The maximum shift of operating voltage in five successive firings. Each reading taken at the end of one minute of operation, followed by a one minute off period before refiring.

4. The maximum sudden jump in operating voltage when operating current is varied slowly over the specified operating range.

5. Measured with 85 volts across non-conducting tube.

6. Across a plate load resistor of 10,000 ohms with an applied vibrational acceleration of 15 G at 40 cycles per second.

SYLVANIA

engineering data service 6795

QUICK REFERENCE DATA

The Sylvania Type 6795 is a miniaturized X-band TR tube featuring reversible contact type mounting. It is a broad band tube for use in the 8500-9600 Mc frequency region.

MECHANICAL DATA

Ambient Temperature Range (Non-Operating)	−40 to +100° C
Outline	See Drawing
Operating Mounting Position	Any
(Either end may be used as input or output)	

ELECTRICAL DATA

FREQUENCY RANGE

Operational Band for VSWR of 1.4 Max.	8565–9487 Mc
Operational Band for VSWR of 1.9 Max.	8490–9578 Mc

IGNITOR CHARACTERISTICS

Open Circuit Voltage	−700 V dc
Current	100 μa dc
Voltage Drop	200–375 V dc

LOW POWER LEVEL UNFIRED CHARACTERISTICS

Insertion Loss, I_i = 100 μa, 8490-9578 Mc	0.9 db	Max.

HIGH POWER LEVEL FIRED CHARACTERISTICS

Flat Leakage Power[1]	40 Mw	Max.
Spike Leakage Energy[1]	0.2 erg	Max.
Recovery Time[2]	10 μsec.	Max.
Arc Loss[3]	0.8 db	Max.

NOTES:

1. $P_o = 40 \pm 10\%$ Kw; $t_{p1} = 1.0$ μsec.; $t_{p2} = 0.5$ μsec.; $prr = 1000$ pps, $I_i = 100$ μa.
2. $P_o = 200$ Kw; $t_p = 1.0$ μsec.; $prr = 1000$pps; $I_i = 100$ μa.
3. $P_o = 4$ Kw; $t_p = 1.0$ μsec.; $prr = 1000$ pps.

APPLICATION DATA

The 6795 was developed for duplexer applications where small physical size is a major requirement. The slip-in type of contact mounting is adaptable to quick disconnect systems for insertion or removal of the TR tube from the duplexer.

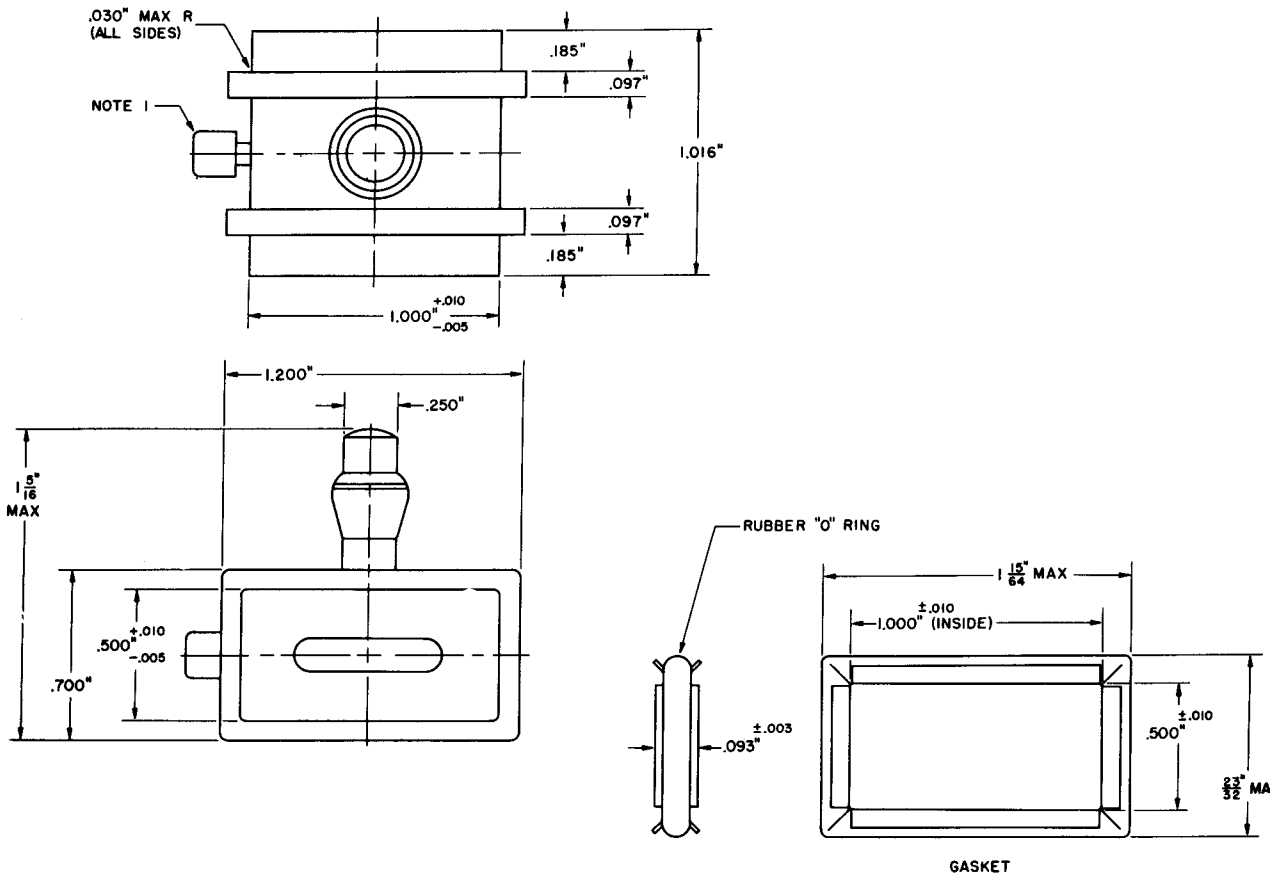
In addition to branched duplexer applications where transmitter peak powers of 200 kilowatts or less may be used, the tube is ideal for use as an auxiliary TR tube in ferrite duplexers. The 6795 will protect a crystal from incident line powers well below the 1 watt peak power level.

The information in this EDS is furnished without assumption of responsibility on the part of Sylvania Electric Products, Inc., for its use or interpretation or for any infringement of patent or other rights of third parties resulting from such use or interpretation.

SYLVANIA ELECTRIC PRODUCTS INC.
SPECIAL TUBE OPERATIONS
WOBURN, MASSACHUSETTS

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
JUNE, 1957

OUTLINE DRAWING



NOTES:

1. *Exhaust tube must not extend beyond flanges more than 3/16 inches.*
2. *The 6795 uses two gaskets as shown.*

ADVANCE DATA

from JETEC release
#1545, Nov. 28, 1955

MECHANICAL DATA

Ambient Temperature Range (Non-Operating)	-40 ± 100° C
Outline	See Drawing
Mounting Position	Any

(Use 3 db Short Slot Hybrid Couplers)

ELECTRICAL DATA [1]

FREQUENCY RANGE 8490-9578 Mc

VSWR Presented to Antenna [2]		
8490 Mc	1.4	Max.
8565-9487 Mc	1.2	Max.
9578 Mc	1.4	Max.
VSWR Presented to Transmitter		
8490-9578 Mc (P_o = 40 Kw, Pulse Width = 1.0 usec, prr = 1000 pps)	1.2	Max.

IGNITOR CHARACTERISTICS

Open Circuit Voltage	-700 Volts d c	
Current (Each Ignitor)	100 ua d c	
Voltage Drop (Each Ignitor)	-200 to -375 Volts d c	
Ignition Time (Each Ignitor)	5 Sec.	Max.

LOW POWER LEVEL UNFIRED CHARACTERISTICS [2]

Duplexer Loss (I_i = 100 ua)

8490 Mc	1.0 db	Max.
8565 Mc	0.9 db	Max.
9000 Mc	0.9 db	Max.
9487 Mc	0.9 db	Max.
9578 Mc	1.0 db	Max.

HIGH POWER LEVEL FIRED CHARACTERISTICS

Flat Leakage Power (40 Kw)	20 Mw	Max.
Spike Leakage Energy (40 Kw)	.1 erg	Max.
Recovery Time (200 Kw)	7 usec	Max.
Arc Loss (4 Kw)	0.8 db	Max.

NOTES:

1. The following shall be conducted with the 6796 mounted between two short slot hybrid couplers. The VSWR of the hybrids shall not exceed 1.10 from 8490 to 9578 megacycles. Each hybrid shall split the power evenly within 0.25 db.

2. The tube is mounted between the two short slot hybrid junctions with a matched load on the dummy load arm. The movable short on the magnetron arm is shifted through all phases.

QUICK REFERENCE DATA

The Sylvania Type 6796 is a dual X-band TR tube designed for broad band operation in the 8500-9600 Mc frequency region. It is similar to the 6334, but shorter physically. Type 6796 was formerly TR703.

SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

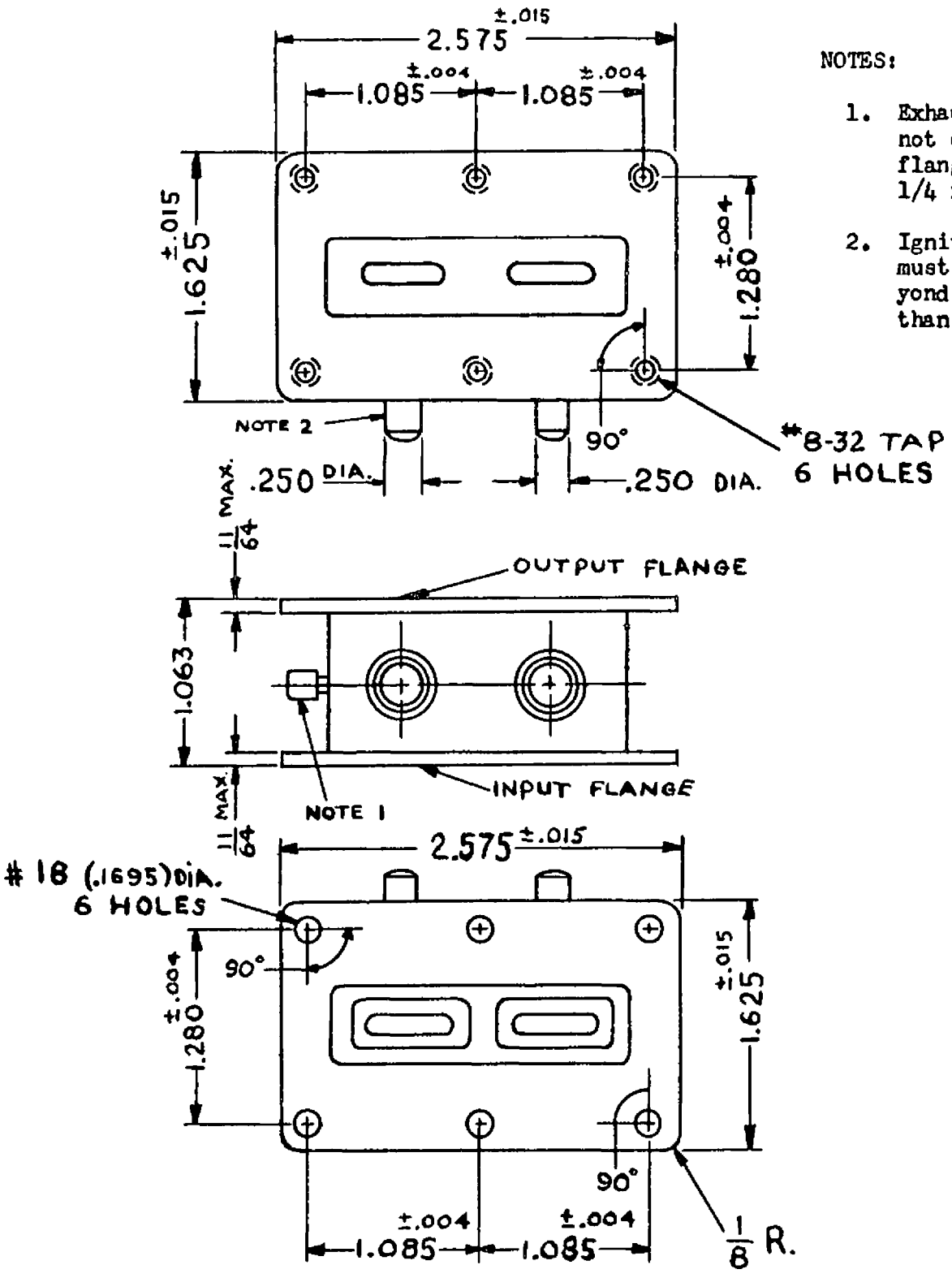
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

October 14, 1955

APPLICATION DATA

The 6796 was designed for use with short slot hybrid junctions to give broad band coverage in the X-band region. Duplexer performance equivalent to that obtainable with a 6334 can be obtained with a more compact physical package.

OUTLINE DRAWING



NOTES:

1. Exhaust tube must not extend beyond flanges more than 1/4 inches.
2. Ignitor terminals must not extend beyond flanges more than 7/16 inches.

ADVANCE DATA

MECHANICAL DATA

Ambient Temperature Range (Non-Operating)	-40 to +100° C
Outline	See Drawing
Mounting Position	Any

(Use 3db Short Slot Hybrid Couplers)

(Either end may be used as input or output)

ELECTRICAL DATA [1]

FREQUENCY RANGE 8490-9578 Mc

VSWR Presented to Antenna [2]		
8490 Mc	1.4	Max.
8565-9487 Mc	1.2	Max.
9578 Mc	1.4	Max.
VSWR Presented to Transmitter		
8490-9578 Mc (p_o = 40 Kw, Pulse Width = 1.0 usec, prr = 1000 pps)	1.2	Max.

IGNITOR CHARACTERISTICS

Open Circuit Voltage	-700 Volts d c	
Current	100 ua d c	
Voltage Drop (Each Ignitor)	-200 to -375 Volts d c	
Ignition Time (Each Ignitor)	5 Sec.	Max.

LOW POWER LEVEL UNFIRED CHARACTERISTICS [2]

Duplexer Loss (I_i = 100 ua)

8490 Mc	1.0 db	Max.
8565 Mc	0.9 db	Max.
9000 Mc	0.9 db	Max.
9487 Mc	0.9 db	Max.
9578 Mc	1.0 db	Max.

HIGH POWER LEVEL FIRED CHARACTERISTICS

Flat Leakage Power (40 Kw)	20 Mw	Max.
Spike Leakage Energy (40 Kw)	.1 erg	Max.
Recovery Time (200 Kw)	7 usec.	Max.
Recovery Time (100 Kw)	5 usec.	Max.
Arc Loss (4 Kw)	0.8 db	Max.

QUICK REFERENCE DATA

The Sylvania Type 6797 is a miniaturized dual X-band TR tube featuring reversible contact type mounting. It is a broad band tube for use in balanced duplexers in the 8500-9600 Mc frequency region. The Type 6797 was formerly Type TR823.

SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

October 14, 1955

from JETEC release #1545, Nov. 28, 1955

NOTES:

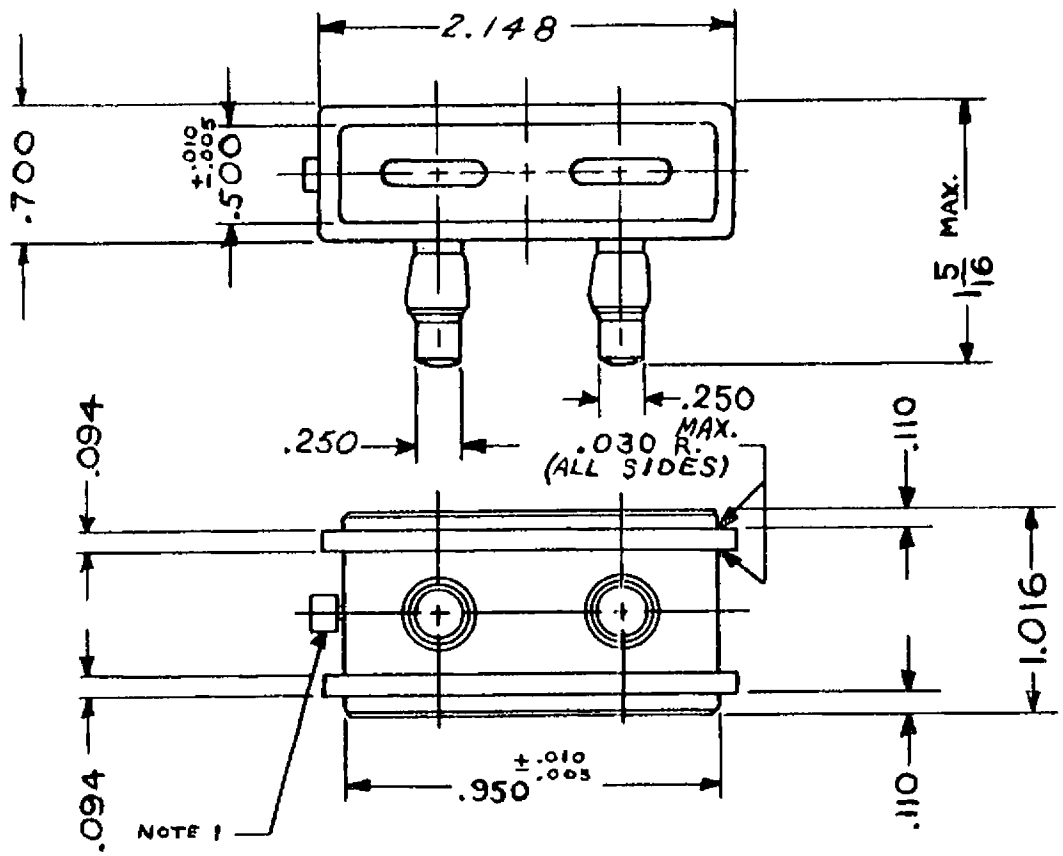
1. The following shall be conducted with the 6797 mounted between two short slot hybrid couplers. The VSWR of the hybrids shall not exceed 1.10 from 8490 to 9578 megacycles. Each hybrid shall split the power evenly within 0.25 db.

2. The tube is mounted between the short slot hybrid junctions with a matched load on the dummy load arm. The movable short on the magnetron arm is shifted through all phases.

APPLICATION DATA

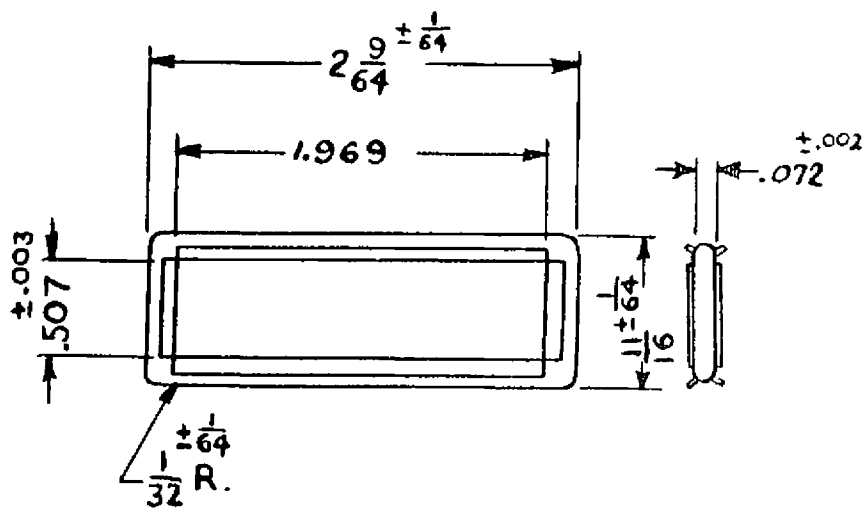
The 6797 was developed for balanced duplexer application using short slot hybrid junctions in which small physical size is a major requirement. Bulky flanges have been eliminated by the use of slip-in construction. This type of mounting is adaptable to quick disconnect designs.

OUTLINE DRAWING



NOTES:

1. Exhaust tube must not extend beyond flanges more than 3/16 inches.
2. The 6797 uses two gaskets as shown.



from JETEC release #1548, Dec. 12, 1955

ADVANCE DATA

MECHANICAL DATA

Mounting	Cathode Vertical
Overall Dimensions	12 1/2 X 6 1/16 X 5 1/16
Net Weight	33 Lbs. Approx.
Cooling	Forced Air
Pressurization	50 psig maximum air or its equivalent pressure of sulfur hexafluoride (SF6) must be used in the waveguide to insure that no electrical breakdown occurs. Recommended minimum pressure of 40 psig air or its equivalent SF6 in a smooth waveguide.
Output Coupling	RG-96/U Waveguide
Vibration (non-operating)	50 Cycles - 10 G

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage-Preheat	6.0 ± 5% Volts
Heater Current at 5.0 Volts	1.8 - 2.4 Amps
Minimum Preheat Time	4 Minutes
Heater Power During Operation	(Note 1)

RATINGS (Absolute Maximum) [2]

Heater Voltage	7.0 Volts
Peak Current	40 Amps
Peak Anode Voltage	20 Kv
Average Power Input	160 Watts
Maximum Frequency Pulling at VSWR 1.5/1	50 Mc
Anode Temperature	130° C
Maximum Pulse Duration	0.5 us
Maximum Duty Cycle	.00035
Minimum Pulse Voltage Rise Time	0.05 us
Maximum VSWR	1.5/1
R F Bandwidth	3.0/tp Mc

TYPICAL OPERATION

	Oscillator 1	Oscillator 2	
Pulse Recurrent Frequency	1000	2000	pps
Pulse Duration	0.25	0.10	us
Peak Anode Voltage	19	19	Kv
Peak Anode Current	28	30	Amps
Average Anode Current	7	6	Ma
Useful Range of Average Current	5-7	5.5-8	Ma
Average Power Output	26	21	Watts
Input Capacitance	7.55		uuf

QUICK REFERENCE DATA

Sylvania Type 6799 is a high power, pulsed, fixed frequency (34512-35208 Mc) magnetron. The unit is supplied with magnet in place.

SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

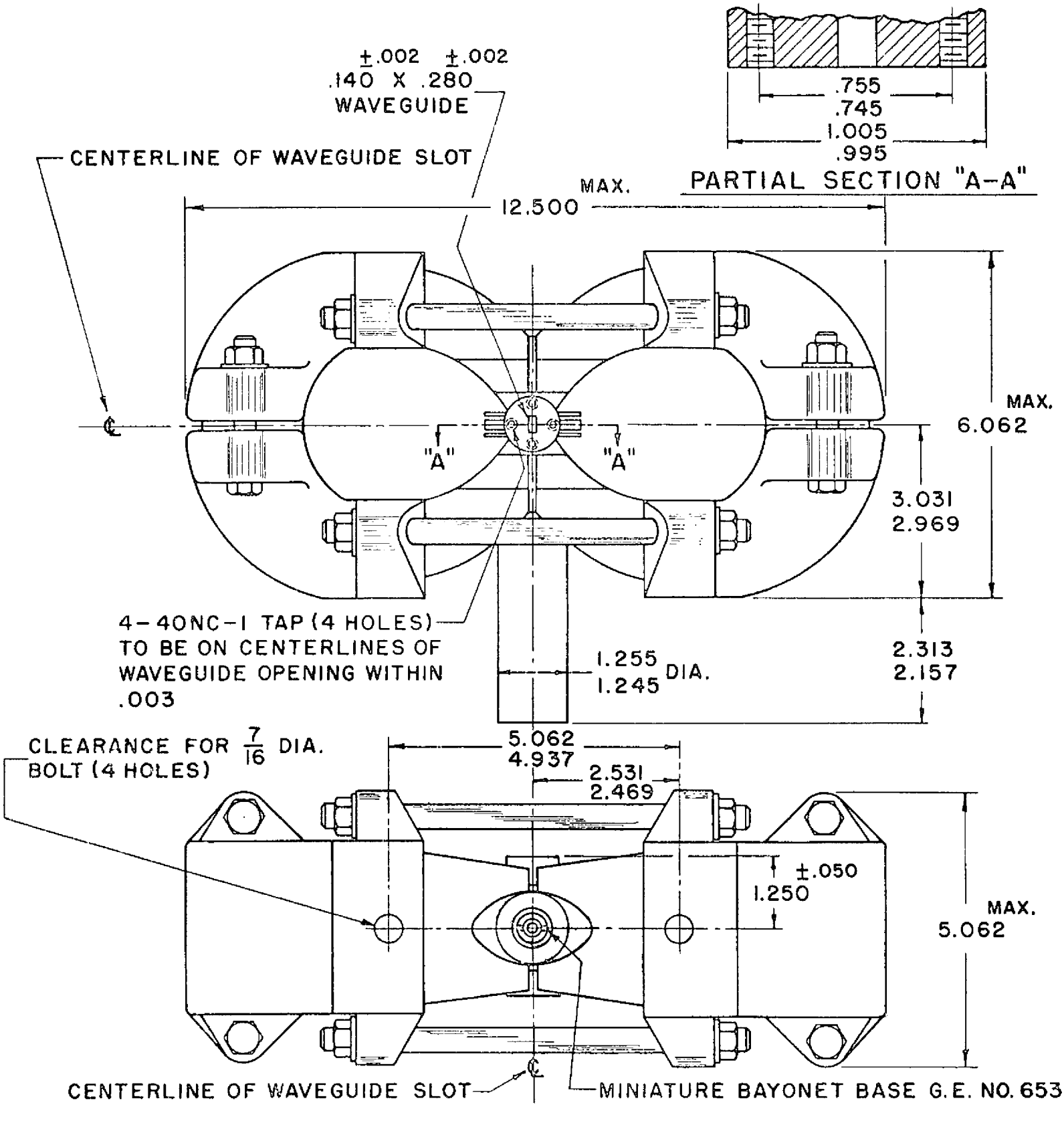
Nov. 8, 1955

NOTES:

1. During operation, reduce heater power in accordance with the following formula:

$$E_f = 5.0\ (1 - \frac{I_b}{5})\ \text{volts, where } I_b \text{ is in ma,}$$
$$\text{for } I_b \leq 5 \text{ ma}$$
$$E_f = 0 \text{ for } I_b > 5 \text{ ma}$$

2. The values specified are based on the "absolute system" and are not to be exceeded under any service conditions. The ratings are limiting values above which serviceability of any individual tube may be impaired. It does not necessarily follow that combinations of absolute maximum ratings can be attained simultaneously.


±.002 ±.002
.140 X .280
WAVEGUIDE
CENTERLINE OF WAVEGUIDE SLOT
.755
.745
1.005
.995
PARTIAL SECTION "A-A"
MAX.
12.500
MAX.
6.062
"A"
"A"
3.031
2.969
4-40NC-1 TAP (4 HOLES)
TO BE ON CENTERLINES OF
WAVEGUIDE OPENING WITHIN
.003
1.255
1.245 DIA.
2.313
2.157
CLEARANCE FOR 7/16 DIA.
BOLT (4 HOLES)
5.062
4.937
2.531
2.469
±.050
1.250
MAX.
5.062
CENTERLINE OF WAVEGUIDE SLOT
MINIATURE BAYONET BASE G.E. NO. 653

MECHANICAL DATA

Bulb	T-9
Base	Octal
Outline	See Drawing
Basing	See Drawing
Output Cathodes	No. 0, 5, 8, and 9
Zero Position	No. 0 Cathode Aligned with Pin No. 6 ± 10°
Mounting Position	Any

ELECTRICAL DATA

INTERELECTRODE CAPACITANCES (Approx.)

Any Cathode to All Other Elements	4.2 pf
Guide No. 2 to All Other Elements	10 pf
Guide No. 1 to All Other Elements	11 pf

RATINGS (Absolute Values)

	Min.	Max.
Anode Supply Voltage	350	800 Volts
Voltage Between Electrodes (Other than Anode)	—	140 Volts
Transfer Voltage	35	140 Volts
Anode Current	0.3	0.6 Ma
Input Frequency	0	4 Kpps
Ambient Temperature	−55	+60 °C

TYPICAL OPERATING CHARACTERISTICS

Anode Supply Voltage[1]	350 Volts	
Nominal Tube Drop	187 Volts	
Guide Bias	+35 Volts	Min.
Square Double Pulse Drive Amplitude (Each Pulse)[2]	−75 Volts	Min.
Square Double Pulse Width (Each Pulse)[2]	60 μSec.	Min.
Forced Reset Pulse Amplitude	−120 Volts	Min.
Forced Reset Pulse Width	50 μSec.	Min.
Cathode Load Resistor[3]	150 K-Ohms	Max.

NOTES:

1. *A value for the anode resistor can be computed by subtracting the nominal tube drop from the supply voltage and dividing the remainder by the desired operating current.*
2. *Two separate pulses, back to back or with slight overlap, must be maintained.*
3. *The peak pulse output voltage can be determined by the IR drop across the chosen cathode resistor.*
4. *A counter tube brochure is available on request from Sylvania Electric Products Inc., 1100 Main Street, Buffalo 9, New York.*

QUICK REFERENCE DATA

The Type 6802 is a cold cathode, bidirectional decade counter tube with top viewed readout. It is designed to operate at inputs up to 4000 pulses per second. Cathodes No. 0, 5, 8, and 9 are brought out to individual base pins. Applications include computing, scaling, counting, frequency dividing, coding modulating, matrixing, indexing, multiplexing, addition and subtraction. (See Note 4.)



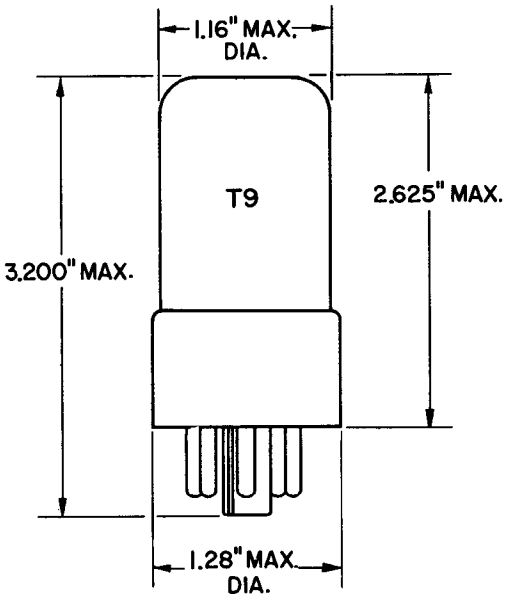
SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

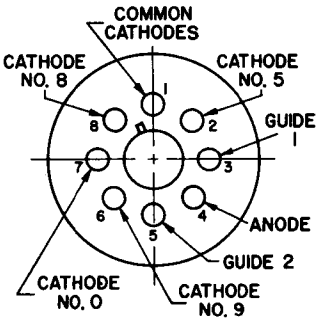
DECEMBER, 1963

File Under
SPECIAL PURPOSE
ELECTRONIC TUBES

OUTLINE



BASE CONNECTIONS



MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DK
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Values)

Impact Acceleration	450 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature (At Hottest Point)	165° C
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	6.3 V
Heater Current	150 mA
Heater Power	0.95 W

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid to Plate	1.3	1.4 μμf
Input	2.4	2.2 μμf
Output	2.4	0.7 μμf

RATINGS[1, 5 & 6] (Absolute Maximum)

Plate Voltage	165 Vdc
Peak Plate Forward Voltage[7]	600 v
Plate Dissipation	2.2 W
DC Grid Voltage	
Positive	5.5 Vdc
Negative	5.5 Vdc
Peak Grid Voltage	
Positive	27.5 v
Negative	220 v
Average Positive Grid Current	5.5 mAdc
Peak Positive Grid Current	110 mA
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode[8]	
Total DC and Peak	200 v
DC	100 Vdc
Heater Negative with Respect to Cathode	
Total DC and Peak	200 v
Grid Circuit Resistance	1.0 Meg

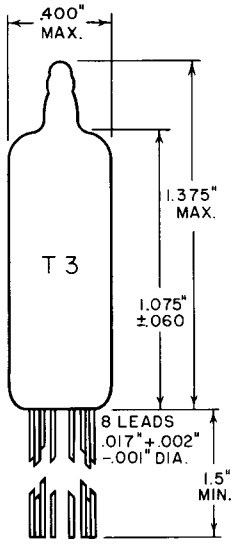
AVERAGE CHARACTERISTICS

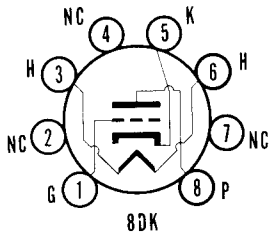
Plate Voltage	100 Vdc
Grid Voltage	0 Vdc
Cathode Resistor	150 Ohms
Plate Current	10 mAdc
Transconductance	6000 μmhos
Amplification Factor	29
Plate Resistance	4800 Ohms
Plate Current at Conditions Ebb = 125 Vdc; Ecc = +3 Vdc; Rp = 2700 Ohms; Rg = 60000 Ohms	15.5 mAdc
Cutoff with Ebb = 140 Vdc; Rp = 2700 Ohms; Rg = 60000 Ohms; Grid Supply Voltage for Ib = 100 μAdc	-8.5 Vdc Max.

QUICK REFERENCE DATA

The Premium Subminiature Type 6814 is a sharp cutoff, medium mu triode intended primarily for application in electronic computers. The tube is characterized by high zero bias plate current and exceptional freedom from the development of cathode interface.

The 6814 is designed to provide dependable service under severe conditions of shock, vibration, high temperature and high altitude.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

FEBRUARY 1957

AVERAGE CHARACTERISTICS (Continued)

Interelectrode Resistance	
Plate to All at 300 Vdc; Ef = 6.3 V	10 Meg Min.
Grid to All at 100 Vdc; Ef = 6.3 V	10 Meg Min.
Cathode Positive so that no Cathode Emission Occurs	

TIME DEPENDENT CHARACTERISTICS

Minimum Number of Heater Cycles	2500
Regulation of Heater Supply	3 Precent Max.
Ef = 7.0 Vac	
Ehk = 140 Vac	

NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *The ratings of peak characteristics apply to a square topped pulse of 1000 cps frequency and 1.0% duty factor.*
7. *Per MIL-E-1C Par. 6.5 and General Section of the Sylvania Subminiature Tube Manual titled Specifications and Ratings.*
8. *Heater Positive not recommended for reliable operation.*

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Heater-Cathode Voltage	0 V
Plate Voltage	100 Vdc	Cathode Resistor MIL-E-1 Par. 3.2.2.1	150 Ohms
Grid Voltage	0 V		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.10.8	Heater Current:	0.65	138	—	—	—	162	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid Current: Eb = 150 Vdc; Rk = 220 Ohms, Rg = 1.0 Meg	0.65	0	—	—	—	−0.4	μAdc
4.10.4.1	Plate Current (1): Ebb = 125 Vdc; Ecc = +3 Vdc; Rp = 2700 Ohms; Rg = 0.06 Meg	0.65	14	—	15.5	—	—	mAdc
4.10.5.2	Grid Voltage: Ebb = 140 Vdc; Rp = 2700 Ohms; Rg = 0.06 Meg; Adj Ecc for Ib = 100 μa	0.65	—	—	—	—	8.5	Vdc
- - - -	Continuity and Shorts (Inoperatives): Note 2	1.0	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes:	2.5	—	—	—	—	—	
	g-all = 100 V	—	50	—	—	—	—	Meg
	p-all = 300 V	—	50	—	—	—	—	Meg
4.10.4.1	Plate Current (2): Ef = 5.7 V; Ebb = 125 Vdc; Ecc = +3 Vdc; Rp = 2700 Ohms; Rg = 0.06 Meg	2.5	13	—	—	—	—	mAdc
4.10.6.2	Grid Emission: Note 5 Ef = 7.5 V; Rg = 1.0 Meg; Rk = 0 Ohms; Ec = -8.5 Vdc	2.5	0	—	—	—	-0.5	μAdc
4.10.9	Transconductance: Sm	2.5	5000	—	6000	—	7000	μmhos
4.10.11.1	Amplification Factor:	6.5	25	—	—	29	33	
4.10.4.1	Plate Current (3):	6.5	7.5	—	10	—	12.5	mAdc
4.10.14	Capacitance:	6.5	—	—	—	—	—	
	No Shield Cgp	—	1.1	—	1.4	—	1.8	μμf
	No Shield Cin	—	1.6	—	2.2	—	2.8	μμf
	No Shield Cout	—	0.5	—	0.7	—	0.9	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 20 ±5 mm Hg.; Voltage = 300 Vac	6.5	—	—	—	—	—	
4.9.19.1	Vibration: F = 40 cps; G = 15; Rp = 10,000 Ohms; Ck = 1000 μf	2.5	—	—	—	—	50	mVac
Degradation Rate Acceptance Tests, Note 3								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max.	6.5	—	—	—	—	—	
- - - -	Post Shock and Fatigue Test End Points:							
	Vibration	—	—	—	—	—	200	mVac
	Heater-Cathode Leakage							
	Ehk = +100 Vdc	—	—	—	—	—	15	μAdc
	Ehk = -100 Vdc	—	—	—	—	—	15	μAdc
	Plate Current (1)	—	13	—	—	—	—	mAdc
	Grid Voltage	—	—	—	—	—	-8.5	Vdc
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic 1st Sample	Combined Samples	Limits Min.	Max.	Units
Acceptance Life Tests, Note 3							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec = Eb = O V	2.5	—	—	—	—	
4.11.5							
4.11.3.1	Intermittent Life Test: Note 4 Eb = 150 Vdc; Rk = 220 Ohms; Rg1 = 1.0 Meg; T Envelope = +165°C min.; Ehk = +200 Vdc	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic: 1st Sample	Allowable Defectives per Characteristic: Combined Samples	Limits: Min.	Limits: Max.	Units
Acceptance Life Tests, Note 3 (Continued)							
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Plate Current (1)	—	1	3	13	—	mAdc
	Grid Voltage	—	1	3	—	-8.5	Vdc
	Grid Current	—	1	3	0	-0.6	μAdc
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	10	μAdc
	Ehk = -100 Vdc	—	—	—	—	10	μAdc
	Heater Current	—	2	5	136	166	mA
	Insulation of Electrodes	—	2	5	—	—	
	g1-all	—	—	—	10	—	Meg
	p-all	—	—	—	10	—	Meg
	Total Defectives	—	4	8	—	—	
Information Life Test, Note 6							
- - - -	Interface Impedance Evaluation Life Test: Ef = 7.0 V; Eb = Ec = O V; Continuous Operation for 500 Hours	—	—	—	—	—	
- - - -	Evaluation Life Test End Points: (500 Hours) Note 7						
	Interface Impedance Zi	—	—	—	—	50	Ohms

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: All tubes shall be tested for continuity of all circuits, including duplicate pin connections to the same electrode; for shorts between any of the tube elements or between the elements and the no-connection base pins; and for air leaks.

Testing for shorts shall be performed using the Sylvania Automatic Tapper, B5-1379-A6. Each tube shall be tapped a total of six taps, three in each of two planes 90° apart. The tapper shall be adjusted so that the peak acceleration level delivered to the tube is 75 G's as measured with a Gulton A-305 accelerometer and KA-1 kit. The shorts detecting equipment shall be a dc device capable of detecting as shorts the following interelement resistances of the given time durations.

Interelement Resistance	*Time Duration*
4.5 megohms or less	80 μsec or greater
2.2 megohms or less	27 μsec or greater
1.0 megohm or less	14 μsec or greater
0.1 megohm or less	4.5 μsec or greater
10,000 ohms or less	2.5 μsec or greater

Continuity testing shall be performed with tapping of the tube as specified in MIL-E-1 Par. 4.7.5.

Tubes which give indication of one or more of the following shall be rejected without retesting.

(a) Any short during tapping
(b) Any open circuit
(c) Air leaks (defined in 5.3.6.1, Inspection Instructions for Electron Tubes).

3: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3 Subminiature lead fatigue
4.9.20.5 Shock
4.9.20.6 Fatigue
4.11.7 Heater cycling life test
4.11.5 Intermittent life test

4: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the bulb. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life rack.

5: Prior to this test, tubes shall be preheated five (5) minutes at conditions indicated below. Test within three (3) seconds after preheating. Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission Test.

Ef	Eb	Ec	Rk	Rg
V	Vdc	Vdc	Ohms	Meg
7.5	150	0	220	1.0

6: This life test shall be conducted on a minimum of one sample of ten tubes each month of production. Operate the life test tubes continuously. Read at 500 hours for information only.

7: Interface impedance measurements shall be made in accordance with Method B, the Frost Method, of ASTM Standard F300-55T, "Interface Impedance Characteristics of Vacuum Tube Cathodes". Preheat tubes to be tested for three minutes with EF = 6.3 V the only applied voltages every time interface impedance test is to be performed. Test with conditions Ef = 6.3 V; Eb = 100 Vdc; Ec/Ib = 1.0 mAdc; Esig = 0.2 V peak to peak square wave at 50 kc.

APPLICATION DATA

The Sylvania Premium Subminiature Type 6814 is a sharp cutoff, medium mu triode having high zero bias plate current. The Type 6814 is characterized by extremely tight controls on cutoff and zero bias plate current, making it especially well suited for miltivibrator and/or frequency divider service in electronic computers. The Type 6814 also exhibits exceptional freedom from the development of cathode interface after long periods under off conditions, and freedom from momentary shorts. The heater-cathode construction is designed to provide dependable service under conditions of intermittent operation.

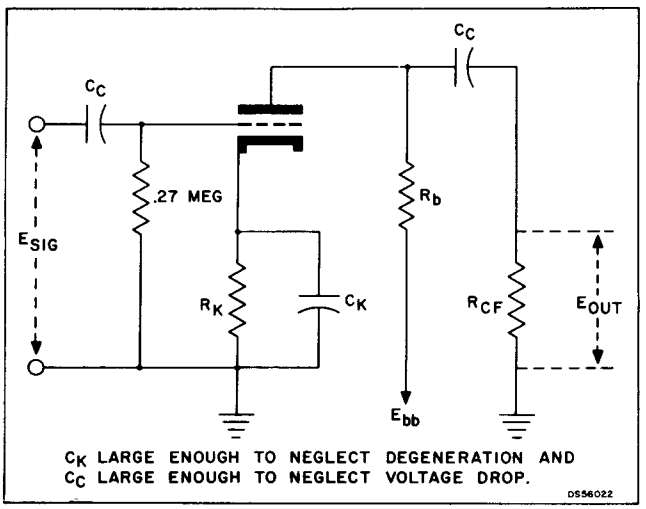
The Type 6814 is designed for long life and stable operation under conditions of severe shock, vibration, high altitude and high temperature and is manufactured and inspected to meet the applicable specification for reliability.

Life expectancy is described by the life tests specified on the attached pages and/or individual specification. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other that those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

RESISTANCE COUPLED AMPLIFIER DATA

	Ebb = 100 Volts						Ebb = 250 Volts					
Rb (megohms)	.047		0.10		0.27		.047		0.10		0.27	
Rcf (megohms)	0.1	0.27	0.27	0.47	0.27	0.47	0.1	0.27	0.27	0.47	0.27	0.47
Rk (ohms)	1500	1800	3300	3900	8200	10000	1000	1200	2200	2700	5600	6800
Ib (ma)	1.13	1.06	0.57	0.53	0.24	0.22	3.20	2.98	1.57	1.46	0.63	0.59
Ec (volts)	-1.69	-1.91	-1.88	-2.06	-1.93	-2.18	-3.20	-3.58	-3.45	-3.94	-3.53	-4.0
Eb (volts)	45.5	48	41	45	34	39	97	103	90	100	76	87
Esig (volts, rms)	0.5	0.5	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0
Eout (volts, rms)	9.0	9.15	9.1	9.1	8.45	8.7	20.4	20.8	20.4	20.3	18.5	19.4
Gain	18.0	18.3	18.2	18.2	16.9	17.4	20.4	20.8	20.4	20.3	18.5	19.4
% Distortion	3.7	2.8	2.6	2.2	2.9	2.0	2.3	1.9	2.0	1.6	2.2	1.4
Esig* (volts, rms)	0.66	0.80	0.85	0.95	0.75	1.00	1.85	2.15	2.07	2.42	1.90	2.44
Eout (volts, rms)	11.8	14.5	15.5	17.3	12.5	17.4	37.0	44.0	42.2	49.0	35.1	47
Gain	17.9	18.1	18.2	18.2	16.8	17.4	20.0	20.5	20.4	20.2	18.4	19.2
% Distortion	5.0	5.0	5.0	5.0	5.0	4.8	4.85	4.9	5.0	5.0	5.0	5.0

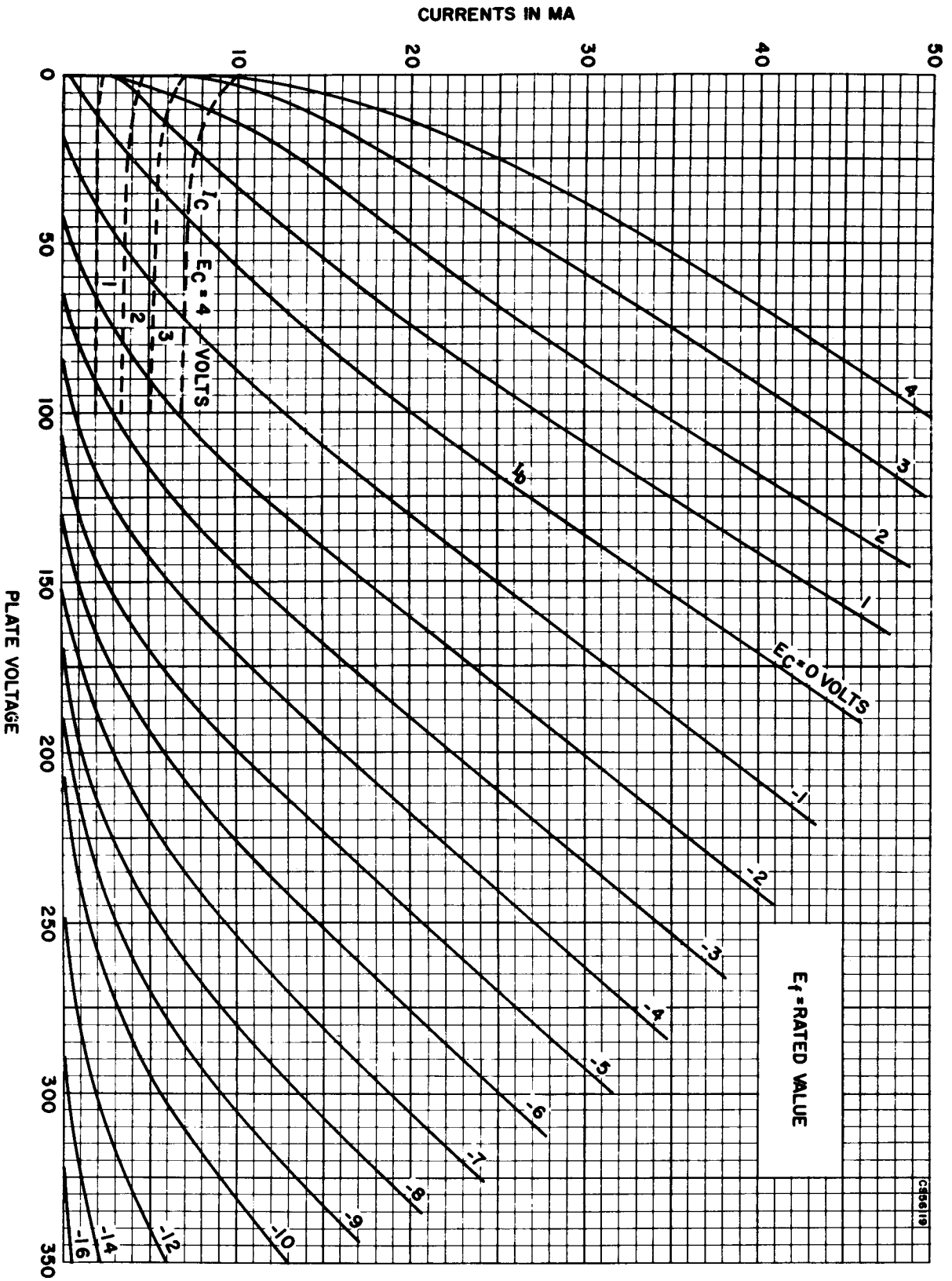
*Maximum signal for 5% distortion or ⅛ microampere grid current.



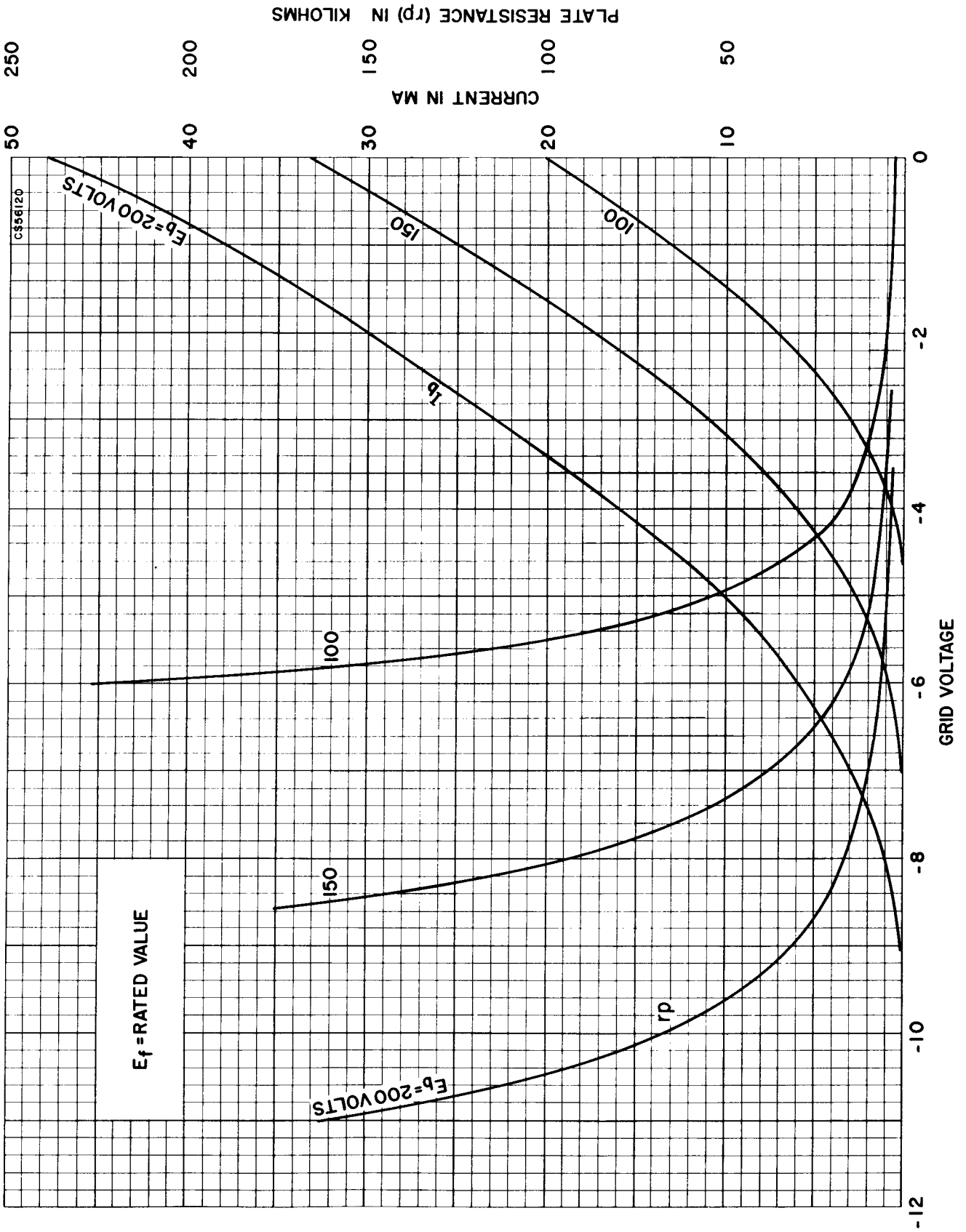
Resistance coupled amplifier circuit

The information presented on this data sheet is furnished without assuming any obligation.

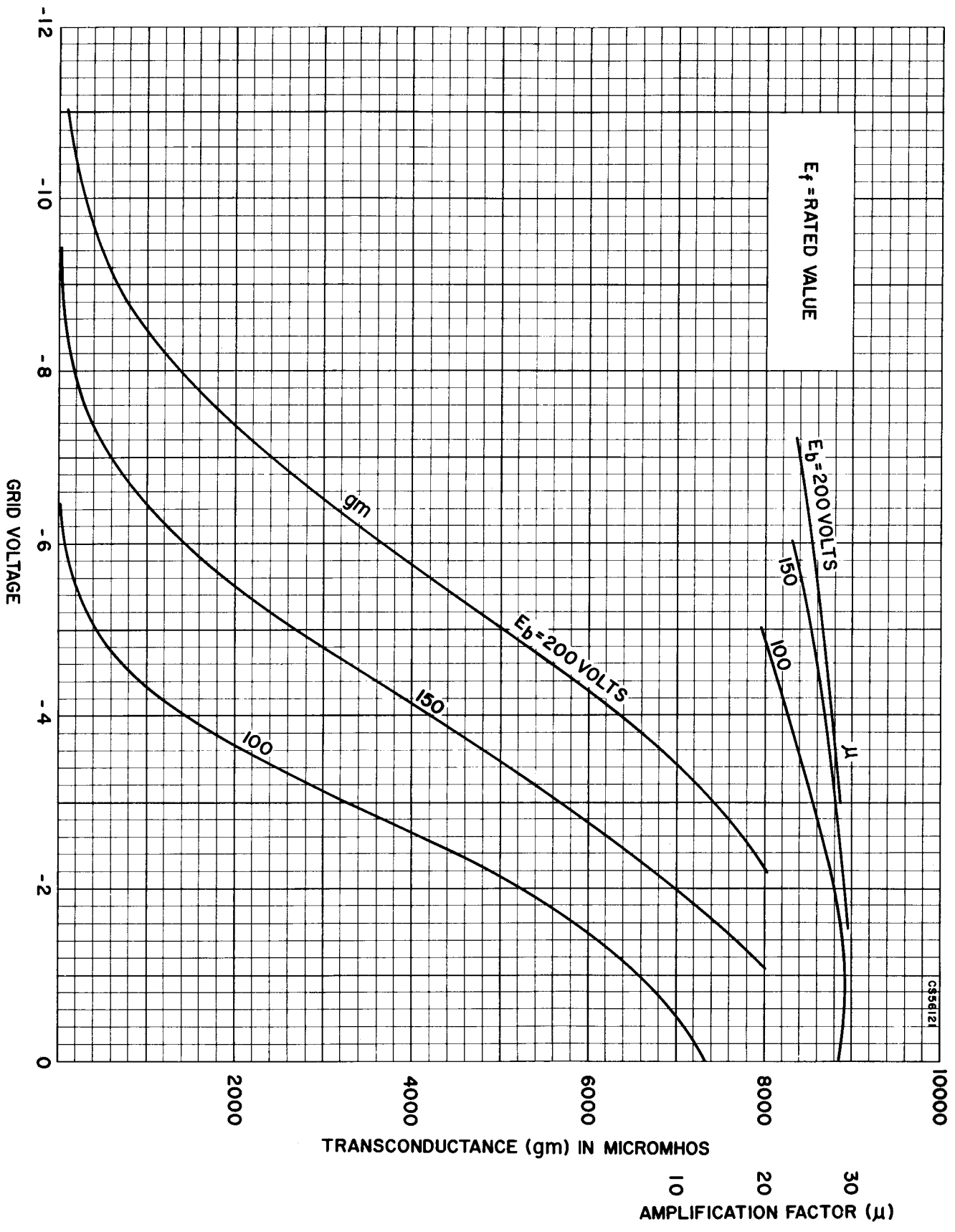
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



MECHANICAL DATA

Bulb	T5 ½
Base	Miniature Button 7 Pin
Mounting Position	Any
Dimensions	See Outline

ELECTRICAL DATA

	Min.	Max.
Anode Current	0.4	0.8 Ma
Supply Voltage (Anode to Cathode)	350	Vdc
Input Pulse Amplitude		
Square Wave	30	Vp-p
Sine Wave	45	Vp-p
Input Pulse Width	20	μsec
Quiescent Period	20	μsec
Input Frequency		10,000 PPS

TYPICAL OPERATION

DC Supply Voltage	400 V
Anode Resistor	430,000 Ohms
Anode Current	0.5 Ma
Cathode Resistor	68,000 Ohms
Cathode Capacitance	1000 μμf
Output Voltage, at 4000 PPS	25 Volts

PRINCIPLE OF OPERATION

A glow discharge will be established between the anode and either cathode when a steady voltage greater than the ionization voltage is applied. There will not be any preference for the glow to form on a particular cathode unless a temporary negative bias voltage is applied to the desired cathode.

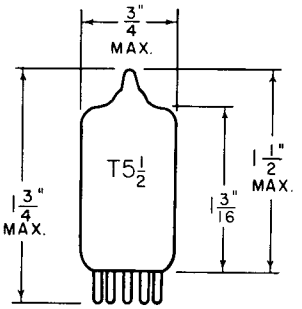
Assume that a glow discharge exists between the anode (A) and cathode #1 (K_1) in Fig. 3. When a negative pulse is applied to the guide electrode (G), which is in ionization coupling with K_1 and K_2, the glow will transfer to G. The glow will remain on G as long as the negative potential is maintained; but when the guide voltage is driven positive, the glow will want to transfer to either K_1 or K_2. If the duration of the negative pulse on G is less than the cathode time constant ($R_1 C_1$) a positive voltage will remain on K_1 because of the previous glow current. The glow will then prefer to transfer from G to the more negative K_2. After transfer the glow will remain on K_2 until a second negative pulse arrives on G. At this time the voltage on K_1 will have decayed and the glow will transfer back to K_1 by the same mechanism that originally caused transfer to K_2.

OPERATION NOTES:

To change the frequency range it is best to vary the cathode capacitance and leave the cathode resistance fixed in order to maintain approximately equal output voltages. Maximum frequency is obtained with a square wave or sine wave input. Random drive is possible at any repetition rate up to the maximum rating if the negative pulse input width is constant and the minimum quiescent period is observed. For best results the cathode capacitors should be kept as large as possible. Like all counter tubes the anode resistor should be soldered directly adjacent to the socket to minimize anode to cathode capacitance.

QUICK REFERENCE DATA

The Sylvania Type 6846 binary tube is a rugged, low cost, cold cathode counter tube consisting of four electrodes enclosed in a gaseous medium used for counting, frequency division and two channel switching.



Pin 1—Cathode No. 1
2—Guide
3—Cathode No. 2
4—NC
5—NC
6—Anode
7—NC

SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
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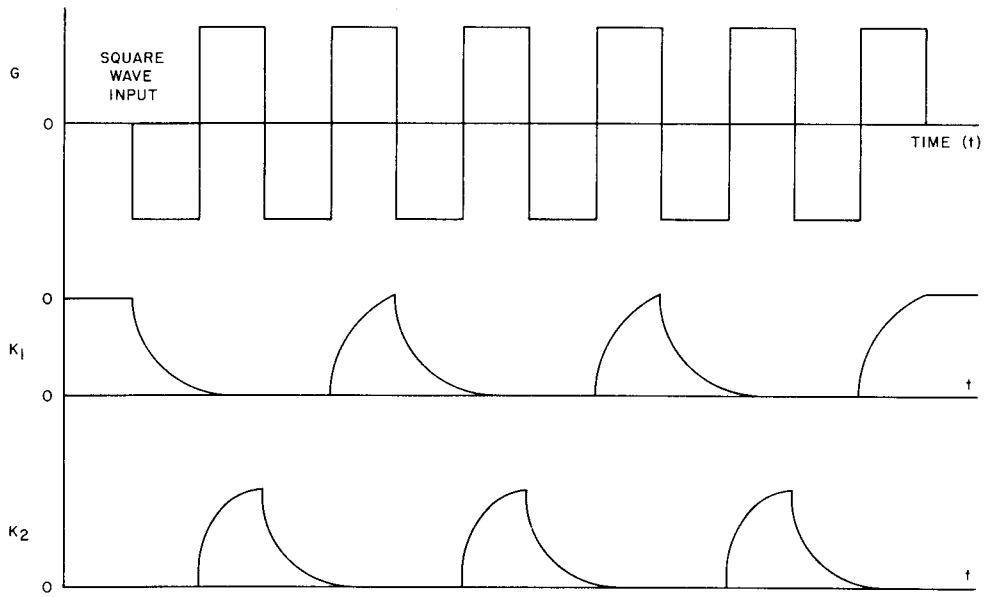
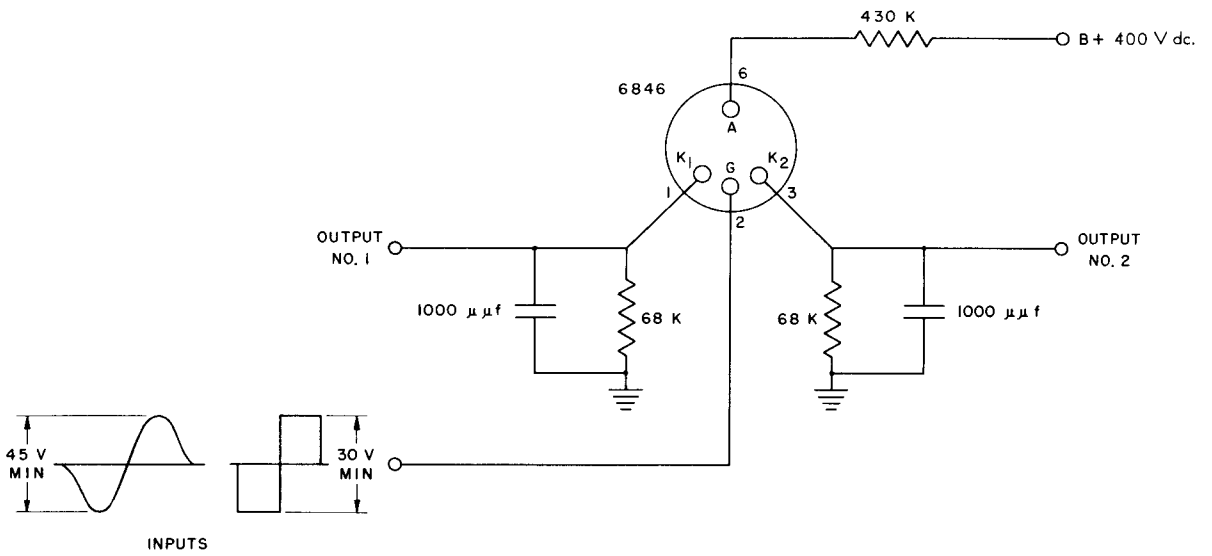
JULY 1956



VOLTAGE — TIME CHARACTERISTICS 6846 BINARY COUNTER TUBE FIG. 2



TYPICAL BINARY COUNTER TUBE DRIVING CIRCUIT FIG. 3

ADVANCE DATA

MECHANICAL DATA

Bulb	T 5 ½
Base	Tinned Flexible Leads (2 15/16" Min. Length)
Mounting Position	Any

ELECTRICAL DATA

Anode Voltage	500 to 1000	Volts	d c
Trigger Voltage			
tp = 2 μsec	215	Volts	Min.
tp = 200 μsec	180	Volts	Min.
	(See Control Data)		
Peak Cathode Current			
Minimum	10	Amperes	
Maximum	500	Amperes	
Power Input[1]	1	Watt	Max.
Trigger Grid Bias[2]	0	Volts	
Trigger Grid Current	10	μa	Min.
Keep Alive Current	30 to 100	μa	
Anode Delay Time	8	μsec	Max.
Ambient Temperature	-55 to +85	°C	

TYPICAL OPERATION

Anode Voltage	500	Volts	d c
Trigger Voltage, tp = 200 μsec	180	Volts	
Peak Cathode Current	60	Amperes	
Frequency	1	pps	
Trigger Grid Bias	0	Volts	
Keep Alive Current	50	μa	
Power Input	1/8	Watt	

NOTES:

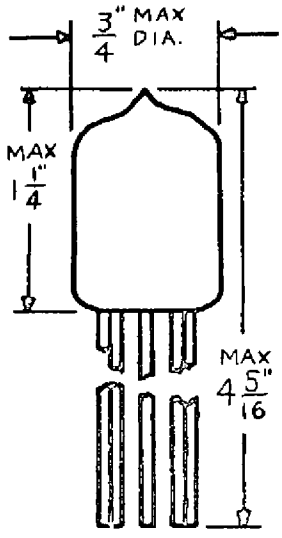
1. Watts = $\frac{FCV^2}{2}$, where C = Discharge Capacity in μf
   V = Anode Voltage in KV
   F = pps (Trigger pulses per sec.)

2. Grid may be run positive with respect to cathode in order to decrease trigger voltage with some reduction in hold-off voltage (i.e. - Reduction in upper anode voltage range)

from JETEC release #1666, June 18, 1956

QUICK REFERENCE DATA

The Sylvania Type 6873 is a ruggedized cold cathode trigger tube with increased trigger sensitivity and higher operating voltage capabilities.



Pin No.	1	Cathode
	2	Clipped at Base
	3	Trigger Grid
	4	Anode
	5	Clipped at Base
	6	Keep-Alive
	7	Clipped at Base

SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

May 17, 1956

APPLICATION DATA

The Sylvania Type 6873 trigger tube is an inert-gas filled, internally-triggered, cold cathode tube of extremely rugged and reliable design. The tube is designed for electronic relay and switching service involving extremely high instantaneous peak currents of the order of hundreds of amperes - at low average current levels.

A special grid design enables the 6873 to be triggered by a pulse of very low power (1-2 milliwatts). Because of this, it is possible to trigger the 6873 directly from a phototube without intervening amplifiers. The 6873 tube directly bridges the gap between very low instantaneous current levels and very high instantaneous current levels.

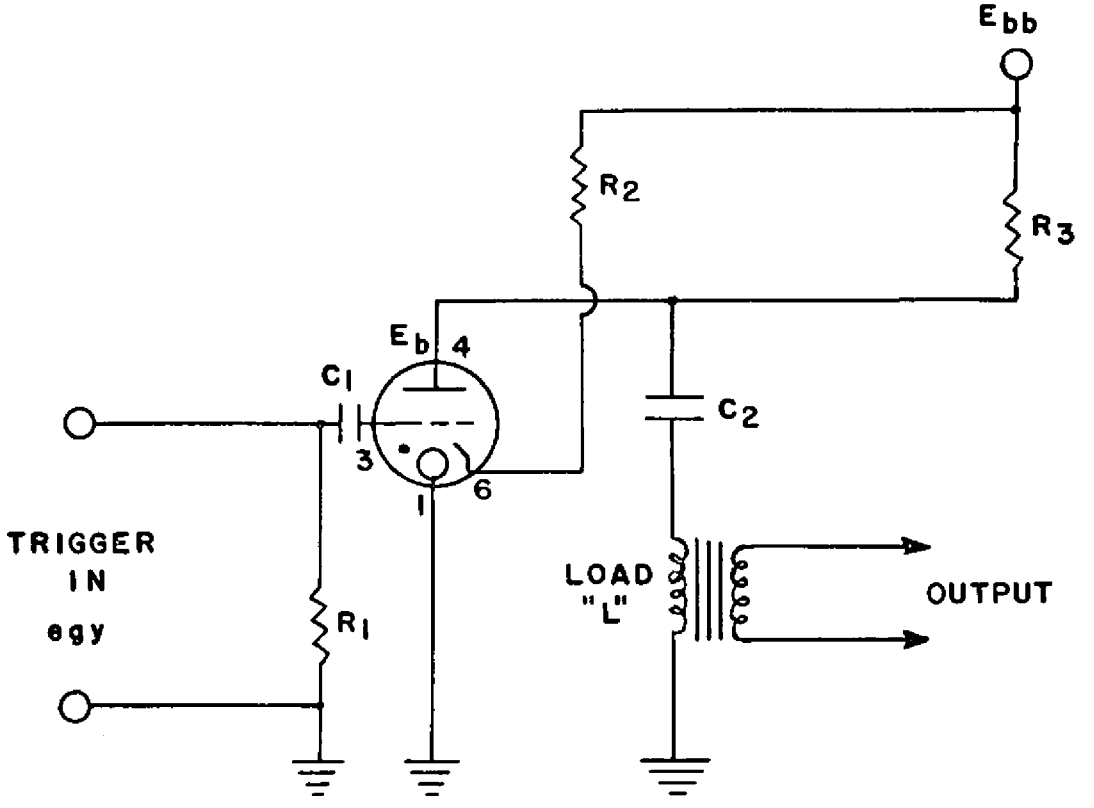
The extremely rugged and reliable design of the 6873 tube makes it ideal for use in applications requiring dependable operation under extreme environmental conditions of shock, vibration, and temperature variations.

The use of a keep-alive grid insures relatively stable triggering characteristics throughout life with a maximum anode delay of 8 micro-seconds under typical operating conditions.

The 6873 comes equipped with flexible lead wires eliminating the need for a tube socket and, because direct connections are required, a resulting increase in reliability is obtained.

Since the 6873 cathode depends upon a minimum peak current for its activation, Sylvania recommends that circuit values be chosen to insure at least 10 amperes minimum peak current flow during each operation.

TYPICAL OPERATING CIRCUIT



R_1 : 50 ohms to 100,000 ohms* typical

R_2 : 10 megohms to 30 megohms*

R_3 : Depends on "pps" and "C2"

$$R_3 \cong \frac{1}{C_2 \times pps}$$

where:

pps = operating frequency

C_1 : 0.1 µfd 600 w Vdc

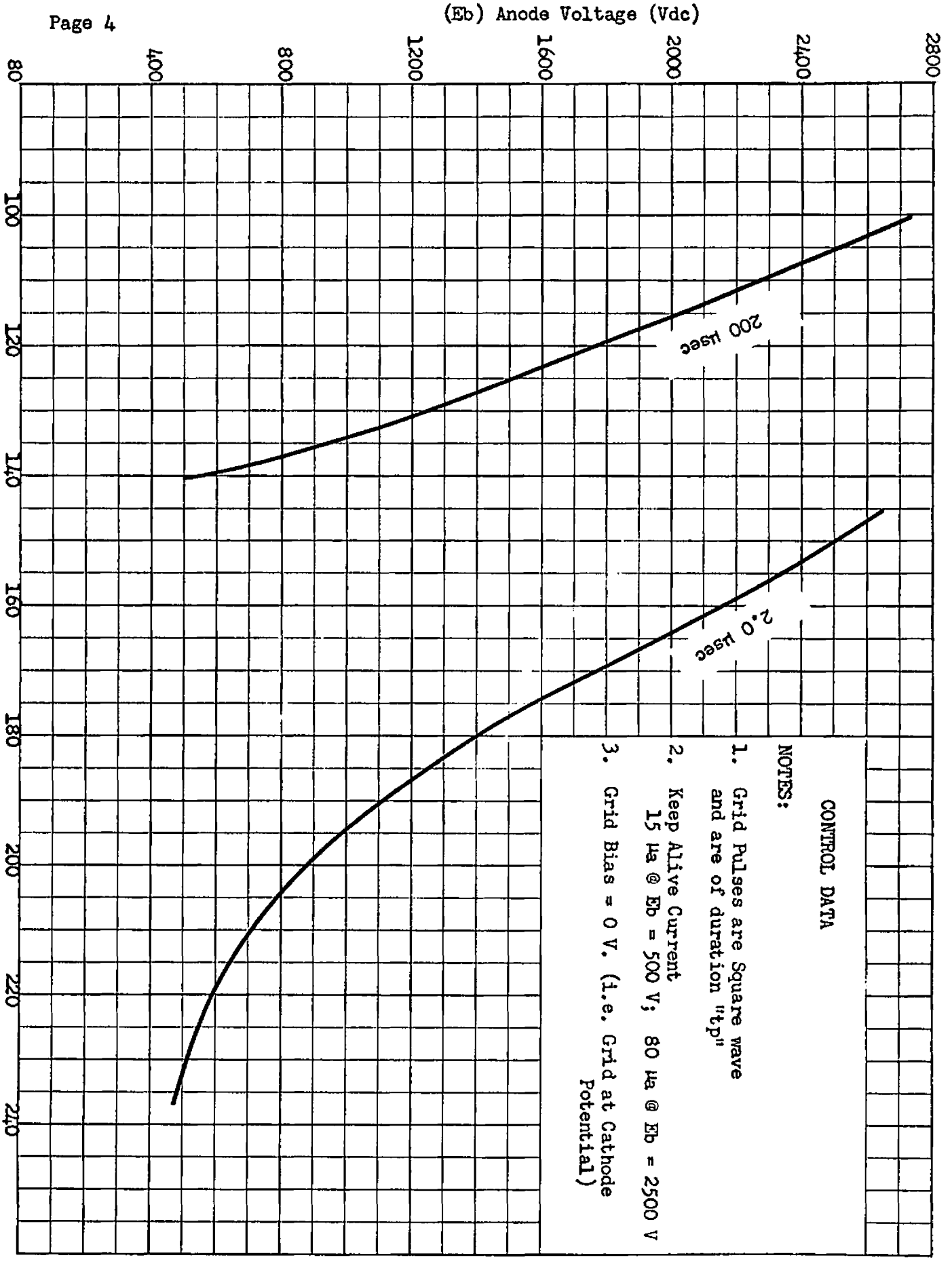
C_2 : 0.1 - 0.25 µfd typical

egy: 180-250 V at 2.0 µsec min. duration

E_{bb}: 500-2000 Vdc

L : usually low impedance so that peak current is ≥ 10 amperes (i.e. ignition transformer)

*see ratings for limitations


(Eb) Anode Voltage (Vdc)
400
800
1200
1600
2000
2400
2800
80
100
120
140
160
180
200
220
240
(egy) Grid Voltage for Firing
200 µsec
2.0 µsec
CONTROL DATA
NOTES:
1. Grid Pulses are Square wave and are of duration "tp"
2. Keep Alive Current 15 µa @ Eb = 500 V; 80 µa @ Eb = 2500 V
3. Grid Bias = 0 V. (i.e. Grid at Cathode Potential)

ADVANCE DATA

MECHANICAL DATA

Mounting Position	Any	
Overall Dimensions	7 11/16 x 6 5/8 x 4 21/64	Inches
Net Weight	13	Lbs. approx.
Cooling [1]	Forced Air	
Pressurization	40-45	psi abs.
Output Coupling	Standard Choke Flange UG-52/U	
Vibration (non-operating)	50 cycles - 10 G	
Tuner Drive Torque	24 in. - oz. (Max.) at room temp.	
Backlash	10 Mc/sec. (Max.)	
Tuning Rate	Nominal Rate = 5.1 Mc/turn of worm shaft	

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage - Preheat [2]	13.75	V
Heater Current at 13.75 V	3.00 - 3.75	Amps
Minimum preheat time	3	Minutes

RATINGS (Absolute Maximum) [3]

Heater Voltage [2]			
Heater Current (Surge)		12	Amps
Peak Current		30	Amps
Average Power Input		690	Watts
Anode Temperature [1]		150°	C
Cathode Terminal Temperature [1]		165°	C
Pulse Duration		3.3	μs
Duty Cycle		.0013	
Rate-of-rise of Voltage [4]	Osc. 1:	135	KV/μs
	Osc. 2:	110	KV/μs
VSWR		1.5:1	

TYPICAL OPERATION [1, 2, 5]

	Oscillation 1	Oscillation 2		
Pulse Recurrence Frequency	1000	333	pps	
Pulse Duration [4]	1.0	3.0	μs	
Peak Anode Voltage	21.0	20.5	kv	
Peak Anode Current	27.5	23.5	Amps	
Average Anode Current	27.5	23.5	Ma	
Useful range of average current	18-27.5	18-23.5	Ma	
Average Power Output	180	140	Watts	Min. [6]
Pulling Factor	16	16	Mc	Max.

from JETEC release #1845, Feb. 11, 1957

QUICK REFERENCE DATA

Sylvania Type 6874, selected bandwidth M561, is a high power, pulsed, tunable magnetron with frequency range between 8800 - 9400 Mc. The 6874 is similar to 4J50 with the tube supplied with magnet in place.

SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

December 26, 1956

NOTES:

1. Cooling should be provided to keep anode temperature below 125° C and cathode terminal below 165° C at "BH" on outline drawing.

2. During high voltage pulse operation, reduce heater voltage according to the following formula:

Power Input $\leqq$ 100 watts	Ef = 13.75 V
Power Input $>$ 100 watts	Ef = 14 (1-Pi/1120)

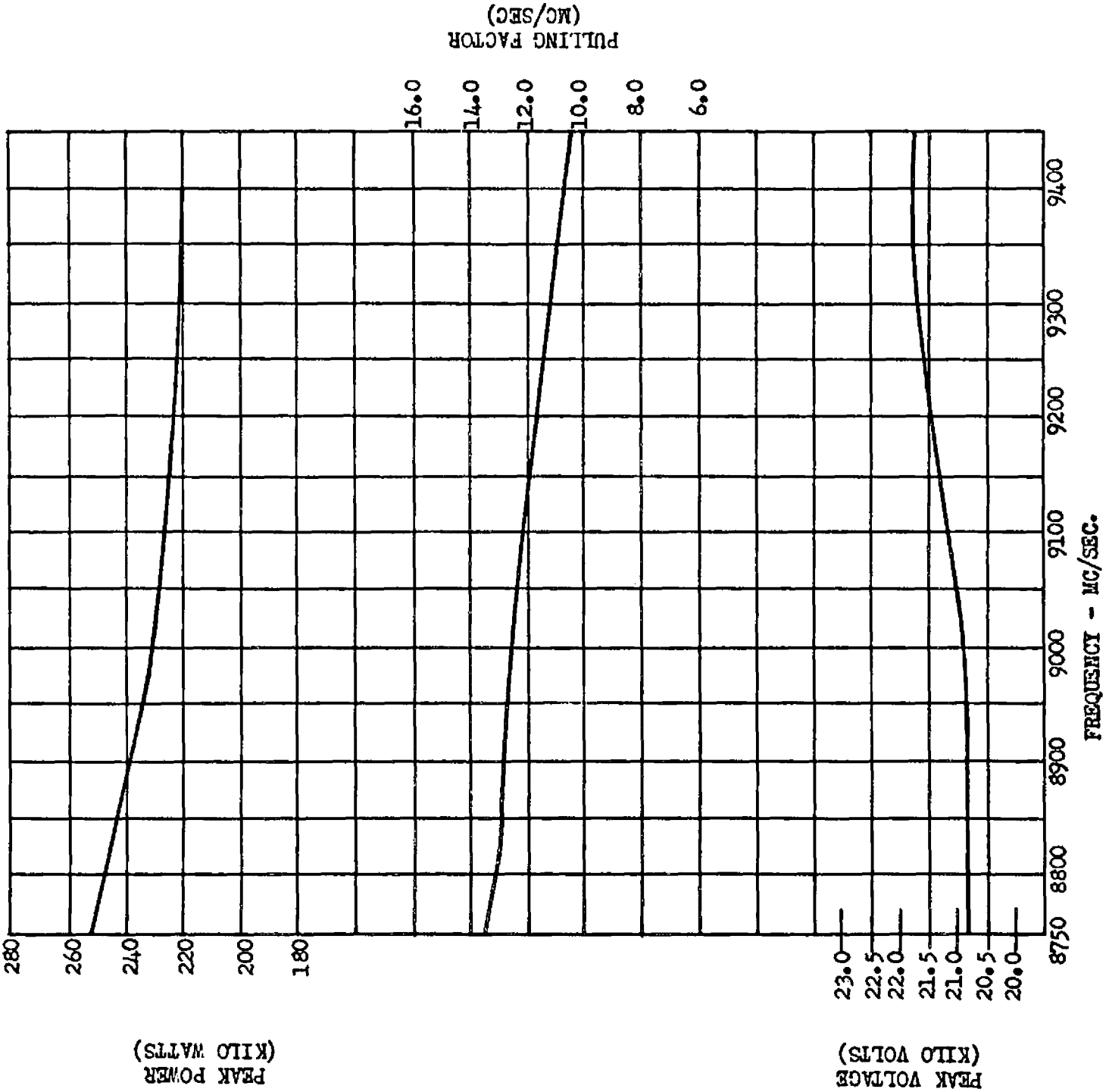
3. The values specified are based on the "absolute system" and are not to be exceeded under any service conditions. The ratings are limiting values above which serviceability of any individual tube may be impaired. It does not necessarily follow that combinations of absolute maximum ratings can be attained simultaneously.

4. The rrv shall be expressed in kilovolts per microsecond defined by the steepest tangent to the leading edge of the voltage pulse above 80% amplitude. Any capacitance used in viewing system shall not exceed 6 $\mu\mu$f.

5. Pressurize waveguide to 600 mm Hg for peak input power greater than 635 KW.

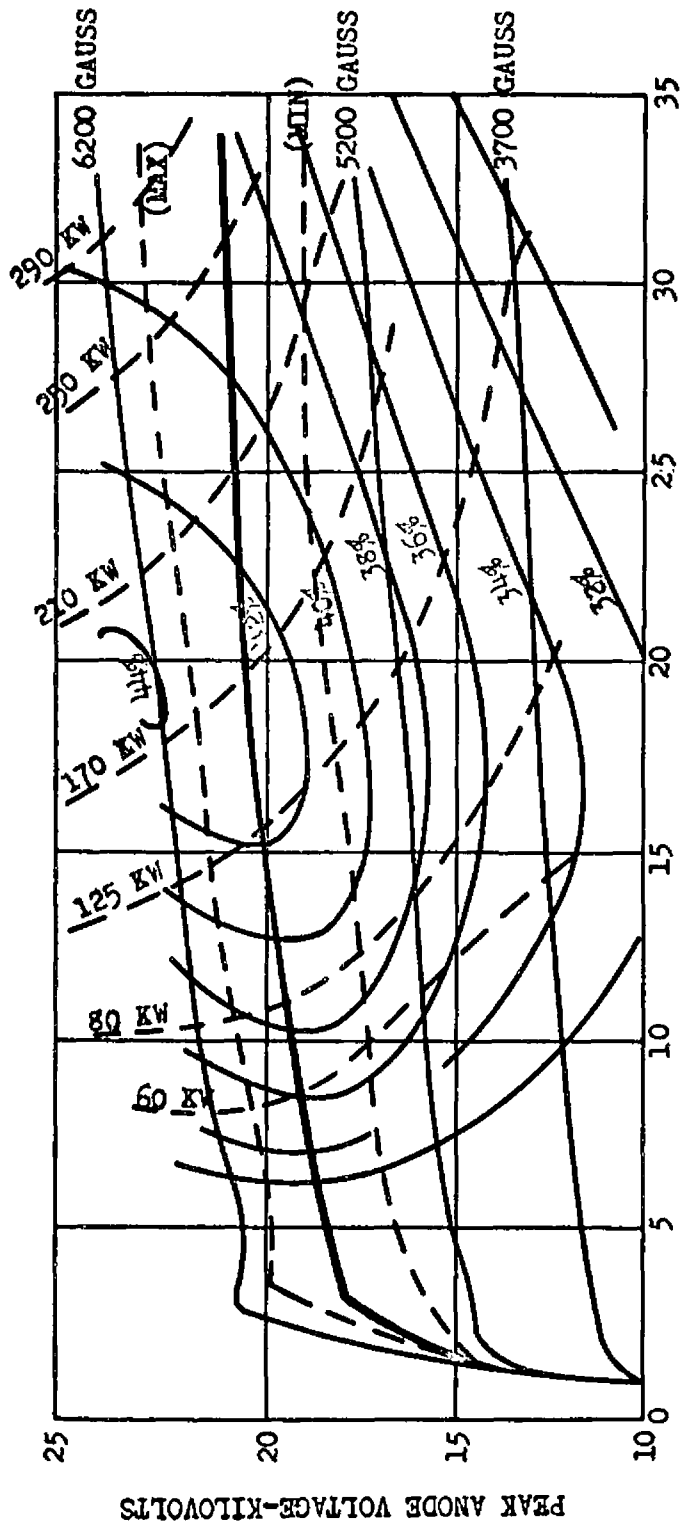
6. The minimum power requirement must be satisfied over the specified frequency band. This test is also to determine that there are not serious defaults of performance over the tuning range.

6874
AVERAGE PERFORMANCE DATA

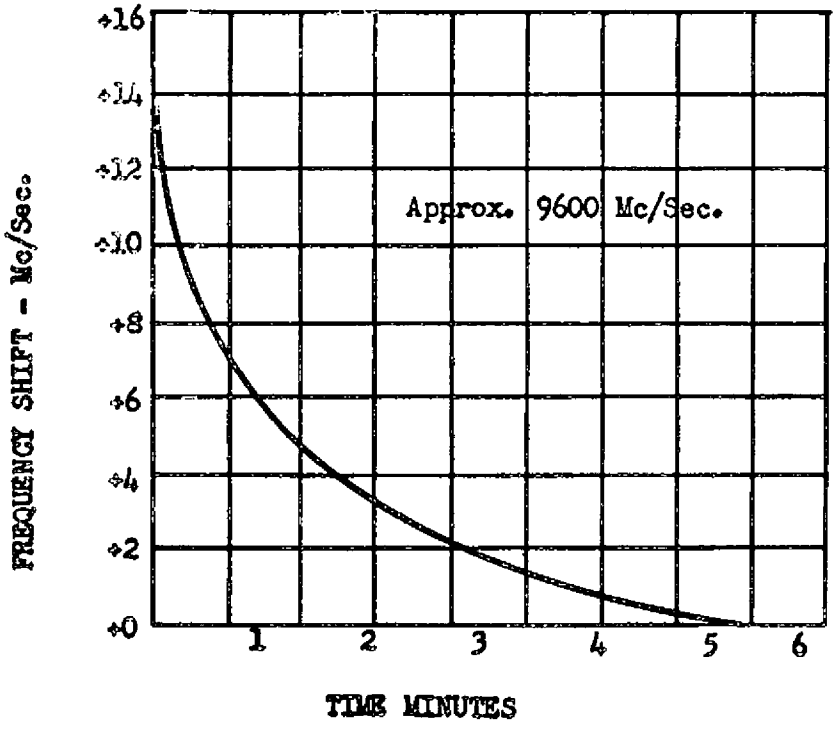


AVERAGE PERFORMANCE CHART

For Type 6874 (Refer to heavy line)
Eo, 9075; TP = 1 μsec; Duty Cycle = .001

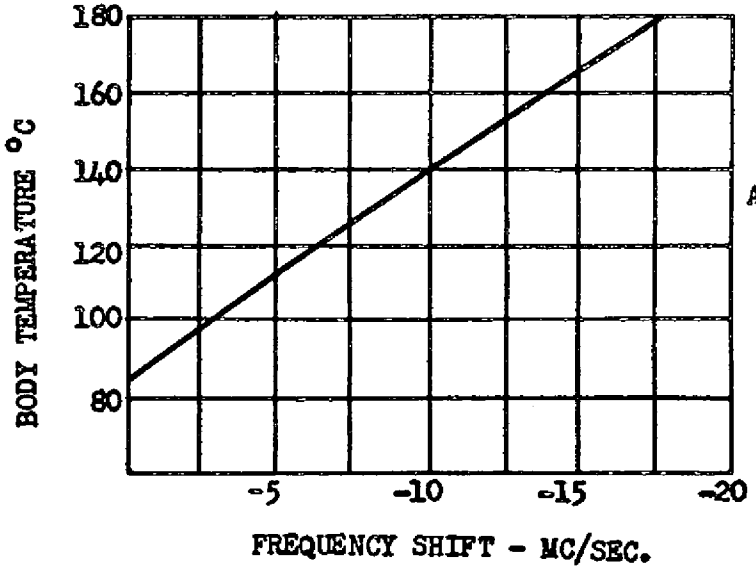


FREQUENCY SHIFT DATA - 6874

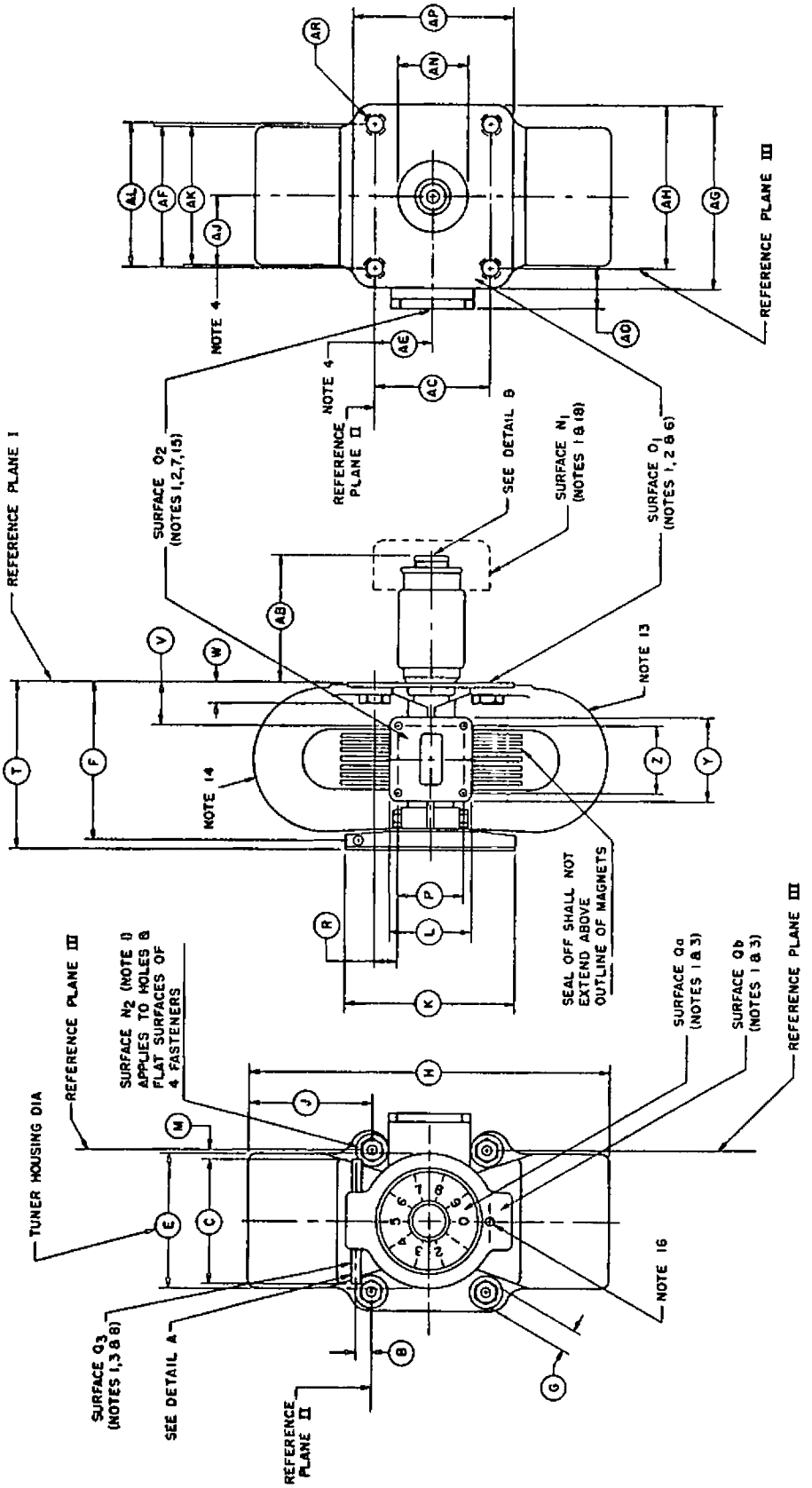


FREQUENCY DRIFT VS. TIME FROM APPLICATION OF ANODE POWER

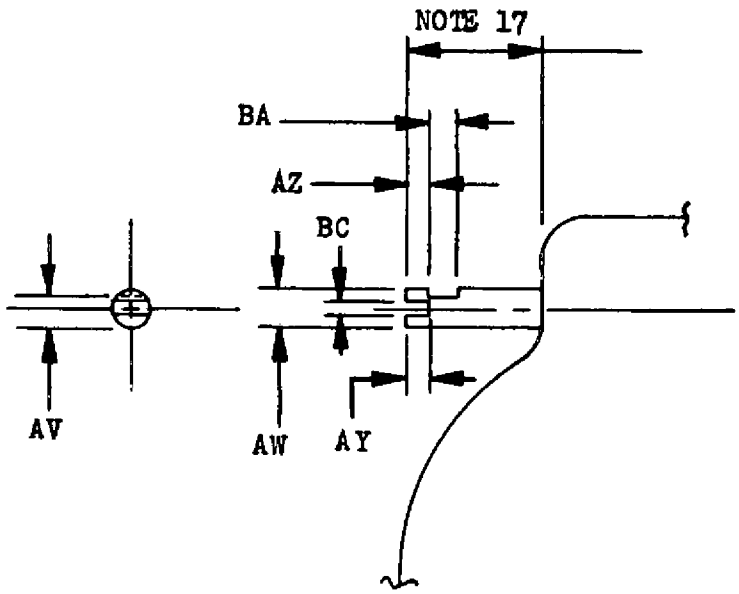
FREQUENCY VS. BODY TEMPERATURE



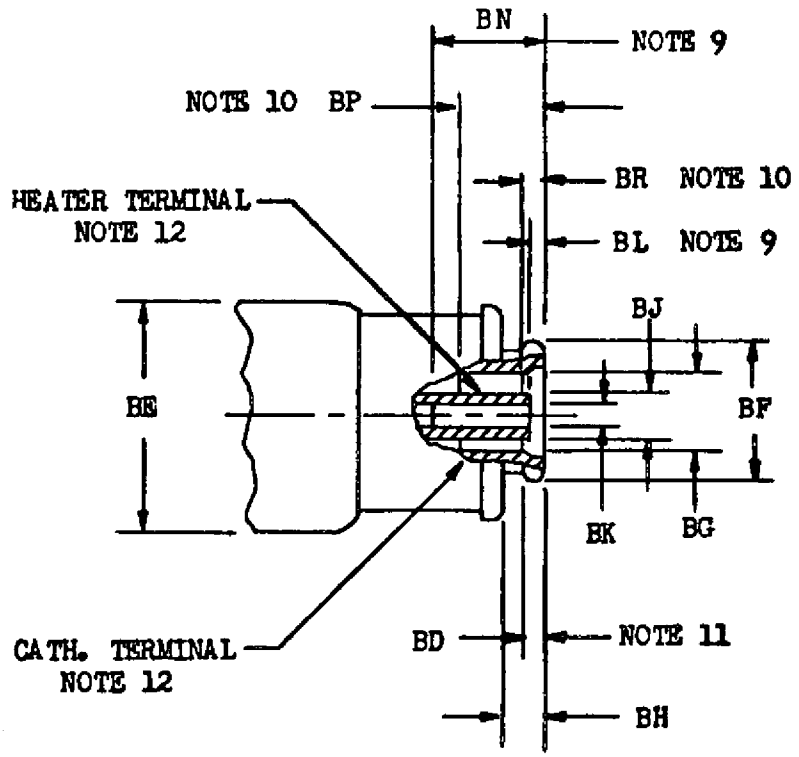
APPROX. 9300 Mc/sec



Refer to Pages 8 & 9 for Outline Dimensions and Outline Notes



DETAIL "A"



DETAIL "B"

Refer to Pages 8 & 9 For Outline Dimensions and Outline Notes

	REF.	DIMENSIONS
**	B	.221 ± .035
**	C	2 3/4
**	E	2 15/16 Max.
*	F	3 31/64 ± 3/64
**	G	1/2
**	H	7 11/16
**	J	2 19/32
**	K	3 7/8 Max.
**	L	1.830
*	M	1/8 ± 1/16
	P	1.474 ± .004
	R	1.513 ± .045
*	T	3 15/16 Max.
	V	.977 ± .032
*	W	5/8 ± 1/32
**	Y	1.830
	Z	1.352 ± .004
	AB	2 11/16 ± 1/16
	AC	2.500
	AD	.907 ± .025
*	AE	1.250 Note 4
*	AF	3" Max.
**	AG	3 7/8 Max.
*	AH	3 27/64 Max.

	REF.	DIMENSIONS
*	AJ	1.500 Note 4
**	AK	2 7/8 Max.
	AL	3.000
**	AN	1 1/2 Max.
**	AP	3 15/32 Max.
*	AR	.281 ± .005
*	AV	5/32
*	AW	.187
*	AY	1/8
*	AZ	1/8
*	BA	8/16
	BC	.052
**	BD	1/8
**	BE	1 1/2 Max.
	BF	$.830\ ^{+\ .000}_{-\ .005}$
	BG	$.540\ ^{-\ .000}_{+\ .005}$
	BH	1/4 ± 1/32
*	BJ	1/4
	BK	.169 ± .005
	BL	5/32 ± 1/32
	BN	3/4 Min.
	BP	.316 Min.
	BR	.156 Max.

** Qualification Approval Measurements

* Design Test Measurements

NOTES:

** 1. All metal surfaces, covered by black finish except those marked N, O, or Q. Surfaces marked N or O shall be silver, nickel plated or brass surfaces.

2. Hermetic connections can be made to surfaces O_1 & O_2.

3. Surfaces marked Q are tuner parts and shall have the following markings:

(a) Black line running between index hole & tuner dial on an aluminum, silver, nickel plated or brass surface.

(b) Decimal dial face numbered from 0 to 9 with 1/10 division marks applied to a black surface.

* 4. The axis of the cathode terminal shall be within a radius of 3/64 of the specified location, Note 5 applies.

5. The limits include angular as well as lateral deviations.

6. All points on the mounting surface shall be within .015" of Ref. Plane I.

7. With the flange on a plane surface a .005 thickness gauge 1/8 wide shall not enter.

8. Clockwise rotation of the indicated end of the worm shaft, will result in the increased frequency, 138 turns of the worm shaft is required to traverse the frequency range in one direction.

9. These dimensions define the extremities of the cylindrical section given by the (BK) dimension

10. These dimensions define the extremities of the cylindrical sections given by the (BG) dimension the step with Max. depth of .156 is optional.

**11. No clamping means to bear beyond the dimension.

12. The heater terminal shall be concentric with the cathode terminal within 0.010.

13. Marking-warning maintain minimum clearance 2" between the magnet & magnetic material

14. Marking-type No. & Commercial or Mil Stamp.

**15. The opening in the waveguide shall be enclosed by a dust cover when tube is not in not in use.

16. Number appearing here indicates number of complete revolutions of gear from 0 to 6.

17. It shall be possible for a sleeve .195 I.D. x .406" O.D. to pass over ends of shaft to within 1/4" of face of worm bracket.

18. Silver plate or nickel plate over full extent of plug connection as defined in Notes 9 & 10.

MECHANICAL DATA

Bulb	T-5½
Base	7 Pin Miniature
Outline	See Drawing
Basing	See Drawing
Output Cathodes	No. 0, 2, 8, and 9
Zero Position	No. 0 Cathode Aligned with Pin No. 5 ± 10°
Mounting Position	Any

ELECTRICAL DATA

INTERELECTRODE CAPACITANCES (Approx.)

Any Cathode to All Other Elements	2.4 pf
Guide No. 2 to All Other Elements	9.0 pf
Guide No. 1 to All Other Elements	8.3 pf

RATINGS (Absolute Values)

	Min.	Max.
Anode Supply Voltage[1]	350	800 Volts
Voltage Between Electrodes (Other than Anode)	—	140 Volts
Transfer Voltage	35	140 Volts
Anode Current	0.3	0.6 Ma
Input Frequency	0	5 Kpps
Ambient Temperature	−55	+60 °C

TYPICAL OPERATING CHARACTERISTICS

Anode Supply Voltage[1]	350 Volts	
Nominal Tube Drop	187 Volts	
Guide Bias	+35 Volts	Min.
Square Double Pulse Drive Amplitude (Each Pulse)[2]	−75 Volts	Min.
Square Double Pulse Width (Each Pulse)[2]	60 μSec.	Min.
Forced Reset Pulse Amplitude	−120 Volts	Min.
Forced Reset Pulse Width	50 μSec.	Min.
Cathode Load Resistor[3]	150 K-Ohms	Max.

NOTES:

1. *A value for the anode resistor can be computed by substracting the nominal tube drop from the supply voltage and dividing the remainder by the desired operating current.*
2. *Two separate pulses, back to back or with slight overlap, must be maintained.*
3. *The peak pulse output voltage can be determined by the IR drop across the chosen cathode resistor.*
4. *A counter tube brochure is available on request from Sylvania Electric Products Inc., 1100 Main Street, Buffalo 9, New York.*

QUICK REFERENCE DATA

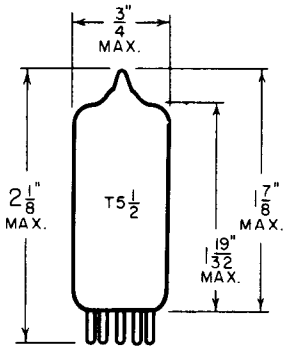
The Type 6879 is a cold cathode, bidirectional decade counter tube with top viewed readout. It is designed to operate at inputs up to 5000 pulses per second. Cathodes No. 0, 2, 8, and 9 are brought out to individual base pins. Applications include computing, scaling, counting, frequency dividing, coding, modulating, matrixing, indexing, multiplexing, addition and subtraction. (See Note 4.)



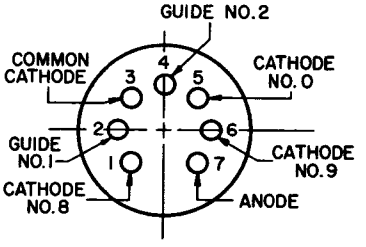
SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.
Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
DECEMBER, 1963

File Under
SPECIAL PURPOSE
ELECTRONIC TUBES

OUTLINE



BASE CONNECTIONS



SYLVANIA

engineering data service 6888

MECHANICAL DATA

Bulb	T-9
Base	B8-26, Small Wafer Octal with Sleeve, 8-Pin or Low Loss Phenolic Small Wafer Octal with External Barriers and Sleeve, 8-Pin
Outline	9-12
Basing	8N
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 (±5%) Volts
Heater Current	800 Ma
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	200 Volts
Heater Positive with Respect to Cathode	25 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

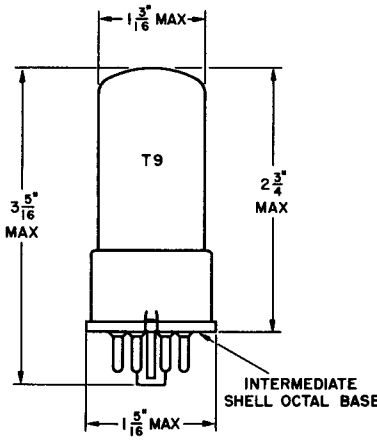
Grid No. 1 to Plate	0.70 μμf
Grid No. 3 to Plate	3.80 μμf
Grid No. 1 Input: g1 to (g2+g3+p+h+k)	12.0 μμf
Grid No. 3 Input: g3 to (g2+g1+p+h+k)	6.0 μμf
Output: p to (g1+g2+g3+h+k)	6.5 μμf
Grid No. 1 to Grid No. 3	0.65 μμf

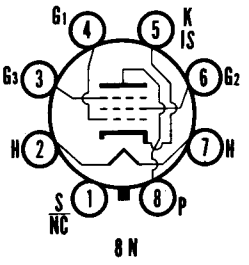
RATINGS (Absolute Maximum)

DC Plate Voltage	250 Volts	Max.
Positive DC Grid No. 3 Voltage	250 Volts	Max.
Negative DC Grid No. 3 Voltage	250 Volts	Max.
Positive DC Grid No. 2 Voltage	150 Volts	Max.
Negative DC Grid No. 1 Voltage	100 Volts	Max.
Peak Positive Plate Voltage	500 Volts	Max.
Peak Positive Grid No. 1 Voltage	30 Volts	Max.
Peak Positive Grid No. 2 Voltage	150 Volts	Max.
Plate Dissipation	8.0 Watts	Max.
Grid No. 2 Dissipation	2.0 Watts	Max.
Grid No. 3 Dissipation	2.0 Watts	Max.
DC Cathode Current	80 Ma	Max.
Peak Cathode Current[1]	600 Ma	Max.
Positive DC Grid No. 1 Current	5.0 Ma	Max.
External Grid No. 1 Circuit Resistance		
Fixed Bias Operation	0.5 Megohm	Max.
Bulb Temperature (Hottest Point)	130 Degrees C	

QUICK REFERENCE DATA

The Sylvania Type 6888 is a dual control, computer pentode designed for long life and low failure rates. It is utilized in pulse amplifier, core driver and coincidence circuits.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JUNE, 1957

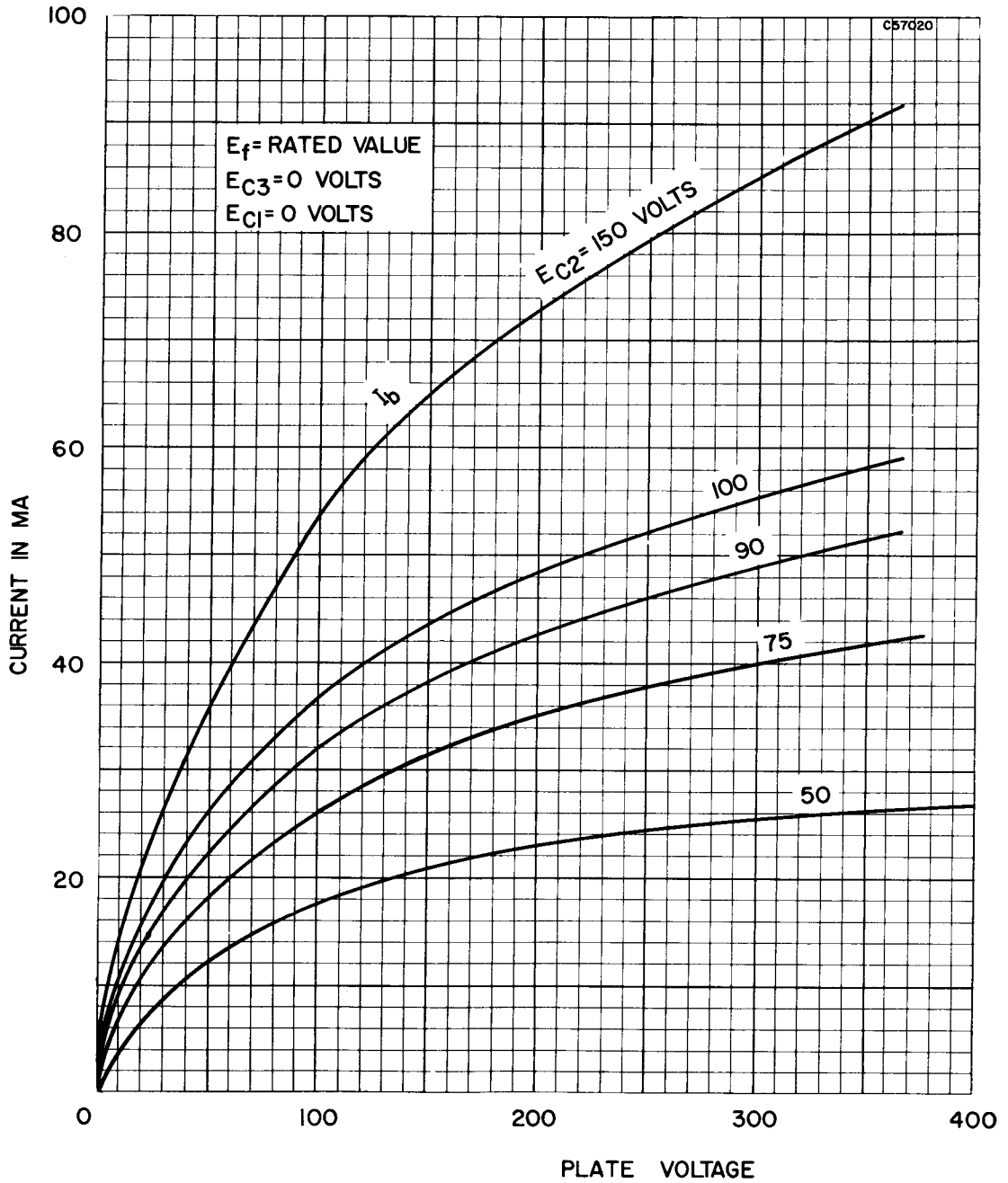
AVERAGE CHARACTERISTICS

Plate Voltage	150 Volts
Grid No. 3 Voltage	0 Volts
Grid No. 2 Voltage	90 Volts
Grid No. 1 Voltage[2]	
Plate Current	37.5 Ma
Grid No. 2 Current	19 Ma
Grid No. 1 Cutoff Voltage Eb = 150 Vdc; Ec2 = 90 Vdc; Ec3 = 0; Ec1/Ib = 30 μa	−13.8 Volts
Grid No. 1 Cutoff Voltage Eb = 150 Vdc; Ec2 = 90 Vdc; Ec3 = 0; Ec1/Ib = 2.5 ma	−9.4 Volts
Grid No. 3 Cutoff Voltage Eb = 150 Vdc; Ec1 = 0; Ec2 = 90 Vdc; Ec3/Ib = 2.0 ma	−8.6 Volts
Triode Amplification Factor Eb = Ec2 = 90 Vdc; Plate and Grid No. 2 Tied; Ec1 = −2.0 Vdc; Ec3 = 0	10
Tetrode Cutoff Voltage Eb = Ec3 = 250 Vdc; Grid No. 3 and Plate Tied; Ec2 = 90 Vdc; Ec1/Ib = 2.0 ma	−11.5 Volts
Pulse Plate Current Eb = 150 Vdc; Ec2 = 90 Vdc; Ec3 = +10 Vdc; Ec1 = +10 v tp = 5 μsec; prr = 2000 pps	145 Ma
Pulse Screen Current Eb = 150 Vdc; Ec2 = 90 Vdc; Ec3 = +10 Vdc; Ec1 = +10 v tp = 5 μsec; prr = 2000 pps	17 Ma

NOTES:

1. *This rating applies to a current pulse whose duration is 0.1 μsec, whose duty factor is 20% and the averaging time of which is 1.0 milsec.*
2. *Tie grid No. 1 to +90 Vdc through a 0.47 megohm resistor.*

AVERAGE PLATE CHARACTERISTICS



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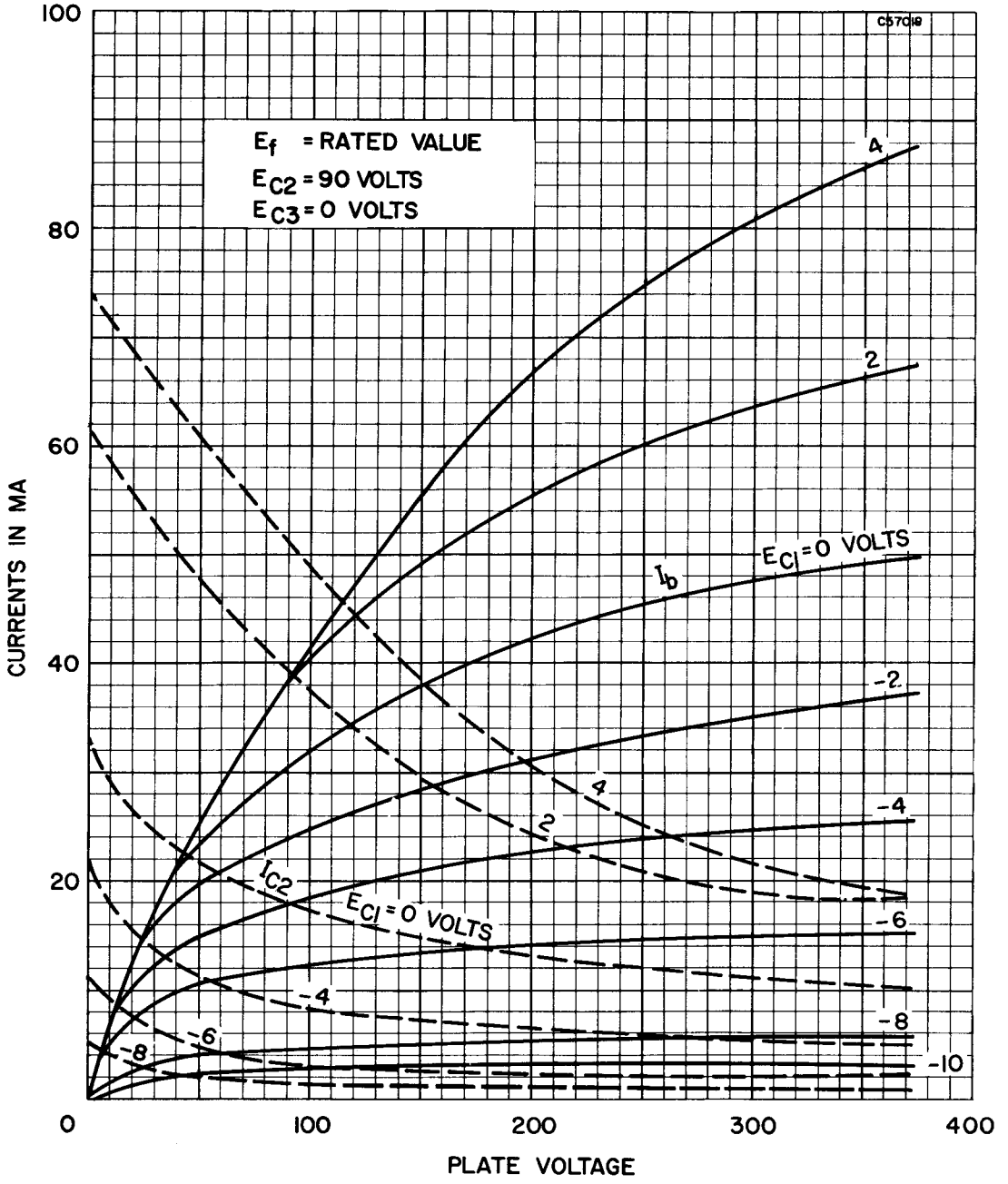
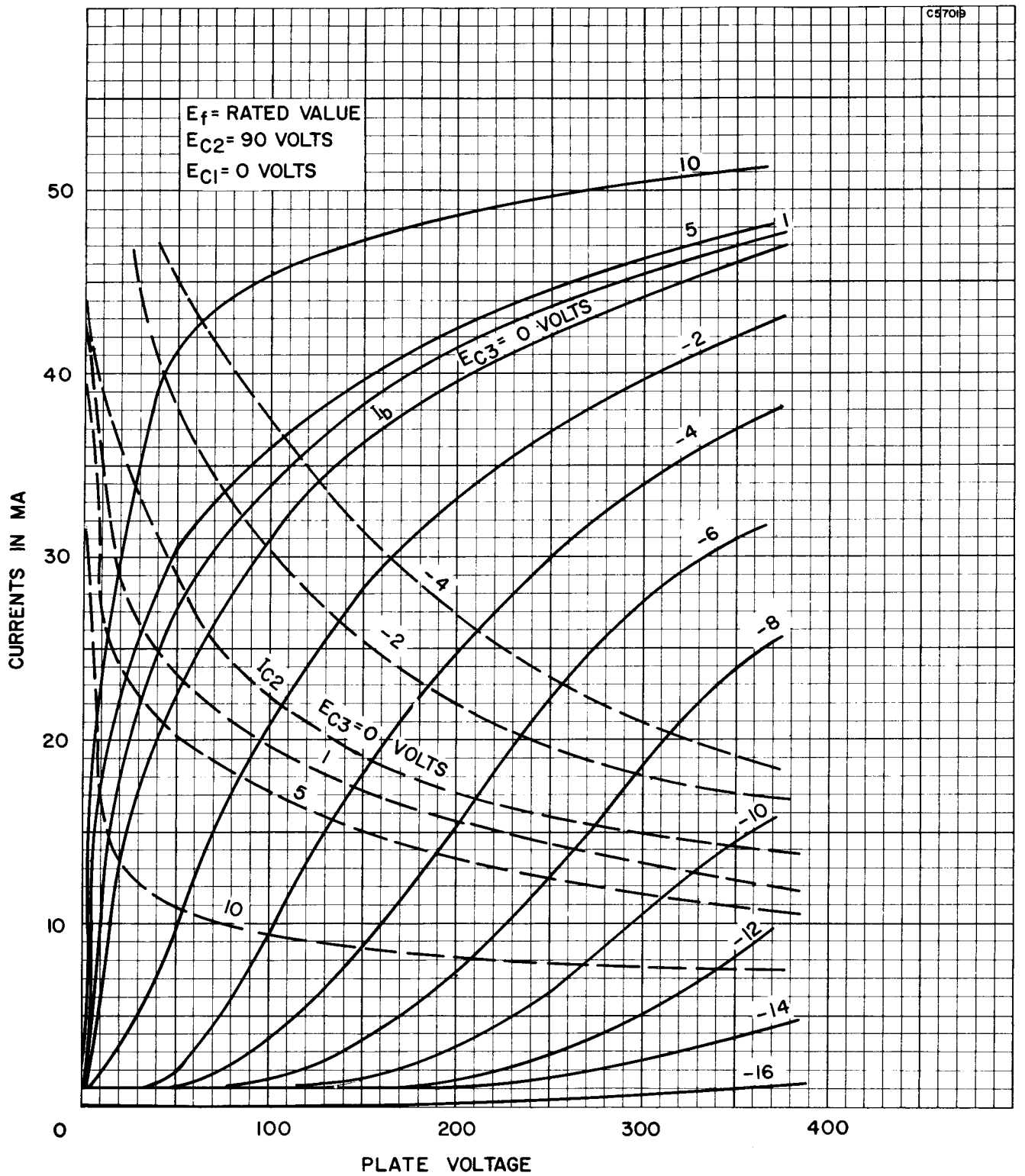
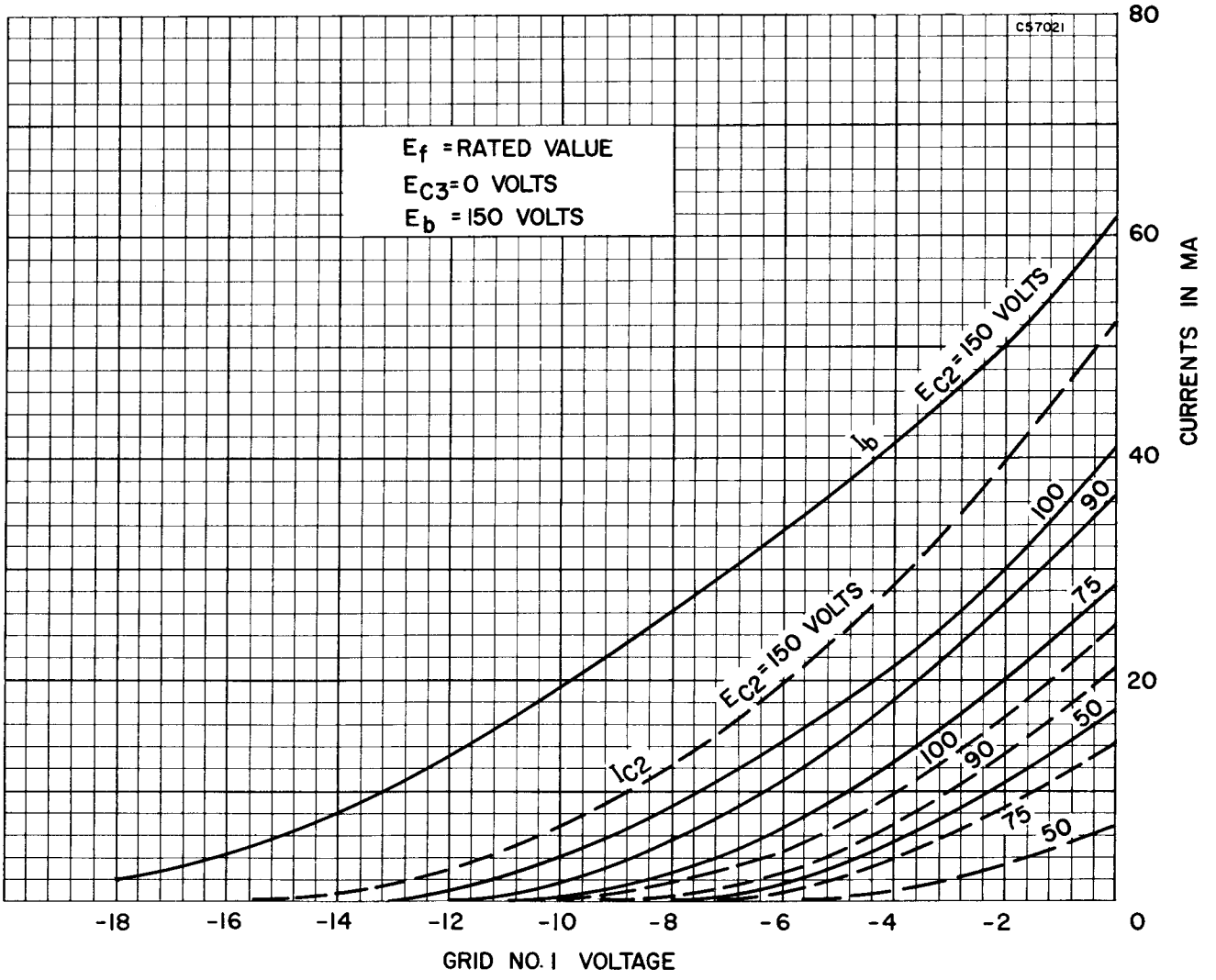


AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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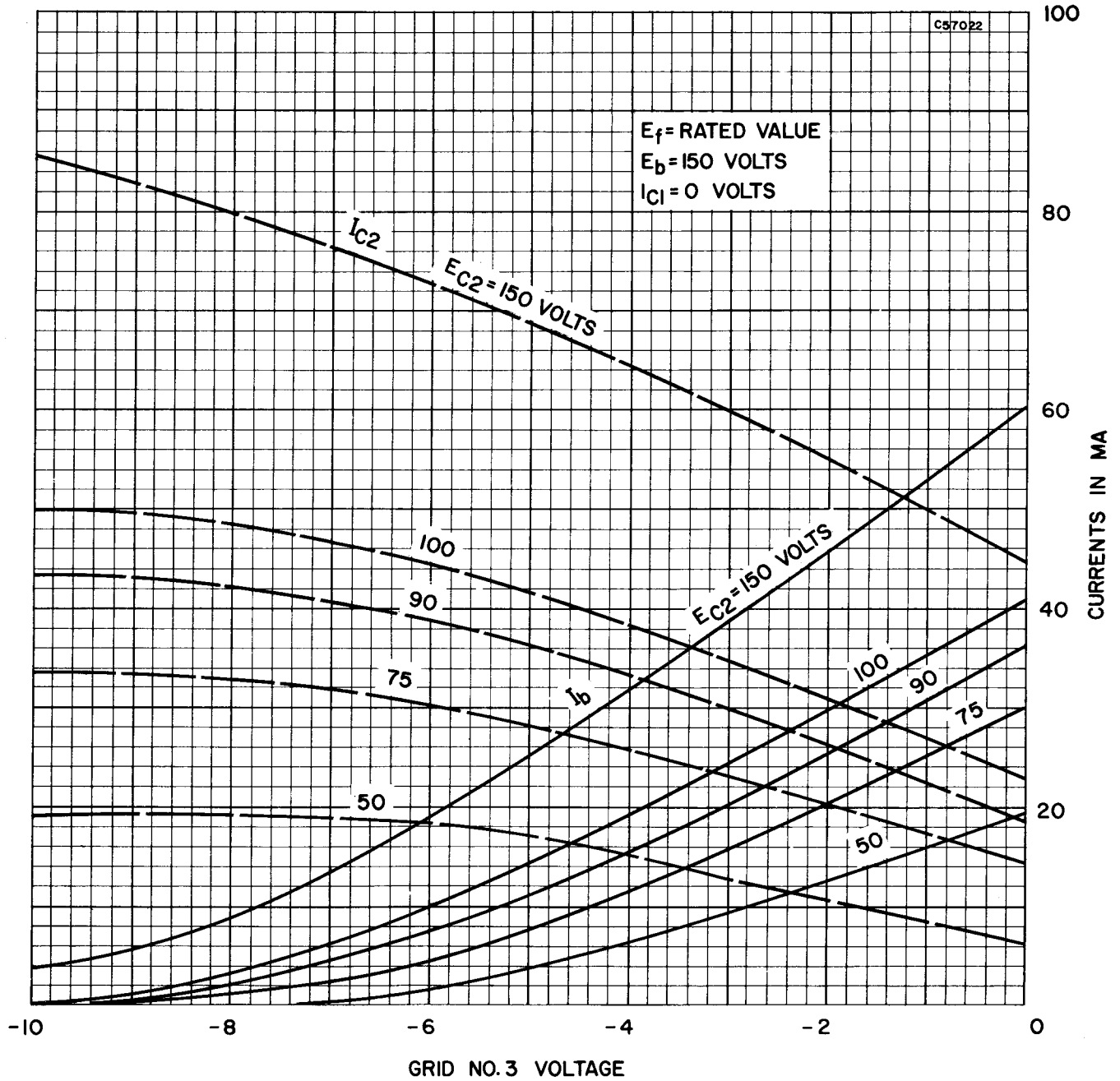

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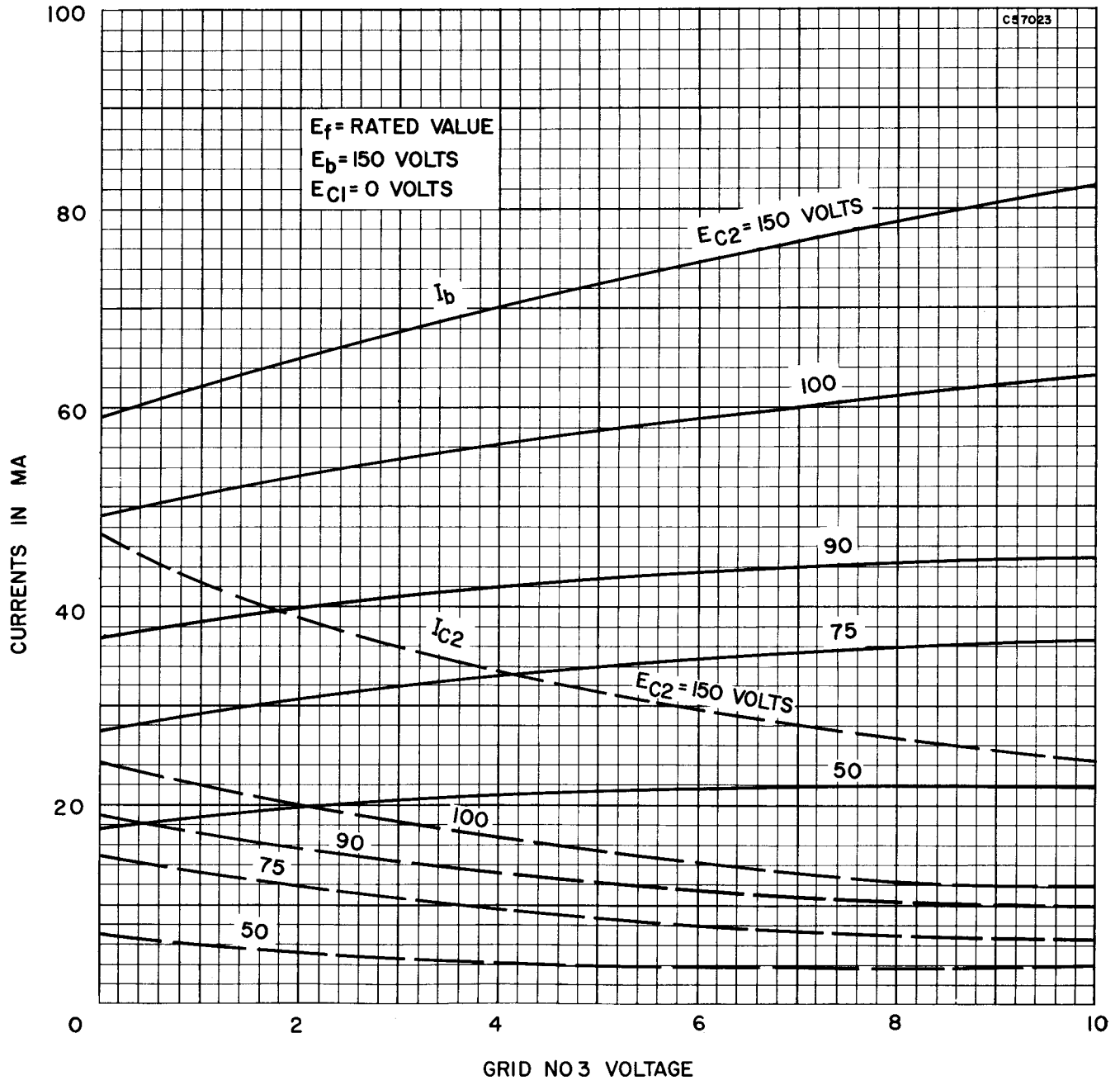
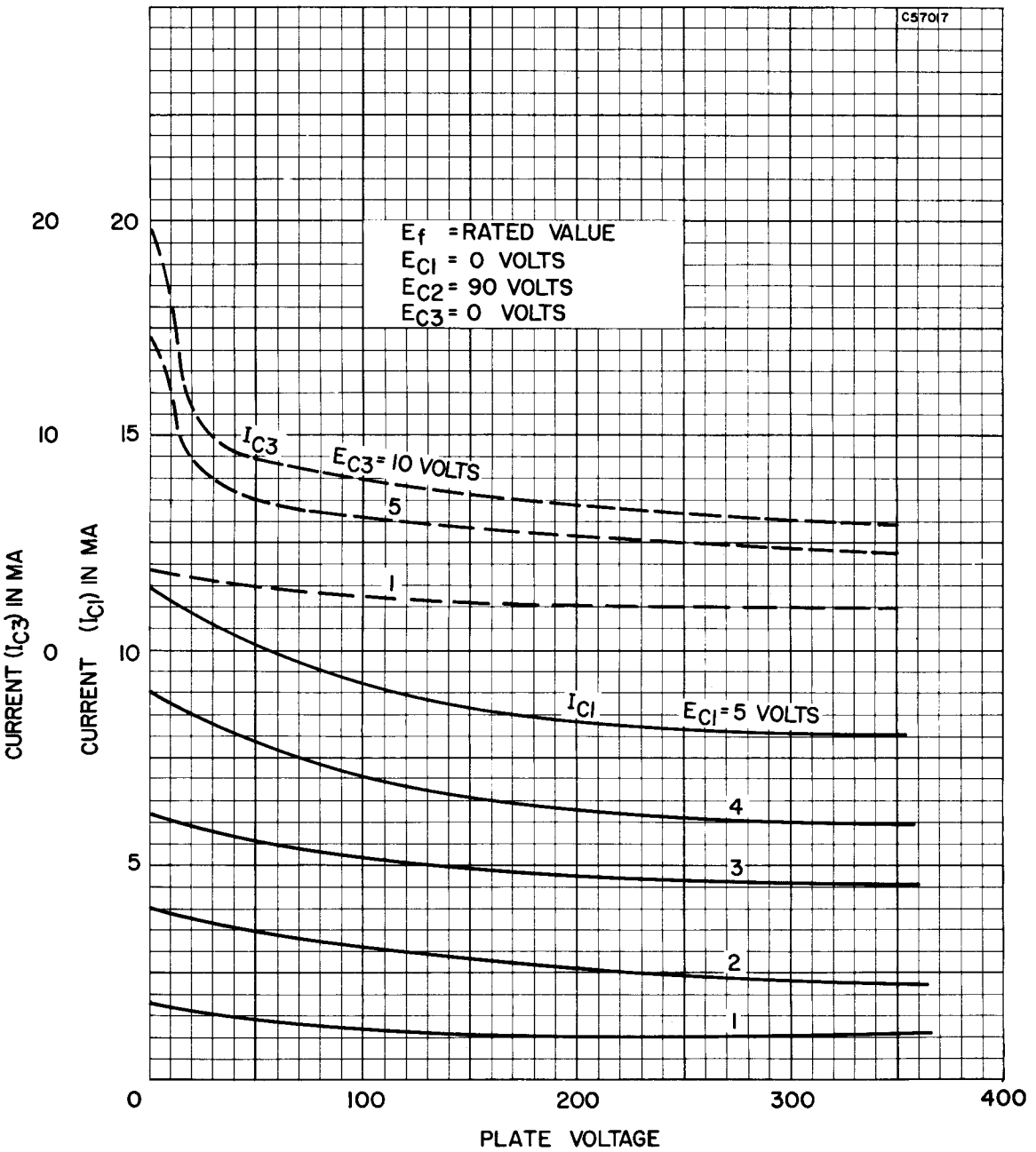


AVERAGE CHARACTERISTICS



SYLVANIA

engineering data service

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6902

ADVANCE DATA

MECHANICAL DATA

Dimensions	Per Outline
Envelope	Metal Capsule
Base	Octal Plug
Basing	Per Outline
Cathode	Philips Impregnated
Focusing Field	Electromagnet
Magnetic Field Strength	1000 Gauss
Length of Magnetic Field	7 inches
Mounting Position	Any
Connector	UG-595/U
Weight (1)	1 lb. approx.
Cooling	Forced Air

ELECTRICAL DATA

MAXIMUM RATINGS (Absolute Values) (2)

Heater Voltage	12.0 ±5%	volts
Maximum Heater Cathode Voltage	0	volts
Maximum Accelerator Voltage	2000	volts
Maximum Accelerator Current	5	milliamperes
Maximum Helix Voltage	2000	volts
Maximum Helix Current	2	milliamperes
Maximum Collector Voltage	2100	volts
Maximum Collector Dissipation	25	watts
Maximum Focusing Electrode Voltage	±50	volts
Maximum Helix Voltage to Ground	2000	volts

TYPICAL OPERATING CONDITIONS (3)

Heater Voltage	12.0	volts
Heater Current	1.2	amperes
Focus Electrode Voltage	0	volts d.c.
Gun Anode Voltage	500	volts d.c.
Accelerator Voltage	500-2000	volts d.c.
Helix Voltage	500-2000	volts d.c.
Collector Voltage (4)	590-2090	volts d.c.
Cathode Current	12	milliamperes
Helix Current	0.5	milliamperes
Collector Current	10	milliamperes
Maximum Power Output	100	milliwatts
Minimum Power Output	10	milliwatts
Tuning Sensitivity		
Center Frequency	6.4	Mc/volt
Maximum	11.2	Mc/volt

from JETEC release #1907, April 22, 1957

QUICK REFERENCE DATA

The Sylvania type 6902 is a Backward Wave Oscillator designed for voltage tunable service over the frequency range 17500-27000 megacycles with a power output of 10-100 mW.

SYLVANIA ELECTRIC PRODUCTS INC.

SPECIAL TUBE OPERATIONS
WOBURN, MASS.

Prepared and Released by The

PRODUCT DEVELOPMENT LABORATORY
KEW GARDENS, N.Y.
4 FEBRUARY 1957

NOTES:

1. Magnet not included, information on request.

2. Voltages given with respect to the cathode.

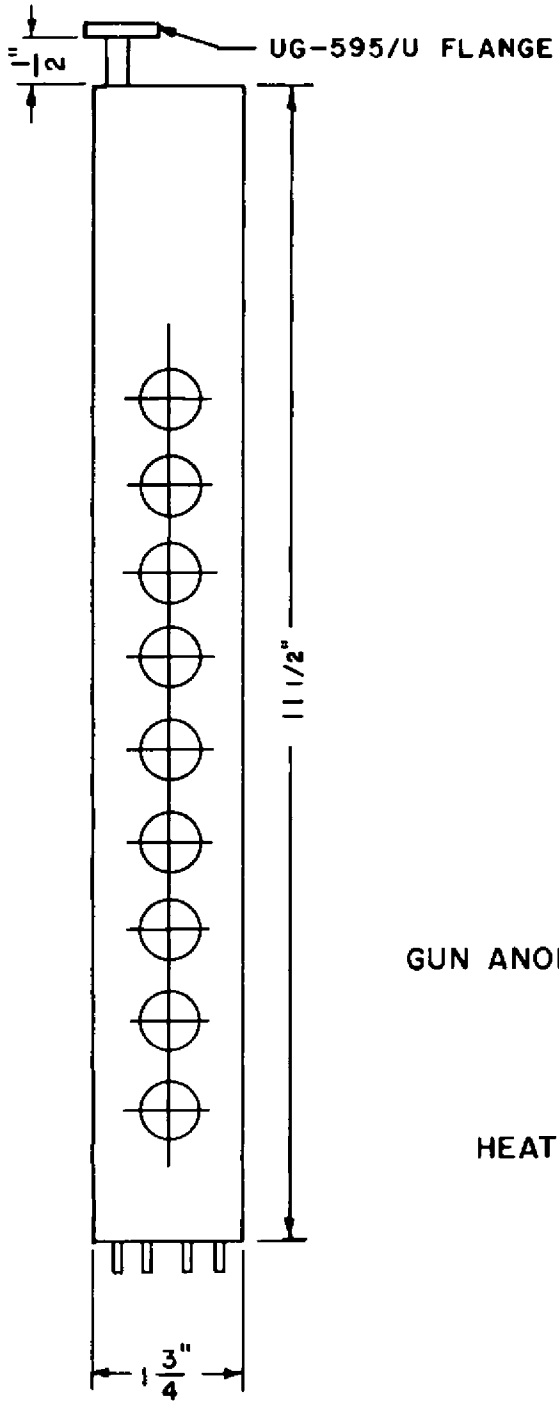
3. Voltages given with respect to the cathode. The tube operated with the helix connected to the accelerator. One side of the heater should be tied to the cathode. Either accelerator or cathode may be grounded.

4. Collector is 90 volts positive with respect to the accelerator.

TUBE TYPE 6902

OUTLINE AND BASING DIAGRAM

17.5 – 27 K.M.C. – B.W.O.



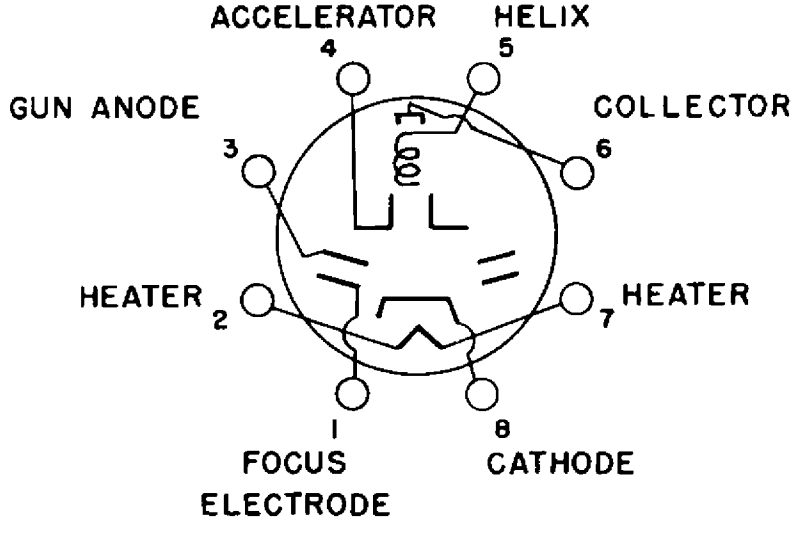
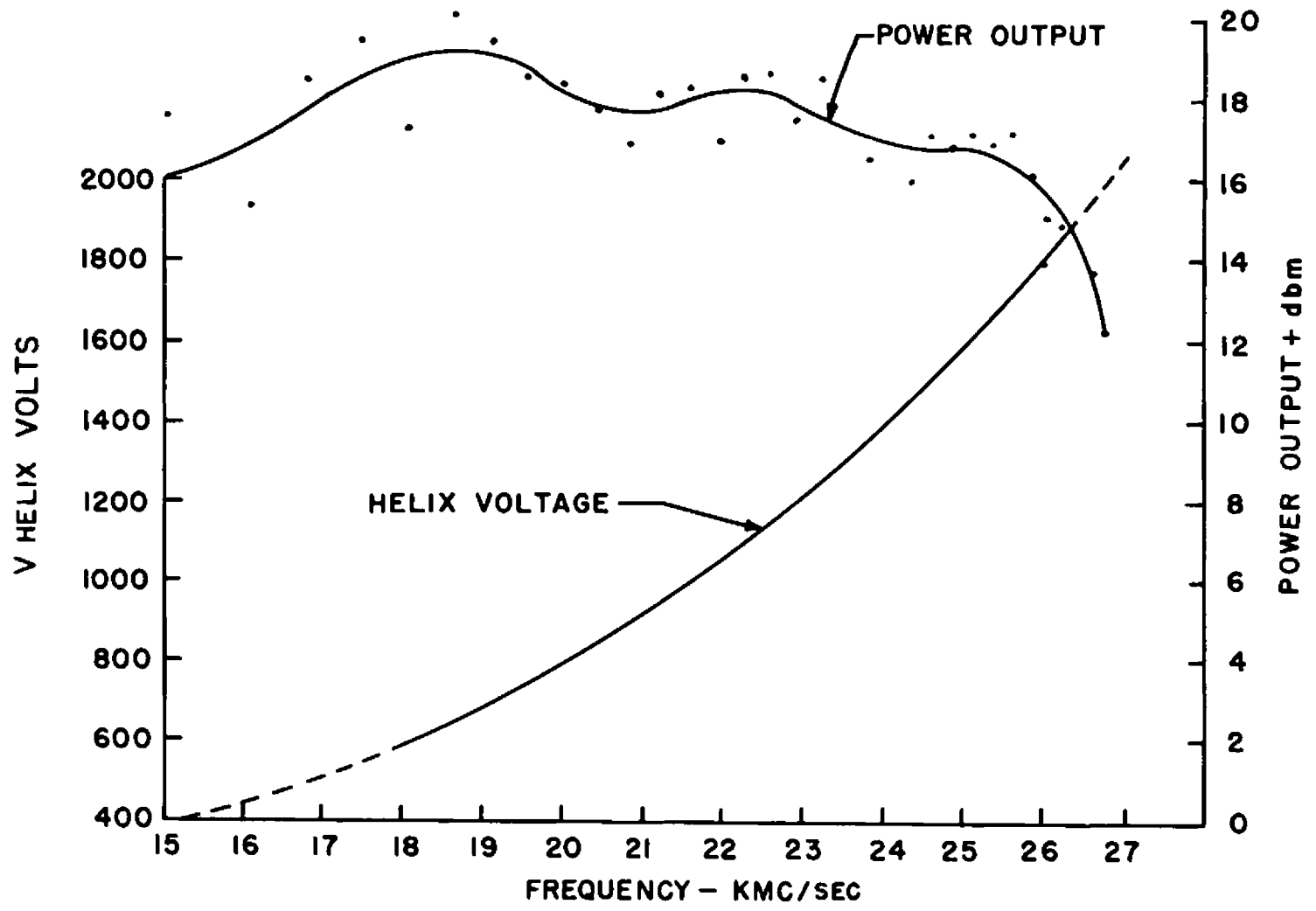


FIG. 1

SYLVANIA ELECTRIC PROD. INC.
4 FEBRUARY, 1957

SYLVANIA 6902

POWER OUTPUT AND HELIX VOLTAGE VS. FREQUENCY



SYLVANIA ELECTRIC PROD. INC.
4 FEBRUARY, 1957

MECHANICAL DATA

Bulb	T-9
Base	Octal
Outline	See Drawing
Basing	See Drawing
Output Cathodes	No. 0, 5, 8, and 9
Zero Position	No. 0 Cathode Aligned with Pin No. 6 ± 10°
Mounting Position	Any

ELECTRICAL DATA

INTERELECTRODE CAPACITANCES (Approx.)

Any Cathode to All Other Elements	4.2 pf
Guide No. 2 to All Other Elements	10 pf
Guide No. 1 to All Other Elements	11 pf

RATINGS (Absolute Values)

	Min.	Max.
Anode Supply Voltage[1]	400	800 Volts
Voltage Between Electrodes (Other than Anode)	—	140 Volts
Transfer Voltage	35	140 Volts
Anode Current	0.6	0.8 Ma
Input Frequency	0	100 Kpps
Ambient Temperature	−55	+60 °C

TYPICAL OPERATING CHARACTERISTICS

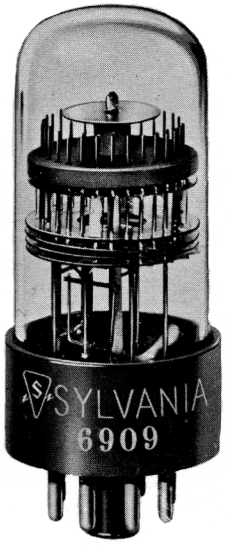
Anode Supply Voltage[1]	400 Volts	
Nominal Tube Drop	235 Volts	
Guide Bias	+45 Volts	Min.
Square Double Pulse Drive Amplitude (Each Pulse)[2]	−85 Volts	Min.
Square Double Pulse Width (Each Pulse)[2]	4 μSec.	Min.
Forced Reset Pulse Amplitude	−120 Volts	Min.
Forced Reset Pulse Width	4 μSec.	Min.
Cathode Load Resistor[3]	50 K-Ohms	Max.

NOTES:

1. *A value for the anode resistor can be computed by subtracting the nominal tube drop from the supply voltage and dividing the remainder by the desired operating current.*
2. *Two separate pulses, back to back or with slight overlap, must be maintained.*
3. *The peak pulse output voltage can be determined by the IR drop across the chosen cathode resistor.*
4. *A counter tube brochure is available on request from Sylvania Electric Products Inc., 1100 Main Street, Buffalo 9, New York.*

QUICK REFERENCE DATA

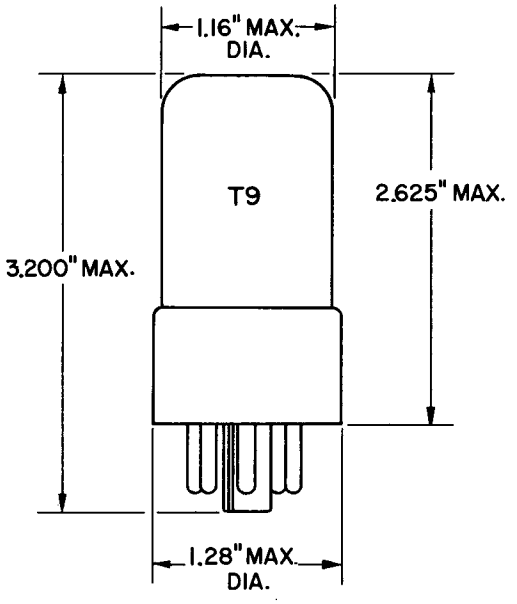
The Type 6909 is a cold cathode, bidirectional decade counter tube with top viewed readout. It is designed to operate at inputs up to 100,000 pulses per second. Cathodes No. 0, 5, 8, and 9 are brought out to individual base pins. Applications include computing, scaling, counting, frequency dividing, coding, modulating, matrixing, indexing, multiplexing, addition and subtraction. (See Note 4.)



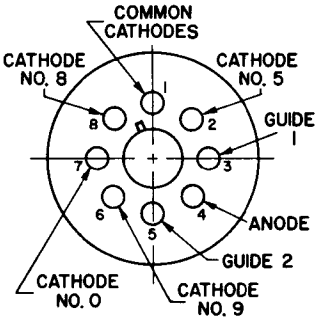
SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.
Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
DECEMBER, 1963

File Under
SPECIAL PURPOSE
ELECTRONIC TUBES

OUTLINE



BASE CONNECTIONS



MECHANICAL DATA

Bulb	T-11
Base[1]	Modified Duodecal
Outline	See Drawing
Basing	See Drawing
Output Cathodes	No. 0 thru 9
Zero Position	No. 0 Cathode Aligned with Pin No. 12 ± 10°
Mounting Position	Any

ELECTRICAL DATA

INTERELECTRODE CAPACITANCES (Approx.)

Any Cathode to All Other Elements	4.2 pf
Guide No. 2 to All Other Elements	10 pf
Guide No. 1 to All Other Elements	11 pf

RATINGS (Absolute Values)

	Min.	Max.
Anode Supply Voltage[2]	400	800 Volts
Voltage Between Electrodes (Other than Anode)	—	140 Volts
Transfer Voltage	35	140 Volts
Anode Current	0.6	0.8 Ma
Input Frequency	0	100 Kpps
Ambient Temperature	−55	+60 °C

TYPICAL OPERATING CHARACTERISTICS

Anode Supply Voltage[2]	400 Volts	
Nominal Tube Drop	235 Volts	
Guide Bias	+45 Volts	Min.
Square Double Pulse Drive Amplitude (Each Pulse)[3]	−85 Volts	Min.
Square Double Pulse Width (Each Pulse)[3]	4 μSec.	Min.
Forced Reset Pulse Amplitude	−120 Volts	Min.
Forced Reset Pulse Width	4 μSec.	Min.
Cathode Load Resistor[4]	50 K-Ohms	Max.

NOTES:

1. *Sockets are available from Sylvania Electric Products Inc., 1035 Westminster, Williamsport, Pennsylvania. (Part No. 7460-0008)*
2. *A value for the anode resistor can be computed by subtracting the nominal tube drop from the supply voltage and dividing the remainder by the desired operating current.*
3. *Two separate pulses, back to back or with slight overlap, must be maintained.*
4. *The peak pulse output voltage can be determined by the IR drop across the chosen cathode resistor.*
5. *A counter tube brochure is available on request from Sylvania Electric Products Inc., 1100 Main Street, Buffalo 9, New York.*

QUICK REFERENCE DATA

The Type 6910 is a cold cathode, bidirectional decade counter tube with top viewed readout. It is designed to operate at inputs up to 100,000 pulses per second. All 10 cathodes are brought out to individual base pins. Applications include computing, scaling, counting, frequency dividing, coding, modulating, matrixing, indexing, multiplexing, addition and subtraction. (See Note 5.)



SYLVANIA
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RECEIVING TUBE
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EMPORIUM, PA.

Prepared and Released By The
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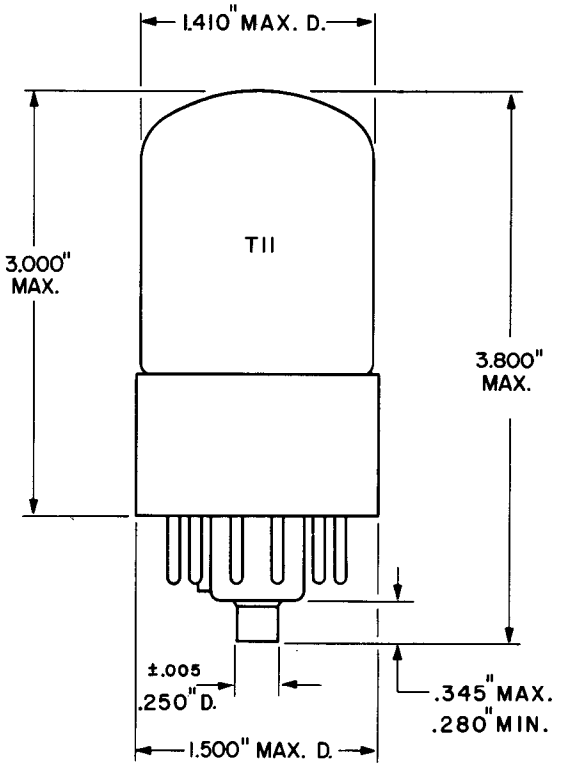
EMPORIUM, PENNSYLVANIA

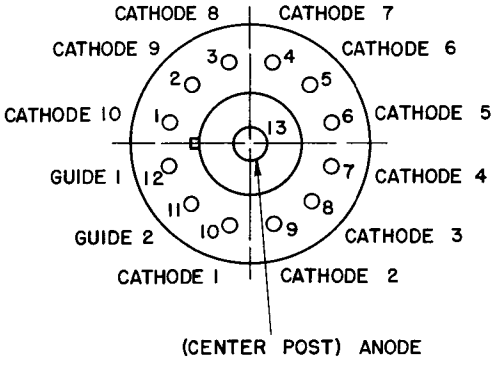
DECEMBER, 1963

File Under
SPECIAL PURPOSE
ELECTRONIC TUBES

OUTLINE



BASE CONNECTIONS



SYLVANIA

engineering data service

6913

ADVANCE DATA

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button, 9-Pin
Outline	6-3
Basing	9A
Cathode	Coated Unipotential
Mounting Position	
Preferred	upright, or with plate majors in a vertical position
Permissible	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage ± 5% (Series/Parallel)	12.6/6.3	Volts	
Heater Current (Series/Parallel)	300/600	Ma	
Heater Power (Series/Parallel)	3.8/3.8	Watts	
Heater-Cathode Voltage (Design Center Values)			
Heater Negative with Respect to Cathode			
Total DC and Peak	200	Volts	Max.
Heater Positive with Respect to Cathode[1]			
DC	100	Volts	Max.
Total DC and Peak	200	Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Each Section) Unshielded

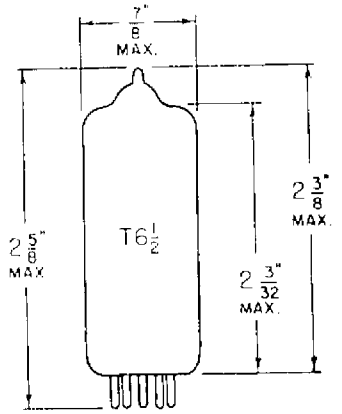
Grid to Plate (g to p)	3.4	µµf	
Input: (g to h ⋄ k)	3.6	µµf	
Output: (p to h ⋄ k)	0.50	µµf	
Grid No. 1 to Grid No. 2 (g1 to g2)	0.30	µµf	Max.
Plate No. 1 to Plate No. 2 (p1 to p2)	1.40	µµf	Max.
Heater to Cathode (h to k)	5.0	µµf	

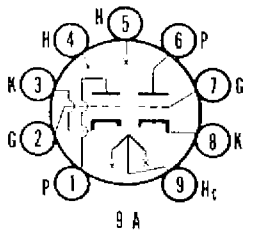
RATINGS (Design Center Values-Except as Noted)

Plate Voltage (dc)	300	Volts	Max.
Peak Plate Voltage (Abs. Max.)[2]	1000	Volts	
Negative DC Grid Voltage	75	Volts	Max.
Positive DC Grid Voltage	3.5	Volts	Max.
Peak Negative Grid Voltage	400	Volts	Max.
Peak Positive Grid Voltage[2]	13	Volts	Max.
Average Positive Grid Current	5	Ma	Max.
Peak Positive Grid Current[2]	100	Ma	Max.
Average Cathode Current	25	Ma	Max.
Peak Cathode Current[2]	300	Ma	Max.
Plate Dissipation/Plate	3.5	Watts	Max.
Total Plate Dissipation	7.0	Watts	Max.
Bulb Temperature	120	°C	Max.
Grid Circuit Resistance			
Fixed Bias	0.1	Megohm	Max.
Cathode Bias	0.5	Megohm	Max.

QUICK REFERENCE DATA

The Sylvania Type 6913 is a miniature T-6½, twin triode designed for use in high speed digital computers. Each section of the 6913 features a high zero bias plate current, sharp cutoff and a separate cathode connection.





9 A

SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

July 31, 1956

CHARACTERISTICS (Each Section)[3]

Heater Voltage	12.6	Volts	
Plate Voltage	150	Volts	
Grid Voltage	-5.0	Volts	
Plate Current	11.0	Ma	
Transconductance	4600	µmhos	
Amplification Factor	18		
Plate Resistance (Approx.)	3900	Ohms	
Grid Voltage for Ib = 100 µa[4]	-11	Volts	(Approx.)
Grid Voltage for Ib = 1.0 Ma[5]	-12	Volts	(Approx.)

Interelectrode Resistance (Each Section)[3]

Plate to All (Min.)	50	Megohms
Grid to All (Min.)	50	Megohms

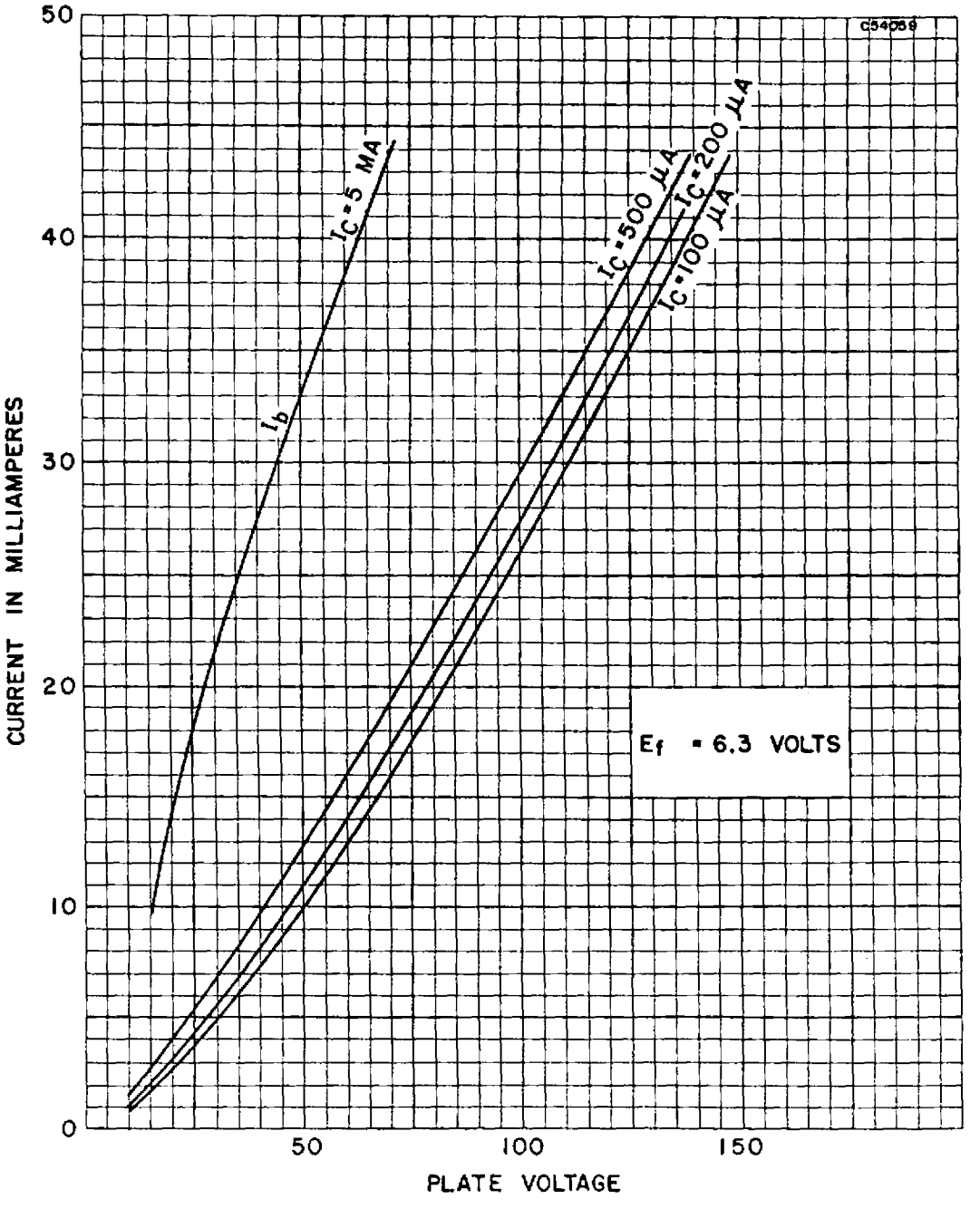
Time Dependant Characteristics

Minimum Number of Heater Cycles	2000	
Regulation of Heater Supply (Max.)	4	%
Heater Voltage (AC)	7.0	Volts
Heater Cathode Voltage (AC)	140	Volts

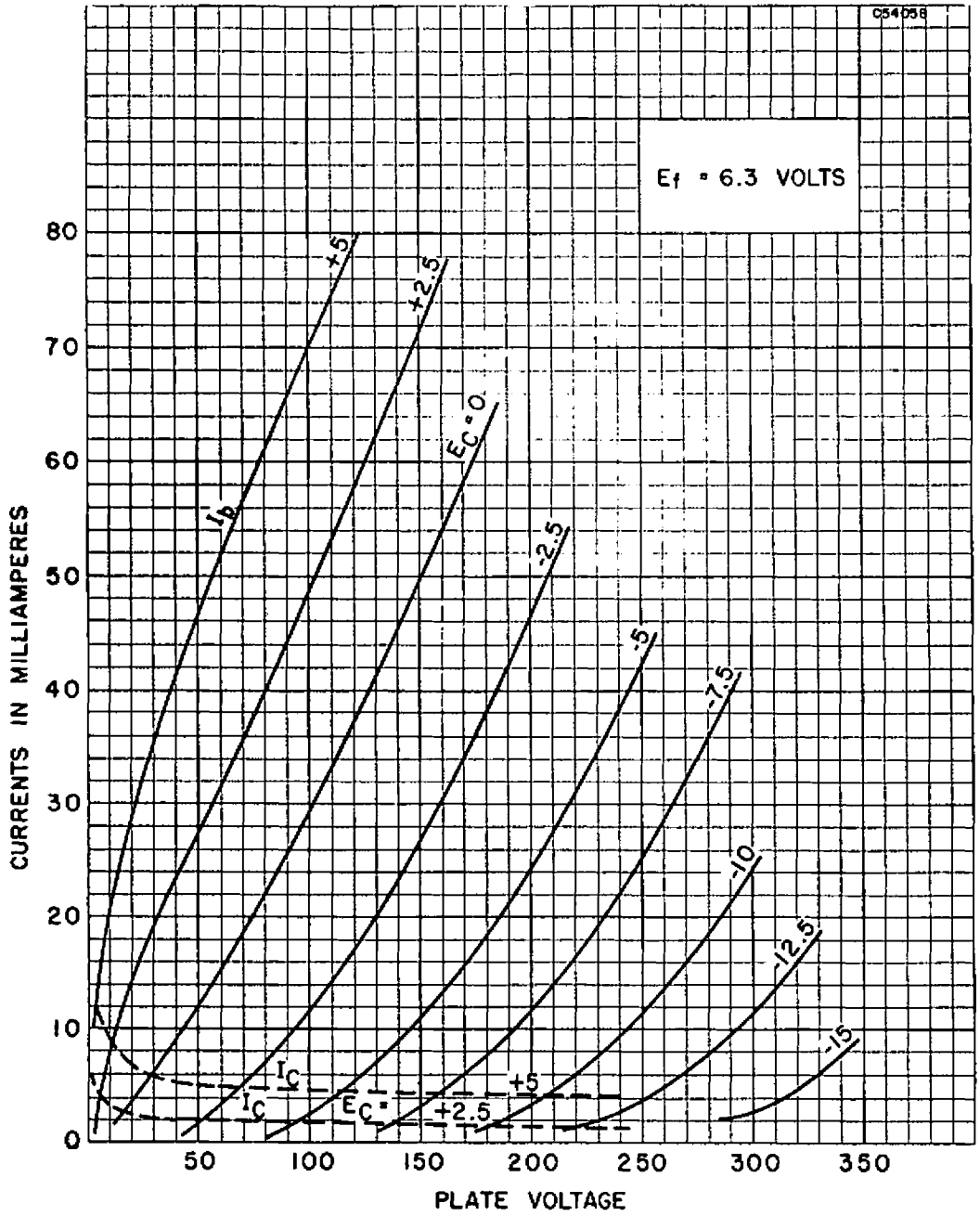
NOTES:

1. Heater Positive is not recommended for reliable operation.
2. At 8% duty cycle, 1 megacycle repetition rate.
3. Section not under test shall be grounded.
4. With plate voltage of 150 volts.
5. With plate voltage of 200 volts.
6. With applied dc voltage of 300 volts and heater voltage of 6.3 volts. Cathode Positive so that no cathode emission occurs.

AVERAGE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS
EACH SECTION



SYLVANIA GUIDED MISSILE TUBES

6943

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-11
Basing	8DC
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature	250 °C	
Altitude[2]	80,000 Ft.	
Radiation		
Total Dosage (*S* neutrons/sq. cm/sec.)	10^{16} nvt	
Dose Rate (neutrons/sq. cm/sec.)	10^{12} nv	

DURABILITY CHARACTERISTICS

Impact Acceleration (¾ msec Duration)	450 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)	10 G	Max.

FAILURE RATE RATING

Class (1) — Inoperatives	1.3%/200 Hours
Class (2) — All End Points	5.4%/200 Hours
Class (3) — All End Points	2.7%/200 Hours

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	6.3 V
Heater Current	175 mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[4]

Grid No. 1 to Plate	0.015 μμf	Max.
Input	3.0 μμf	
Output	3.0 μμf	

RATINGS[1] (Absolute Maximum)

Heater Voltage[3]	6.3 (−12, + 10%) V
Plate Voltage	250 Vdc
Peak-Plate Forward Voltage[5]	360 v
Grid No. 3 Voltage	
Positive Value	0 Vdc
Negative Value	20 Vdc
Grid No. 2 Voltage	150 Vdc
Plate Dissipation	1.0 W
Grid No. 2 Dissipation	0.33 W
Cathode Current	15 mAdc
Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid No. 1 Circuit Resistance	1.0 Meg

CHARACTERISTICS

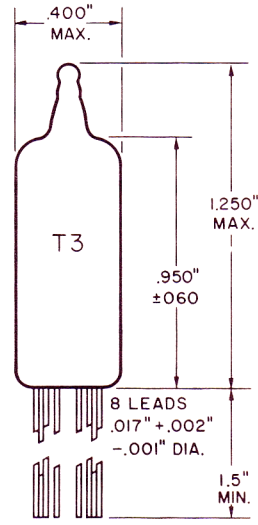
Plate Voltage	100 Vdc
Grid No. 3 Voltage	0 Vdc
Grid No. 2 Voltage	100 Vdc
Cathode Resistor	150 Ohms
Plate Current	8.0 mAdc
Grid No. 2 Current	2.3 mAdc
Transconductance	3600 μmhos
Plate Resistance	300,000 Ohms
Grid No. 1 Voltage for Ib = 100 μAdc Max.	−7.5 Vdc

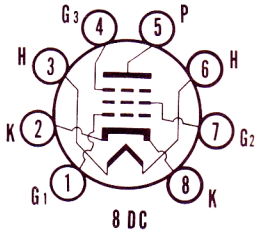
QUICK REFERENCE DATA

The Sylvania Premium Subminiature Type 6943 is a sharp-cutoff RF pentode designed specifically for guided missile service.

This type is characterized by extraordinary freedom from interelement short circuits of short term duration, by high resistance to interelement leakage, and by stable performance. It is designed for service at high altitudes and where severe conditions of mechanical shock, vibration and high temperature are encountered.

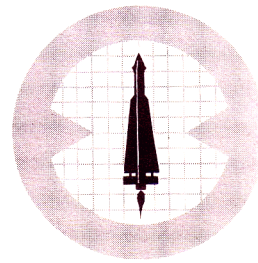
The 6943 is manufactured and inspected to meet the applicable specification for reliable operation.





sylvania electronic tubes

A Division of
Sylvania Electric Products Inc.



6943

NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltage (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts. The Min. and Max. values are 5.5 and 6.9 volts respectively.*
4. *External shield No. 318 connected to cathode.*
5. *MIL-E-1D Par. 6.5.1.1 does not apply. Peak voltages shown should not be exceeded.*

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Grid No. 2 Voltage	100 Vdc
Plate Voltage	100 Vdc	Heater-Cathode Voltage MIL-E-1 Par. 3.2.26.1	0 V
Grid No. 1 Voltage	0 V	Cathode Resistor	150 Ohms
Grid No. 3 Voltage, MIL-E-1 Par. 3.2.26.1	0 V		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1.

MIL-E-1 Ref.	Test	AQL (%)	Limits — Note 2 Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 1, Note 1								
4.10.8	Heater Current	0.65	165	—	175	—	185	mA
4.10.15	Heater-Cathode Leakage	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid Current: Ic1 Eb = Ec2 = 125 Vdc; Ec1 = −2.5 Vdc; Rk = 0; Rg1 = 1.0 Meg	0.65	0	—	—	—	−0.1	μAdc
4.10.4.1	Plate Current (1): ALD = 1.7	—	—	7.2	8.0	8.8	—	mAdc
4.10.4.1	Plate Current (1):	0.65	6.0	—	—	—	10.0	mAdc
4.10.4.1	Plate Current (2): Ec1 = −7.5 Vdc; Rk = 0 Ohms	0.65	—	—	—	—	100	μAdc
4.10.4.3	Screen Grid Current: Ic2	0.65	—	—	2.3	—	3.6	mAdc
4.10.9	Transconductance (1): ALD = 700 Sm	—	—	3300	3600	3900	—	μmhos
4.10.9	Transconductance (1): Sm	0.65	2800	—	—	—	4400	μmhos
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
----	Suppressor: Tie Grid No. 2 to Plate	0.4	—	—	—	—	—	
4.9.1.1	Mechanical: Envelope JEDEC 3-11	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes	2.5	—	—	—	—	—	
	Eg1-all = −100 V	—	500	—	—	—	—	Meg
	Ep-all = −300 V	—	500	—	—	—	—	Meg
	Eg2-all = −200 V	—	500	—	—	—	—	Meg
4.10.9	Transconductance (2): Δ Sm Ef = 5.5 V	2.5	—	—	—	—	15	%
4.10.4.1	Plate Current (3): Ec1 = −5.5 Vdc; Rk = 0 Ohms	2.5	5	—	—	—	—	μAdc
4.10.6.2	Grid Emission: Notes 3 and 4 Ic1 Ef = 7.5 V; Ec1 = −7.5 Vdc; Rg1 = 1.0 Meg; Rk = 0 Ohms	2.5	0	—	—	—	−0.5	μAdc
4.10.3.2	AF Noise: Note 5 Esig (Cal.) = 70 mVac; Ec2 = 19 Vdc; Rg1 = 0.1 Meg; Rg2 = 1000 Ohms; Rp = 0.2 Meg; Ck = 1000 μf	2.5	—	—	—	—	—	
----	Hum: Note 6 Ef = 6.3 Vac @ 400 cps; Eb = Ec1 = Ec2 = Ec3 = 0; Rk = 10,000 Ohms	2.5	—	—	—	—	15	mv pk-pk
----	Operation Time: Note 7	6.5	—	—	—	—	20	Secs
4.10.10	Plate Resistance	6.5	0.20	—	0.30	—	—	Meg
4.10.14	Capacitances: Shield No. 318	6.5	—	—	—	—	—	
	Cg1p	—	—	—	—	—	0.015	μμf
	Cin	—	2.2	—	3.0	—	3.8	μμf
	Cout	—	2.2	—	3.0	—	3.8	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Note 8 Pressure = 21 ± 2 mm Hg; Voltage = 300 Vac	6.5	—	—	—	—	—	
4.9.19.1	Vibration (1): RP = 10,000 Ohms; Ck = 1000 μf; F = 40 cps; G = 10	1.0	—	—	—	—	40	mVac
----	White Noise Vibration: Notes 9 & 10 Rp = 10,000 Ohms; Ck = 100 μf	2.5	—	—	—	150	300	mv pk-pk
	Peak Acceleration = 15 G	2.5	—	—	—	20	40	mVac

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits — Note 2 Min.	LAL	Bogey	UAL	Max.	Units
	Degradation Rate Acceptance Tests, Note 4							
4.9.5.3	Subminiature Lead Fatigue	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Note 11							
	Hammer Angle = 30°	20	—	—	—	—	—	
4.9.20.6	Fatigue: Notes 8 and 12							
	G = 10; Variable Frequency	6.5	6	—	—	—	—	Hours
----	Post Shock and Fatigue Test End Points:							
	Vibration (1):	—	—	—	—	—	120	mVac
	Heater-Cathode Leakage							
	Ehk = ±100 Vdc	—	—	—	—	—	15	μAdc
	Change in Transconductance (1) of							
	Individual Tubes △ Sm	—	—	—	—	—	15	%
4.9.6.3	Glass Strain	4.0	—	—	—	—	—	
	Acceptance Life Tests, Note 4							
4.11.7	Heater Cycling Life Test (1): (2000 Cycles Min.) Note 13 Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec1 = Ec3 = Ec2 = Eb = 0 V	2.5	—	—	—	—	—	
4.11.7	Heater Cycling Life Test (2): (300 Cycles Min.) Note 13 Ef = 10 V; Ehk = +200 Vdc; Rhk = 0; 10 secs on, 4 min. off; Eb = Ec1 = Ec2 = 0	10.0	—	—	—	—	—	
4.11.3.1	Stability Life Test: Note 14 Eb = 250 Vdc; Ec2 = 150 Vdc; Rk = 1000 Ohms; Ehk = +200 Vdc; Rg1 = 1.0 Meg; TA = Room	—	—	—	—	—	—	
4.11.4	Stability Life Test End Points:							
	Change in Transconductance (1) of							
	Individual Tubes △ Sm	1.0	—	—	—	—	15	%
4.11.3.1	Survival Rate Life Test: (100 Hours) Note 15 Ebb = 250 Vdc; Tie Grid No. 2 to Plate; Rk = 470 Ohms; Rp = 15,000 Ohms; Rg = 1.0 Meg; TA = Room	—	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points:							
	Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	—	
	Transconductance (1)	1.0	2400	—	—	—	—	μmhos
	Grid Current	2.5	0	—	—	—	−0.1	μAdc
	Heater-Cathode Current: Ihk	0.65	—	—	—	—	10	μAdc
	Electrode Insulation:	6.5	—	—	—	—	—	
	Rg1-all	—	200	—	—	—	—	Meg
	Rg2-all	—	200	—	—	—	—	Meg
	Rp-all	—	200	—	—	—	—	Meg

MIL-E-1 Ref.	Test	LOT ACCEPTANCE LIMITS (1) MIN.	MAX.	FAILURE RATE CLASS (3) LIMITS MIN.	MAX.	Units
4.11.5	Intermittent Life Test: Notes 16 and 17 Survival Rate life conditions; T Envelope = 250°C Min.	—	—	—	—	
4.11.4	Intermittent Life Test End Points: (200 Hours)					
	Inoperatives: Note 18	—	—	—	—	
	Grid Current	0	−0.5	0	−1.0	μAdc
	Heater Current	165	190	160	195	mA
	Change in Transconductance (1) of					
	Individual Tubes; △ Sm/t	—	20	0	25	%
	Transconductance (2): △ Sm/Ef	—	15	—	25	%
	Heater-Cathode Leakage Ehk = ±100 Vdc	—	10	—	15	μAdc
	Insulation of Electrodes					
	g1-all	200	—	25	—	Megohms
	p-all	200	—	25	—	Megohms
	g2-all	200	—	25	—	Megohms
	Transconductance (1) Average change					
	Avg. △ Sm/t	—	15	—	—	%

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	ALLOWABLE DEFECTIVES
	Acceptance Life Tests, Note 4 (Cont'd.)	
----	Individual Lot Acceptance	
	Total Inoperatives	2
	Total Defectives	5
----	Failure Rate Tests: Note 17	
	Failure Rate Class 1 Inoperatives:	5
	Failure Rate Class 2	
	Combined defectives to Limits (1) Including Inoperatives:	16
	Failure Rate Class 3	
	Combined defectives to F.R. 3 Limits Including Inoperatives	8

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding Inoperatives and Mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: For Variables Sampling Procedure, see MIL-E-1, Appendix C, Paragraph 20.2.4.

3: Prior to this test, tubes shall be preheated for 5 minutes at the conditions indicated below. Test within three seconds after preheating. Three minute test is not permitted. Grid Emission is a destructive test so tubes subjected to it are not to be accepted under this specification, nor are subsequent tests to be performed on the same tubes.

Ef	Eb	Ec1	Ec2	Ec3	Rk/k	Rg1
V	Vdc	Vdc	Vdc	Vdc	ohms	Meg
7.5	250	0	150	0	1000	1.0

4: Destructive Tests: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature Lead Fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater Cycling Life Tests (1) & (2)
4.11.5	Intermittent Life Test
4.10.6.2	Grid Emission

5: The rejection level shall be set at the VU meter reading obtained during calibration.

6: Maximum total distortion of the filament supply voltage shall be 5%. The frequency response of the peak-to-peak measuring device from 20 cps to 5000 cps must be within 0.5 db of its response at 400 cps. Ground all leads except those for the cathodes and heater lead #3. Measure Hum voltage across specified Rk in each cathode separately.

7: Insert a cold tube into the test socket having all Plate Current (1) conditions applied and record Ib continuously for three minutes. Plate Current must reach 85% of the three minute figure within the time indicated.

8: This test shall be conducted on the initial lot and thereafter on a lot approximately every 30 days. In the event of lot failure, the lot shall be rejected and the succeeding lot shall be subjected to this test. Once a lot has passed, the 30-day rule shall apply. MIL-STD-105, Sample Size Code Letter F shall apply.

9: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "WHITE NOISE" spectrum which is free from discontinuities from 100 cps to 5000 cps and such that the RMS value of acceleration for frequencies outside this band shall constitute no more than five percent of the total RMS acceleration. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 ± 0.2 G's RMS acceleration. With this the case, the RMS value of acceleration for any bandwidth within the specified spectrum is equal to:

$$Grms = 2.3 \sqrt{3.32 \log_{10} (f2/f1)}$$

where f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

Half the tubes in the sample shall be vibrated in position X1, the other half in position X2.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (250 Kohms or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 30 db at 13,000 cps. For reading the peak-to-peak value of output voltage, the filter output shall be fed directly to the input of a Ballantine Model 305 peak-to-peak electronic voltmeter or equal, while the RMS value shall be measured with a Hewlett Packard Model 400 C or equal. The impedance of the plate and screen voltage supplies shall not exceed that of a 40 μf capacitor at 10 cps.

10: For variables sampling procedure use MIL-E-1, Appendix C, par. 20.2.4.2.2.

11: A grid resistor of 0.1 meg shall be added; however, this resistor will not be used when a thyratron type short indicator is employed.

12: The tubes shall be rigidly mounted on a table vibrating at a constant acceleration level of 10 G. The frequency of vibration shall be varied from 30 cps to 3000 cps and back to 30 cps, with the period of the sweep cycle being three minutes. The rate of change of frequency with time shall be such that the frequency varies logarithmically with time. The tubes shall be vibrated for a total of six hours, that is, two hours in each of the three positions X1, X2, and Y1. Filament voltage only shall be applied to the tube under test.

13: The no load to steady state full load regulation of the heater voltage supply shall be not more than 3.0%.

14: The sampling and testing procedure for the Stability Life Test shall be in accordance with MIL-E-1, Appendix C, Section 20.2.5.1.

15: For Survival Rate Life Test, the sampling and testing procedure shall be as defined in Sections 20.2.5.2 to 20.2.5.2.5 inclusive of MIL-E-1, Appendix C.

16: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of No. 40B and S, or small diameter elements welded to a ring of 0.025-inch diameter phosphor bronze placed in contact with the envelope. The envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5 percent) under normal conditions, is determined to operate at or above the minimum specified temperature in any socket of the life-test rack.

17: **1.0 Intermittent Life Test Evaluation:** The life test conducted in accordance with this specification shall be evaluated in two separate procedures. The first will be an evaluation on an individual lot basis in a similar manner to the one normally specified for reliable tubes. The second evaluation is the determination of a failure rate and its compliance to this specification.

The life test will be conducted in accordance with MIL-E-1 procedures for reliable tubes except that the sampling plan will be changed from the presently specified double sampling plan

ACCEPTANCE CRITERIA NOTES (Continued)

to a single sampling plan with n = 40. Individual lot acceptance will be based on this sample size and the conformance of the lot to the maximum allowable defectives for inoperatives and also for combined defectives as specified.

2.0 **The Failure Rate Control:**

a. Purpose: It is the purpose of this specification to establish a means by which the Military may monitor and evaluate the failure rate of this tube type in order to provide a statistically valid description of this parameter that may be utilized in computing the reliability of equipments in which this type is used.

b. Description: The failure rates on this type shall be evaluated using the life test information gathered on individual lots. Only those lots that pass the life test criteria for individual lots shall be used in the calculations for failure rates. The failure rate shall be based on a 5 lot moving average with the cumulative number of failures for each failure rate class plotted on their respective failure rate charts (See Charts 1, 2 and 3). Non-conformance of a tube to the 200 hour end points shall be considered a failure.

The failure rate charts consist of a plot of consecutive lots manufactured with each point indicating the cumulative number of failures in the last five lots as evaluated against the specified criteria. In the operation of this procedure, each time a new lot is added, the number of defects from the earliest lot is dropped from the accumulation of defectives so that each plotted point on the chart will represent a total sample size of 200 tubes.

Any lot which fails the individual lot acceptance criteria shall not be included in the cumulations for failure rate charts. However, the number of defectives for such a failing lot should be plotted on the failure rate chart in its chronological order with the other lots. This point is plotted for information only.

c. Qualification: In order to become a qualified source to this specification, it is mandatory that the manufacturer supply data on charts 1, 2 and 3 indicating that his failure rate is within the acceptable limits. A total quantity of 200 tubes life tested for 200 hours is required and this should be representative of two or more consecutively manufactured lots (e.g., 100 tubes from each of 2 lots or 40 from each of 5 lots). In the event more than 40 tubes per lot are used in the life test sample in order to accelerate qualification for failure rate, only the first 40 tubes life tested per lot shall be evaluated for the individual lot acceptance criteria.

d. Maintenance of Failure Rate: When the manufacturer has become a qualified source to this specification and has received proper approval from the Military, those lots utilized for qualification and subsequent lots where the 5 lot moving evaluation failure rate continues within the specification, are to be considered acceptable to this specification and may be marked and shipped accordingly.

e. Non-conformance of Failure Rate: The failure rate will be considered non-conforming when the total number of defectives (for the particular failure rate under evaluation) accumulated from the past 5 lot life test exceeds the number permissible as contained in the specification and on the failure rate chart. The lot of tubes which caused the failure rate limit to be violated shall be considered as acceptable and can be marked and shipped in accordance with this specification. When a failure rate criteria has been violated, the manufacturer has lost qualification to this specification and cannot mark and ship any subsequent lots to this specification without being requalified.

f. Requalification for Failure Rate: Since all three failure rates specified in this specification are computed from the same life test data, a violation of 1 failure rate requires requalification for all three failure rates. Requalification shall follow the same procedure as for original qualification. Starting after the last lot which rendered disqualification, a life test sample of 200 tubes from the next two new consecutive lots will be required to conform to this specification before qualification is reinstated to the manufacturer.

g. Charts: Each manufacturer intending or planning to supply tubes to this specification must forward his qualification data in the form of the three failure rate charts to the Military. These charts must be duly approved and signed by the Resident Government Inspector as representing the factual results of the life tests which were conducted in complete accordance with MIL-E-1 and this specification.

18: An inoperative as referenced in Life Tests shall be defined as a tube having one (1) or more of the following defects: Discontinuity (Ref. 4.7.1), Permanent Shorts (Ref. 4.7.2), Air Leaks (Ref. 4.7.6).

APPLICATION DATA

The Sylvania Premium Subminiature Type 6943 is a sharp-cutoff pentode designed specifically for guided missile service. The 6943 is intended for use as an rf amplifier at frequencies up to approximately 100 mc. It is also well suited to a variety of low-frequency applications.

As the frequency of operation is increased, consideration should be given to the resultant decrease in input resistance, Figure 1. In some applications it may be advantageous to place an unbypassed resistance in the cathode circuit to compensate for the change in input capacitance with bias. This unbypassed resistance reduces the effective gm of the tube by the factor

$$\frac{1}{1 + gm\ Rk\left(\frac{Ib + Ic2}{Ib}\right)}$$

However, it also has the effect of raising the input resistance of the tube under certain operating conditions so that both a net increase in gain and a net decrease in input capacitance change may result. The curves of Figures 2 and 3 illustrate the effect of unbypassed cathode resistance on input resistance and capacitance. The 6943 is particularly well suited to such applications since the suppressor grid may be grounded directly, thus providing greater stability. It should be noted that the suppressor grid is not intended as a control electrode. The external suppressor grid connection also facilitates the possible employment of suppressor grid neutralization techniques*.

Two cathode leads are provided to minimize lead inductance and permit isolation of the input and output circuits.

Resistance-coupled amplifier data is presented in the accompanying table.

This type is characterized by extraordinary freedom from interelement short circuits of short term duration, by high resistance to interelement leakage, and by stable performance. It is designed for service at high altitudes and where severe conditions of mechanical shock, vibration and high temperature are encountered. These characteristics give the type special value in guided missile applications.

Tube durability under extreme vibration for extended periods is assured by more stringent fatigue-testing techniques. Excitation for the fatigue test varies in frequency from 30 cps to 3,000 cps and back to 30 cps. Three minutes are required to sweep through one complete cycle. The sweep-frequency vibration has a constant acceleration level of 10 G in contrast to the 2.5 G level formerly used on most reliable receiving tube types. The sweep-frequency cycle is repeated continuously for two hours in

APPLICATION DATA (Continued)

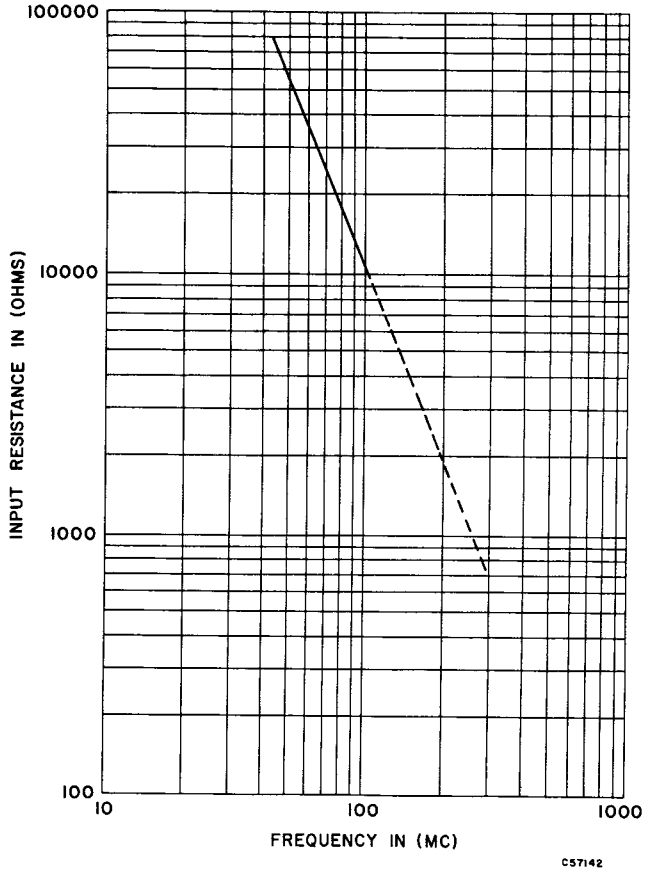


Figure 1—Input resistance vs frequency.

each of three positions, totalling six hours.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A further discussion of the white noise vibration test is included in the frontal section of this manual.

The 6943 is manufactured and inspected to meet the applicable specification for reliability. Life expectancy is described by the life tests, specified on the attached pages. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

When operated under conditions common to on-off control applications, the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

*"A Method of Neutralizing IF Amplifier Tubes at 44 Mc by Means of Suppressor Grid Reaction," Sylvania Engineering Information Service, Vol. 3, No. 1, April 1956.

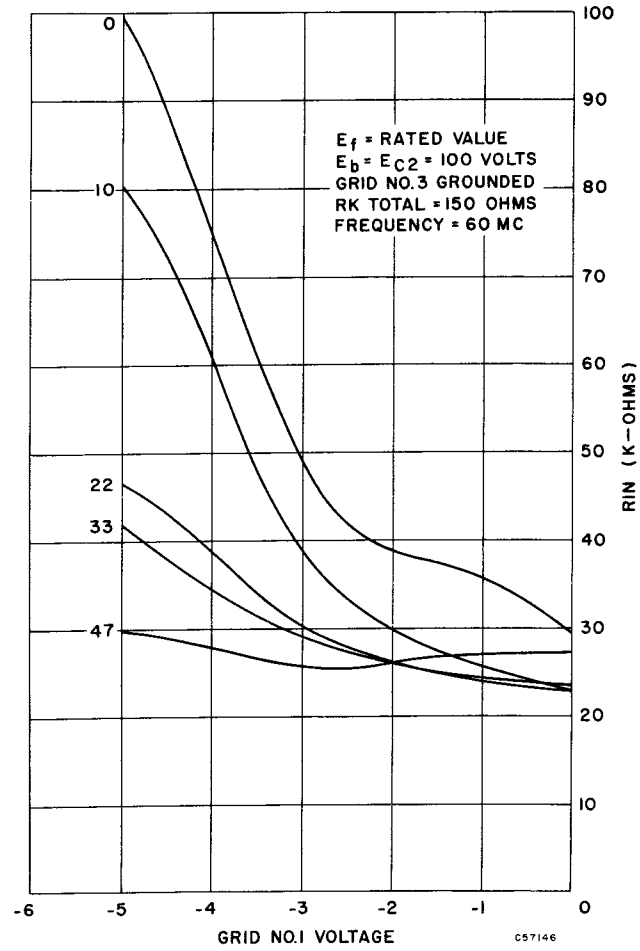


Figure 2—Effect of unbypassing portions of 150-Ohm cathode resistor on input-resistance at 60 mc.

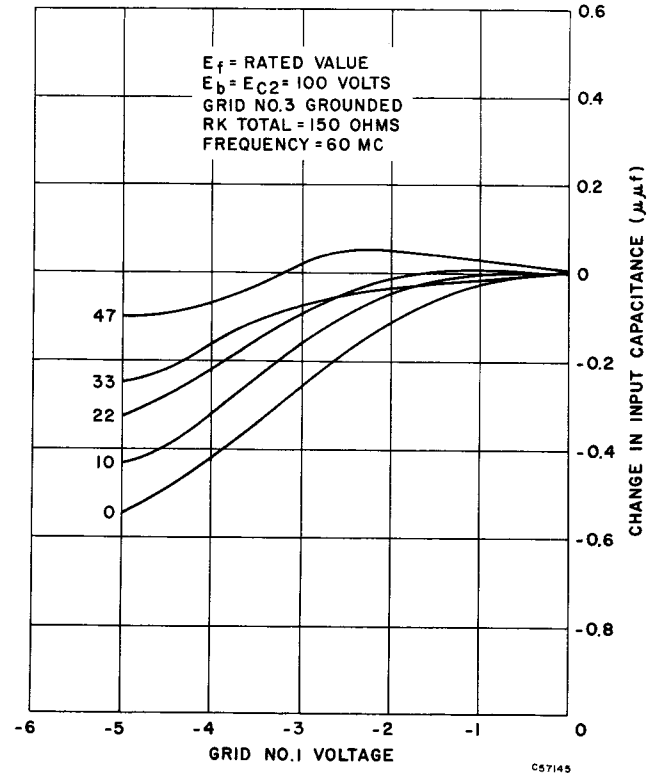
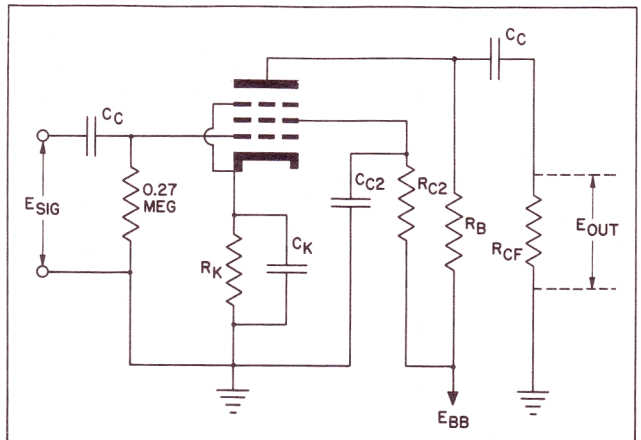


Figure 3—Effect of unbypassing portions of 150-Ohm cathode resistor on input capacitance at 60 mc.

RESISTANCE COUPLED AMPLIFIER DATA

	Ebb = 150 Volts						Ebb = 250 Volts					
Rb (megohms)	.150		.270		0.47		.100		0.150		0.68	
Rc2 (megohms)	.47	.47	.82	.82	1.5	1.5	.33	.33	.56	.56	2.20	2.20
Rcf (megohms)	.27	.47	.47	1.0	.47	1.0	.27	.47	.27	.47	.47	1.0
Rk (ohms)	1500	2200	3300	3900	4700	4700	1300	1300	1500	1500	3600	4700
Ib (ma)	.70	.66	.37	.37	.24	.22	1.68	1.68	1.06	1.06	.28	.28
Ic2 (ma)	.24	.22	.14	.13	.08	.08	.52	.52	.34	.34	.10	.10
Ec1 (volts)	−1.41	−1.81	−1.67	−1.95	−1.49	−1.42	−2.86	−2.86	−2.10	−2.10	−1.39	−1.76
Ec2 (volts)	35	23	36	42	25	26	76	76	55	55	27	33
Eb (volts)	44	63	48	48	38	46	79	79	89	90	56	60
Esig (V rms)	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10
Eout (V rms)	9.8	10.5	11	12.4	10.8	13.0	10.8	12	11.2	13	14	17.5
Gain	98	105	110	124	108	130	108	120	112	130	140	175
% Distortion	2.0	0.9	1.7	2.1	1.6	4.1	0.8	1.0	1.0	1.6	3.2	4.3
Esig (volts rms)*	.34	.40	.33	.35	.24	.28	.68	.73	.48	.53	.27	.31
Eout (volts rms)	25.3	29	27	30	21.6	26.9	51	56.5	39.0	45	31	40
Gain	74.5	72.5	82	75	90	96	75	77.4	81	85	115	129
% Distortion	2.1	5.0	5.2	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.2	5.1

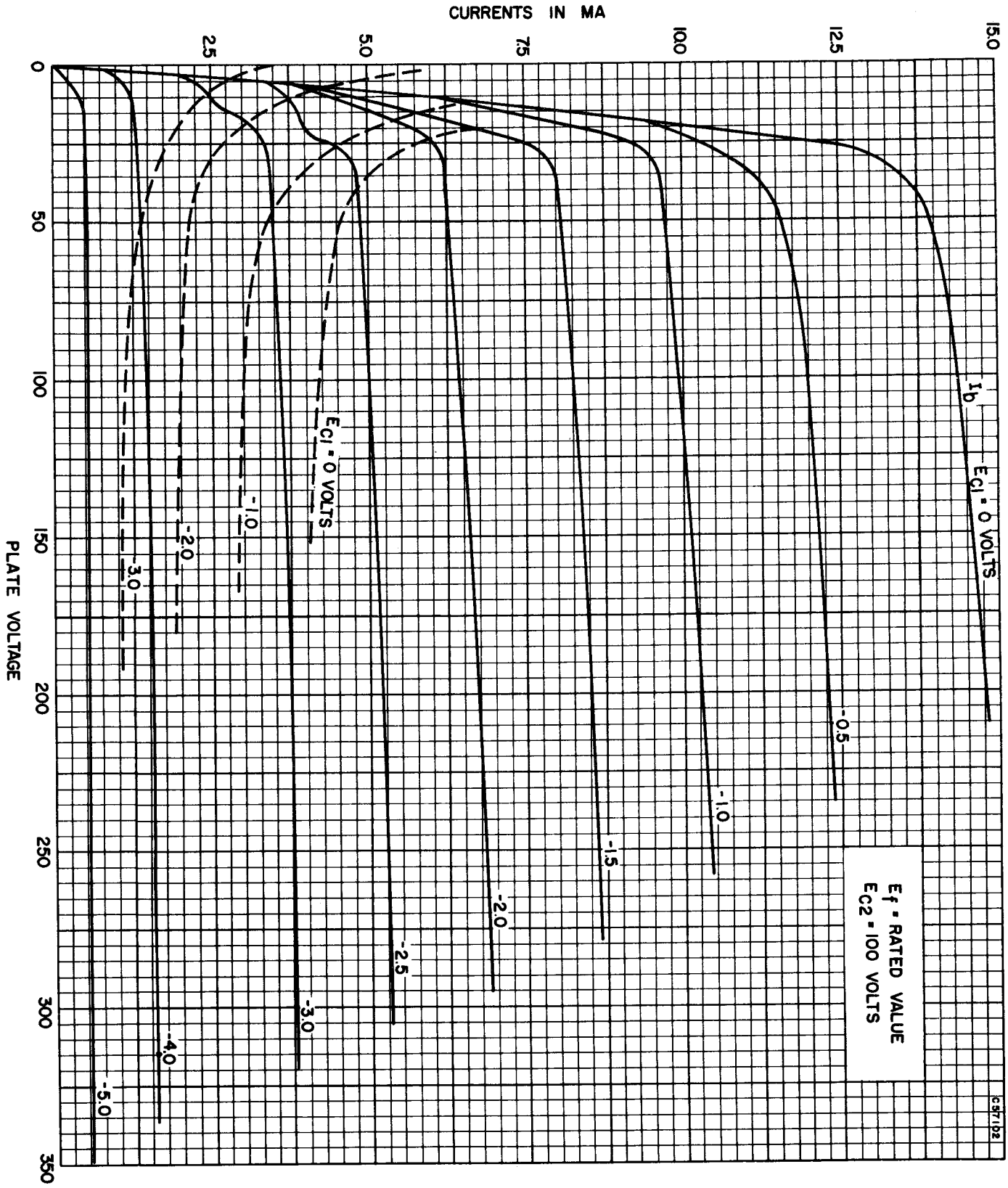
*Maximum signal for 5% distortion or ⅛ microampere grid current.



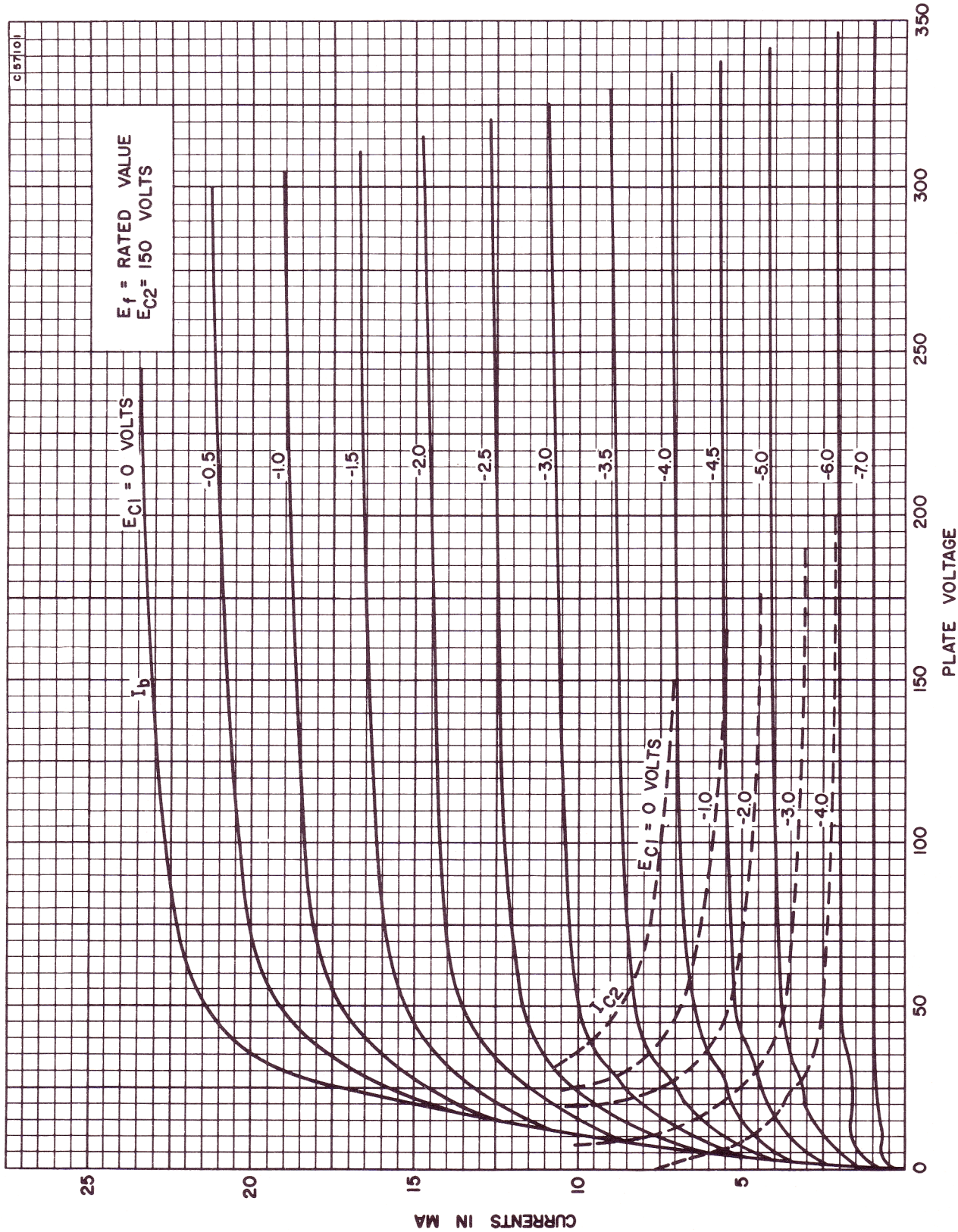
Resistance-coupled amplifier circuit
(Grid No. 3 externally connected to cathode)

6943

AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



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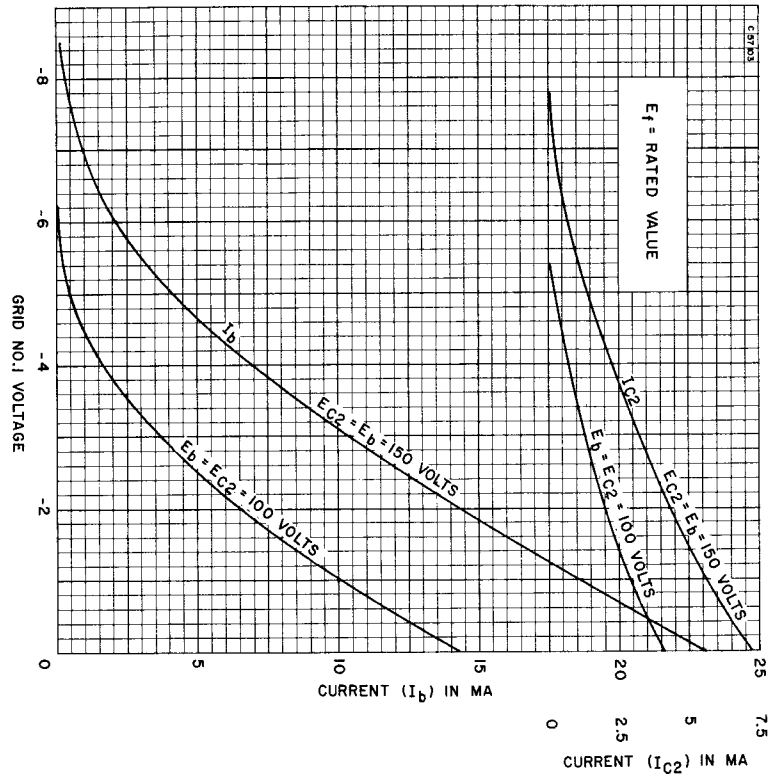
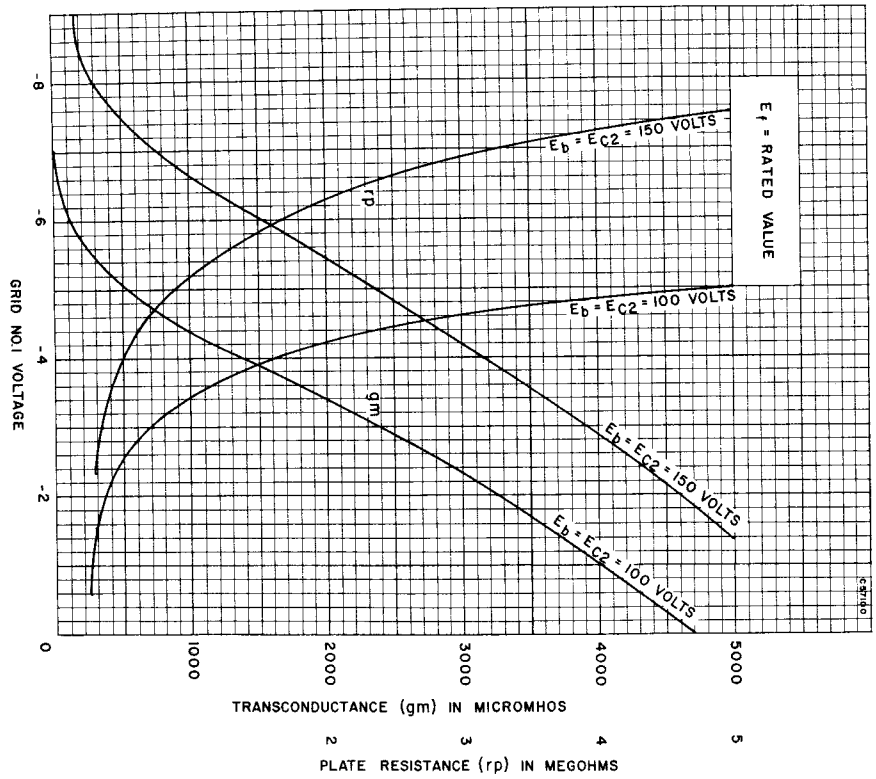
AVERAGE TRANSFER CHARACTERISTICS
(Pentode Connected)



AVERAGE TRANSFER CHARACTERISTICS
(Pentode Connected)



MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-11
Basing	8DC
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature	250 °C	
Altitude[2]	80,000 Ft.	
Radiation		
Total Dosage (*S* neutrons/sq. cm/sec.)	10^{16} nvt	
Dose Rate (neutrons/sq. cm/sec.)	10^{12} nv	

DURABILITY CHARACTERISTICS

Impact Acceleration (¾ msec Duration)	450 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)	10 G	Max.

FAILURE RATE RATING

Class (1) — Inoperatives	1.3%/200 Hours
Class (2) — All end points	5.4%/200 Hours
Class (3) — All end points	2.7%/200 Hours

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	6.3 V
Heater Current	175 mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[4]

Grid No. 1 to Plate	0.015 μμf	Max.
Input	2.9 μμf	
Output	3.1 μμf	

RATINGS[1] (Absolute Maximum)

Heater Voltage[3]	6.3 (−12, + 10%) V
Plate Voltage	250 Vdc
Peak-Plate Forward Voltage[5]	360 v
Grid No. 3 Voltage	
Positive Value	0 Vdc
Negative Value	20 Vdc
Grid No. 2 Voltage	150 Vdc
Plate Dissipation	1.0 W
Grid No. 2 Dissipation	0.36 W
Cathode Current	15.0 mAdc
Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid No. 1 Circuit Resistance	1.0 Meg

CHARACTERISTICS

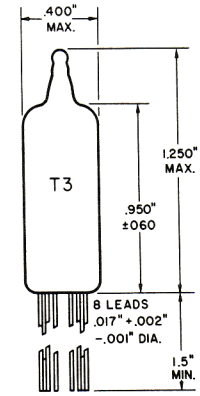
Plate Voltage	100 Vdc
Grid No. 3 Voltage	0 Vdc
Grid No. 2 Voltage	100 Vdc
Cathode Resistor	150 Ohms
Plate Current	7.0 mAdc
Grid No. 2 Current	2.0 mAdc
Transconductance	3200 μmhos
Plate Resistance	280,000 Ohms
Grid No. 1 Voltage for Transconductance = Approx. 25 μmhos (75 μmhos Max.)	−12 Vdc

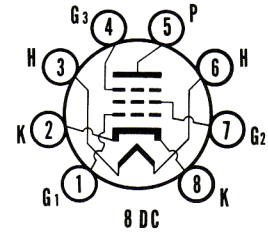
QUICK REFERENCE DATA

The Sylvania Premium Subminiature Type 6944 is a semi-remote cutoff RF pentode designed specifically for guided missile service.

This type is characterized by extraordinary freedom from interelement short circuits of short term duration, by high resistance to interelement leakage, and by stable performance. It is designed for service at high altitudes and where severe conditions of mechanical shock, vibration and high temperature are encountered.

The 6944 is manufactured and inspected to meet the applicable specification for reliable operation.





sylvania electronic tubes

A Division of
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NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts. The Min. and Max. values are 5.5 and 6.9 volts respectively.*
4. *External shield No. 318 connected to cathode.*
5. *MIL-E-1D Par. 6.5.1.1 does not apply. Peak voltage shown should not be exceeded.*

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Grid No. 2 Voltage	100 Vdc
Plate Voltage	100 Vdc	Heater-Cathode Voltage MIL-E-1 Par. 3.2.26.1	0 V
Grid No. 1 Voltage	0 V	Cathode Resistor	150 Ohms
Grid No. 3 Voltage, MIL-E-1 Par. 3.2.26.1	0 V		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1.

MIL-E-1 Ref.	Test	AQL (%)	Limits — Note 2 Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 1, Note 1								
4.10.8	Heater Current	0.65	165	—	175	—	185	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid Current: Ic1 Eb = Ec2 = 125 Vdc; Ec1 = −2.5 Vdc; Rk = 0; Rg1 = 1.0 Meg	0.65	0	—	—	—	−0.1	μAdc
4.10.4.1	Plate Current (1): ALD 1.7	—	—	6.2	7.0	7.8	—	mAdc
4.10.4.1	Plate Current (1):	0.65	5.0	—	—	—	9.0	mAdc
4.10.4.3	Screen Grid Current: Ic2	0.65	—	—	2.0	—	3.0	mAdc
4.10.9	Transconductance (1): ALD = 500 Sm	—	—	2950	3200	3450	—	μmhos
4.10.9	Transconductance (1): Sm	0.65	2600	—	—	—	3800	μmhos
4.7.5	Continuity and Shorts (Inoperatives)	0.4	—	—	—	—	—	
----	Suppressor: Tie Grid No. 2 to Plate	0.4	—	—	—	—	—	
4.9.1.1	Mechanical: Envelope JEDEC 3-11	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes	2.5	—	—	—	—	—	
	Eg1-all = −100 V	—	500	—	—	—	—	Meg
	Ep-all = −300 V	—	500	—	—	—	—	Meg
	Eg2-all = −200 V	—	500	—	—	—	—	Meg
4.10.9	Transconductance (2): Ef = 5.5 V △ Sm	2.5	—	—	—	—	15	%
4.10.9	Transconductance (3): Sm Ec1 = −12 Vdc; Rk = 0 Ohms	2.5	0.1	—	25	—	75	μmhos
4.10.6.2	Grid Emission: Notes 3 and 4 Ic1 Ef = 7.5 V; Ec1 = −12 Vdc; Rg1 = 1.0 Meg; Rk = 0 Ohms	2.5	0	—	—	—	−0.5	μAdc
4.10.3.2	AF Noise: Note 5 Esig. (Cal.) = 70 mVac; Ec2 = 19 Vdc; Rg1 = 0.1 Meg; Rg2 = 1000 Ohms; Rp = 0.2 Meg; Ck = 1000 μf	2.5	—	—	—	—	—	
----	Hum: Note 6 Ef = 6.3 Vac @ 400 cps; Eb = Ec1 = Ec2 = 0; Rk = 10,000 Ohms	2.5	—	—	—	—	15	mv pk-pk
----	Operation Time: Note 7	6.5	—	—	—	—	20	secs
4.10.10	Plate Resistance	6.5	0.160	—	0.280	—	—	Meg
4.10.14	Capacitance: Shield No. 318	6.5	—	—	—	—	—	
	Cg1p	—	—	—	—	—	0.02	μμf
	Cin	—	2.2	—	2.9	—	3.6	μμf
	Cout	—	2.2	—	2.9	—	3.6	μμf
4.9.12.1	Low Pressure Voltage Breakdown: No. 8 Pressure = 21 ± 2 mm Hg; Voltage = 300 Vac	6.5	—	—	—	—	—	
4.9.19.1	Vibration (1): RP = 10,000 Ohms; Ck = 1000 μf; F = 40 cps; G = 10	1.0	—	—	—	—	40	mVac
----	White Noise Vibration: Notes 9 & 10 Rp = 10,000 Ohms; Ck = 1000 μf	2.5	—	—	—	150	300	mv pk-pk
	Peak Acceleration = 15 G	2.5	—	—	—	20	40	mVac

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits — Note 2 Min.	LAL	Bogey	UAL	Max.	Units
Degradation Rate Acceptance Tests, Note 4								
4.9.5.3	Subminiature Lead Fatigue	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Note 11 Hammer Angle = 30°;	20	—	—	—	—	—	
4.9.20.6	Fatigue: Notes 8 and 12 G = 10; Variable Frequency	6.5	6	—	—	—	—	Hours
----	Post Shock and Fatigue Test End Points:							
	Vibration (1):	—	—	—	—	—	120	mVac
	Heater-Cathode Leakage							
	Ehk = +100 Vdc	—	—	—	—	—	15	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	15	μAdc
	Change in Transconductance (1) of Individual Tubes △ Sm	—	—	—	—	—	15	%
4.9.6.3	Glass Strain:	4.0	—	—	—	—	—	
Acceptance Life Tests, Note 4								
4.11.7	Heater Cycling Life Test (1): (2000 Cycles Min.) Note 13 Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec1 = Ec2 = Ec3 = Eb = 0 V	2.5	—	—	—	—	—	
4.11.7	Heater Cycling Life Test (2): (300 Cycles Min.) Note 13 Ef = 10 V; Ehk = +200 Vdc; Rhk = 0; 10 secs. on, 4 min. off	10.0	—	—	—	—	—	
4.11.3.1	Stability Life Test: Note 14 Eb = 250 Vdc; Ec2 = 150 Vdc; Rk = 910 Ohms; Ehk = +200 Vdc; Rg1 = 1.0 Meg; TA = Room	—	—	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes △ Sm	1.0	—	—	—	—	15	%
4.11.3.1	Survival Rate Life Test: (100 Hours) Note 15 Ebb = 250 Vdc; Tie Grid No. 2 to Plate; Rk = 390 Ohms; Rp = 15,000 Ohms; Rg1 = 1.0 Meg; TA = Room	—	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points:							
	Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	—	
	Transconductance (1) Sm	1.0	2200	—	—	—	—	μmhos
	Grid Current	2.5	0	—	—	—	0.1	μAdc
	Heater-Cathode Current: Ihk	0.65	—	—	—	—	10	μAdc
	Electrode Insulation:	6.5	—	—	—	—	—	
	Rg1-all	—	200	—	—	—	—	Meg
	Rg2-all	—	200	—	—	—	—	Meg
	Rp-all	—	200	—	—	—	—	Meg

MIL-E-1 Ref.	Test	LOT ACCEPTANCE LIMITS (1) MIN.	MAX.	FAILURE RATE CLASS (3) LIMITS MIN.	MAX.	Units
4.11.5	Intermittent Life Test: Notes 16 & 17: Survival Rate Life conditions; T Envelope = 250°C Min.	—	—	—	—	
4.11.4	Intermittent Life Test End Points: (200 Hours)					
	Inoperatives: Note 18	—	—	—	—	
	Grid Current	0	−0.5	0	−1.0	μAdc
	Heater Current	165	190	160	195	mA
	Change in Transconductance (1) of Individual Tubes △ Sm	—	20	0	25	%
	Transconductance (2) △ Sm/Ef	—	15	—	25	%
	Heater-Cathode Leakage					
	Ehk = ±100 Vdc	—	10	—	15	μAdc
	Insulation of Electrodes					
	g-all	200	—	25	—	Megohms
	p-all	200	—	25	—	Megohms
	g2-all	200	—	25	—	Megohms
	Transconductance (1) Average Change					
	Avg. △ Sm/t	—	15	—	—	%

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	ALLOWABLE DEFECTIVES
Acceptance Life Tests, Note 4, (Cont'd.)		
----	Individual Lot Acceptance	
	Total Inoperatives	2
	Total Defectives	5
----	Failure Rate Tests: Note 17	
	Failure Rate Class 1	
	Inoperatives:	5
	Failure Rate Class 2	
	Combined defectives to Limits (1)	
	Including Inoperatives:	16
	Failure Rate Class 3	
	Combined defectives to F.R. 3 Limits	
	Including Inoperatives:	8

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding Inoperatives and Mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: For Variables Sampling Procedure, see MIL-E-1, Appendix C, Paragraph 20.2.4.

3: Prior to this test, tubes shall be preheated for 5 minutes at the conditions indicated below. Test within three seconds after preheating. Three minute test is not permitted. Grid Emission is a destructive test so tubes subjected to it are not to be accepted under this specification, nor are subsequent tests to be performed on the same tubes.

Ef V	Eb Vdc	Ec1 Vdc	Ec2 Vdc	Ec3 Vdc	Rk/k ohms	Rg1 Meg
7.5	250	0	150	0	910	1.0

4: Destructive Tests: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature Lead Fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater Cycling Life Tests (1) & (2)
4.11.5	Intermittent Life Test
4.10.6.2	Grid Emission

5: The rejection level shall be set at the VU meter reading obtained during calibration.

6: Maximum total distortion of the filament supply voltage shall be 5%. The frequency response of the peak-to-peak measuring device from 20 cps to 5000 cps must be within 0.5 db of its response at 400 cps. Ground all leads except those for the cathodes and heater lead #3. Measure Hum voltage across specified Rk in each cathode separately.

7: Insert a cold tube into the test socket having all Plate Current (1) conditions applied and record Ib continuously for three minutes. Plate Current must reach 85% of the three minute figure within the time indicated.

8: This test shall be conducted on the initial lot and thereafter on a lot approximately every 30 days. In the event of lot failure, the lot shall be rejected and the succeeding lot shall be subjected to this test. Once a lot has passed, the 30-day rule shall apply. MIL-STD-105, Sample Size Code Letter F shall apply.

9: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "WHITE NOISE" spectrum which is free from discontinuities from 100 cps to 5000 cps and such that the RMS value of acceleration for frequencies outside this band shall constitute no more than five percent of the total RMS acceleration. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 ± 0.2 G's RMS acceleration. With this the case, the RMS value of acceleration for any bandwidth within the specified spectrum is equal to:

$$Grms = 2.3 \sqrt{3.32 \log_{10} (f2/f1)}$$

where f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak acceleration shall be such that the peak value of acceleration is at least 15 G's.

Half the tubes in the sample shall be vibrated in position X1, the other half in position X2.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (250 Kohms or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 30 db at 13,000 cps. For reading the peak-to-peak value of output voltage, the filter output shall be fed directly to the input of a Ballantine Model 305 peak-to-peak electronic voltmeter or equal, while the RMS value shall be measured with a Hewlett Packard Model 400 C or equal. The impedance of the plate and screen voltage supplies shall not exceed that of a 40 μf capacitor at 10 cps.

10: For variables sampling procedure use MIL-E-1, Appendix C, par. 20.2.4.2.2.

11: A grid resistor of 0.1 meg shall be added; however, this resistor will not be used when a thyratron type short indicator is employed.

12: The tubes shall be rigidly mounted on a table vibrating at a constant acceleration level of 10 G. The frequency of vibration shall be varied from 30 cps to 3000 cps and back to 30 cps, with the period of the sweep cycle being three minutes. The rate of change of frequency with time shall be such that the frequency varies logarithmically with time. The tubes shall be vibrated for a total of six hours, that is, two hours in each of the three positions X1, X2, and Y1. Filament voltage only shall be applied to the tube under test.

13: The no load to steady state full load regulation of the heater voltage supply shall be not more than 3.0%.

14: The sampling and testing procedure for the Stability Life Test shall be in accordance with MIL-E-1, Appendix C, Section 20.2.5.1.

15: For Survival Rate Life Test, the sampling and testing procedure shall be as defined in Sections 20.2.5.2 to 20.2.5.2.5 inclusive of MIL-E-1, Appendix C.

16: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of No. 40B and S, or small diameter elements welded to a ring of 0.025-inch diameter phosphor bronze placed in contact with the envelope. The envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5 percent) under normal conditions, is determined to operate at or above the minimum specified temperature in any socket of the life-test rack.

17: **1.0 Intermittent Life Test Evaluation:** The life test conducted in accordance with this specification shall be evaluated in two separate procedures. The first will be an evaluation on an individual lot basis in a similar manner to the one normally specified for reliable tubes. The second evaluation is the determination of a failure rate and its compliance to this specification.

ACCEPTANCE CRITERIA NOTES (Continued)

The life test will be conducted in accordance with MIL-E-1 procedures for reliable tubes except that the sampling plan will be changed from the presently specified double sampling plan to a single sampling plan with n = 40. Individual lot acceptance will be based on this sample size and the conformance of the lot to the maximum allowable defectives for inoperatives and also for combined defectives as specified.

2.0 **The Failure Rate Control:**

a. Purpose: It is the purpose of this specification to establish a means by which the Military may monitor and evaluate the failure rate of this tube type in order to provide a statistically valid description of this parameter that may be utilized in computing the reliability of equipments in which this type is used.

b. Description: The failure rates on this type shall be evaluated using the life test information gathered on individual lots. Only those lots that pass the life test criteria for individual lots shall be used in the calculations for failure rates. The failure rate shall be based on a 5 lot moving average with the cumulative number of failures for each failure rate class plotted on their respective failure rate charts (See Charts 1, 2 and 3). Non-conformance of a tube to the 200 hour end points shall be considered a failure.

The Failure rate charts consist of a plot of consecutive lots manufactured with each point indicating the cumulative number of failures in the last five lots as evaluated against the specified criteria. In the operation of this procedure, each time a new lot is added, the number of defects from the earliest lot is dropped from the accumulation of defectives so that each plotted point on the chart will represent a total sample size of 200 tubes.

Any lot which fails the individual lot acceptance criteria shall not be included in the cumulations for failure rate charts. However, the number of defectives for such a failing lot should be plotted on the failure rate chart in its chronological order with the other lots. This point is plotted for information only.

c. Qualification: In order to become a qualified source to this specification, it is mandatory that the manufacturer supply data on charts 1, 2 and 3 indicating that his failure rate is within the acceptable limits. A total quantity of 200 tubes life tested for 200 hours is required and this should be representative of two or more consecutively manufactured lots (e.g., 100 tubes from each of 2 lots or 40 from each of 5 lots). In the event more than 40 tubes per lot are used in the life test sample in order to accelerate qualification for failure rate, only the first 40 tubes life tested per lot shall be evaluated for the individual lot acceptance criteria.

d. Maintenance of Failure Rate: When the manufacturer has become a qualified source to this specification and has received proper approval from the Military, those lots utilized for qualification and subsequent lots where the 5 lot moving evaluation failure rate continues within the specification, are to be considered acceptable to this specification and may be marked and shipped accordingly.

e. Non-conformance of Failure Rate: The failure rate will be considered non-conforming when the total number of defectives (for the particular failure rate under evaluation) accumulated from the past 5 lot life test exceeds the number permissible as contained in the specification and on the failure rate chart. The lot of tubes which caused the failure rate limit to be violated shall be considered as acceptable and can be marked and shipped in accordance with this specification. When a failure rate criteria has been violated, the manufacturer has lost qualification to this specification and cannot mark and ship any subsequent lots to this specification without being requalified.

f. Requalification for Failure Rate: Since all three failure rates specified in this specification are computed from the same life test data, a violation of 1 failure rate requires requalification for all three failure rates. Requalification shall follow the same procedure as for original qualification. Starting after the last lot which rendered disqualification, a life test sample of 200 tubes from the next two new consecutive lots will be required to conform to this specification before qualification is reinstated to the manufacturer.

g. Charts: Each manufacturer intending or planning to supply tubes to this specification must forward his qualification data in the form of the three failure rate charts to the Military. These charts must be duly approved and signed by the Resident Government Inspector as representing the factual results of the life tests which were conducted in complete accordance with MIL-E-1 and this specification.

18: An inoperative as referenced in Life Tests shall be defined as a tube having one (1) or more of the following defects: Discontinuity (Ref. 4.7.1), Permanent Shorts (Ref. 4.7.2), Air Leaks (Ref. 4.7.6).

APPLICATION DATA

The Sylvania Premium Subminiature Type 6944 is a semi-remote cutoff pentode designed specifically for guided missile service. This type is intended for use as an agc-controlled rf and/or if amplifier at frequencies up to approximately 100 mc. The 6944 is also well suited to a variety of low frequency applications.

As the frequency of operation is increased, consideration should be given to the resultant decrease in input resistance, Figure 1. In some applications it may be advantageous to place an unbypassed resistance in the cathode circuit to compensate for the change in input capacitance with bias. This unbypassed resistance reduces the effective gm of the tube by the factor

$$\frac{1}{1 + gm\ Rk \left(\frac{Ib + Ic2}{Ib}\right)}$$

However, it also has the effect of raising the input resistance of the tube under certain operating conditions so that both a net increase in gain and a net decrease in input capacitance change may result. The curves of Figures 2 and 3 illustrate the effect of unbypassed cathode resistance on input resistance and capacitance. The 6944 is particularly well suited to such applications since the suppressor grid may be grounded directly, thus providing greater stability. It should be noted that the suppressor grid is not intended as a control electrode. The external suppressor grid connection also facilitates the possible employment of suppressor grid neutralization techniques*.

Two cathode leads are provided to minimize lead inductance and permit isolation of the input and output circuits.

This type is characterized by extraordinary freedom from interelement short circuits of short term duration, by high resistance to interelement leakage, and by stable performance. It is designed for service at high altitudes and where severe conditions of mechanical shock, vibration and high temperature are encountered. These characteristics give the type special value in guided missile applications.

Tube durability under extreme vibration for extended periods is assured by more stringent fatigue testing techniques. Excitation for the fatigue test varies in frequency from 30 cps to 3,000 cps and back to 30 cps. Three minutes are required to sweep through one complete cycle. The sweep-frequency vibration has a constant acceleration level of 10 G in contrast to the 2.5 G level formerly used on most reliable receiving tube types. The sweep-frequency cycle is repeated continuously for two hours in each of three positions, totalling six hours.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise

APPLICATION DATA (Continued)

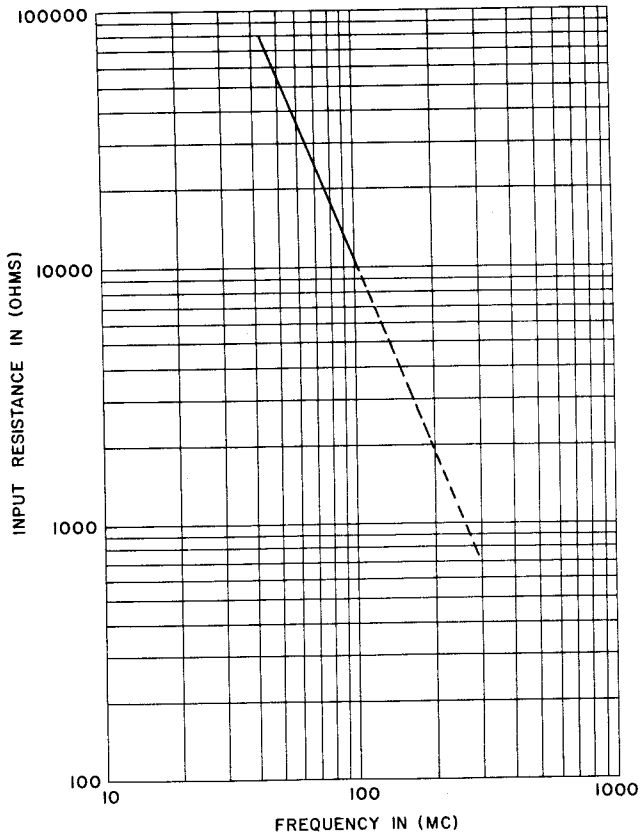


Figure 1—Input resistance vs frequency.

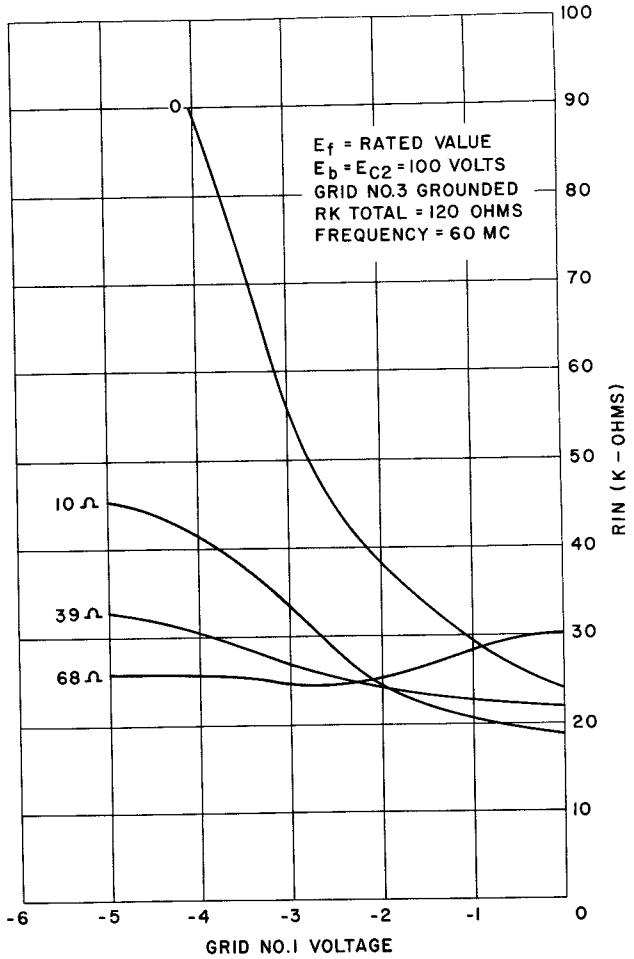


Figure 2—Effect of unbypassing portions of 150-Ohm cathode resistor on input resistance at 60 mc.

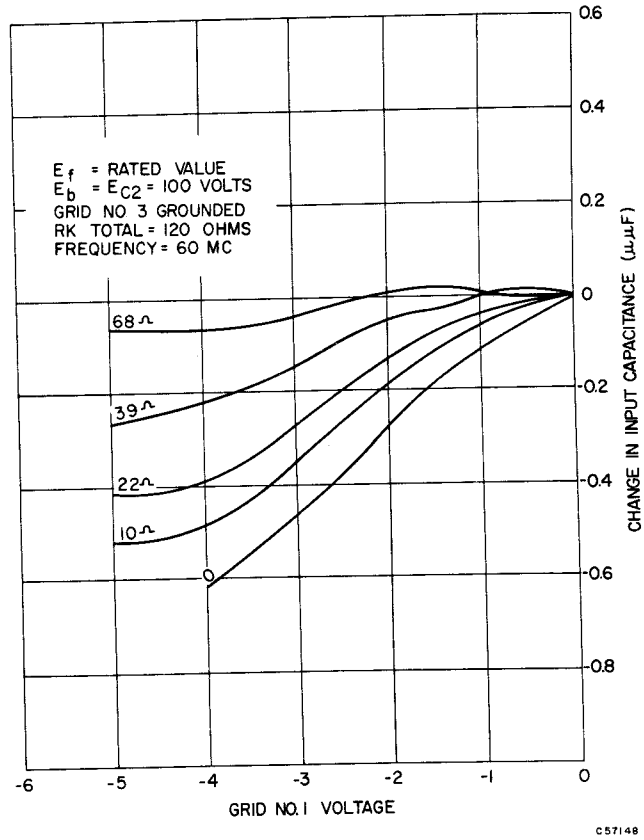


Figure 3—Effect of unbypassing portions of 150-Ohm cathode resistor on input capacitance at 60 mc.

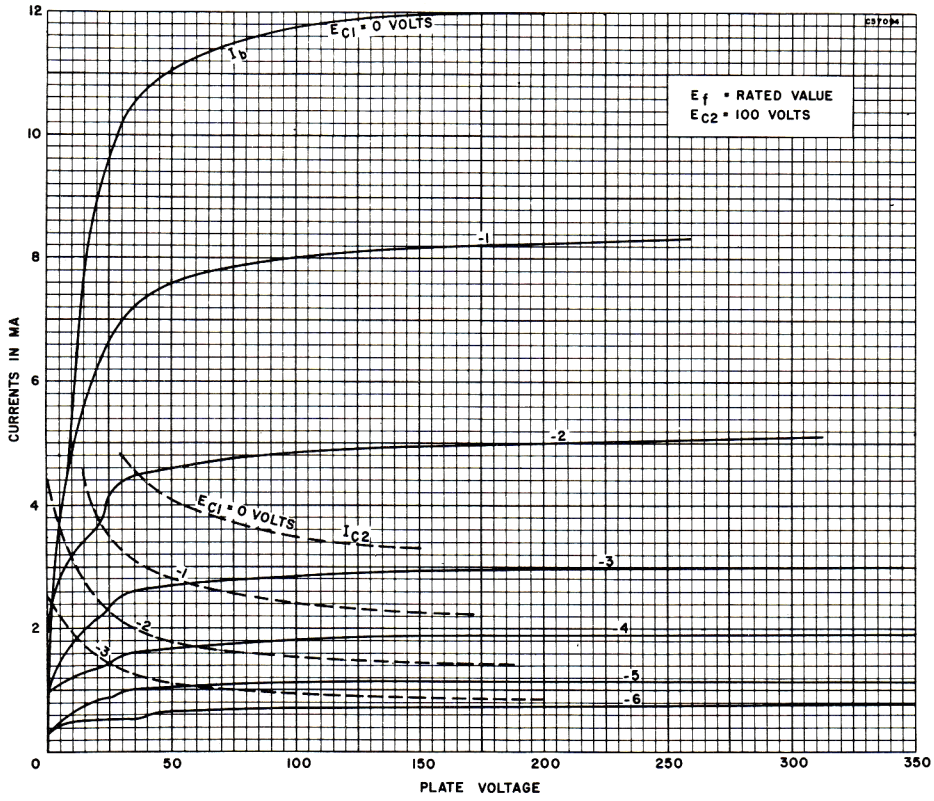
output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A further discussion of the white noise vibration test is included in the frontal section of this manual.

The 6944 is manufactured and inspected to meet the applicable specification for reliability. Life expectancy is described by the life tests, specified on the attached pages. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

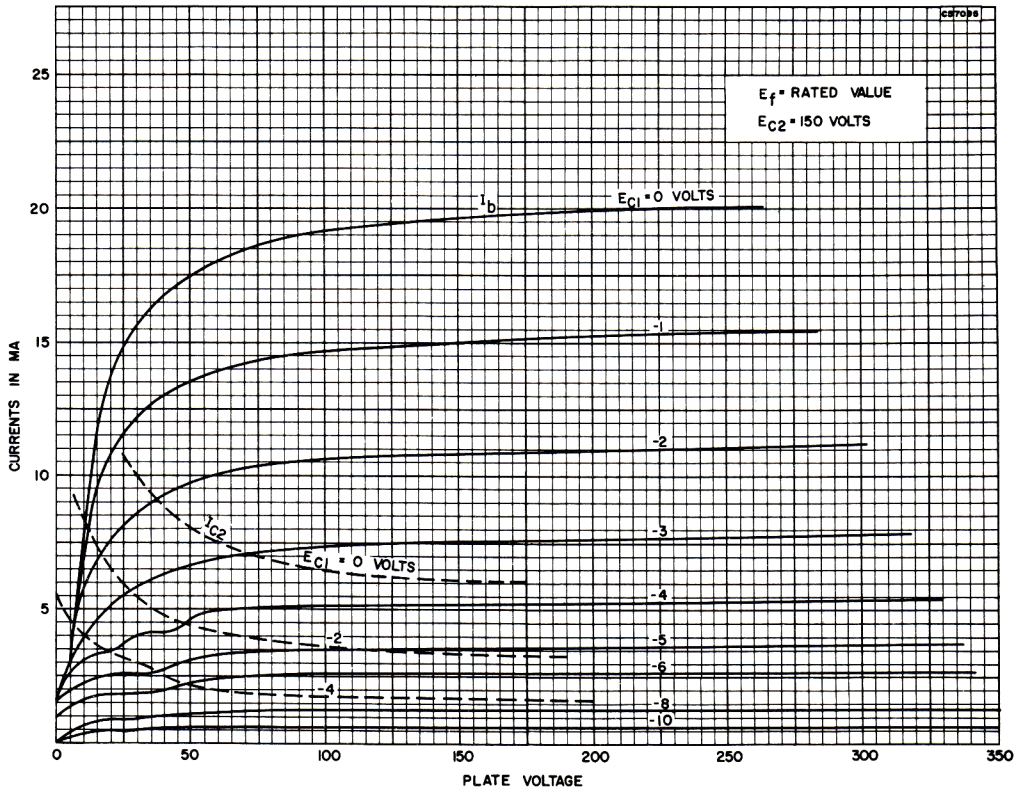
When operated under conditions common to on-off control applications, the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

*"A Method of Neutralizing IF Amplifier Tubes at 44 Mc by Means of Suppressor Grid Reaction," Sylvania Engineering Information Service, Vol. 3, No. 1, April 1956.

AVERAGE PLATE CHARACTERISTICS

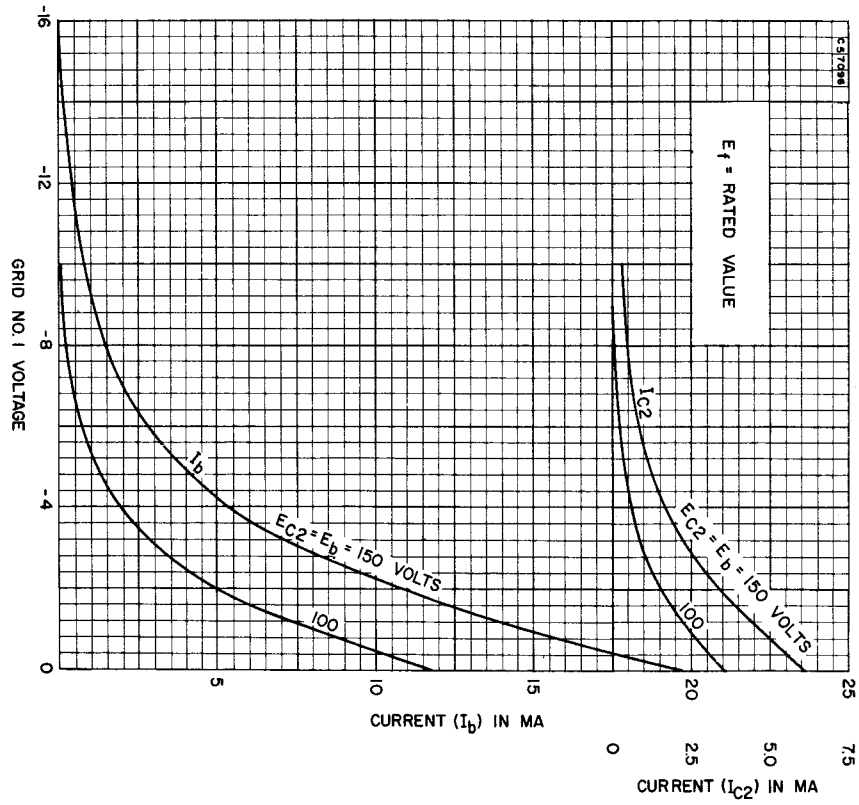


AVERAGE PLATE CHARACTERISTICS

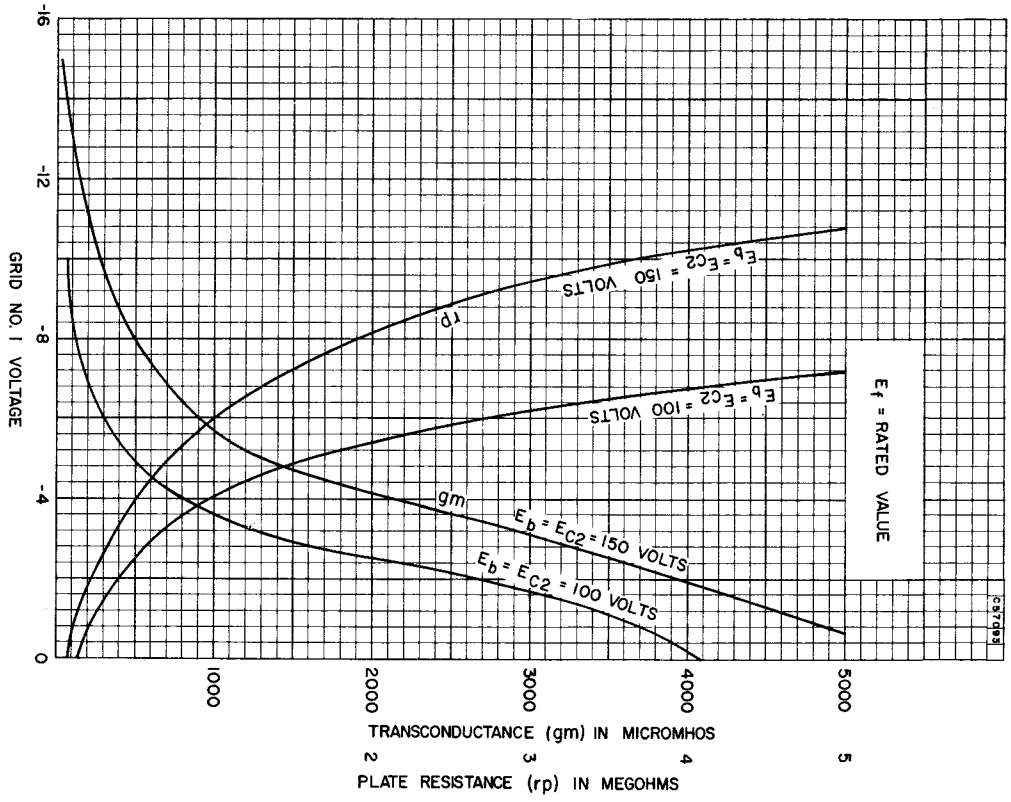


6944

AVERAGE TRANSFER CHARACTERISTICS
(Pentode Connected)



AVERAGE TRANSFER CHARACTERISTICS
(Pentode Connected)



MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-3
Basing	8DL
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature	250	C°
Altitude[2]	80,000	Ft.
Radiation		
Total Dosage (*S* neutrons/sq. cm/sec.)	10^{16}	nvt
Dose Rate (neutrons/sq. cm/sec.)	10^{12}	nv

DURABILITY CHARACTERISTICS

Impact Acceleration (¾ msec Duration)	450 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)	10 G	Max.

FAILURE RATE RATING

Class (1) — Inoperatives	1.3%/200 Hours
Class (2) — All end points	5.4%/200 Hours
Class (3) — All end points	2.7%/200 Hours

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	6.3	V
Heater Current	350	mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[4]

Grid No. 1 to Plate	0.13 μμf	Max.
Input	5.0 μμf	
Output	5.5 μμf	

RATINGS[1] (Absolute Maximum)

Heater Voltage[3]	6.3 (−12, + 10%)	V
Plate Voltage	250	Vdc
Peak-Plate Forward Voltage[5]	360	v
Grid No. 2 Voltage	150	Vdc
Plate Dissipation	3.0	W
Grid No. 2 Dissipation	0.33	W
Cathode Current	40	mAdc
DC Grid No. 1 Voltage		
Positive Value	0	Vdc
Negative Value	55	Vdc
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	200	v
Heater Negative with Respect to Cathode	200	v
Grid No. 1 Circuit Resistance	0.5	Meg

AVERAGE CHARACTERISTICS

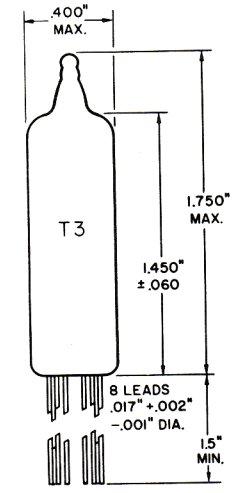
	Triode Connected	Pentode Connected	
Plate Voltage	100	100	Vdc
Grid No. 2 Voltage	100	100	Vdc
Cathode Bias Resistor	270	270	Ohms
Plate Current	26	25	mAdc
Grid No. 2 Current	—	1.5	mAdc
Transconductance	3700	3500	μmhos
Amplification Factor	5.0	—	
Plate Resistance (Approx.)	1500	20,000	Ohms
Ec1 for Ib = 35 μa Max.		−40	Vdc

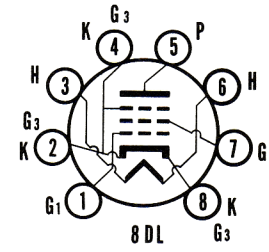
QUICK REFERENCE DATA

The Sylvania Premium Subminiature Type 6945 is a beam power pentode designed specifically for guided missile service.

This type is characterized by extraordinary freedom from interelement short circuits of short term duration, by high resistance to interelement leakage, and by stable performance. It is designed for service at high altitudes and where severe conditions of mechanical shock, vibration and high temperature are encountered.

The 6945 is manufactured and inspected to meet the applicable specification for reliable operation.





sylvania electronic tubes

A Division of
Sylvania Electric Products Inc.

6945

CHARACTERISTICS AND TYPICAL OPERATION

	Triode Connected		Pentode Connected	
Class A1 Amplifier (Single Tube)				
Plate Voltage	150	250	150	Volts
Grid No. 2 Voltage	—	—	110	Volts
Cathode Resistor	680	2700	470	Ohms
Peak AF Grid No. 1 Voltage	16.3	38.2	10.6	Volts
Zero-Signal Plate Current	23.8	14.2	21.5	Ma
Max.-Signal Plate Current	25.3	15.5	20.5	Ma
Zero-Signal Grid No. 2 Current	—	—	0.8	Ma
Max.-Signal Grid No. 2 Current	—	—	3.23	Ma
Load Resistance	2200	6000	7000	Ohms
Max.-Signal Power Output	0.43	0.94	1.22	Watts
Total Harmonic Distortion (Approx.)	11.0	16.7	11.0	Percent

TWO TUBES IN PUSH-PULL

	Class A1		Class AB2	
Plate Voltage	150	200	185	Volts
Grid No. 2 Voltage	110	125	110	Volts
Grid No. 1 Voltage	—	—	−15	Volts
Cathode Resistor	270	560	—	Ohms
Peak AF Grid to Grid Voltage	21.2	39.6	31.2	Volts
Zero-Signal Plate Current	37.5	27.0	26.7	Ma
Max.-Signal Plate Current	38.0	31.6	46.0	Ma
Zero-Signal Grid No. 2 Current	1.35	0.8	0.67	Ma
Max.-Signal Grid No. 2 Current	4.67	4.30	5.90	Ma
Load Resistance (Plate to Plate)	12,000	13,000	10,000	Ohms
Max.-Signal Power Output	2.42	3.41	4.76	Watts
Total Harmonic Distortion (Approx.)	4.1	4.9	1.02	Percent

NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulations of the heater voltage to its center rated value of 6.3 volts. The Min. and Max. values are 5.5 and 6.9 volts respectively.*
4. *External shield No. 318 connected to cathode.*
5. *MIL-E-1D Par. 6.5.1.1 does not apply. Peak voltage shown should not be exceeded.*

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Grid No. 2 Voltage	100 Vdc
Plate Voltage	100 Vdc	Heater-Cathode Voltage MIL-E-1 Par. 3.2.26.1	0 V
Grid No. 1 Voltage	0 V	Cathode Resistor MIL-E-1 Par. 3.2.26.1	270 Ohms

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1.

MIL-E-1 Ref.	Test	AQL (%)	Limits — Note 2 Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 1, Note 1								
4.10.8	Heater Current	0.65	330	—	350	—	370	mA
4.10.15	Heater-Cathode Leakage	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	10	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	10	μAdc
4.10.6.1	Grid Current:							
	Rg1 = 0.5 Meg	0.65	0	—	—	—	−1.0	μAdc
4.10.4.1	Plate Current (1): ALD = 5.2	—	—	22.8	25	27.2	—	mAdc
4.10.4.1	Plate Current (1):	0.65	19	—	—	—	31	mAdc
4.10.4.1	Plate Current (2):							
	Ec1 = −40 Vdc; Rk = 0 Ohms	0.65	—	—	—	—	35	μAdc
4.10.16.1	Power Output (1): Po							
	Esig = 6.4 Vac; Rp = 3000 Ohms; Ck = 1000 μf	0.65	0.50	—	0.80	—	—	W
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1.1	Mechanical:							
	Envelope JEDEC 3-3	—	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits — Note 2 Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes:	2.5	—	—	—	—	—	
	Eg1-all = −100 V	—	100	—	—	—	—	Meg
	Ep-all = −300 V	—	100	—	—	—	—	Meg
	Eg2-all = −200 V	—	100	—	—	—	—	Meg
4.10.9	Transconductance (1): ADL = 600 Sm	—	—	3240	3500	3760	—	μmhos
4.10.9	Transconductance (1):	2.5	2900	—	—	—	4100	μmhos
4.10.9	Transconductance (2):							
	Ef = 5.5 V	2.5	—	—	—	—	15	%
4.10.4.3	Screen Grid Current:	2.5	—	—	1.5	—	3.0	mAdc
4.10.6.2	Grid Emission (Ic1): Notes 3 and 4							
	Ef = 7.5 V; Ec1 = −40 Vdc; Rg1 = 0.5 Meg; RK = 0	2.5	0	—	—	—	−2.0	μAdc
4.10.3.2	AF Noise: Note 5							
	Esig. (Cal.) = 150 mVac; Ec1 = −7.2 Vdc; Rg1 = 0.5 Meg; Rg2 = 0.1 Meg; Rp = 2000 Ohms; Rk = 0;							
	Cg2 = 4 μf	2.5	—	—	—	—	—	
4.10.11.1	Amplification Factor: Note 6	6.5	4.0	—	5.0	—	6.0	
4.10.9	Transconductance (3): Note 6	6.5	3200	—	3700	—	4100	μmhos
4.10.4.1	Plate Current (3): Note 6	6.5	20	—	26	—	32	mAdc
----	Hum: Note 7							
	Ef =6.3 Vac @ 400 cps;							
	Eb = Ec1 = Ec2 = 0; Rk = 1000 Ohms	2.5	—	—	—	—	15	mv pk-pk
----	Operation Time: Note 8	6.5	—	—	—	—	25	Secs.
4.10.10	Plate Resistance	6.5	.013	—	.020	—	—	Meg
4.10.14	Capacitance: Shield No. 318	6.5	—	—	—	—	—	
	Cg1p	—	—	—	—	—	0.13	μμf
	Cin	—	3.8	—	5.0	—	6.2	μμf
	Cout	—	4.5	—	6.0	—	7.5	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Note 9							
	Presure = 21 ±2 mm Hg; Voltage = 300 Vac	6.5	—	—	—	—	—	
4.9.19.1	Vibration (1):							
	Rp = 2,000 Ohms; Ck = 1000 μf;							
	F = 40 cps; G = 10	1.0	—	—	—	—	60	mVac
----	White Noise Vibration: Notes 10 and 11							
	Rp = 2,000 Ohms; Ck = 1000 μf	2.5	—	—	—	300	550	mv pk-pk
	Peak Acceleration = 15 G	2.5	—	—	—	40	60	mVac
Degradation Rate Acceptance Tests, Note 4								
4.9.5.3	Subminiature Lead Fatigue	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Note 12							
	Hammer Angle = 30°;	20	—	—	—	—	—	
4.9.20.6	Fatigue: Notes 9 and 13							
	G = 10; Variable Frequency;	6.5	6	—	—	—	—	Hours
----	Post Shock and Fatigue Test End Points:							
	Vibration (1):	—	—	—	—	—	180	mVac
	Heater-Cathode Leakage							
	Ehk = +100 Vdc	—	—	—	—	—	15	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	15	μAdc
	Change in Transconductance (1) of Individual Tubes Δ Sm	—	—	—	—	—	15	%
4.9.6.3	Glass Strain	4.0	—	—	—	—	—	
Acceptance Life Tests, Note 4								
4.11.7	Heater Cycling Life Test (1): (2000 Cycles Min.) Note 14							
	Ef = 7.0 v; 1 min. on, 4 min. off;							
	Ehk = 140 Vac; Ec1 = Ec2 = Eb = 0	2.5	—	—	—	—	—	
4.11.7	Heater Cycling Life Test (2): (300 Cycles Min.) Note 14							
	Ef = 10 V; Ehk = +200 Vdc; Rhk = 0;							
	10 secs. on, 4 min. off;	10.0	—	—	—	—	—	
4.11.3.1	Stability Life Test: Note 15							
	Eb = 250 Vdc; Ec2 = 150 Vdc; Ehk = +200 Vdc;							
	Rg1 = 0.5 Meg; TA = Room; Rk = 1700 Ohms	—	—	—	—	—	—	
4.11.4	Stability Life Test End Points:							
	Change in Transconductance (1) of Individual Tubes Δ Sm	1.0	—	—	—	—	15	%
4.11.3.1	Survival Rate Life Test: (100 Hours) Note 16							
	Ebb = 250 Vdc; Tie Grid No. 2 to Plate; Rk = 820 Ohms; Rp = 5100 Ohms; Rg1 = 0.5 Meg; TA = Room	—	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points:							
	Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	—	
	Transconductance (1)	1.0	2600	—	—	—	—	μmhos
	Grid Current	2.5	0	—	—	—	−1.0	μAdc
	Heater-Cathode Current: Ihk	0.65	—	—	—	—	40	μAdc
	Electrode Insulation:	6.5		—	—	—	—	
	Rg1-all	—	200	—	—	—	—	Meg
	Rg2-all	—	200	—	—	—	—	Meg
	Rp-all	—	200	—	—	—	—	Meg

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	LOT ACCEPTANCE LIMITS (1) MIN.	LOT ACCEPTANCE LIMITS (1) MAX.	FAILURE RATE CLASS (3) LIMITS MIN.	FAILURE RATE CLASS (3) LIMITS MAX.	Units
	Acceptance Life Tests, Note 4 (Cont'd.)					
4.11.5	Intermittent Life Test: Notes 17 and 18					
	Survival Rate Life conditions; T Envelope = 250°C Min.	—	—	—	—	
4.11.4	Intermittent Life Test End Points: (200 Hours)					
	Inoperatives: Note 19	—	—	—	—	
	Grid Current:	0	−1.0	0	−1.5	μAdc
	Heater Current	330	380	320	390	mA
	Change in Transconductance (1) of Individual Tubes; △ Sm/t	—	20	—	25	%
	Transconductance (2): △ Sm/Ef	—	15	—	25	%
	Heater-Cathode Leakage Ehk = ±100 Vdc	—	40	—	60	μAdc
	Insulation of Electrodes					
	g1-all	200	—	25	—	Megohms
	p-all	200	—	25	—	Megohms
	g2-all	200	—	25	—	Megohms
	Transconductance (1) Average Change Avg. △ Sm/t					

MIL-E-1 Ref.	Test	ALLOWABLE DEFECTIVES
----	Individual Lot Acceptance	
	Total Inoperatives	2
	Total Defectives	5
----	Failure Rate Tests: Note 18	
	Failure Rates Class 1 Inoperatives:	5
	Failure Rate Class 2 Combined defectives to Limits (1) Including Inoperatives:	16
	Failure Rate Class 3 Combined defectives to F.R. 3 Limits Including Inoperatives:	8

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding Inoperatives and Mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: For Variables Sampling Procedure, see MIL-E-1, Appendix C, Paragraph 20.2.4.

3: Prior to this test, tubes shall be preheated for 5 minutes at the conditions indicated below. Test within three seconds after preheating. Three minute test is not permitted. Grid Emission is a destructive test so tubes subjected to it are not to be accepted under this specification, nor are subsequent tests to be performed on the same tubes.

Ef	Eb	Ec1	Ec2	Rk/k	Rg1
V	Vdc	Vdc	Vdc	ohms	Meg
7.5	250	0	150	1700	0.5

4. Destructive Tests: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature Lead Fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater Cycling Life Tests (1) & (2)
4.11.5	Intermittent Life Test
4.10.6.2	Grid Emission

5: The rejection level shall be set at the VU meter reading obtained during calibration.

6: Triode connection — Tie grid #2 to plate.

7. Maximum total distortion of the filament supply voltage shall be 5%. The frequency response of the peak-to-peak measuring device from 20 cps to 5000 cps must be within 0.5 db of its response at 400 cps. Ground all leads except those for the cathodes and heater lead #3. Measure Hum voltage across specified Rk in each cathode separately.

8: Insert a cold tube into the test socket having all Plate Current (1) conditions applied and record Ib continuously for three minutes. Plate Current must reach 85% of the three minute figure within the time indicated.

9: This test shall be conducted on the initial lot and thereafter on a lot approximately every 30 days. In the event of lot failure, the lot shall be rejected and the succeeding lot shall be subjected to this test. Once a lot has passed, the 30-day rule shall apply. MIL-STD-105, Sample Size Code Letter F shall apply.

10: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "WHITE NOISE" spectrum which is free from discontinuities from 100 cps to 5000 cps and such that the RMS value of acceleration for frequencies outside this band shall constitute no more than five percent of the total RMS acceleration. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 ± 0.2 G's RMS acceleration. With this the case, the RMS value of acceleration for any bandwidth within the specified spectrum is equal to:

$$Grms = 2.3 \sqrt{3.32 \log_{10} (f2/f1)}$$

where f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

Half the tubes in the sample shall be vibrated in position X1, the other half in position X2.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (250 Kohms or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall

ACCEPTANCE CRITERIA NOTES (Continued)

be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 30 db at 13,000 cps. For reading the peak-to-peak value of output voltage, the filter output shall be fed directly to the input of a Ballantine Model 305 peak-to-peak electronic voltmeter or equal, while the RMS value shall be measured with a Hewlett Packard Model 400 C or equal. The impedance of the plate and screen voltage supplies shall not exceed that of a 40 μf capacitor at 10 cps.

11: For variables sampling procedure, use MIL-E-1, Appendix C, par. 20.2.4.2.2.

12: A grid resistor of 0.1 meg shall be added; however, this resistor will not be used when a thyratron type short indicator is employed.

13: The tubes shall be rigidly mounted on a table vibrating at a constant acceleration level of 10 G. The frequency of vibration shall be varied from 30 cps to 3000 cps and back to 30 cps, with the period of the sweep cycle being three minutes. The rate of change of frequency with time shall be such that the frequency varies logarithmically with time. The tubes shall be vibrated for a total of six hours, that is, two hours in each of the three positions X1, X2, and Y1. Filament voltage only shall be applied to the tube under test.

14: The no load to steady state full load regulation of the heater voltage supply shall be not more than 3.0%.

15: The sampling and testing procedure for the Stability Life Test shall be in accordance with MIL-E-1, Appendix C, Section 20.2.5.1.

16: For Survival Rate Life Test, the sampling and testing procedure shall be as defined in Sections 20.2.5.2 to 20.2.5.2.5 inclusive of MIL-E-1, Appendix C.

17: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of No. 40B and S, or small diameter elements welded to a ring of 0.025-inch diameter phosphor bronze placed in contact with the envelope. The envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5 percent) under normal conditions, is determined to operate at or above the minimum specified temperature in any socket of the life-test rack.

18: **1.0 Intermittent Life Test Evaluation:** The life test conducted in accordance with this specification shall be evaluated in two separate procedures. The first will be an evaluation on an individual lot basis in a similar manner to the one normally specified for reliable tubes. The second evaluation is the determination of a failure rate and its compliance to this specification.

The life test will be conducted in accordance with MIL-E-1 procedures for reliable tubes except that the sampling plan will be changed from the presently specified double sampling plan to a single sampling plan with $n = 40$. Individual lot acceptance will be based on this sample size and the conformance of the lot to the maximum allowable defectives for inoperatives and also for combined defectives as specified.

2.0 The Failure Rate Control:

a. Purpose: It is the purpose of this specification to establish a means by which the Military may monitor and evaluate the failure rate of this tube type in order to provide a statistically valid description of this parameter that may be utilized in computing the reliability of equipments in which this type is used.

b. Description: The failure rates on this type shall be evaluated using the life test information gathered on individual lots. Only those lots that pass the life test criteria for individual lots shall be used in the calculations for failure rates. The failure rate shall be based on a 5 lot moving average with the cumulative number of failures for each failure rate class plotted on their respective failure rate charts (See Charts 1, 2 and 3). Non-conformance of a tube to the 200 hour end points shall be considered a failure.

The Failure rate charts consist of a plot of consecutive lots manufactured with each point indicating the cumulative number of failures in the last five lots as evaluated against the specified criteria. In the operation of this procedure, each time a new lot is added, the number of defects from the earliest lot is dropped from the accumulation of defectives so that each plotted point on the chart will represent a total sample size of 200 tubes.

Any lot which fails the individual lot acceptance criteria shall not be included in the cumulations for failure rate charts. However, the number of defectives for such a failing lot should be plotted on the failure rate chart in its chronological order with the other lots. This point is plotted for information only.

c. Qualification: In order to become a qualified source to this specification, it is mandatory that the manufacturer supply data on charts 1, 2 and 3 indicating that his failure rate is within the acceptable limits. A total quantity of 200 tubes life tested for 200 hours is required and this should be representative of two or more consecutively manufactured lots (e.g., 100 tubes from each of 2 lots or 40 from each of 5 lots). In the event more than 40 tubes per lot are used in the life test sample in order to accelerate qualification for failure rate, only the first 40 tubes life tested per lot shall be evaluated for the individual lot acceptance criteria.

d. Maintenance of Failure Rate: When the manufacturer has become a qualified source to this specification and has received proper approval from the Military, those lots utilized for qualification and subsequent lots where the 5 lot moving evaluation failure rate continues within the specification, are to be considered acceptable to this specification and may be marked and shipped accordingly.

e. Non-conformance of Failure Rate: The failure rate will be considered non-conforming when the total number of defectives (for the particular failure rate under evaluation) accumulated from the past 5 lot life test exceeds the number permissible as contained in the specification and on the failure rate chart. The lot of tubes which caused the failure rate limit to be violated shall be considered as acceptable and can be marked and shipped in accordance with this specification. When a failure rate criteria has been violated, the manufacturer has lost qualification to this specification and cannot mark and ship any subsequent lots to this specification without being requalified.

f. Requalification for Failure Rate: Since all three failure rates specified in this specification are computed from the same life test data, a violation of 1 failure rate requires requalification for all three failure rates. Requalification shall follow the same procedure as for original qualification. Starting after the last lot which rendered disqualification, a life test sample of 200 tubes from the next two new consecutive lots will be required to conform to this specification before qualification is reinstated to the manufacturer.

g. Charts: Each manufacturer intending or planning to supply tubes to this specification must forward his qualification data in the form of the three failure rate charts to the Military. These charts must be duly approved and signed by the Resident Government Inspector as representing the factual results of the life tests which were conducted in complete accordance with MIL-E-1 and this specification.

19: An inoperative as referenced in Life Tests shall be defined as a tube having one (1) or more of the following defects: Discontinuity (Ref. 4.7.1), Permanent Shorts (Ref. 4.7.2), Air Leaks (Ref. 4.7.6).

APPLICATION DATA

The Premium Subminiature Type 6945 is a subminiature beam power audio pentode having a relatively high power sensitivity. It is capable of efficient operation at low supply voltages. It is useful as an audio output, servo-driver or series passing tube in voltage regulator circuits.

The 6945 is also useful in many pulse applications including Class C service at low radio frequencies.

Triode connected the 6945 displays the low mu, high perseverance qualities desirable in servo control circuits. In this application, when utilizing an ac plate supply, precautions should be taken to insure against poor tube and circuit reliability.

Since conduction occurs for only one-half cycle high plate supply voltage is often deemed necessary in order to realize sufficient output. Excessive positive plate voltage, however, causes an appreciable increase in secondary emission. In addition, presence of the negative half-cycle of plate encourages primary emission by the plate and grids.

The effects of back emission can be minimized by (1) employing a low value grid resistor, (2) inserting series diodes, such as the Sylvania 5641, in the plate circuits, (3) operate the tubes conservatively with respect to supply voltage, peak currents, element dissipation and bulb temperature. Back emission approximates an exponential curve with increasing plate voltage swing and plate disc dissipation. For further discussion the reader is referred to the frontal section of this manual or "Effects of AC Plate Voltages on Tube Performance," Sylvania Engineering Information Service, Vol. 1, No. 10, May 1954.

This type is characterized by extraordinary freedom from interelement short circuits of short term duration, by high resistance to interelement leakage, and by stable performance. In addition, vibrational output when the tube is subjected to wide band (White Noise) vibration is held to a very low value. It is designed for service at high altitudes and where severe conditions of mechanical shock, vibration and high temperature are encountered. These characteristics give the type special value in guided missile applications.

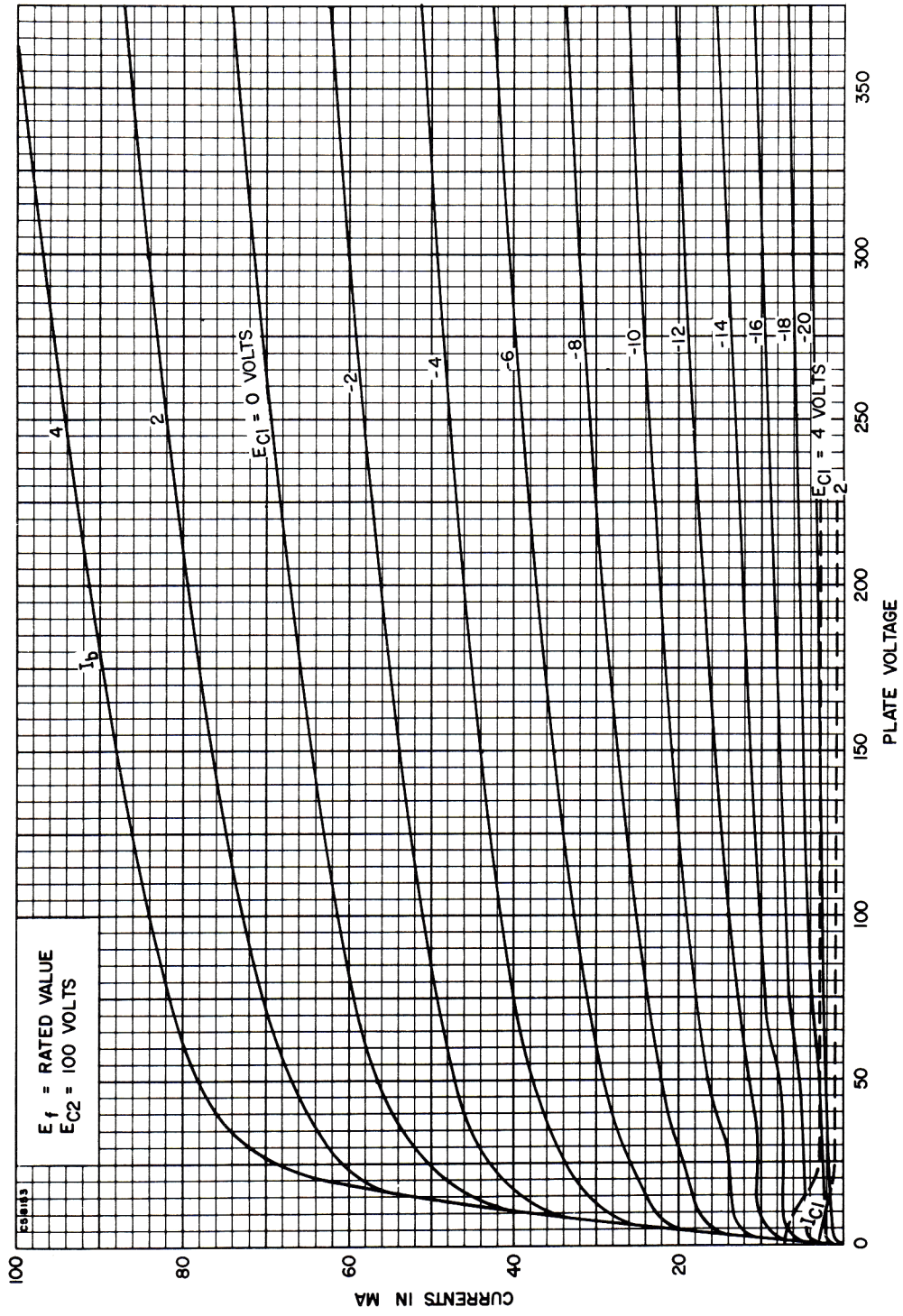
Tube durability under extreme vibration for extended periods is assured by more stringent fatigue testing techniques. Excitation for the fatigue test varies in frequency from 30 cps to 3,000 cps and back to 30 cps. Three minutes are required to sweep through one complete cycle. The sweep-frequency vibration has a constant acceleration level of 10 G in contrast to the 2.5 G level formerly used on most reliable receiving tube types. The sweep-frequency cycle is repeated continuously for two hours in each of three positions, totalling six hours.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

The 6945 is manufactured and inspected to meet the applicable specification for reliability. Life expectance is described by the life tests, specified on the attached pages. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

When operated under conditions common to on-off control applications, the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

AVERAGE PLATE CHARACTERISTICS



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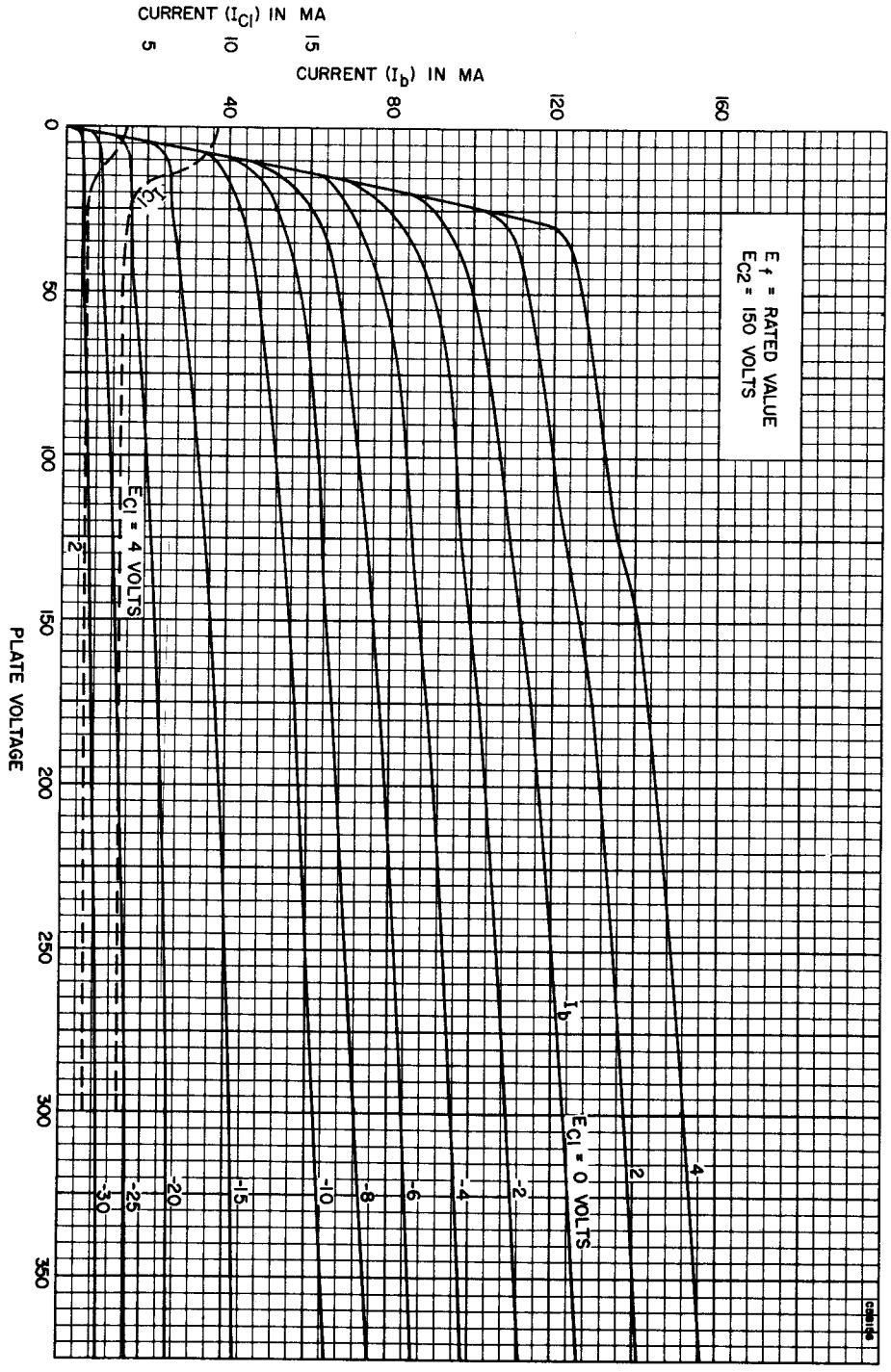
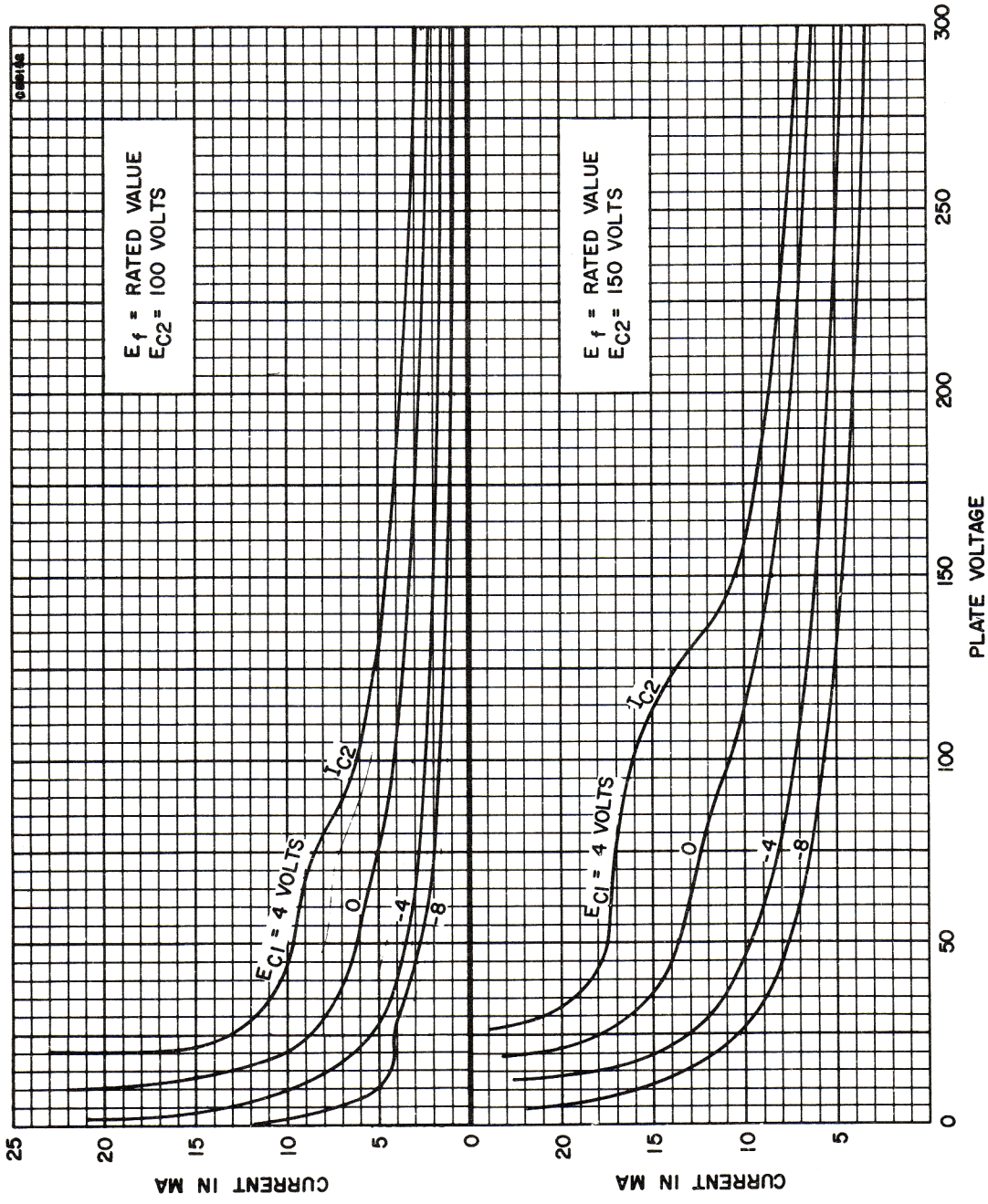
AVERAGE PLATE CHARACTERISTICS



AVERAGE SCREEN CHARACTERISTICS



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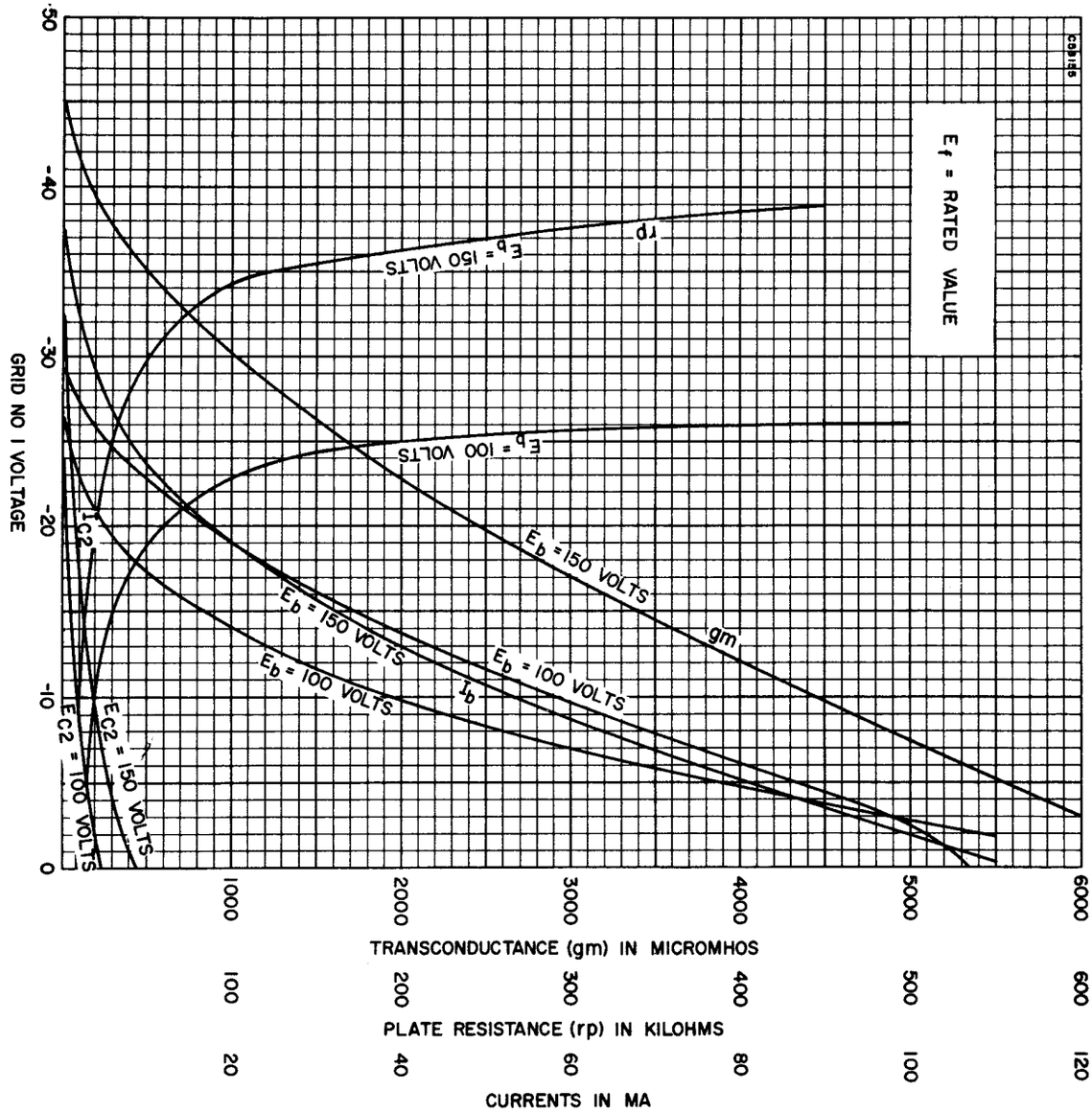
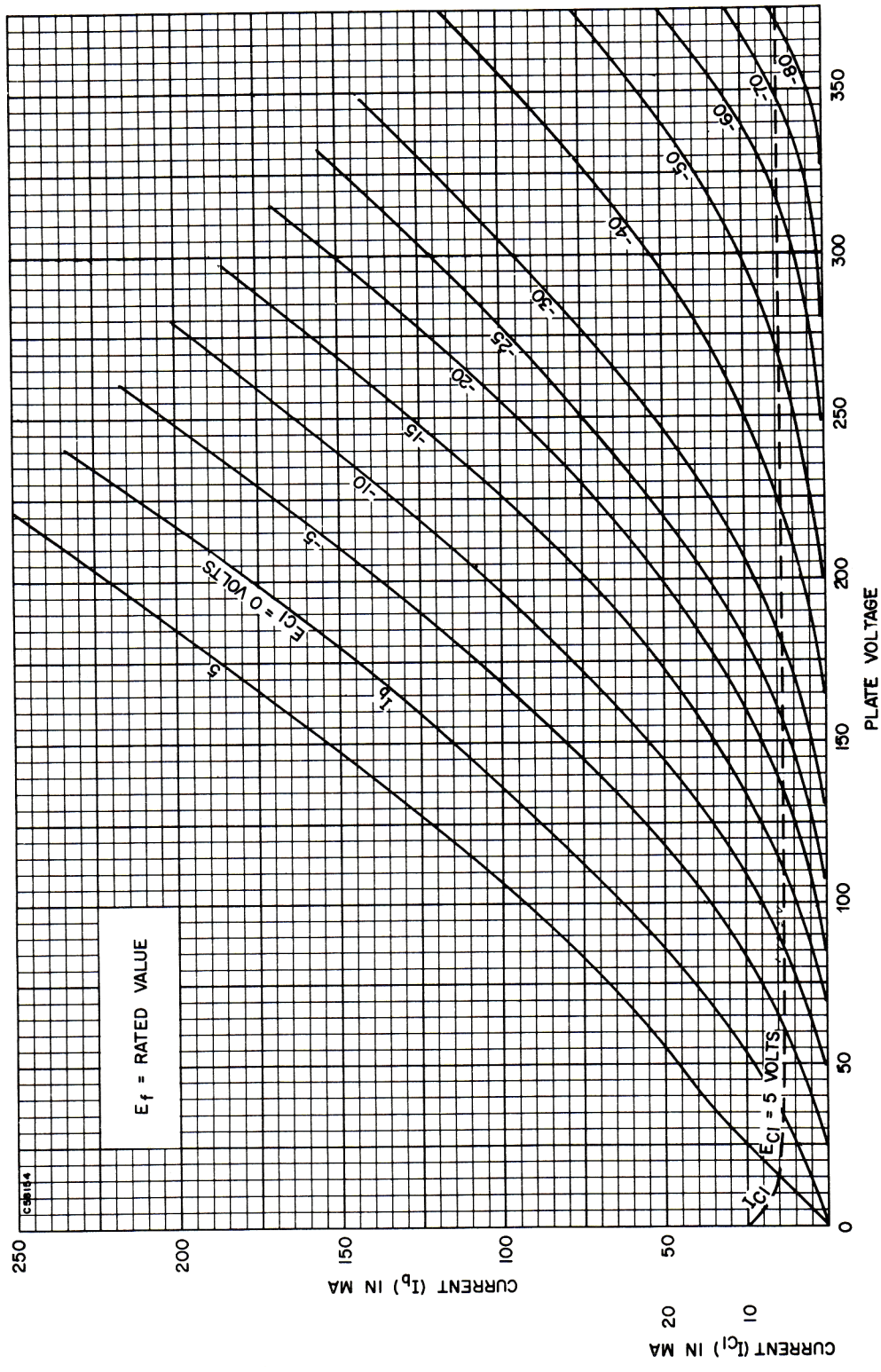
AVERAGE TRANSFER CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS
(TRIODE CONNECTED)



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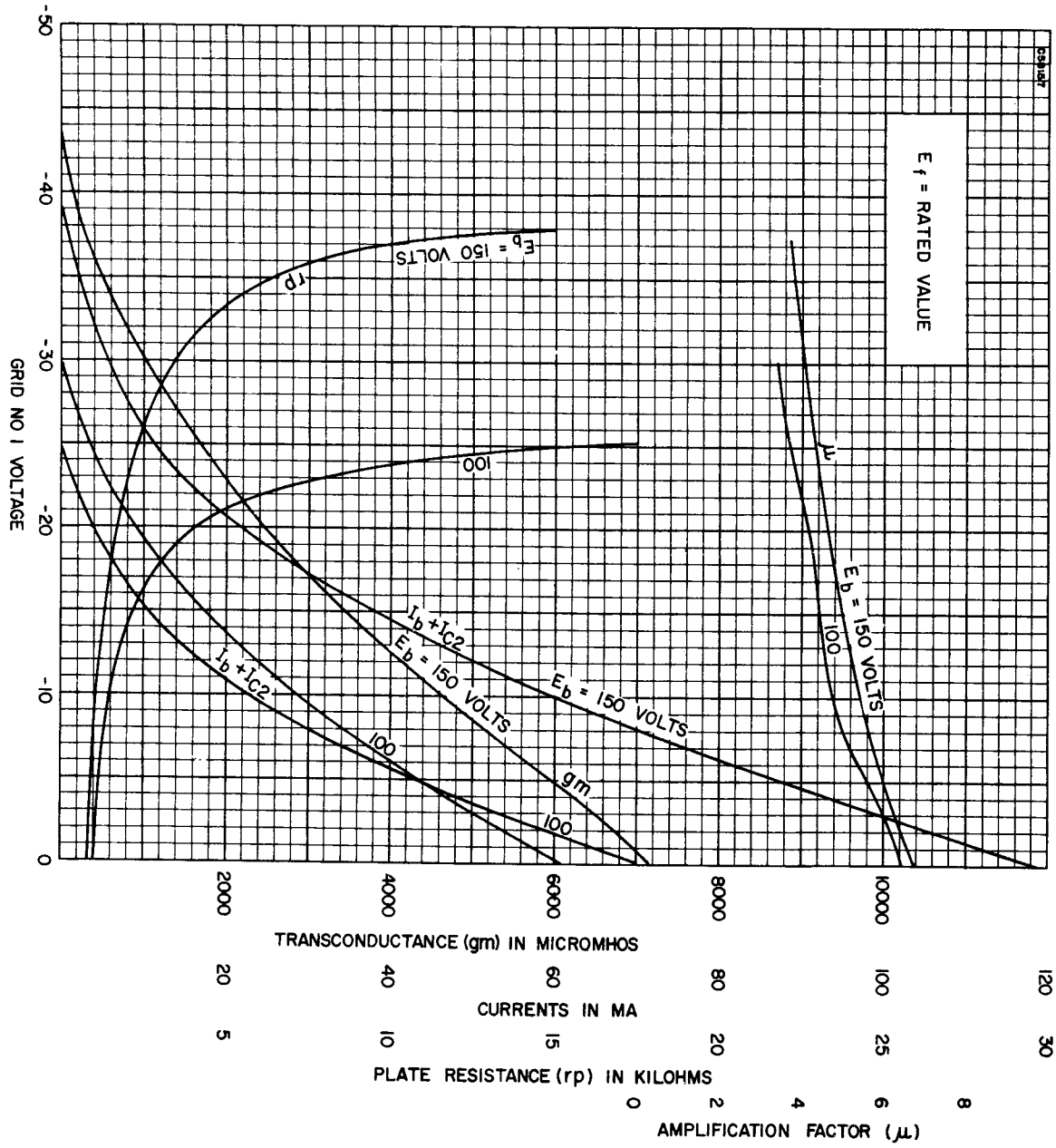
AVERAGE TRANSFER CHARACTERISTICS
(TRIODE CONNECTED)



MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-11
Basing	8DK
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature	250 °C	
Altitude[2]	80,000 Ft.	
Radiation		
Total Dosage (*S* neutrons/sq. cm/sec.)	10^{16} nvt	
Dose Rate (neutrons/sq. cm/sec.)	10^{12} nv	

DURABILITY CHARACTERISTICS

Impact Acceleration (¾ msec Duration)	450 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)	10 G	Max.

FAILURE RATE RATING

Class (1) — Inoperatives	1.3%/200 Hours
Class (2) — All end points	5.4%/200 Hours
Class (3) — All end points	2.7%/200 Hours

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	6.3 V
Heater Current	175 mA

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate	1.0 μμf
Input	1.6 μμf
Output	0.75 μμf

RATINGS[1] (Absolute Maximum)

Heater Voltage[3]	6.3 (−12, + 10%) V
Plate Voltage	250 Vdc
Peak-Plate Forward Voltage[4]	360 v
Plate Dissipation	1.5 W
Cathode Current	15 mAdc
DC Grid Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid Circuit Resistance	1.0 Meg

CHARACTERISTICS

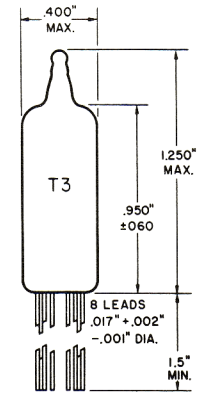
Plate Voltage	100 Vdc
Cathode Resistor	270 Ohms
Plate Current	9.0 mAdc
Amplification Factor	16.5
Transconductance	3800 μmhos
Grid Voltage for Ib = 150 μAdc Max.	−11.5 Vdc
Grid Voltage for Ib = 5 μAdc Min.	−8.5 Vdc

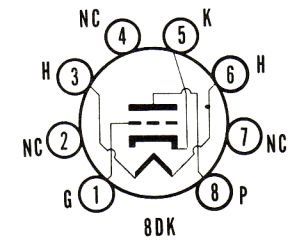
QUICK REFERENCE DATA

The Sylvania Premium Subminiature Type 6946 is a general purpose medium-mu triode designed specifically for guided missile service.

This type is characterized by extraordinary freedom from interelement short circuits of short term duration, by high resistance to interelement leakage, and by stable performance. It is designed for service at high altitudes and where severe conditions of mechanical shock, vibration and high temperature are encountered.

The 6946 is manufactured and inspected to meet the applicable specification for reliable operation.





sylvania electronic tubes

A Division of
Sylvania Electric Products Inc.

NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltage (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts. The Min. and Max. values are 5.5 and 6.9 volts respectively.*
4. *MIL-E-1D Par. 6.51.1 does not apply. Peak voltage shown should not be exceeded.*

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage . . . . . 6.3 V
Plate Voltage . . . . . 100 Vdc
Grid Voltage . . . . . 0 V
Heater-Cathode Voltage MIL-E-1 Par. 3.2.26.1 . 0 V
Cathode Resistor MIL-E-1 Par. 3.2.26.1 . . . . 270 Ohms

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1.

MIL-E-1 Ref.	Test	AQL (%)	Limits — Note 2 Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 1, Note 1								
4.10.8	Heater Current	0.65	165	—	175	—	185	mA
4.10.15	Heater-Cathode Leakage	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid Current:							
	Rg = 1.0 Meg	0.65	0	—	—	—	−0.4	μAdc
4.10.4.1	Plate Current (1): ALD = 2.6	—	—	7.9	9.0	10.1	—	mAdc
4.10.4.1	Plate Current (1):	0.65	6.0	—	—	—	12.0	mAdc
4.10.4.1	Plate Current (2):							
	Ec = −11.5 Vdc; Rk = 0 Ohms	0.65	—	—	—	—	150	uAdc
4.10.9	Transconductance (1): ALD = 690 Sm	—	—	3500	3800	4100	—	μmhos
4.10.9	Transconductance (1): Sm	0.65	3000	—	—	—	4600	μmhos
4.7.5	Continuity and Shorts (Inoperatives)	0.4	—	—	—	—	—	
4.9.1.1	Mechanical:							
	Envelope JEDEC 3-11	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes	2.5	—	—	—	—	—	
	Eg-all = −100 V	—	500	—	—	—	—	Meg
	Ep-all = −300 V	—	500	—	—	—	—	Meg
4.10.9	Transconductance (2):							
	Ef = −5.5 V △ Sm	2.5	—	—	—	—	15	%
4.10.4.1	Plate Current (3):							
	Ec1 = −8.5; Rk = 0	2.5	5.0	—	—	—	—	μAdc
4.10.6.2	Grid Emmission (Ic1): Notes 3 & 4							
	Ef = 7.5 V; Ec = −11.5 Vdc;							
	Rg = 1.0 Meg; Rk = 0 Ohms	2.5	0	—	—	—	−0.5	μAdc
4.10.3.2	AF Noise: Note 5							
	Esig. (Cal.) = 50 mVac; Ec = −4							
	Vdc; Rg = 0.1 Meg; Rp = 0.01 Meg;							
	Rk = 0 Ohms	2.5	—	—	—	—	—	
4.10.11.1	Amplification Factor	6.5	14.0	—	16.5	—	19.0	
4.10.7.5	Pulse Emission: Note 6							
	Ef = 6.0 V; e pulse = 50 v;							
	tp = 25 μsec; prr = 200 pps	6.5	—	—	—	—	—	
	ik	—	200	—	—	—	—	ma
	△ ik/tp	—	—	—	—	—	20	%
----	Hum: Note 7							
	Ef = 6.3 Vac @ 400 cps; Eb = Ec = 0;							
	Rk = .005 Meg	2.5	—	—	—	—	15	mv pk-pk
----	Operation Time: Note 8	6.5	—	—	—	—	20	secs
4.10.14	Capacitance: No Shield	6.5	—	—	—	—	—	
	Cgp	—	0.72	—	1.0	—	1.22	μμf
	Cin	—	1.2	—	1.6	—	2.0	μμf
	Cout	—	0.55	—	.75	—	0.93	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Note 9							
	Pressure = 21 ±2 mm Hg; Voltage = 300 Vac	6.5	—	—	—	—	—	
4.9.19.1	Vibration (1):							
	Rp = 10,000 Ohms; Ck = 1000 μf;							
	F = 40 cps; G = 10	1.0	—	—	—	—	25	mVac
----	White Noise Vibration: Notes 10 & 11							
	Rp = 10,000 Ohms; Ck = 1000 μf	2.5	—	—	—	30	60	mv pk-pk
	Peak Acceleration = 15 G	2.5	—	—	—	5	10	mVac

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits — Note 2 Min.	LAL	Bogey	UAL	Max.	Units
Degradation Rate Acceptance Tests, Note 4								
4.9.5.3	Subminiature Lead Fatigue	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Note 12 Hammer Angle = 30°	20	—	—	—	—	—	
4.9.20.6	Fatigue: Notes 9 and 13 G = 10; Variable Frequency	6.5	6	—	—	—	—	Hours
----	Post Shock and Fatigue Test End Points							
	Vibration (1):	—	—	—	—	—	75	mVac
	Heater-Cathode Leakage							
	Ehk = +100 Vdc	—	—	—	—	—	15	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	15	μAdc
	Change in Transconductance (1)							
	of Individual Tubes △ Sm	—	—	—	—	—	15	%
4.9.6.3	Glass Strain:	4.0	—	—	—	—	—	
Acceptance Life Tests, Note 4								
4.11.7	Heater Cycling Life Test (1): (2000 Cycles Min.) Note 14 Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec = Eb = 0 V	2.5	—	—	—	—	—	
4.11.7	Heater Cycling Life Test (2): (300 Cycles Min.) Note 14 Ef = 10 V; Ehk = +200 Vdc; Rhk = 0; 10 secs. on, 4 min. off	10.0	—	—	—	—	—	
4.11.3.1	Stability Life Test: Note 15 Eb = 250 Vdc; Ehk = +200 Vdc; Rg = 1.0 Meg; TA = Room; Rk = 200 Ohms	—	—	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes △ Sm	1.0	—	—	—	—	15	%
4.11.3.1	Survival Rate Life Test: (100 Hours) Note 16 Ebb = 250 Vdc; Rk = 510 Ohms; Rp = 0.01 Meg; Rg = 1.0 Meg; TA = Room	—	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points:							
	Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	—	
	Grid Current	2.5	0	—	—	—	−0.1	μAdc
	Heater-Cathode Current: Ihk	0.65	—	—	—	—	10	μAdc
	Electrode Insulation:	6.5	—	—	—	—	—	
	Rp-all	—	200	—	—	—	—	Meg
	Rg1-all	—	200	—	—	—	—	Meg

MIL-E-1 Ref.	Test	LOT ACCEPTANCE LIMITS (1) MIN.	MAX.	FAILURE RATE CLASS (3) LIMITS MIN.	MAX.	Units
4.11.5	Intermittent Life Test: Notes 17 & 18 Survival Rate Life Conditions; T Envelope = 250°C Min.	—	—	—	—	
4.11.4	Intermittent Life Test End Points (200 Hours)					
	Inoperatives: Note 19	—	—	—	—	
	Grid Current	0	−1.0	0	−1.5	μAdc
	Heater Current	165	190	160	195	mA
	Change in Transconductance (1) of					
	Individual Tubes; △ Sm/t	—	20	—	25	%
	Transconductance (2): △ Sm/Ef	—	15	—	25	%
	Heater-Cathode Leakage					
	Ehk = ±100 Vdc	—	10	—	15	μAdc
	Insulation of Electrodes					
	p-all	200	—	25	—	Meg
	g-all	200	—	25	—	Meg
	Transconductance (1) Average Change					
	Avg. △ Sm/t	—	15	—	—	%

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	ALLOWABLE DEFECTIVES
Acceptance Life Tests, Note 4, (Cont'd.)		
----	Individual Lot Acceptance	
	Total Inoperatives	2
	Total Defectives	5
----	Failure Rate Tests: Note 18	
	Failure Rate Class 1	
	Inoperatives:	5
	Failure Rate Class 2	
	Combined defectives to Limits (1)	
	Including Inoperatives:	16
	Failure Rate Class 3	
	Combined defectives to F. R. 3 Limits	
	Including Inoperatives:	8

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding Inoperatives and Mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: For Variables Sampling Procedure, see MIL-E-1, Appendix C, Paragraph 20.2.4.

3: Prior to this test, tubes shall be preheated for 5 minutes at the conditions indicated below. Test within three seconds after preheating. Three minute test is not permitted. Grid Emission is a destructive test so tubes subjected to it are not to be accepted under this specification, nor are subsequent tests to be performed on the same tubes.

Ef	Eb	Ec1	Rk/k	Rg1
V	Vdc	Vdc	ohms	Meg
7.5	250	0	2000	1.0

4: Destructive Tests: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature Lead Fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater Cycling Life Tests (1) & (2)
4.11.5	Intermittent Life Test
4.10.6.2	Grid Emission

5: The rejection level shall be set at the VU meter reading obtained during calibration.

6: The pulse shall be applied to the plate and grid tied together. It shall be a square wave meeting the pulse shape requirement of MIL-E-1, par. 4.10.7.5, and in addition, the maximum amplitude shall occur within the first 20% of tp. The pulse shall be applied by means of a driving circuit which produces the specified pulse voltage directly at the plate and grid terminals with respect to cathode.

Peak currents shall be measured by means of a high impedance oscilloscope or equivalent device connected across a 1.0 ohm cathode resistor whose value is known to an accuracy of 1% The specified limit, ik, refers to the maximum of the pulse amplitude. The variation of the output pulse amplitude, ik (tp), between 2% tp and 80% tp shall not exceed the specified limit where tp is as defined in MIL-E-1, par. 4.10.7.5.

7. Maximum total distortion of the filament supply voltage shall be 5%. The frequency response of the peak-to-peak measuring device from 20 cps to 5000 cps must be within 0.5 db of its response at 400 cps. Ground all leads except those for the cathodes and heater lead #3. Measure Hum voltage across specified Rk in each cathode separately.

8: Insert a cold tube into the test socket having all Plate Current (1) conditions applied and record Ib continuously for three minutes. Plate Current must reach 85% of the three minute figure within the time indicated.

9: This test shall be conducted on the initial lot and thereafter on a lot approximately every 30 days. In the event of lot failure, the lot shall be rejected and the succeeding lot shall be subjected to this test. Once a lot has passed, the 30-day rule shall apply. MIL-STD-105 Sample Size Code Letter F shall apply.

10: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "WHITE NOISE" spectrum which is free from discontinuities from 100 cps to 5000 cps and such that the RMS value of acceleration for frequencies outside this band shall constitute no more than five percent of the total RMS acceleration. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 ± 0.2 G's RMS acceleration. With this the case, the RMS value of acceleration for any bandwidth within the specified spectrum is equal to:

$$Grms = 2.3 \sqrt{3.32 \log_{10} (f2/f1)}$$

where f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

Half the tubes in the sample shall be vibrated in position X1, the other half in position X2.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (250 Kohms or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 30 db at 13,000 cps. For reading the peak-to-peak value of output voltage, the filter output shall be fed directly to the input of a Ballantine Model 305 peak-to-peak electronic voltmeter or equal, while the RMS value shall be measured with a Hewlett Packard Model 400 C or equal. The impedance of the plate and screen voltage supplies shall not exceed that of a 40 μf capacitor at 10 cps.

11: For variables sampling procedure, use MIL-E-1, Appendix C, par. 20.2.4.2.2.

12: A grid resistor of 0.1 meg shall be added; however, this resistor will not be used when a thyratron type short indicator is employed.

13: The tubes shall be rigidly mounted on a table vibrating at a constant acceleration level of 10 G. The frequency of vibration shall be varied from 30 cps to 3000 cps and back to 30 cps, with the period of the sweep cycle being three minutes. The rate of change of frequency with time shall be such that the frequency varies logarithmically with time. The tubes shall be vibrated for a total of six hours, that is, two hours in each of the three positions X1, X2, and Y1. Filament voltage only shall be applied to the tube under test.

14: The no load to steady state full load regulation of the heater voltage supply shall be not more than 3.0%.

15: The sampling and testing procedure for the Stability Life Test shall be in accordance with MIL-E-1, Appendix C, Section 20.2.5.1.

16: For Survival Rate Life Test, the sampling and testing procedure shall be as defined in Sections 20.2.5.2 to 20.2.5.2.5 inclusive of MIL-E-1, Appendix C.

ACCEPTANCE CRITERIA NOTES (Continued)

17: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of No. 40B and S, or small diameter elements welded to a ring of 0.025-inch diameter phosphor bronze placed in contact with the envelope. The envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5 percent) under normal conditions, is determined to operate at or above the minimum specified temperature in any socket of the life-test rack.

18: 1.0 **Intermittent Life Test Evaluation:** The life test conducted in accordance with this specification shall be evaluated in two separate procedures. The first will be an evaluation on an individual lot basis in a similar manner to the one normally specified for reliable tubes. The second evaluation is the determination of a failure rate and its compliance to this specification.

The life test will be conducted in accordance with MIL-E-1 procedures for reliable tubes except that the sampling plan will be changed from the presently specified double sampling plan to a single sampling plan with n = 40. Individual lot acceptance will be based on this sample size and the conformance of the lot to the maximum allowable defectives for inoperatives and also for combined defectives as specified.

2.0 **The Failure Rate Control:**

a. Purpose: It is the purpose of this specification to establish a means by which the Military may monitor and evaluate the failure rate of this tube type in order to provide a statistically valid description of this parameter that may be utilized in computing the reliability of equipments in which this type is used.

b. Description: The failure rates on this type shall be evaluated using the life test information gathered on individual lots. Only those lots that pass the life test criteria for individual lots shall be used in the calculations for failure rates. The failure rate shall be based on a 5 lot moving average with the cumulative number of failures for each failure rate class plotted on their respective failure rate charts (See Charts 1, 2 and 3). Non-conformance of a tube to the 200 hour end points shall be considered a failure.

The Failure rate charts consist of a plot of consecutive lots manufactured with each point indicating the cumulative number of failures in the last five lots as evaluated against the specified criteria. In the operation of this procedure, each time a new lot is added, the number of defects from the earliest lot is dropped from the accumulation of defectives so that each plotted point on the chart will represent a total sample size of 200 tubes.

Any lot which fails the individual lot acceptance criteria shall not be included in the cumulations for failure rate charts. However, the number of defectives for such a failing lot should be plotted on the failure rate chart in its chronological order with the other lots. This point is plotted for information only.

c. Qualification: In order to become a qualified source to this specification, it is mandatory that the manufacturer supply data on charts 1, 2 and 3 indicating that his failure rate is within the acceptable limits. A total quantity of 200 tubes life tested for 200 hours is required and this should be representative of two or more consecutively manufactured lots (e.g., 100 tubes from each of 2 lots or 40 from each of 5 lots). In the event more than 40 tubes per lot are used in the life test sample in order to accelerate qualification for failure rate, only the first 40 tubes life tested per lot shall be evaluated for the individual lot acceptance criteria.

d. Maintenance of Failure Rate: When the manufacturer has become a qualified source to this specification and has received proper approval from the Military, those lots utilized for qualification and subsequent lots where the 5 lot moving evaluation failure rate continues within the specification, are to be considered acceptable to this specification and may be marked and shipped accordingly.

e. Non-conformance of Failure Rate: The failure rate will be considered non-conforming when the total number of defectives (for the particular failure rate under evaluation) accumulated from the past 5 lot life test exceeds the number permissible as contained in the specification and on the failure rate chart. The lot of tubes which caused the failure rate limit to be violated shall be considered as acceptable and can be marked and shipped in accordance with this specification. When a failure rate criteria has been violated, the manufacturer has lost qualification to this specification and cannot mark and ship any subsequent lots to this specification without being requalified.

f. Requalification for Failure Rate: Since all three failure rates specified in this specification are computed from the same life test data, a violation of 1 failure rate requires requalification for all three failure rates. Requalification shall follow the same procedure as for original qualification. Starting after the last lot which rendered disqualification, a life test sample of 200 tubes from the next two new consecutive lots will be required to conform to this specification before qualification is reinstated to the manufacturer.

g. Charts: Each manufacturer intending or planning to supply tubes to this specification must forward his qualification data in the form of the three failure rate charts to the Military. These charts must be duly approved and signed by the Resident Government Inspector as representing the factual results of the life tests which were conducted in complete accordance with MIL-E-1 and this specification.

19: An inoperative as referenced in Life Tests shall be defined as a tube having one (1) or more of the following defects: Discontinuity (Ref. 4.7.1), Permanent Shorts (Ref. 4.7.2), Air Leaks (Ref. 4.7.6).

APPLICATION DATA

The Sylvania Premium Subminiature Type 6946 is a medium-mu triode designed specifically for guided missile service. It is especially well suited to a wide variety of low-frequency applications. These include resistance coupled amplifiers, sync clippers, blocking oscillators and multivibrators. Resistance-coupled amplifier data is shown in the accompanying table and circuit.

The 6946 may also be used as a v h f oscillator or Class-C amplifier. A curve of power output vs frequency at a constant input is shown in Figure 1 for oscillator service. Figure 2 shows the variation of input resistance with frequency.

This type is characterized by extraordinary freedom from interelement short circuits of short term duration, by high resistance to interelement leakage, and by stable performance. In addition, vibrational output when the tube is subjected to wide band (White Noise) vibration is held to a very low value. It is designed for service at high altitudes and where severe conditions of mechanical shock, vibration and high temperature are encountered. These characteristics give the type special value in guided missile applications.

Tube durability under extreme vibration for extended periods is assured by more stringent fatigue testing techniques. Excitation for the fatigue test varies in frequency from 30 cps to 3,000 cps and back to 30 cps. Three minutes are required to sweep through one complete cycle. The sweep-frequency vibration has a constant acceleration level of 10 G in contrast to the 2.5 G level formerly used on most reliable receiving tube types. The sweep-frequency cycle is repeated continuously for two hours in each of three positions, totalling six hours.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown

APPLICATION DATA (Continued)

for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

The 6946 is manufactured and inspected to meet the applicable specification for reliability. Life expectancy is described by the life tests, specified on the attached pages. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

When operated under conditions common to on-off control applications, the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

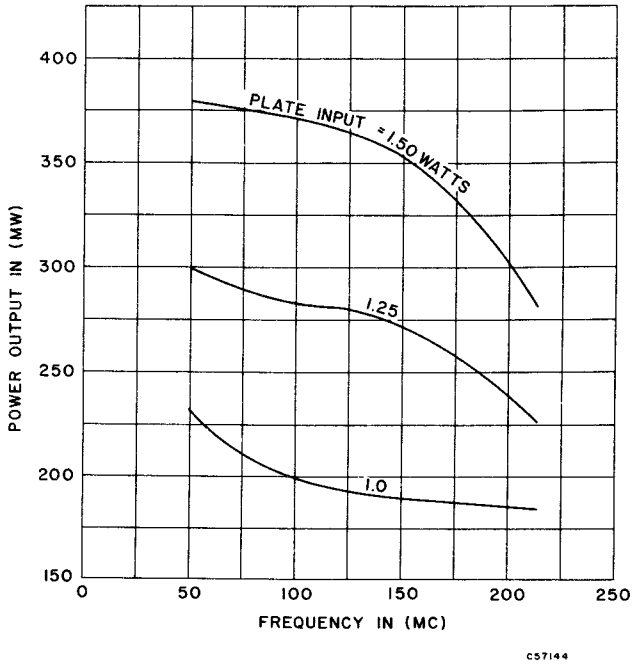


Figure 1—Oscillator performance curve.

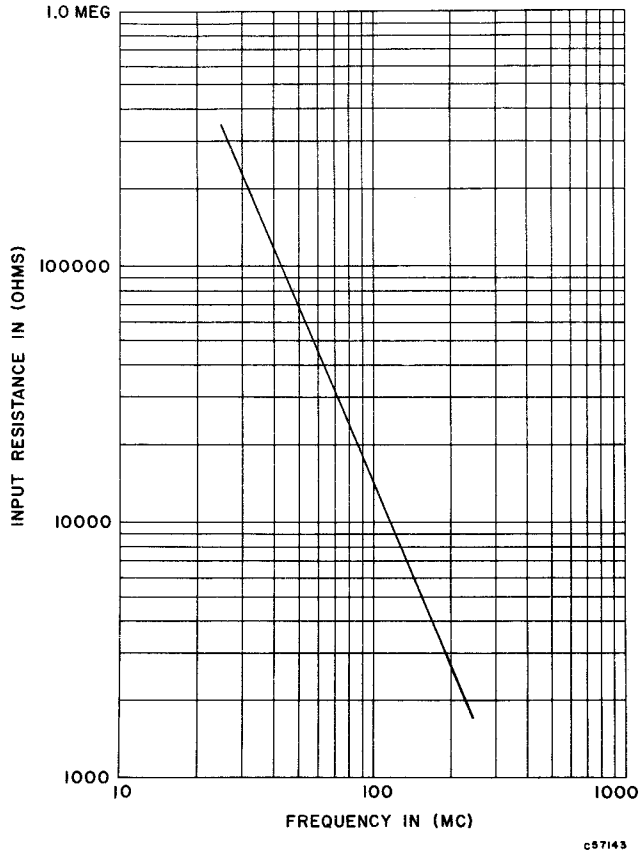


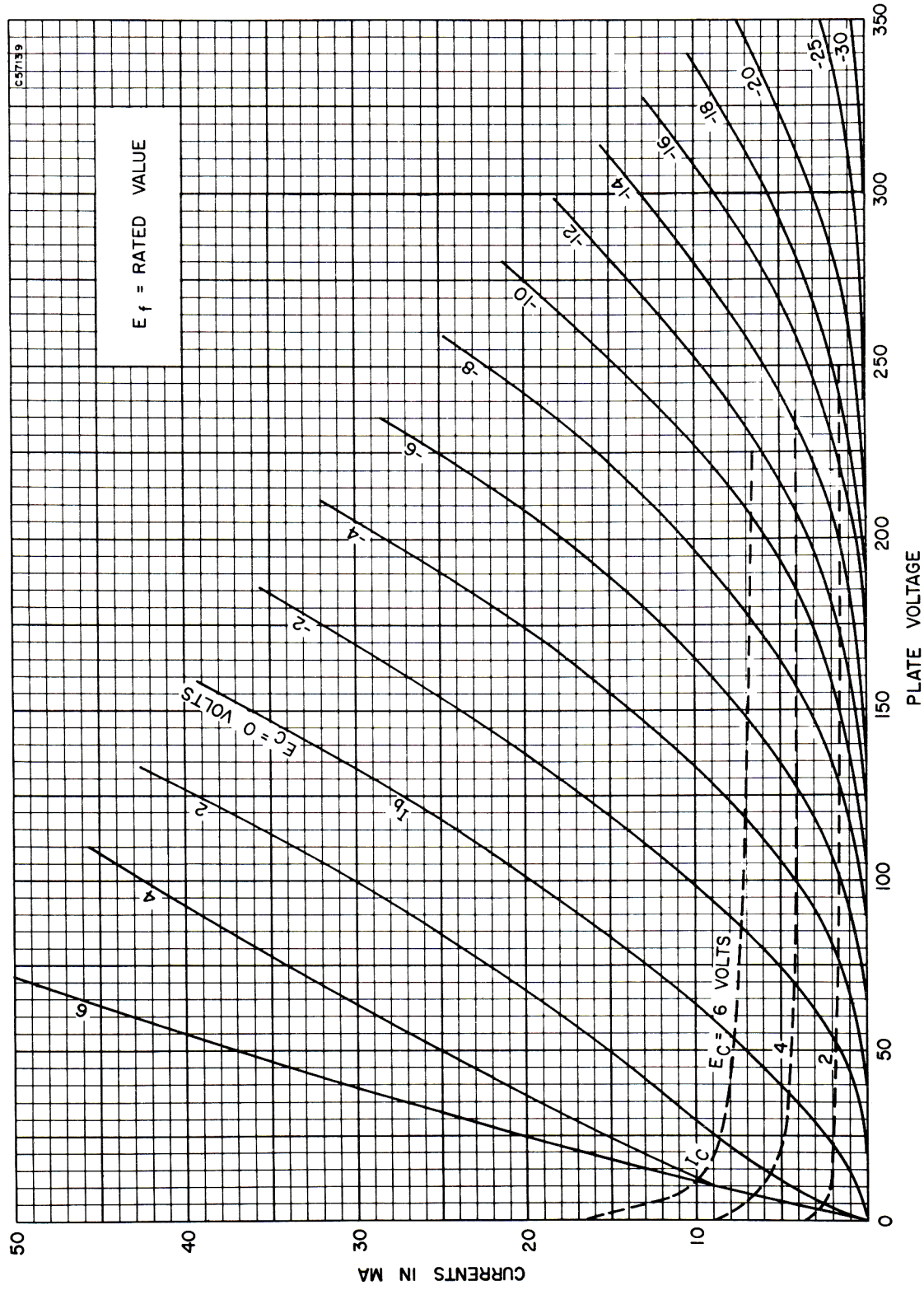
Figure 2—Input resistance vs frequency.

RESISTANCE COUPLED AMPLIFIER DATA

	Ebb = 100 Volts						Ebb = 150 Volts						Ebb = 250 Volts					
Rb (megohms)	.047		0.10		0.27		0.10		0.27		0.47		0.10		0.27		0.47	
Rcf (megohms)	.10	.27	.10	.47	.27	.47	.10	.47	.27	.47	.10	.27	.10	.47	.27	.47	.10	.27
Rk (ohms)	2200	2200	3300	4700	10,000	12,000	2700	4700	8200	10,000	8200	12,000	3300	4700	8200	12,000	6800	10,000
Ib (ma)	1.04	1.04	.61	.55	.23	.22	.96	.82	.37	.35	.25	.22	1.55	1.30	0.63	0.52	.43	.40
Ec (volts)	−2.29	−2.29	−2.01	−1.17	−2.32	−2.68	−2.59	−3.86	−3.03	−3.52	−2.03	−2.60	−5.12	−6.10	−5.16	−6.23	−2.92	−4.00
Eb (volts)	49	49	37	44	35	37	51	64	47	51	32	46	90	114	75	104	45	58
Esig (volts RMS)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Eout (volts RMS)	1.12	1.19	1.13	1.19	.92	.95	1.04	1.05	1.00	1.00	.87	.94	1.07	1.08	1.06	1.04	0.97	1.03
Gain	11.2	11.9	11.3	11.9	9.25	9.50	10.4	10.5	10.0	10.0	8.70	9.40	10.7	10.8	10.6	10.4	9.7	10.3
% Distortion	0.34	0.33	0.34	0.37	0.37	0.36	0.36	0.39	0.39	0.37	0.36	0.46	0.39	0.47	0.43	0.50	0.32	0.40
Esig (volts RMS)*	1.15	1.16	0.94	1.38	1.34	1.60	1.54	2.34	1.96	2.32	0.92	1.64	2.60	3.80	3.10	3.93	1.43	2.68
Eout (volts RMS)	11.2	13.8	10.6	16.3	12.3	15.2	16.0	24.5	19.6	23.2	7.95	15.4	27.4	41.0	32.9	40.0	13.9	27.2
Gain	9.70	11.9	11.3	11.8	9.20	9.50	10.4	10.4	10.0	10.0	8.65	9.40	10.5	10.8	10.6	10.2	9.7	10.2
% Distortion	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

*Maximum signal for 5% distortion or ⅛ microampere grid current.

AVERAGE PLATE CHARACTERISTICS



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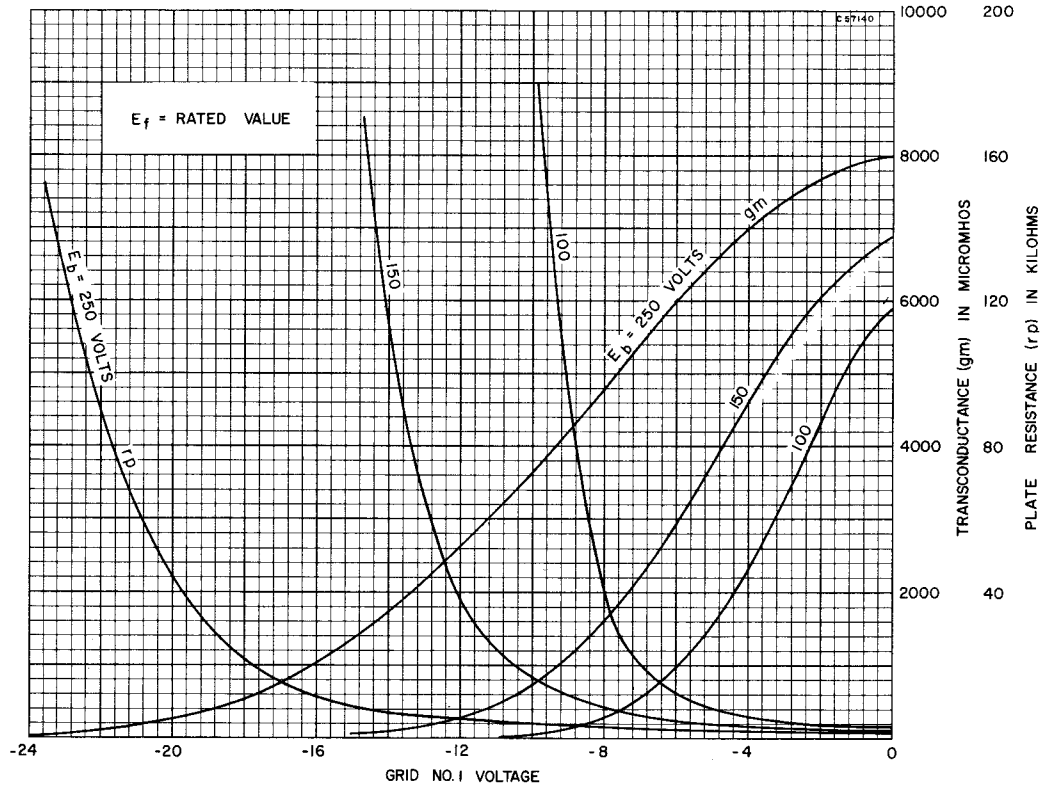
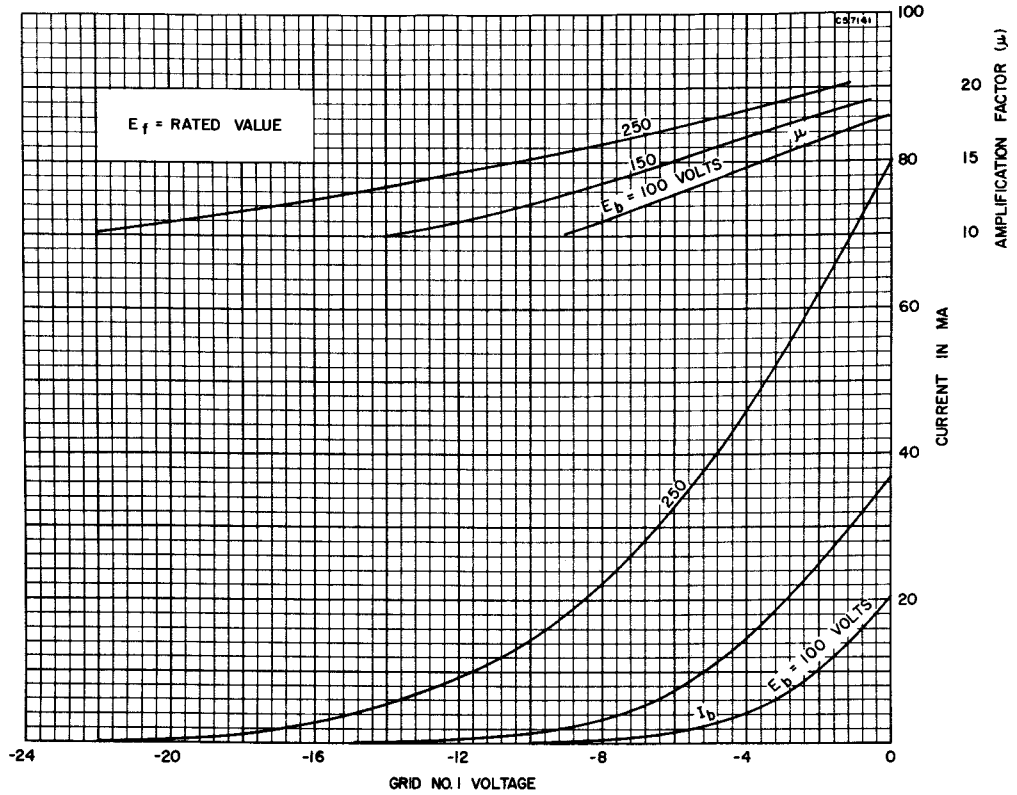
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-11
Basing	8DG
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature	250 °C	
Altitude[2]	80,000 Ft.	
Radiation		
Total Dosage (*S* neutrons/sq. cm/sec.)	10^{16} nvt	
Dose Rate (neutrons/sq. cm/sec.)	10^{12} nv	

DURABILITY CHARACTERISTICS

Impact Acceleration (¾ msec Duration)	450 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)	10 G	Max.

FAILURE RATE RATING

Class (1) — Inoperatives	1.3%/200 Hours
Class (2) — All end points	5.4%/200 Hours
Class (3) — All end points	2.7%/200 Hours

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	6.3 V	
Heater Current	350 mA	

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid to Plate (Each Section)	1.2 μμf	
Input (Each Section)	1.6 μμf	
Output		
Section No. 1	0.20 μμf	
Section No. 2	0.25 μμf	
Grid to Grid	0.013 μμf	Max.
Plate to Plate	0.45 μμf	Max.

RATINGS[1] (Absolute Maximum — Each Section)

Heater Voltage[3]	6.3 (−12, + 10%) V	
Plate Voltage	250 Vdc	
Peak-Plate Forward Voltage[4]	360 v	
Plate Dissipation	0.75 W	
Plate Current	13 mAdc	
DC Grid Voltage		
Positive Value	0 Vdc	
Negative Value	55 Vdc	
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	200 v	
Heater Negative with Respect to Cathode	200 v	
Grid Circuit Resistance	1.0 Meg	

CHARACTERISTICS (Each Section)

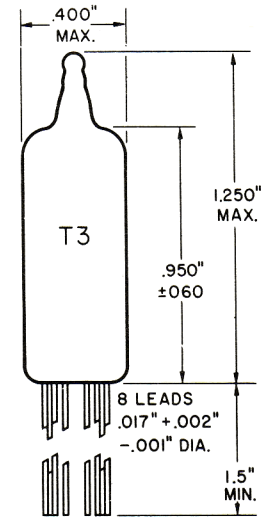
Plate Voltage	150 Vdc	
Cathode Resistor	270 Ohms	
Plate Current	6.5 mAdc	
Amplification Factor	35	
Transconductance	4000 μmhos	
Grid Voltage for Ib = 50 μAdc Max.	−9.0 Vdc	

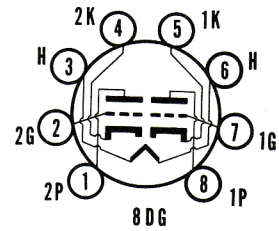
QUICK REFERENCE DATA

The Sylvania Premium Subminiature Type 6947 is a general purpose medium-mu double triode designed specifically for guided-missile service.

This type is characterized by extraordinary freedom from interelement short circuits of short term duration, by high resistance to interelement leakage, and by stable performance. It is designed for service at high altitudes and where severe conditions of mechanical shock, vibration and high temperature are encountered.

The 6947 is manufactured and inspected to meet the applicable specification for reliable operation.





sylvania electronic tubes

A Division of
Sylvania Electric Products Inc.

NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltage (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts. The Min. and Max. values are 5.5 and 6.9 volts respectively.*
4. *MIL-E-1D Par. 6.5.1.1 does not apply. Peak voltage shown should not be exceeded.*

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage . . . . . 6.3 V
Plate Voltage . . . . . 150 Vdc
Grid Voltage . . . . . 0 V
Heater-Cathode Voltage MIL-E-1 Par. 3.2.26.1 . 0 V
Cathode Resistor MIL-E-1 Par. 3.2.26.1 . . . . 270 Ohms

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1.

MIL-E-1 Ref.	Test	AQL (%)	Limits — Note 2 Min.	LAL	Bogey	UAL	Max.	Units
Measurements Acceptance Tests, Part 1, Note 1								
4.10.8	Heater Current	0.65	330	—	350	—	370	mA
4.10.5	Heater-Cathode Leakage: Note 3	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid Current: Note 3							
	Rg = 1.0 Meg	0.65	0	—	—	—	−0.3	μAdc
4.10.4.1	Plate Current (1): ALD = 2.3: Note 3	—	—	5.7	6.5	7.3	—	mAdc
4.10.4.1	Plate Current (1): Note 3	0.65	4.5	—	—	—	8.5	mAdc
4.10.4.1	Plate Current (2): Note 3							
	Ec = −9.0 Vdc; Rk = 0 Ohms	0.65	—	—	—	—	50	μAdc
4.10.9	Transconductance (1): ALD = 900 Sm Note 3	—	—	3700	4000	4300	—	μmhos
4.10.9	Transconductance (1): Sm: Note 3	0.65	3200	—	—	—	4800	μmhos
4.7.5	Continuity and Shorts (Inoperatives)	0.4	—	—	—	—	—	
4.9.1.1	Mechanical: Envelope JEDEC 3-11	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes: Note 3	2.5	—	—	—	—	—	
	Eg-all = −100 V	—	500	—	—	—	—	Meg
	Ep-all = −300 V	—	500	—	—	—	—	Meg
4.10.4.1	Plate Current (1): Difference							
	Between Sections	2.5	—	—	—	—	1.5	mAdc
4.10.9	Transconductance: Note 3							
	Ef = 5.5 V Δ Sm	2.5	—	—	—	—	15	%
4.10.6.2	Grid Emission: Notes 3, 4, & 5							
	Ef = 7.5 V; Ec = −9.0 Vdc; Rg = 1.0 Meg; Rk = 0 Ohms	2.5	0	—	—	—	−0.5	μAdc
4.10.3.2	AF Noise: Notes 6 and 7							
	Esig. (Cal.) = 65 mVac; Ck = 1000 μf; Rg = 0.1 Meg; Rp = 0.01 Meg; Rk = 135 Ohms	2.5	—	—	—	—	—	
4.10.11.1	Amplification Factor: Note 3	6.5	30	—	35	—	40	
----	Pulse Emission: Notes 3 and 8							
	Ef = 6.0 V; e Pulse = 50 v; tp = 25 μsec; Prr = 200 pps	6.5	—	—	—	—	—	
	ik	—	200	—	—	—	—	mA
	Δ ik/tp	—	—	—	—	—	20	%
----	Hum: Notes 3 and 9							
	Ef = 6.3 Vac @ 400 cps; Rk/k = 0.005 Meg	2.5	—	—	—	—	15	mv pk-pk
----	Operation Time: Notes 3 and 10	6.5	—	—	—	—	20	secs
4.10.14	Capacitance: No Shield	6.5	—	—	—	—	—	
	Cgp; Note 3	—	0.9	—	1.2	—	1.5	μμf
	Cin; Note 3	—	1.2	—	1.6	—	2.0	μμf
	Cout; Section 1	—	0.15	—	0.20	—	0.25	μμf
	Cout; Section 2	—	0.19	—	0.25	—	0.31	μμf
	Cgg	—	—	—	—	—	0.013	μμf
	Cpp	—	—	—	—	—	0.45	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Note 11							
	Pressure = 21±2 mm Hg; Voltage = 300 Vac	6.5	—	—	—	—	—	
4.9.19.1	Vibration (1):							
	Rp = 10,000 Ohms; Ck = 1000 μf; F = 40 cps; G = 10	1.0	—	—	—	—	25	mVac
----	White Noise Vibration: Notes 3, 12 & 13							
	Rp = 10,000 Ohms; Ck = 1000 μf	2.5	—	—	—	50	150	mv pk-pk
	Peak Acceleration = 15 G	2.5	—	—	—	5	25	mVac

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits — Note 2 Min.	LAL	Bogey	UAL	Max.	Units
Degradation Rate Acceptance Tests, Note 4								
4.9.5.3	Subminiature Lead Fatigue	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Note 14							
	Hammer Angle = 30°	20	—	—	—	—	—	
4.9.20.6	Fatigue: Notes 3, 11, and 15							
	G = 10, Variable Frequency	6.5	6	—	—	—	—	Hours
----	Post Shock and Fatigue Test End Points							
	Vibration (1):	—	—	—	—	—	75	mVac
	Heater-Cathode Leakage							
	Ehk = +100 Vdc	—	—	—	—	—	15	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	15	μAdc
	Change in Transconductance (1)							
	of Individual Tubes △ Sm	—	—	—	—	—	15	%
4.9.6.3	Glass Strain	4.0	—	—	—	—	—	
Acceptance Life Tests, Note 4								
4.11.7	Heater Cycling Life Test (1): (2000 Cycles Min.) Note 16 Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec = Eb = 0 V	2.5	—	—	—	—	—	
4.11.7	Heater Cycling Life Test (2): (300 Cycles Min.) Note 17 Ef = 10 V; Ehk = +200 Vdc; Rhk = 0; 10 secs on, 4 min. off	10.0	—	—	—	—	—	
4.11.3.1	Stability Life Test: Note 17 Eb = 250 Vdc; Ehk = +200 Vdc; Rg/g = 1.0 Meg; TA = Room; Rk/k = 1600 Ohms	—	—	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes △ Sm	1.0	—	—	—	—	15	%
4.11.3.1	Survival Rate Life Test: (100 Hours) Note 18 Ebb = 250 Vdc; Rk/k = 420 Ohms; Rp/p = 0.02 Meg; Rg/g = 1.0 Meg; TA = Room	—	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points:							
	Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	—	
	Transconductance (1) Sm	1.0	2800	—	—	—	—	umhos
	Grid Current	2.5	0	—	—	—	−0.3	μAdc
	Heater-Cathode Leakage: ±Ihk	0.65	—	—	—	—	10	μAdc
	Insulation of Electrodes:							
	p-all	6.5	200	—	—	—	—	Meg
	g1-all	6.5	200	—	—	—	—	Meg

MIL-E-1 Ref.	Test	LOT ACCEPTANCE LIMITS (1) MIN.	MAX.	FAILURE RATE CLASS (3) LIMITS MIN.	MAX.	Units
4.11.5	Intermittent Life Test: Notes 19 & 20 Survival Rate Life Conditions; T Envelope = 250°C Min.	—	—	—	—	
4.11.4	Intermittent Life Test End Points: (200 Hours)					
	Inoperatives: Note 21	—	—	—	—	
	Grid Current	0	−1.0	0	−1.5	μAdc
	Heater Current	330	380	320	390	mA
	Change in Transconductance (1) of Individual Tubes △ Sm/t	—	20	—	25	%
	Transconductance (2): △ Sm/Ef	—	15	—	25	%
	Heater-Cathode Leakage					
	Ehk = ±100 Vdc	—	10	—	15	μAdc
	Insulation of Electrodes					
	p-all	200	—	25	—	Meg
	g-all	200	—	25	—	Meg
	Transconductance (1) Average Change					
	Avg. △ Sm/t	—	15	—	—	%

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	ALLOWABLE DEFECTIVES
	Acceptance Life Tests, Note 4, (Cont'd.)	
----	Individual Lot Acceptance	
	Total Inoperatives	2
	Total Defectives	5
----	Failure Rate Tests: Note 20	
	Failure Rate Class 1	
	Inoperatives:	5
	Failure Rate Class 2	
	Combined defectives to Limits (1)	
	Including Inoperatives:	16
	Failure Rate Class 3	
	Combined defectives to F.R. 3 Limits	
	Including Inoperatives:	8

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding Inoperatives and Mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: For Variables Sampling Procedure, see MIL-E-1, Appendix C, Paragraph 20.2.4.

3: Test each section separately.

4: Prior to this test, tubes shall be preheated for 5 minutes at the conditions indicated below. Test within three seconds after preheating. Three minute test is not permitted. Grid Emission is a destructive test so tubes subjected to it are not to be accepted under this specification, nor are subsequent tests to be performed on the same tubes.

Ef	Eb	Ec1	Rk/k	Rg1
V	Vdc	Vdc	ohms	Meg
7.5	250	0	1600	1.0

5: Destructive Tests: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature Lead Fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater Cycling Life Tests (1) & (2)
4.11.5	Intermittent Life Test
4.10.6.2	Grid Emission

6: Tie 1k to 2k, 1g to 2g and 1p to 2p.

7: The rejection level shall be set at the VU meter reading obtained during calibration.

8: The pulse shall be applied to the plate and grid tied together. It shall be a square wave meeting the pulse shape requirement of MIL-E-1, par. 4.10.7.5, and in addition, the maximum amplitude shall occur within the first 20% of tp. The pulse shall be applied by means of a driving circuit which produces the specified pulse voltage directly at the plate and grid terminals with respect to cathode.

Peak currents shall be measured by means of a high impedance oscilloscope or equivalent device connected across a 1.0 ohm cathode resistor whose value is known to an accuracy of 1%. The specified limit, ik, refers to the maximum of the pulse amplitude. The variation of the output pulse amplitude, ik (tp), between 20% tp and 80% tp shall not exceed the specified limit where tp is as defined in MIL-E-1, par 4.10.7.5.

9: Maximum total distortion of the filament supply voltage shall be 5%. The frequency response of the peak-to-peak measuring device from 20 cps to 5000 cps must be within 0.5 db of its response at 400 cps. Ground all leads except those for the cathodes and heater lead #3. Measure Hum voltage across specified Rk in each cathode separately.

10: Insert a cold tube into the test socket having all Plate Current (1) conditions applied and record Ib continuously for three minutes. Plate Current must reach 85% of the three minute figure within the time indicated.

11: This test shall be conducted on the initial lot and thereafter on a lot approximately every 30 days. In the event of lot failure, the lot shall be rejected and the succeeding lot shall be subjected to this test. Once a lot has passed, the 30-day rule shall apply. MIL-STD-105, Sample Size Code Letter F shall apply.

12: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately a "WHITE NOISE" spectrum which is free from discontinuities from 100 cps to 5000 cps and such that the RMS value of acceleration for frequencies outside this band shall constitute no more than five percent of the total RMS acceleration. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 ± 0.2 G's RMS acceleration. With this the case, the RMS value of acceleration for any bandwidth within the specified spectrum is equal to:

$$Grms = 2.3 \sqrt{3.32 \log_{10} (f2/f1)}$$

where f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

Half the tubes in the sample shall be vibrated in position X1, the other half in position X2.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (250 Kohms or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 30 db at 13,000 cps. For reading the peak-to-peak value of output voltage, the filter output shall be fed directly to the input of a Ballantine Model 305 peak-to-peak electronic voltmeter or equal, while the RMS value shall be measured with a Hewlett Packard Model 400 C or equal. The impedance of the plate and screen voltage supplies shall not exceed that of a 40 μf capacitor at 10 cps.

13: For variables sampling procedure, use MIL-E-1, Appendix C, par. 20.2.4.2.2.

14: A grid resistor of 0.1 meg shall be added; however, this resistor will not be used when a thyratron type short indicator is employed.

14: The tubes shall be rigidly mounted on a table vibrating at a constant acceleration level of 10 G. The frequency of vibration shall be varied from 30 cps to 3000 cps and back to 30 cps, with the period of the sweep cycle being three minutes. The rate of change of frequency with time shall be such that the frequency varies logarithmically with time. The tubes shall be vibrated for a total of six hours, that is, two hours in each of the three positions X1, X2, and Y1. Filament voltage only shall be applied to the tube under test.

16: The no load to steady state full load regulation of the heater voltage supply shall be not more than 3.0%.

17: The sampling and testing procedure for the Stability Life Test shall be in accordance with MIL-E-1, Appendix C, Section 20.2.5.1.

ACCEPTANCE CRITERIA NOTES (Continued)

18: For Survival Rate Life Test, the sampling and testing procedure shall be as defined in Sections 20.2.5.2 to 20.2.5.2.5 inclusive of MIL-E-1, Appendix C.

19: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of No. 40B and S, or small diameter elements welded to a ring of 0.025-inch diameter phosphor bronze placed in contact with the envelope. The envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5 percent) under normal conditions, is determined to operate at or above the minimum specified temperature in any socket of the life-test rack.

20: **1.0 Intermittent Life Test Evaluation:** The life test conducted in accordance with this specification shall be evaluated in two separate procedures. The first will be an evaluation on an individual lot basis in a similar manner to the one normally specified for reliable tubes. The second evaluation is the determination of a failure rate and its compliance to this specification. The life test will be conducted in accordance with MIL-E-1 procedures for reliable tubes except that the sampling plan will be changed from the presently specified double sampling plan to a single sampling plan with n = 40. Individual lot acceptance will be based on this sample size and the conformance of the lot to the maximum allowable defectives for inoperatives and also for combined defectives as specified.

2.0 The Failure Rate Control:

a. Purpose: It is the purpose of this specification to establish a means by which the Military may monitor and evaluate the failure rate of this tube type in order to provide a statistically valid description of this parameter that may be utilized in computing the reliability of equipments in which this type is used.

b. Description: The failure rates on this type shall be evaluated using the life test information gathered on individual lots. Only those lots that pass the life test criteria for individual lots shall be used in the calculations for failure rates. The failure rate shall be based on a 5 lot moving average with the cumulative number of failures for each failure rate class plotted on their respective failure rate charts (See Charts 1, 2 and 3). Non-conformance of a tube to the 200 hour end points shall be considered a failure.

The Failure rate charts consist of a plot of consecutive lots manufactured with each point indicating the cumulative number of failures in the last five lots as evaluated against the specified criteria. In the operation of this procedure, each time a new lot is added, the number of defects from the earliest lot is dropped from the accumulation of defectives so that each plotted point on the chart will represent a total sample size of 200 tubes.

Any lot which fails the individual lot acceptance criteria shall not be included in the cumulations for failure rate charts. However, the number of defectives for such a failing lot should be plotted on the failure rate chart in its chronological order with the other lots. This point is plotted for information only.

c. Qualification: In order to become a qualified source to this specification, it is mandatory that the manufacturer supply data on charts 1, 2 and 3 indicating that his failure rate is within the acceptable limits. A total quantity of 200 tubes life tested for 200 hours is required and this should be representative of two or more consecutively manufactured lots (e.g., 100 tubes from each of 2 lots or 40 from each of 5 lots). In the event more than 40 tubes per lot are used in the life test sample in order to accelerate qualification for failure rate, only the first 40 tubes life tested per lot shall be evaluated for the individual lot acceptance criteria.

d. Maintenance of Failure Rate: When the manufacturer has become a qualified source to this specification and has received proper approval from the Military, those lots utilized for qualification and subsequent lots where the 5 lot moving evaluation failure rate continues within the specification, are to be considered acceptable to this specification and may be marked and shipped accordingly.

e. Non-conformance of Failure Rate: The failure rate will be considered non-conforming when the total number of defectives (for the particular failure rate under evaluation) accumulated from the past 5 lot life test exceeds the number permissible as contained in the specification and on the failure rate chart. The lot of tubes which caused the failure rate limit to be violated shall be considered as acceptable and can be marked and shipped in accordance with this specification. When a failure rate criteria has been violated, the manufacturer has lost qualification to this specification and cannot mark and ship any subsequent lots to this specification without being requalified.

f. Requalification for Failure Rate: Since all three failure rates specified in this specification are computed from the same life test data, a violation of 1 failure rate requires requalification for all three failure rates. Requalification shall follow the same procedure as for original qualification. Starting after the last lot which rendered disqualification, a life test sample of 200 tubes from the next two new consecutive lots will be required to conform to this specification before qualification is reinstated to the manufacturer.

g. Charts: Each manufacturer intending or planning to supply tubes to this specification must forward his qualification data in the form of the three failure rate charts to the Military. These charts must be duly approved and signed by the Resident Government Inspector as representing the factual results of the life tests which were conducted in complete accordance with MIL-E-1 and this specification.

21: An inoperative as referenced in Life Tests shall be defined as a tube having one (1) or more of the following defects: Discontinuity (Ref. 4.7.1), Permanent Shorts (Ref. 4.7.2), Air Leaks (Ref. 4.7.6).

APPLICATION DATA

The Sylvania Premium Subminiature Type 6947 is a medium mu double triode having separate cathode connections for each section. It is intended as a general purpose tube and is particularly useful in applications where power requirements are such that the 6947 may be employed rather than two high power single triodes. Among the many uses for this type are a number of low frequency amplifier and oscillator configurations. To insure optimum performance in pulse applications this type is subjected to a pulse emission test as shown in the accompanying data. The tube must, under the specified pulse operating conditions, deliver a minimum specified current. A further discussion of this test is included in the general section of this manual.

Resistance coupled amplifier data is shown in the accompanying table.

The Type 6947 may also be used as a vhf amplifier. Instability, however, may be noted with cascode arrangements at frequencies above approximately 100 mc. The 6947 has a low noise figure which makes it particularly well suited to applications as an IF amplifier in the 30 to 60 mc region. Input resistance is plotted as a function of frequency in Figure 1.

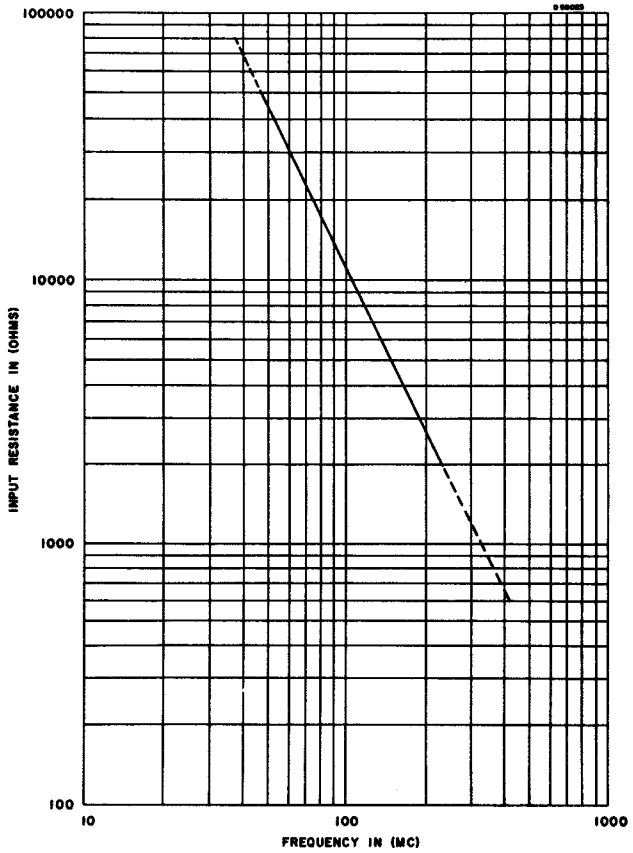


Figure 1—Input resistance vs frequency.

This type is characterized by extraordinary freedom from interelement short circuits of short term duration, by high resistance to interelement leakage, and by stable performance. In addition, vibrational output when the tube is subjected to wide band (White Noise) vibration is held to a very low value. It is designed for service at high altitudes and where severe conditions of mechanical shock, vibration and high temperature are encountered. These characteristics give the type special value in guided missile applications.

Tube durability under extreme vibration for extended periods is assured by more stringent fatigue testing techniques. Excitation for the fatigue test varies in frequency from 30 cps to 3,000 cps and back to 30 cps. Three minutes are required to sweep through one complete cycle. The sweep-frequency vibration has a constant acceleration level of 10 G in contrast to the 2.5 G level formerly used on most reliable receiving tube types. The sweep-frequency cycle is repeated continuously for two hours in each of three positions, totalling six hours.

To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

The 6947 is manufactured and inspected to meet the applicable specification for reliability. Life expectancy is described by the life tests, specified on the attached pages. The actual life expectance of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

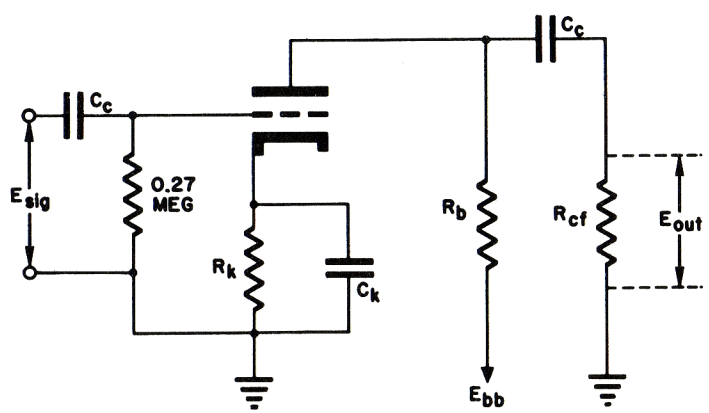
When operated under conditions common to on-off control applications, the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

RESISTANCE COUPLED AMPLIFIER DATA
SELF-BIAS OPERATION

	Ebb = 100 Volts								Ebb = 150 Volts							
Rb (Megs)	.047		.10		.27		.47		.047		.10		.27		.47	
Rcf (Megs)	.10	.27	.10	.47	.27	.47	.47	1.0	.10	.27	.10	.47	.27	.47	.47	1.0
Rk (Ohms)	1800	2200	3300	3900	8200	10,000	12,000	15,000	1200	1500	2200	3300	5600	6800	10,000	12,000
Ib (Ma)	.72	.67	.41	.37	.17	.16	.11	.10	1.30	1.18	.72	.62	.30	.28	.18	.15
Ec (Volts)	−1.30	−1.45	−1.35	−1.45	−1.42	−1.60	−1.34	−1.53	−1.56	−1.77	−1.58	−2.05	−1.70	−1.95	−1.78	−1.83
Eb (Volts)	65	68	58	62	52	55	46	50	97	93	76	76	66	71	65	77
Esig (Volts RMS)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Eout (Volts RMS)	1.70	1.79	1.70	1.93	1.80	1.89	1.89	1.95	1.95	2.03	1.95	2.11	2.06	2.12	2.05	2.06
Gain	17.0	17.9	17.0	19.3	18.0	18.9	18.9	19.5	19.5	20.3	19.5	21.1	20.6	21.2	2.05	20.6
% Distortion	0.80	0.54	0.82	0.44	0.64	0.55	0.58	0.53	0.40	0.37	0.42	0.35	0.40	0.38	0.44	0.45
Esig (Volts RMS)*	.45	.52	.43	.56	.50	.60	.51	.67	.70	.85	.67	.97	.81	.97	.87	1.08
Eout (Volts RMS)	7.6	9.15	7.2	10.8	8.8	11.0	9.4	13.0	13.6	17.2	13.0	20.4	16.6	20.5	17.7	22.3
Gain	16.9	17.6	16.7	19.3	17.6	18.3	18.4	19.4	19.4	20.2	19.4	21.0	20.5	21.1	20.3	20.6
% Distortion	5.0	5.0	5.1	4.4	5.0	5.0	4.6	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

	Ebb = 250 Volts							
Rb (Megs)	.047		.10		.27		.47	
Rcf (Megs)	.10	.27	.10	.47	.27	.47	.47	1.0
Rk (Ohms)	820	1000	1500	2200	4700	5600	8200	10,000
Ib (Ma)	2.57	2.47	1.40	1.24	0.56	0.53	0.32	0.30
Ec (Volts)	−2.10	−2.47	−2.11	−2.73	−2.63	−2.96	−2.64	−3.00
Eb (Volts)	127	132	107	123	96	104	96	106
Esig (Volts RMS)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Eout (Volts RMS)	2.28	2.40	2.23	2.38	2.25	2.30	2.23	2.29
Gain	22.8	24.0	22.3	23.8	22.5	23.0	22.3	22.9
% Distortion	0.35	0.33	0.36	0.39	0.39	0.42	0.47	0.50
Esig (Volts RMS)*	1.22	1.42	1.15	1.67	1.40	1.74	1.55	1.88
Eout (Volts RMS)	27.8	33.5	25.6	39.8	31.5	40.0	34.5	43.0
Gain	22.8	23.5	22.2	23.8	22.5	23.0	22.3	22.8
% Distortion	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

*Maximum signal for ⅛ μa grid current or 5.0% distortion.



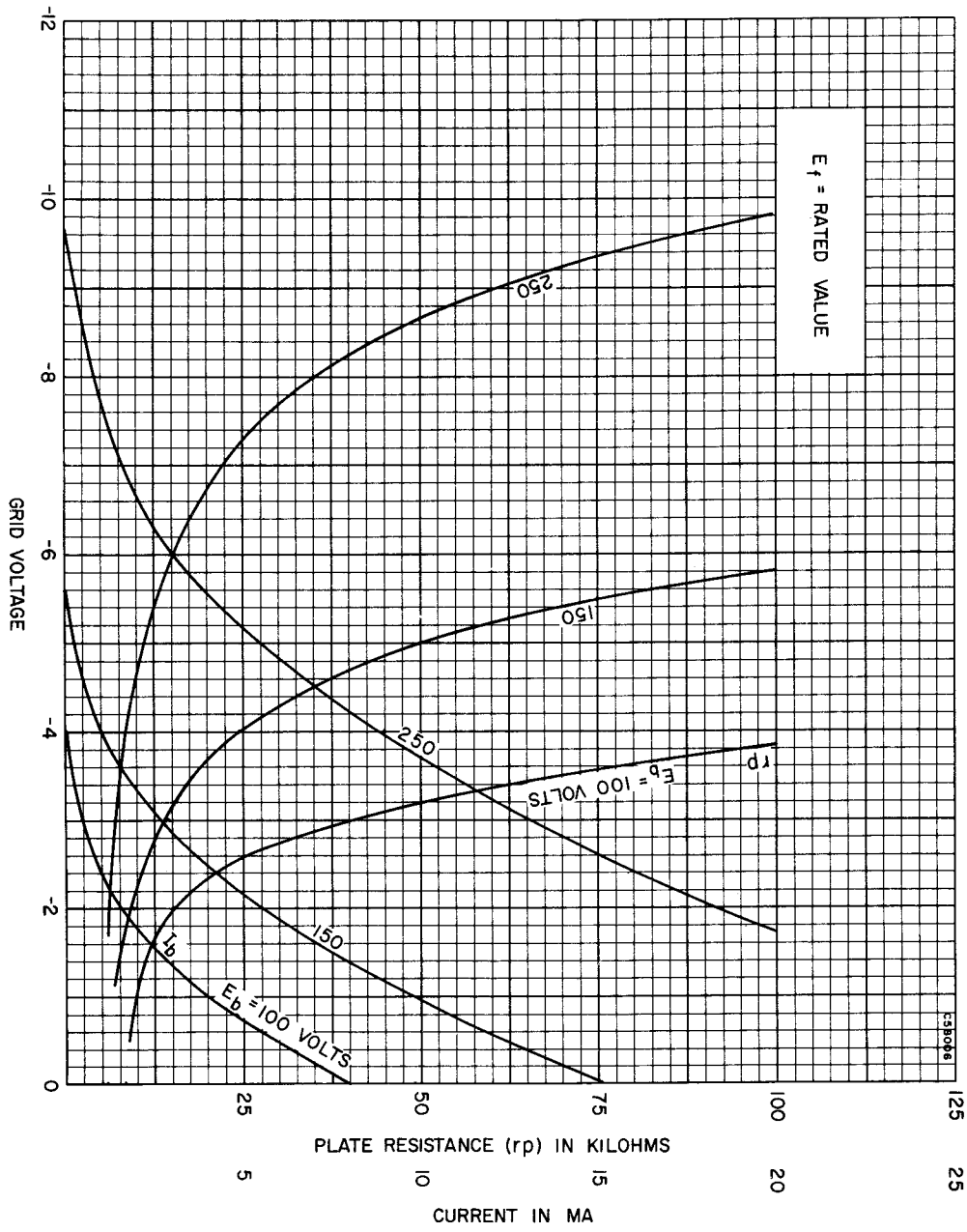
C_K LARGE ENOUGH TO NEGLECT DEGENERATION AND
C_C LARGE ENOUGH TO NEGLECT VOLTAGE DROP

D56024

Resistance Coupled Amplifier Circuit

6947

AVERAGE TRANSFER CHARACTERISTICS



ADVANCE DATA

The Sylvania Type 6948 is a subminiature high mu double triode. This type is characterized by extraordinary freedom from interelement short circuits of short term duration, by high resistance to interelement leakage, and by stable performance. In addition, vibrational output when the tube is subjected to wide band (White Noise) vibration is held to a very low value. It is suitable for service at high altitudes and where severe conditions of mechanical shock, vibration and high temperature are encountered. These characteristics give the type special value in guided missile applications.

MECHANICAL DATA

Bulb	T-3
Base	E8-10 Subminiature Button
Outline	3-11
Basing	8DG
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS [1]

Bulb Temperature (At Hottest Point)	250	°C	Max.
Operational Altitude	80,000	Ft	Max.

DURABILITY CHARACTERISTICS [2]

Impact Acceleration [3]	100	G
Vibrational Acceleration for an Extended Period [4]	10	G
On-Off Heater Cycles [5]	2000	

ELECTRICAL DATA

HEATER CHARACTERISTICS

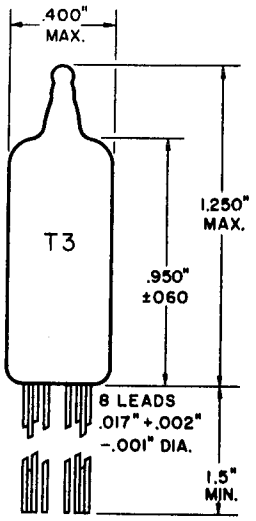
Heater Voltage	6.3	V	
Heater Current	350	mA	
Heater-Cathode Voltage (Absolute Values)	200	v	Max.

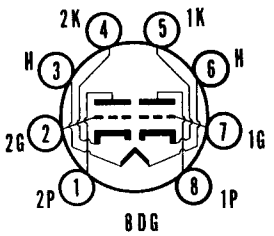
CONTROLLED DETRIMENTS

Interelectrode Insulation [6]	250	Meg	Min.
Total Grid Current [7]	-0.3	μAdc	Max.
Grid Emission [8]	-0.5	μAdc	Max.
Hum Output [9]	15	mv pk-pk	Max.
White Noise Vibration Output [10]	60	mv pk-pk	Max.
	10	mV rms	Max.
Heater-Cathode Leakage [11]	5.0	μAdc	Max.

QUICK REFERENCE DATA

The Sylvania Type 6948 is a subminiature general purpose high mu double triode designed specifically for guided missile service.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

May 6, 1957

DIRECT INTERELECTRODE CAPACITANCES (Without External Shield)

Grid to Plate	0.75	μμf	
Input: g to (h + k)	1.6	μμf	
Output Triode No. 1: p to (h + k)	0.20	μμf	
Output Triode No. 2: p to (h + k)	0.25	μμf	
Coupling			
Grid to Grid	0.014	μμf	Max.
Plate to Plate	0.86	μμf	Max.

RATINGS[1] (Absolute Values)

Heater Voltage Variation	6.3 ± 10%	V	Max.
Instantaneous Plate Voltage	360	v	Max.
Plate Voltage	250	Vdc	Max.
Plate Dissipation (Each Plate)	0.5	W	Max.
Plate Current (Each Plate)	10	mAdc	Max.
Positive Grid Voltage	0	Vdc	Max.
Negative Grid Voltage	55	Vdc	Max.
External Grid Circuit Resistance	1.0	Meg	Max.

AVERAGE CHARACTERISTICS (Each Section)

Conditions:			
Heater Voltage	6.3	V	
Plate Voltage	100	Vdc	
Cathode Bias Resistor	1500	Ohms	
Plate Current	0.8	mAdc	
Transconductance	1650	μmhos	
Amplification Factor	70		
Grid No. 1 Voltage for Ib = 10 μA	-3.5	Vdc	
Plate Current Difference between Sections	0.2	mAdc	Max.
Operation Time[12] (maximum)	20	secs	

NOTES:

1. Limiting values beyond which normal tube life and normal tube performance may be impaired.

2. Tests performed as a measure of the mechanical durability of the tube structure.

3. Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = 4 milliseconds.

4. Vibrational forces applied in any direction for a period of six hours repeatedly sweeping the range from 30 cps to 3000 cps and back, with the period of the sweep cycle being three minutes.

5. One cycle consists of the application of Ef = 7.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.

NOTES: (Cont'd)

6. Measure each section separately with Ef = 6.3 V; Eg-all = -100 Vdc; Ep-all = -300 Vdc; cathode is positive so that no cathode emission occurs.

7. Measure each section separately with Ef = 6.3 V; Eb = 150 Vdc; Rk = 820 Ohms; Rgl = 1.0 Meg.

8. Each section preheated for five minutes with Ef = 7.5 V; Eb = 250 Vdc; Rk = 1500 Ohms; Rg = 1.0 Meg; then each section tested separately with Ef = 7.5 V; Eb = 100 Vdc; Ecl = -3.5 Vdc; Rg = 1.0 Meg. This is a destructive test and therefore must be conducted on a sample basis.

9. Test each section separately with Ef = 6.3 V (400 cps), Eb = 150 Vdc; Rk = 820 Ohms; RL = 10,000 Ohms; measure the hum output across RL in the frequency band from 20 cps to 5000 cps.

10. Test each section separately with Ef = 6.3 V; Eb = 100 Vdc; Rk = 1500 Ohms; Rp = 10,000 Ohms. The White Noise voltage across Rp is filtered to roll off approximately 35 db between 10,000 cps and 13,000 cps and is then measured with both a peak to peak meter and an rms meter. The vibrational force applied to the tube under test is such that the instantaneous values of acceleration form a White Noise spectrum from 100 cps to 5000 cps. Energy within this spectrum is distributed such that each octave of bandwidth delivers 2.3 G's rms acceleration. The degree of clipping is such that peak values of acceleration exceed 15 G's.

11. Measure each section separately with Ef = 6.3 V; Ehk = ±100 Vdc.

12. Operation time is the time required for a tube to reach a value of plate current equal to 85% of that value attained after three minutes.

SYLVANIA engineering data service

ADVANCE DATA

MECHANICAL DATA

General

Base	Small Wafer Octal, B8-21	
Cap	Small	
Output Flange	(See Drawing)	
Cathode	Unipotential Oxide	
Total Tuner Rotation	10-15	Turns/400 Mc
Maximum Tuning Backlash	20	Degrees
Maximum Tuning Torque	20	Ounce Inches
Cooling[2]	Forced Air	
Mounting Position	Any	

Environmental

Vibration, 50 Cycle, (Non-Operating)	10	G
Shock (Non-Operating, 11 ms)	15	G

ELECTRICAL DATA

HEATER CHARACTERISTICS

Voltage	6.3 ± 10%	V
Current (at 6.3 V)	0.7 - 0.9	A

INTERELECTRODE CAPACITANCE

Reflector to All Elements and Shell (Maximum)	5.5	µµf

RATINGS (Absolute Maximum Values)

Heater-Cathode Voltage	±45	Vdc
Resonator Voltage	825	Vdc
Reflector Voltage	-500	Vdc
(Minimum)	-15	Vdc
Cathode Current	110	mAdc
Body Temperature[2]	125	°C

TYPICAL OPERATION (Any Frequency 4600-5000 Mc)

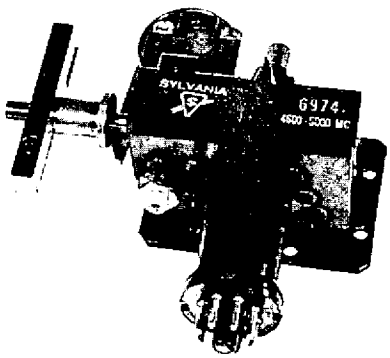
Conditions

Resonator Voltage	800	Vdc
Reflector Voltage[3]	-180 to -410	Vdc

from JEDEC release #2685, Jan. 4, 1960

QUICK REFERENCE DATA

Reflex Klystron
4600-5000 Mc
Over 1 Watt Output
Temperature Compensated
Integral Cavity
Long Life[1]
Wide Tuning Range
Low Distortion
Ideal for Remote Tuning
Low Tuning Torque
Designed for Reflector-Tuner Tracking
Fine Tuning



POWER CONNECTIONS

1. Shell, Resonator
2. nc
3. nc
4. Cathode
5. Heater
6. Heater
7. int con
8. nc

Cap - Reflector

SYLVANIA ELECTRIC PRODUCTS INC.
SPECIAL TUBE OPERATIONS
MOUNTAIN VIEW, CALIFORNIA

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

May 8, 1959

TYPICAL OPERATION (Any Frequency 4600-5000 Mc) (Cont'd)

Characteristics	Min.	Max.	
Cathode Current	-	100	mAdc
Power Output	1	-	W
Electronic Tuning Range (Between Half Power Points)	25	-	Mc
Modulation Sensitivity (±4 Mc at 60 cps)	220	400	kc/v
Modulation Sensitivity Variation	-	95	kc/v
Reflector Voltage Linearity (Departure from Straight Line)	0	±15	Vdc
Pulling Factor (VSWR = 1.5, all Phases)	-	12.5	Mc
Temperature Coefficient (Ambient Temperature = 80° to 30°C)	0	±80	kc/°C

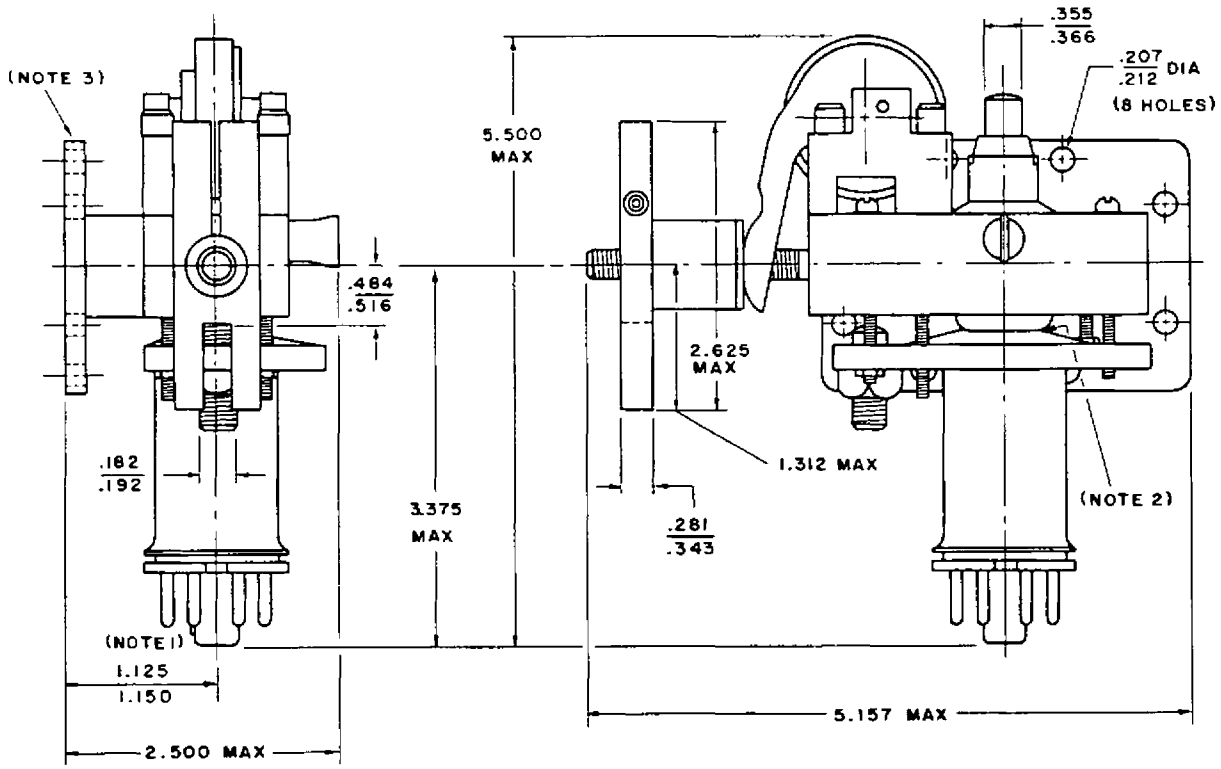
NOTES:

1. Prorated warranted life when operated within ratings is 2000 hours. For maximum shelf life tube must be operated for one hour every six months.

2. Adequate air cooling shall be provided at all times during operation so that the temperature measured at the test point shown on the outline drawing will not exceed 125°C.

3. Adjust for maximum power output.

OUTLINE



OUTLINE NOTES:

1. Dimension applies from flange surface plane to center of end of base guide lug.
2. Temperature test point.
3. Wave guide flange mates with airtron #54626.

MECHANICAL DATA

Bulb	T-1
Base	Subminiature Button Flexible Leads
Outline	See Diagram
Basing	See Diagram
Cathode	Coated Filament
Mounting Position	Note 1

ELECTRICAL DATA

FILAMENT CHARACTERISTICS

Filament Voltage AC or DC	1.0 ± 5 % V
Filament Current	30 Ma

RATINGS (Absolute Maximum)

Plate Voltage	65 Vdc
Plate Current	750 μA
Grid Resistance	1.0 Megohm

CHARACTERISTICS AND TYPICAL OPERATION

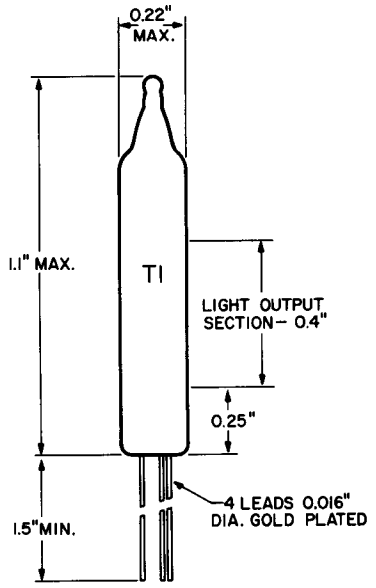
Filament Voltage[2] AC	1.0 Volt
DC Plate Voltage	50 Volts
Grid Resistance	100,000 Ohms
Grid Supply Voltage (Max. Light Output)	0 Volt
Plate Current (Max. Light Output)	585 μA
Grid Supply Voltage (Zero Light Output)	−3 Volts
Plate Current (Zero Light Output)	5 μA

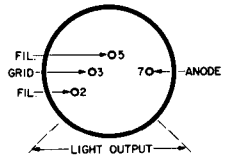
NOTES:

1. *Type 6977 tubes are designed to be soldered-in and mounted flat and parallel to each other on printed circuit boards such that the light output sides of the tubes face the front.*
2. *Center tap of filament transformer grounded.*
3. *The 6977 is well suited for use in transistorized circuits where its high input impedance and small signal requirements do not load the transistor circuit. The 6977 is optimized for side view mounting and will produce a bright blue-green light area approximately 0.4 x .187 inches.*

QUICK REFERENCE DATA

The Sylvania Type 6977 is a filamentary, high vacuum, subminiature indicator triode with a fluorescent anode, capable of operating from DC plate and grid supplies. It is designed for applications in electronic computers and business machines where it can replace neon lamps.[3]





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RECEIVING TUBE
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EMPORIUM, PA.
Prepared and Released By The
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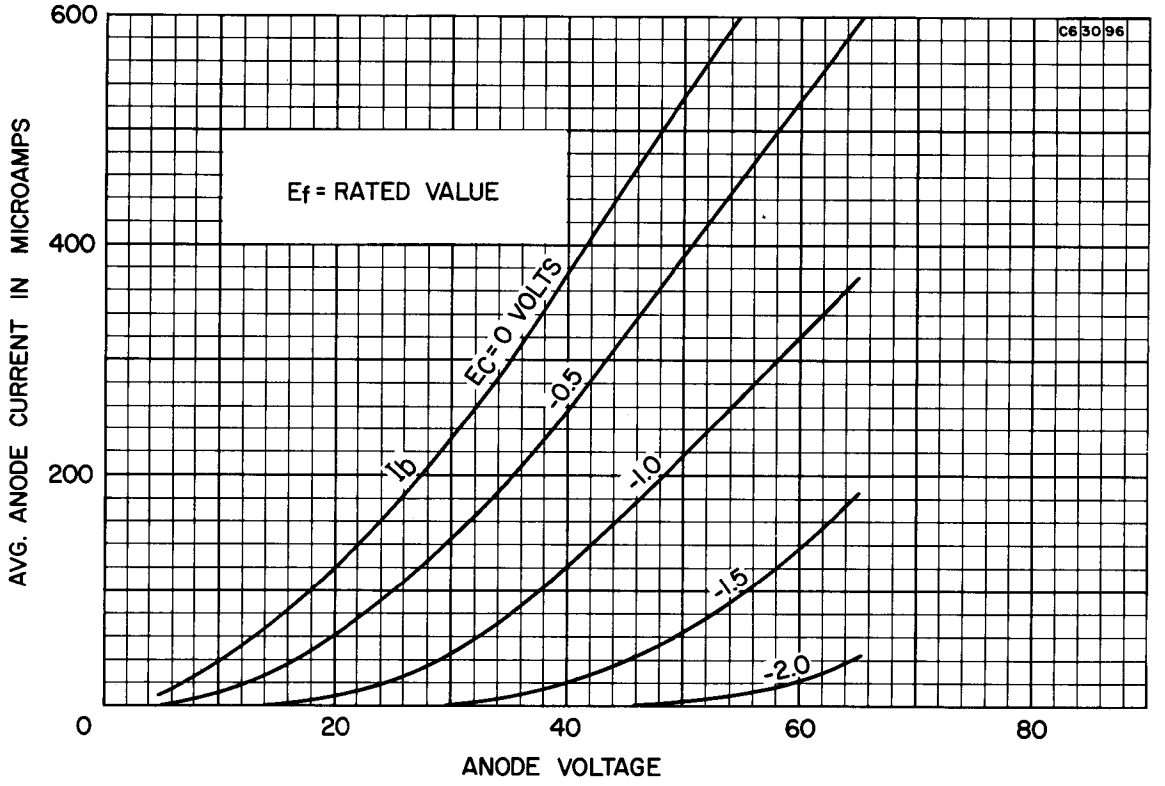
EMPORIUM, PENNSYLVANIA
OCTOBER, 1963

File Under
RECEIVING TUBES

AVERAGE ANODE CHARACTERISTICS



SYLVANIA

engineering data service

SYLVANIA
7025

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9A
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage Series/Parallel	12.6/6.3 Volts	
Heater Current Series/Parallel	150/300 Ma	
Heater-Cathode Voltage		
(Design Center Values)		
Heater Negative with Respect to Cathode		
Total DC and Peak	200 Volts	Max.
Heater Positive with Respect to Cathode		
DC	100 Volts	Max.
Total DC and Peak	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES

	Section 1[1]		Section 2[1]		
	Shielded[2]	Unshielded	Shielded[2]	Unshielded	
Grid to Plate	1.7	1.7	1.7	1.7	μμf
Input g to (h+k)	1.8	1.6	1.8	1.6	μμf
Output p to (h+k)	1.9	0.46	1.9	0.34	μμf

RATINGS (Design Center Values) Each Section

Plate Voltage	300 Volts	Max.
Plate Dissipation	1.0 Watt	Max.
Positive Grid Voltage	0 Volts	Max.
Negative Grid Voltage	−50 Volts	Max.

CHARACTERISTICS AND TYPICAL OPERATION

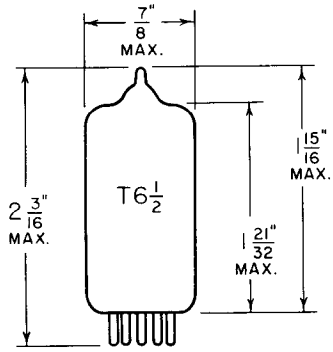
Class A_1 Amplifier — Each Section			
Plate Voltage	100	250	Volts
Grid Voltage	−1	−2	Volts
Plate Current	0.5	1.2	Ma
Transconductance	1250	1600	μmhos
Amplification Factor	100	100	
Plate Resistance	80,000	62,500	Ohms

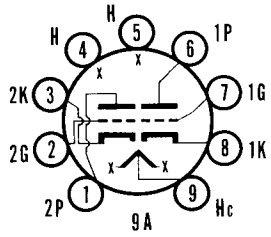
EQUIVALENT NOISE AND HUM VOLTAGE

(Referenced to Grid — Each Unit)		
Average Value[3] (RMS)	1.8	μVolts
Maximum Value[4] (RMS)	7	μVolts

QUICK REFERENCE DATA

The Sylvania Type 7025 is a miniature high-mu twin triode having separate cathodes. It is designed for service as an audio voltage amplifier or phase inverter. The center tapped heater permits operation on 12.6 or 6.3 volts. The Type 7025 is identical to the 12AX7 except for improved noise and hum characteristics.





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SYLVANIA ELECTRIC PRODUCTS, Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PENNSYLVANIA

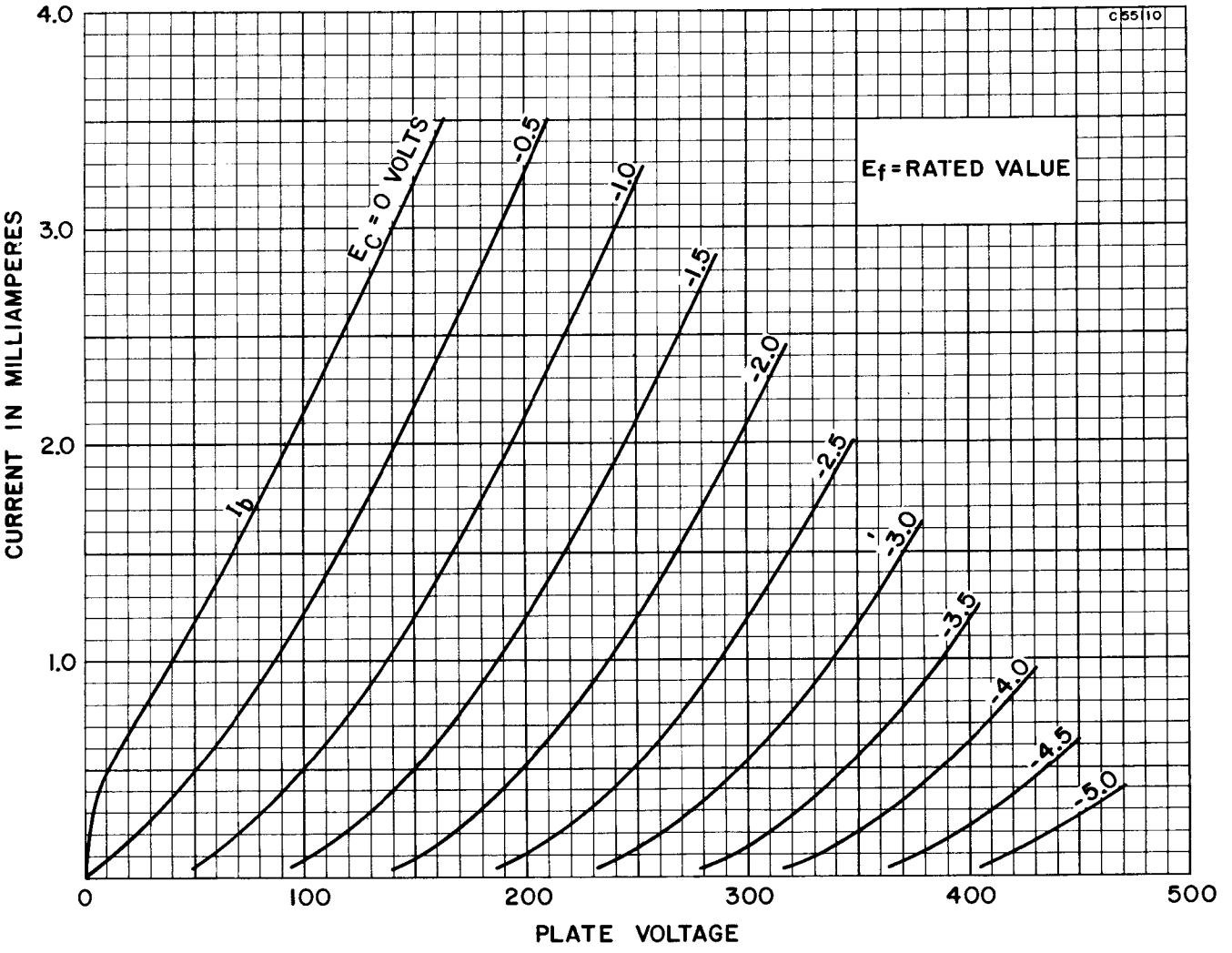
Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

DECEMBER 1958

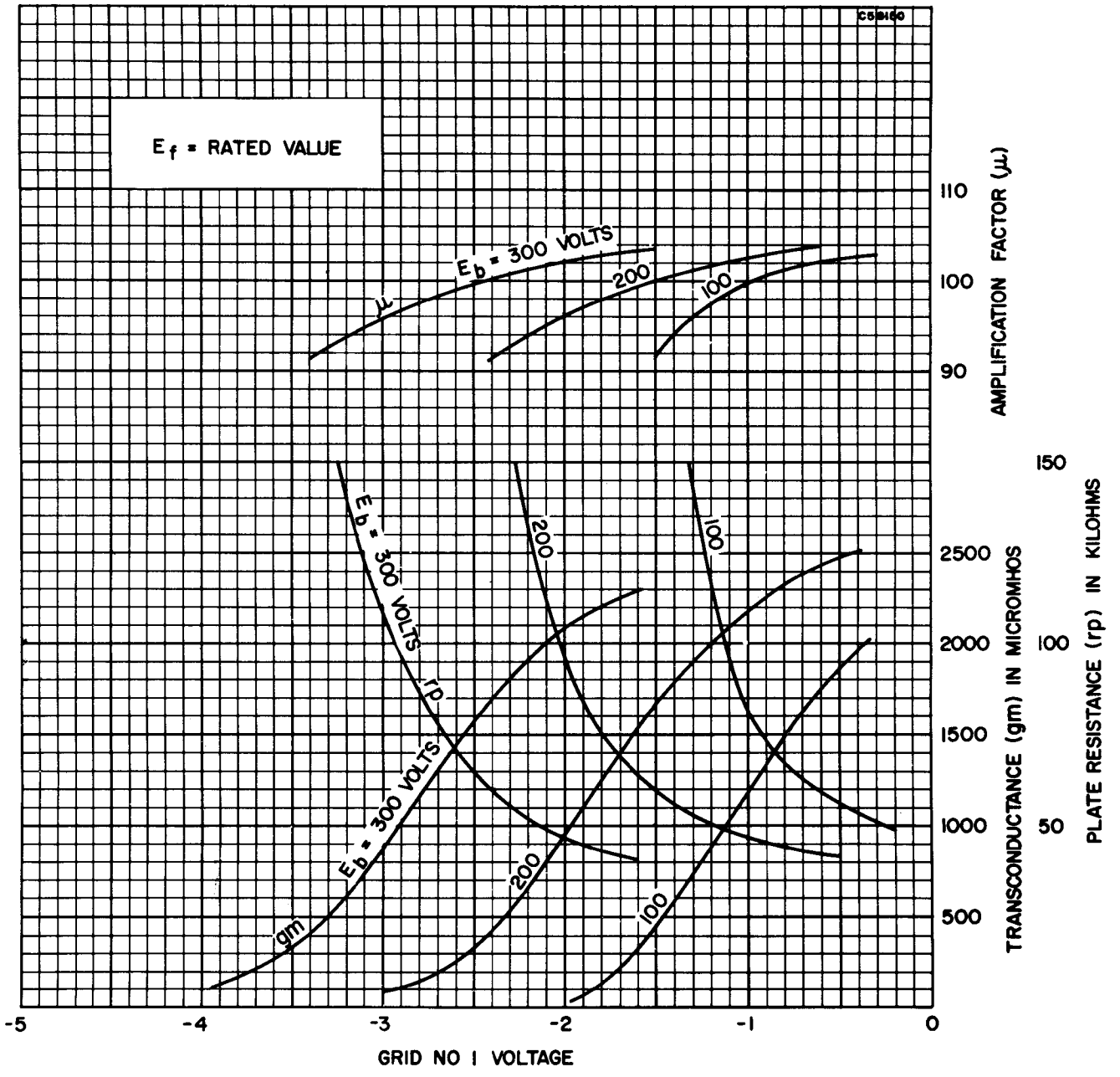
NOTES:

1. *Section No. 1 connects to Pins 6, 7, and 8.*
   Section No. 2 connects to Pins 1, 2, and 3.
2. *External shield No. 315 connected to cathode of section under test.*
3. *Measured under the following conditions: Ef = 6.3 Vac, parallel connection; center-tap of heater transformer grounded; Ef = 250 Vdc; Rg = 0.1 Megohm; Rk = 2700 Ohms; Ck = 100 μf; Rg = O; F = 25 to 10,000 cps.*
4. *Measured under same conditions as "Average Value" except that Rk is unbypassed and Rg = 50,000 Ohms.*

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Small Button 9-Pin
Outline	6-3
Basing	9H
Cathode	Coated Unipotential
Mounting Position	
Preferred	Upright or with Plate Majors in a Vertical Position
Permissible	Any

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section 1		Section 2
Grid to Plate	6.0		6.0 μμf
Input: g to (h+k)	4.8		4.8 μμf
Output: p to (h+k)	0.65		0.55 μμf
Heater to Cathode	6.0		6.0 μμf
Grid No. 1 to Grid No. 2		0.10	μμf
Plate No. 1 to Plate No. 2		1.4	μμf

HEATER CHARACTERISTICS

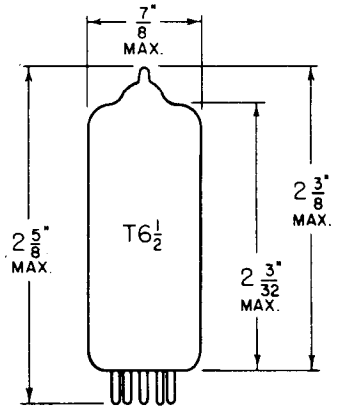
	Series	Parallel	
Heater Voltage	12.6 ± 5%	6.3 ± 5%	Volts
Heater Current	450	900	Ma
Heater Power	5.7	5.7	Watts
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode			
Total DC and Peak		200	Volts
Heater Positive with Respect to Cathode[1]			
DC		100	Volts
Total DC and Peak		200	Volts

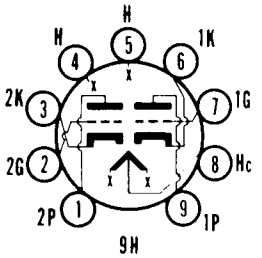
RATINGS (Absolute Maximum Values—Each Section)[2]

Average Plate Voltage[3]	300 Volts	Max.
Peak Plate Voltage (Measured Between Plate and Cathode)[4]	600 Volts	Max.
Grid Voltage		
Negative Bias Value DC	100 Volts	Max.
Positive Bias Value DC	1.0 Volt	Max.
Peak Negative Value[4]	300 Volts	Max.
Peak Positive Value[4]	30 Volts	Max.
Average Positive Grid Current[3]	5.0 Ma	Max.
Peak Positive Grid Current[4]	200 Ma	Max.
Average Plate Dissipation[3]	4.5 Watts	Max.
Average Total Plate Dissipation (Both Sections)[3]	8.0 Watts	Max.
Average Cathode Current[3]	50 Ma	Max.
Peak Cathode Current[4]	400 Ma	Max.
Grid Circuit Resistance		
Fixed Bias	0.1 Megohm	Max.
Cathode Bias	0.47 Megohm	Max.
Bulb Temperature (At hottest point on bulb)	160° C	Max.

QUICK REFERENCE DATA

The Sylvania Type 7044 is a high-perveance, medium-mu, double triode designed primarily for computer applications. The tube is characterized by high zero-bias plate current and exceptional freedom from the development of cathode interface.





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RADIO TUBE DIVISION

EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

NOVEMBER, 1957

INITIAL CHARACTERISTICS (Each Section)[5]

Plate Voltage	120 Volts
Grid Voltage	-2 Volts
Plate Current	36 Ma
Transconductance	10,000 μmhos
Amplification Factor	19
Plate Resistance	1900 Ohms
Grid Voltage for Ib = 200 μa (approx.) at Eb = 150V	-12 Volts
Plate Current (Instantaneous Value) at Eb = 90 Vdc; Ec adjusted for Ic = +250 μa	50 Ma

INITIAL CHARACTERISTICS LIMITS (Range Values for Equipment Design)[5]

	Min.	Max.
Heater Current Ef = 12.6 Volts	410	490 Ma
Plate Current Ef = 12.6 Volts; Eb = 90 Volts; Ec Adjusted for Ic = 250 μa	41	62 Ma
Plate Current Ef = 12.6 Volts; Eb = 120 Volts; Ec = -2 Volts	26	45 Ma
Cutoff Plate Current Ef = 12.6 Volts; Eb = 150 Volts; Ec = -14 Volts	—	200 μa
Reverse Grid Current Ef = 12.6 Volts; Eb = 120 Volts; Ec = -2 Volts	—	1.5 μa
Heater-Cathode Leakage Ef = 12.6 Volts and Ehk = ± 100 Volts	—	30 μa
Minimum Interelectrode Resistance (Except Heater-Cathode)		
Grid to All: Measured with 300 Volts, Grid Negative	50	— Megohms
Plate to All: Measured with 500 Volts, Plate Negative	50	— Megohms
Intermittent Leakage[6]		

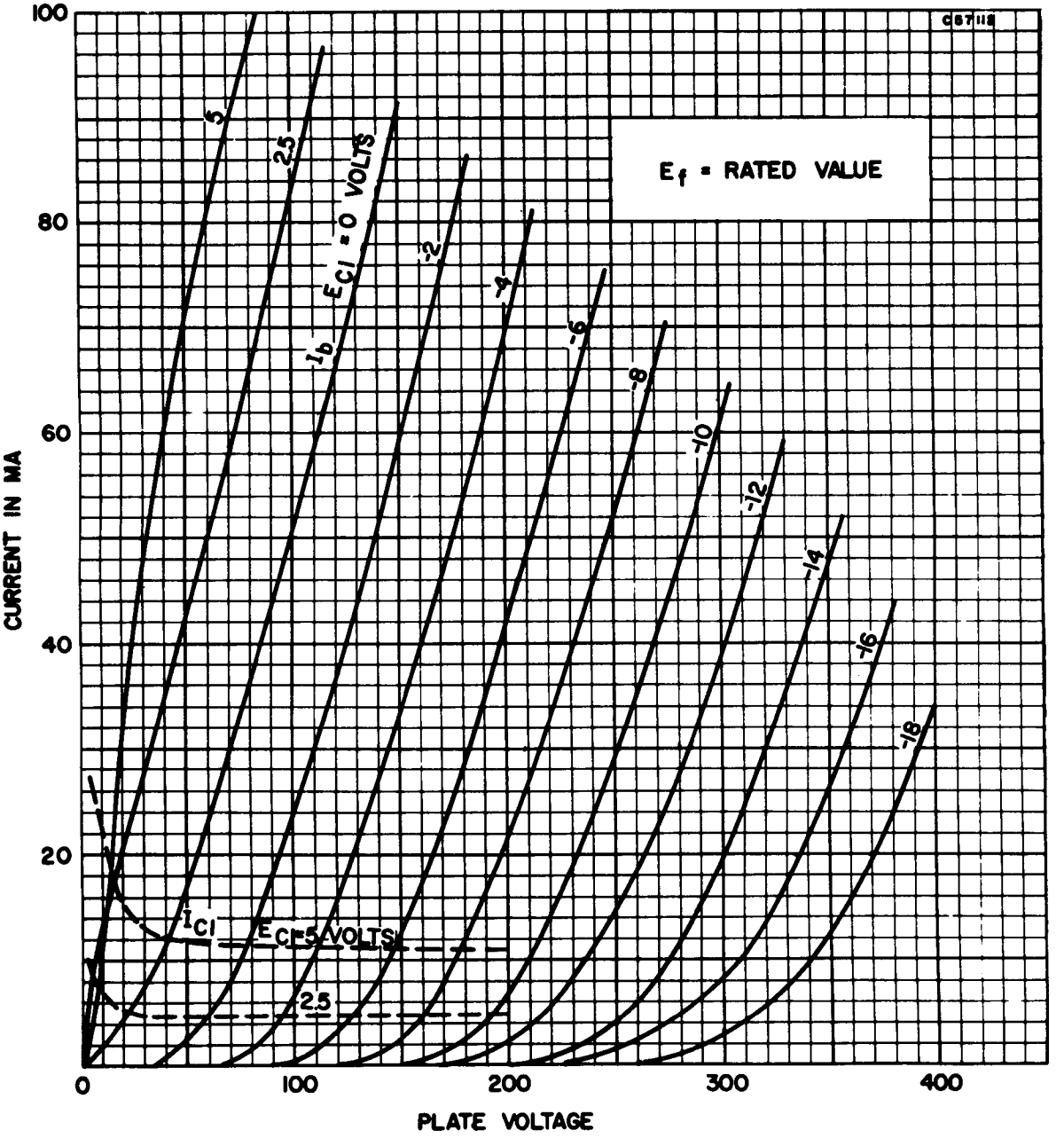
TIME DEPENDENT CHARACTERISTIC LIMITS[5]

Cathode Interface	Min.	Max.
Ef = 12.6 Volts; Eb = 85 Volts; Ec Adjusted for Ib = 2.0 Ma	—	25 Ohms
Number of Heater Cycles[7]	2000	— Cycles

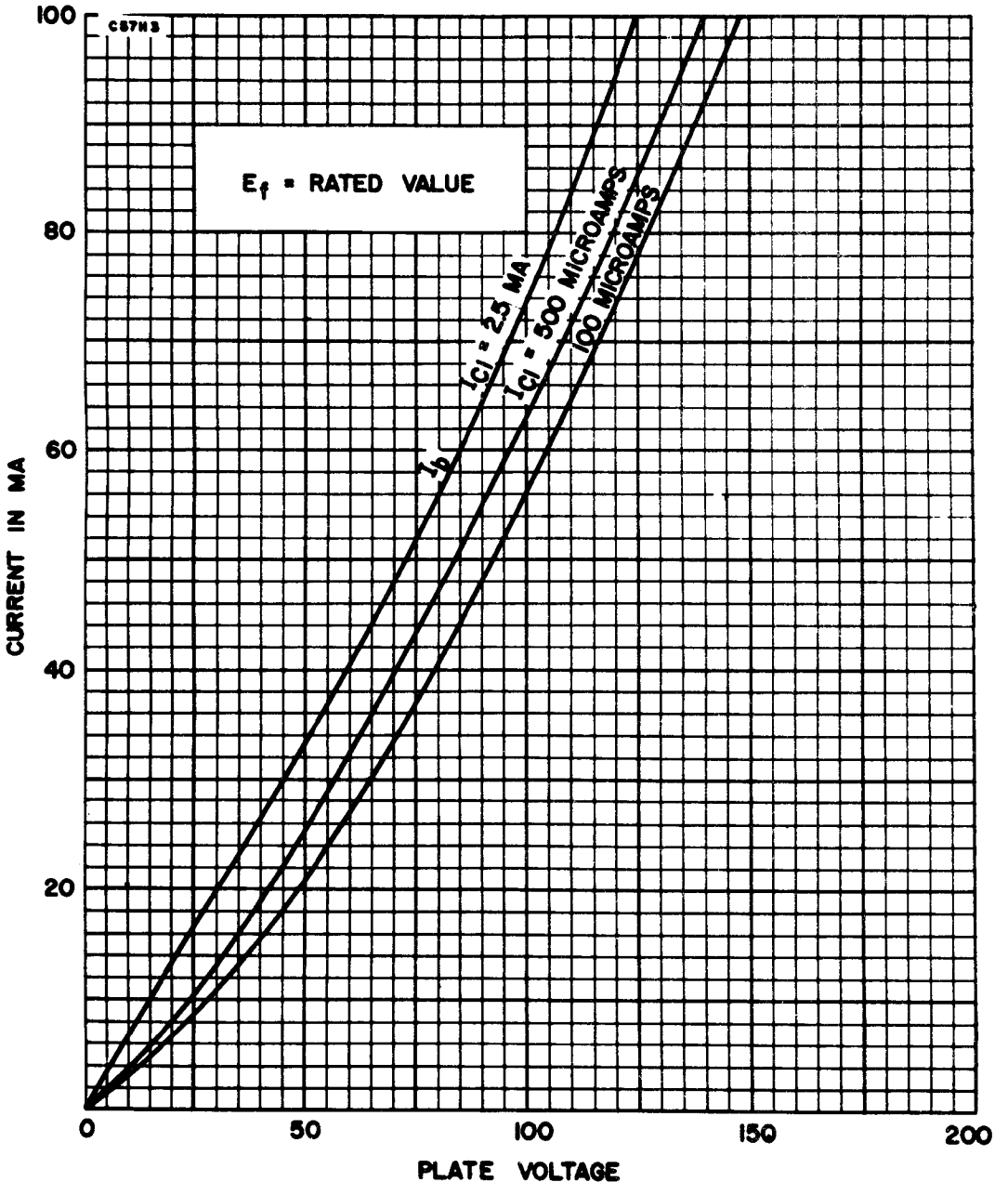
NOTES:

1. *Heater positive not recommended for reliable operation.*
2. *Pulse terms in accordance with IRE Standards on Pulses: Definitions of Terms, Parts I and II, 1951, 1952.*
3. *Averaging time 1 millisecond unless otherwise specified.*
4. *A rectangular pulse is used of 10 μsec width, 1% duty factor (±0.1%) and 1 kc repetition rate. The rise time shall be less than 1 μsec and the fall time shall be less than 2 μsec. Overshoot shall be less than 5% and droop shall be less than 10%.*
5. *Elements of the section not under test shall be grounded.*
6. *Intermittent leakage shall be measured with equipment capable of detecting resistances as follows:*
   less than 1,000 ohms for 2 microseconds.
   less than 100,000 ohms for 15 microseconds.
   less than 2.5 megohms for 1 millisecond.
   The acceleration applied to the tube should be an approximate half sinusoid of 50 to 100 G for a base duration of approximately 500 Microseconds.
7. *One cycle consists of operating the heater on for one minute, with Ef = 15.0 Volts, and off for four minutes. Ehk = 140 Vac, is applied continuously. The no load to steady state full load regulation of the heater voltage supply shall be no more than 3.0 percent.*

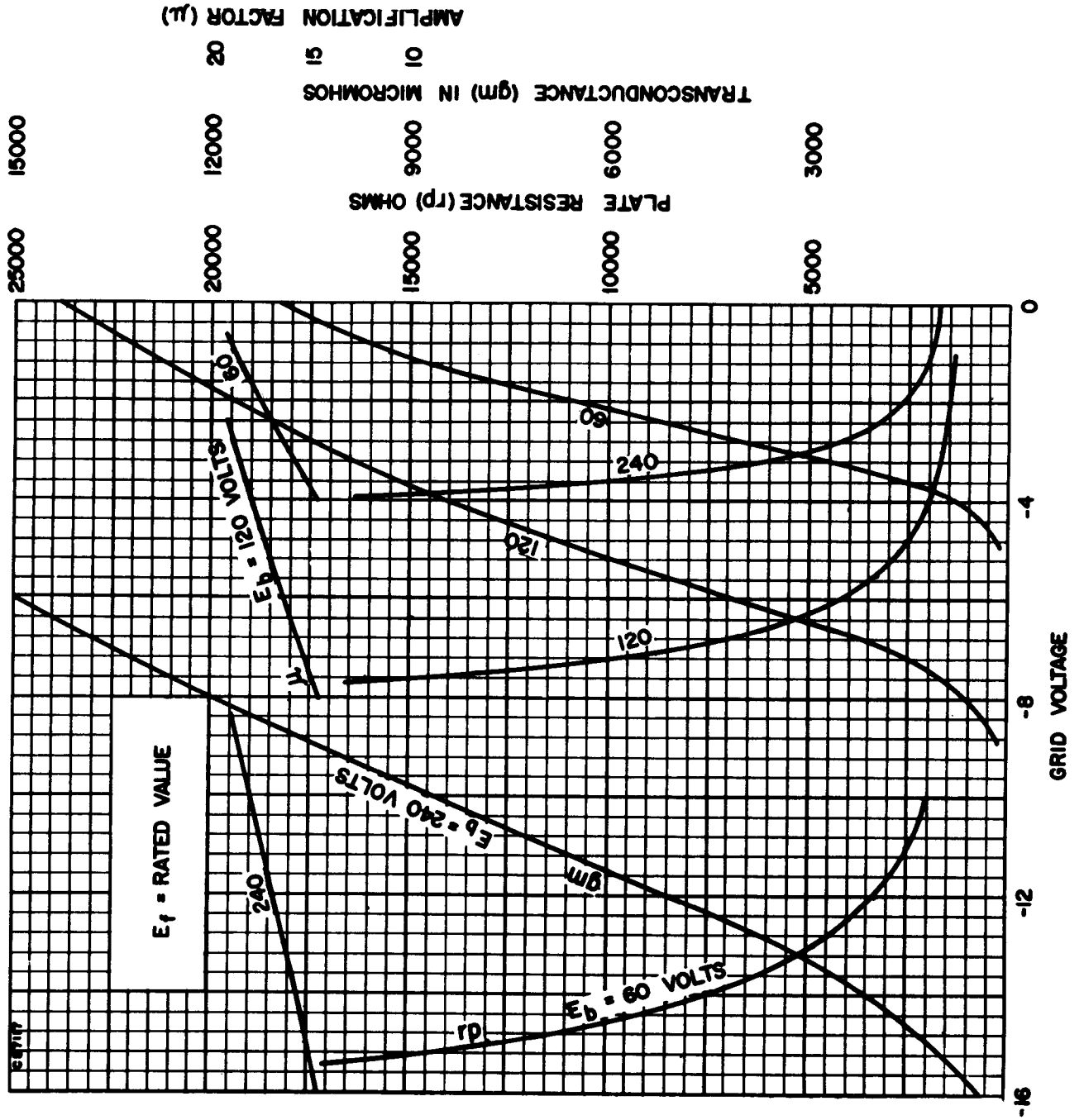
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-1
Basing	6BT
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage Range	12-15	Volts
Heater Current at Ef = 13.5 volts	155	Ma
Heater-Cathode Voltage (Absolute Maximum Values)		
Heater Negative with Respect to Cathode	120	Volts Max.
Heater Positive with Respect to Cathode	120	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[1]

Plate Input (Each Section)	3.2	μμf
Plate to Plate	.026	μμf
Cathode Input (Each Section)	3.6	μμf

RATINGS (Absolute Maximum Values)

Peak Inverse Plate Voltage	350	Volts Max.
AC Plate Supply Voltage Per Plate, RMS	117	Volts Max.
Peak Plate Current Per Plate	60	Ma Max.
DC Output Current Per Plate	10.0	Ma Max.

CHARACTERISTICS

Voltage Drop at I_b = 60 Ma Per Plate	10	Volts

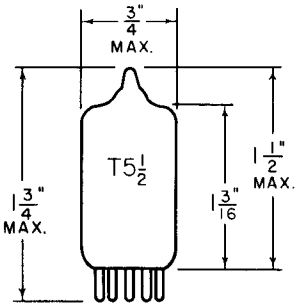
TYPICAL OPERATION

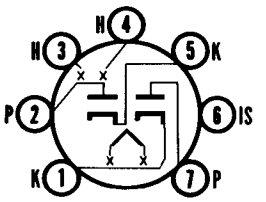
AC Plate Voltage Per Plate	117	Volts
Effective Plate Supply Impedance Per Plate	300	Ohms Min.
DC Output Current Per Plate	9.0	Ma

QUICK REFERENCE DATA

The Sylvania Type 7055 is a miniature, high perveance twin diode, intended for use in mobile communications equipment. Featuring a 13.5 volt heater, the 7055 is designed for dependable operation over the wide range of heater voltage encountered in this service.

Except for heater characteristics, the Type 7055 is similar to the 6AL5.





6 BT

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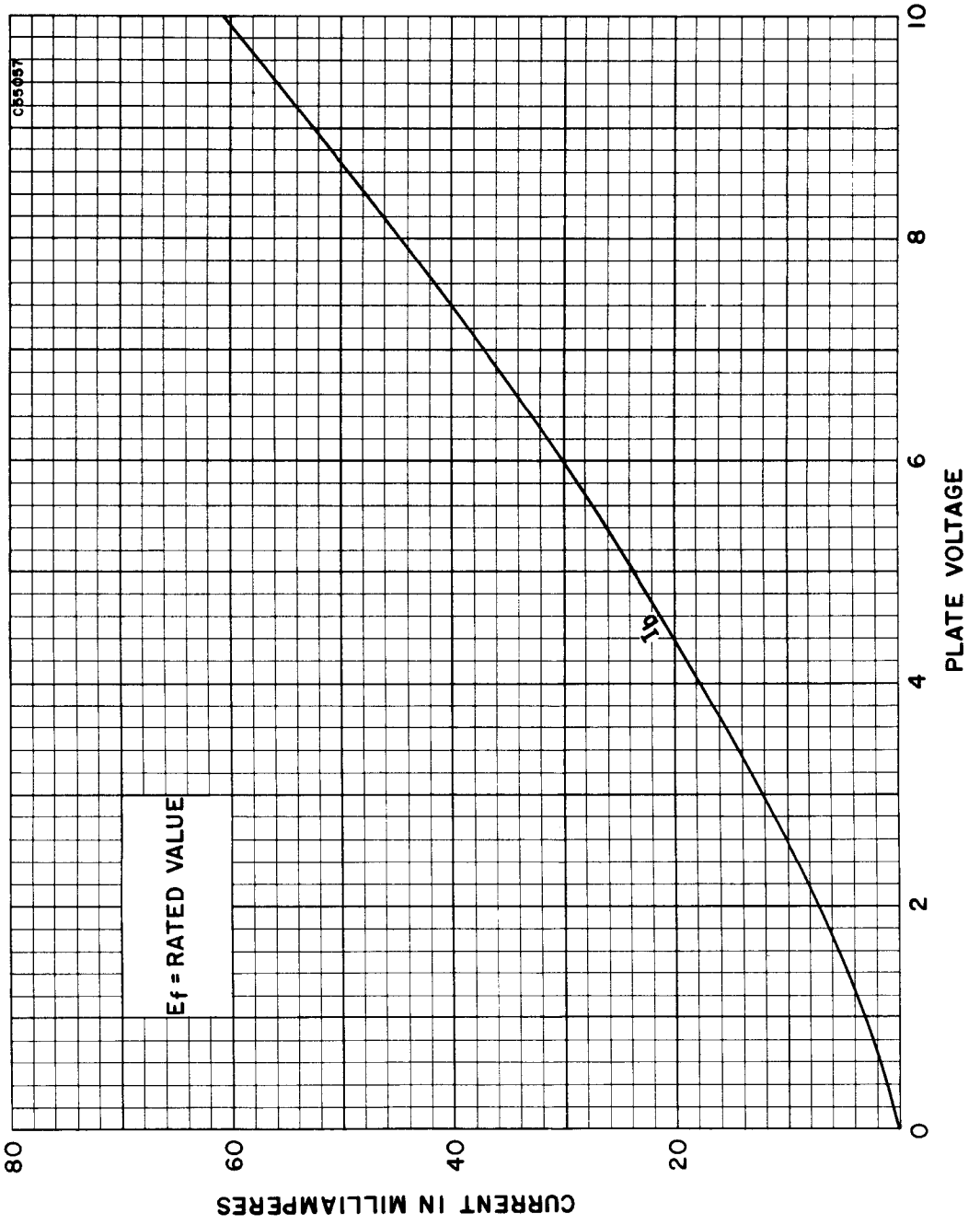
SPECIAL TESTS

Heater Cycling Life Test
Ef = 17.0 V; 1 min. on, 4 min. off;
Ehk = –150 Vdc . . . . . 2000 Cycles Min.

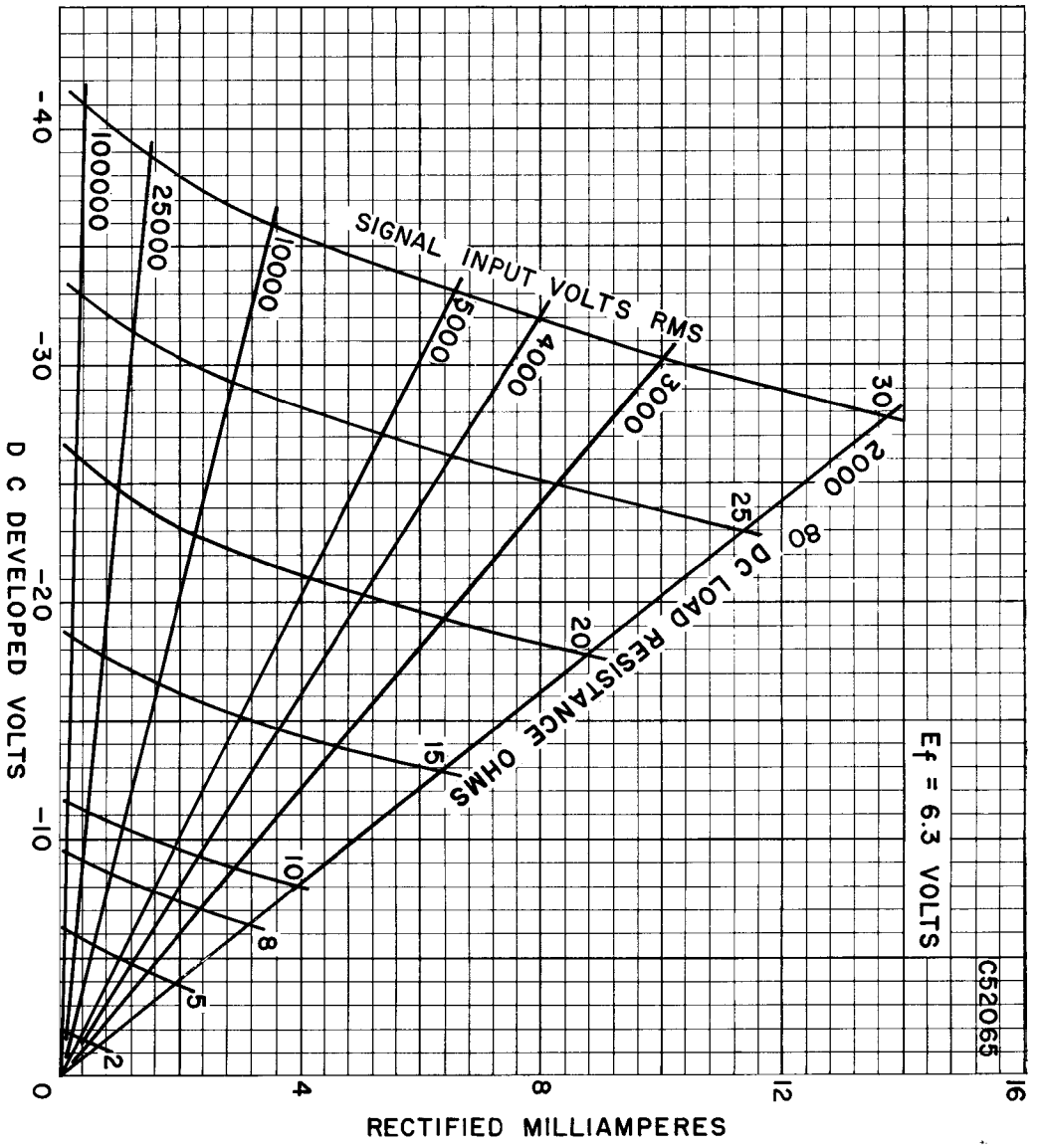
NOTE:

1. *Shield No. 316 connected to cathode of section under test.*

AVERAGE PLATE CHARACTERISTICS
(EACH SECTION)



AVERAGE OPERATING CHARACTERISTICS
(HALF WAVE RECTIFICATION — SINGLE DIODE)



SYLVANIA

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engineering data service 7056

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7CM
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage Range	12-15	Volts
Heater Current at Ef = 13.5 volts	150	Ma
Heater-Cathode Voltage (Absolute Maximum Values)		
Heater Negative with Respect to Cathode	120	Volts Max.
Heater Positive with Respect to Cathode	120	Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

	(Shielded)[1]	(Unshielded)	
Grid No. 1 to Plate	.01	.02	μμf Max.
Input: g1 to (h+k+g2+g3+I.S.)	6.5	6.5	μμf
Output: p to (h+k+g2+g3+I.S.)	3.0	2.0	μμf

RATINGS (Absolute Maximum Values)

Plate Voltage	330	Volts Max.
Grid No. 2 Supply Voltage	330	Volts Max.
Grid No. 2 Voltage	See Rating Chart	
Plate Dissipation	2.0	Watts Max.
Grid No. 2 Input:		
For Grid No. 2 Voltages up to 165 Volts	0.5	Watt Max.
For Grid No. 2 Voltages between 165-330 Volts	See Rating Chart	

CHARACTERISTICS

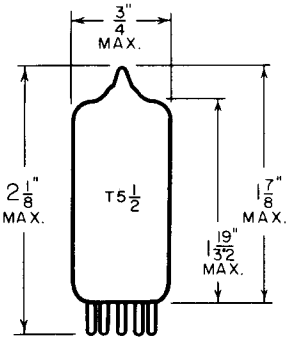
Class A1 Amplifier

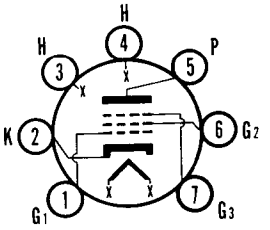
Plate Voltage	200	Volts
Grid No. 3 Voltage	Connected to Cathode	
Grid No. 2 Voltage	150	Volts
Cathode Bias Resistor	180	Ohms
Plate Current	9.5	Ma
Grid No. 2 Current	2.8	Ma
Transconductance	6200	μmhos
Plate Resistance (Approx.)	0.6	Megohm
Ec1 for I_b = 100 μa (Approx.)	−7	Volts

QUICK REFERENCE DATA

The Sylvania Type 7056 is a miniature, high transconductance, sharp-cutoff pentode intended for use in mobile communications equipment. Featuring a 13.5 volt heater, the 7056 is designed for dependable operation over the wide range of heater voltages encountered in this service.

Except for heater characteristics, the Type 7056 is similar to the 6CB6.





7CM

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NOVEMBER, 1959

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SPECIAL TESTS

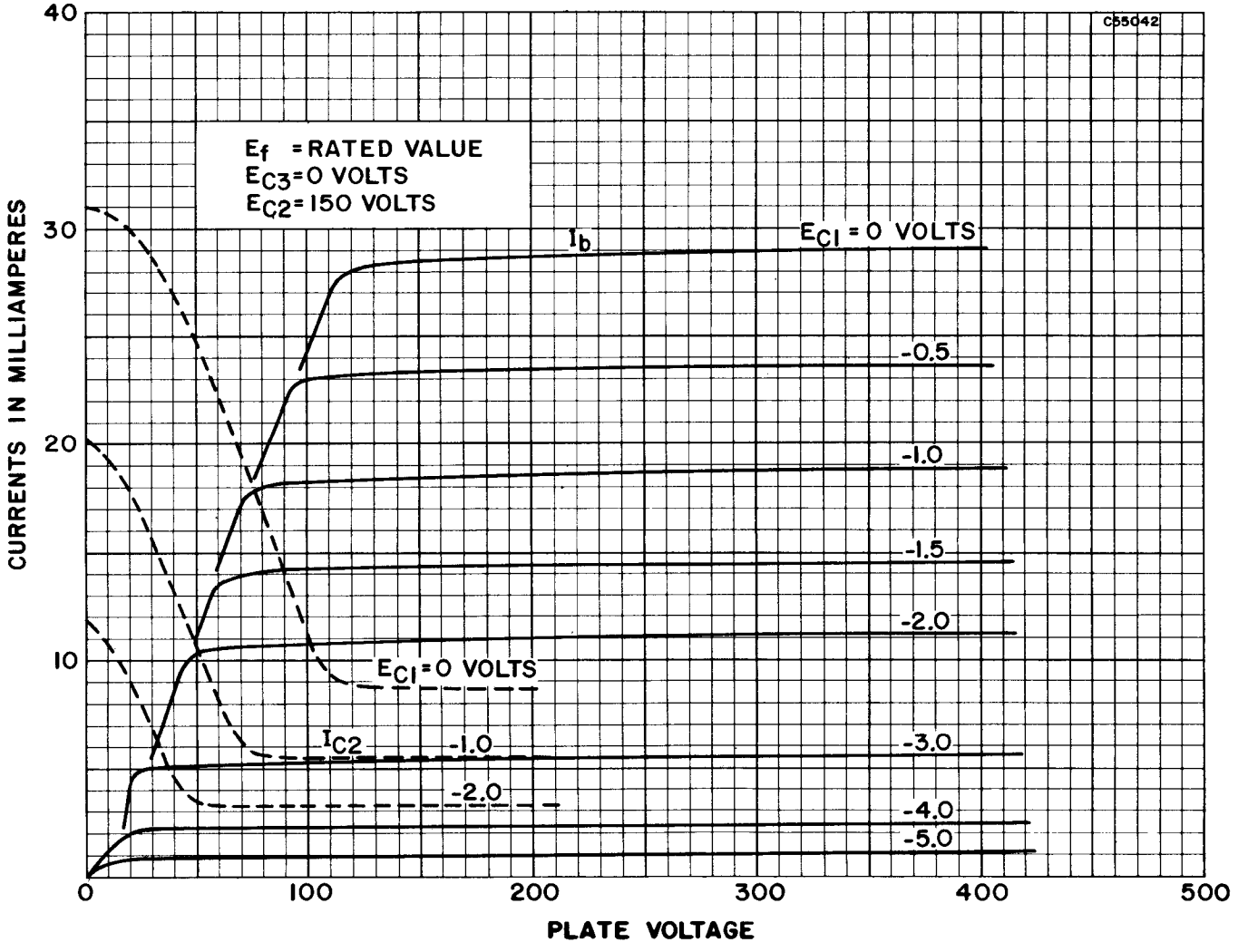
Heater Cycling Life Test
Ef = 17.0 V; 1 min. on, 4 min. off;
Ehk = –150 Vdc . . . . . 2000 Cycles Min.

Low-Frequency Vibration: Ep
G = 2.5 @ 25 cps . . . . . 250 mVac Max.

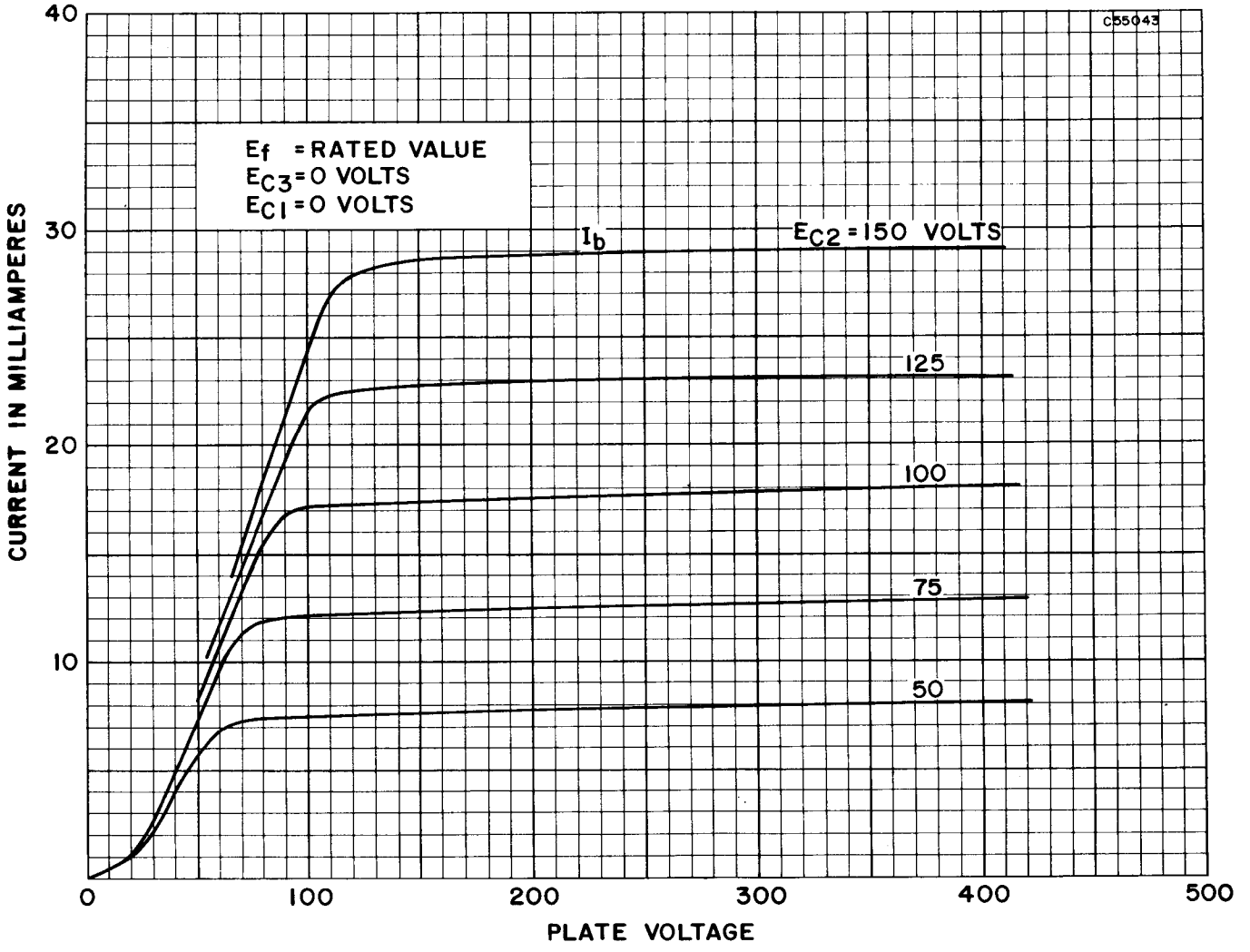
NOTE:

1. Shield No. 315 tied to cathode.

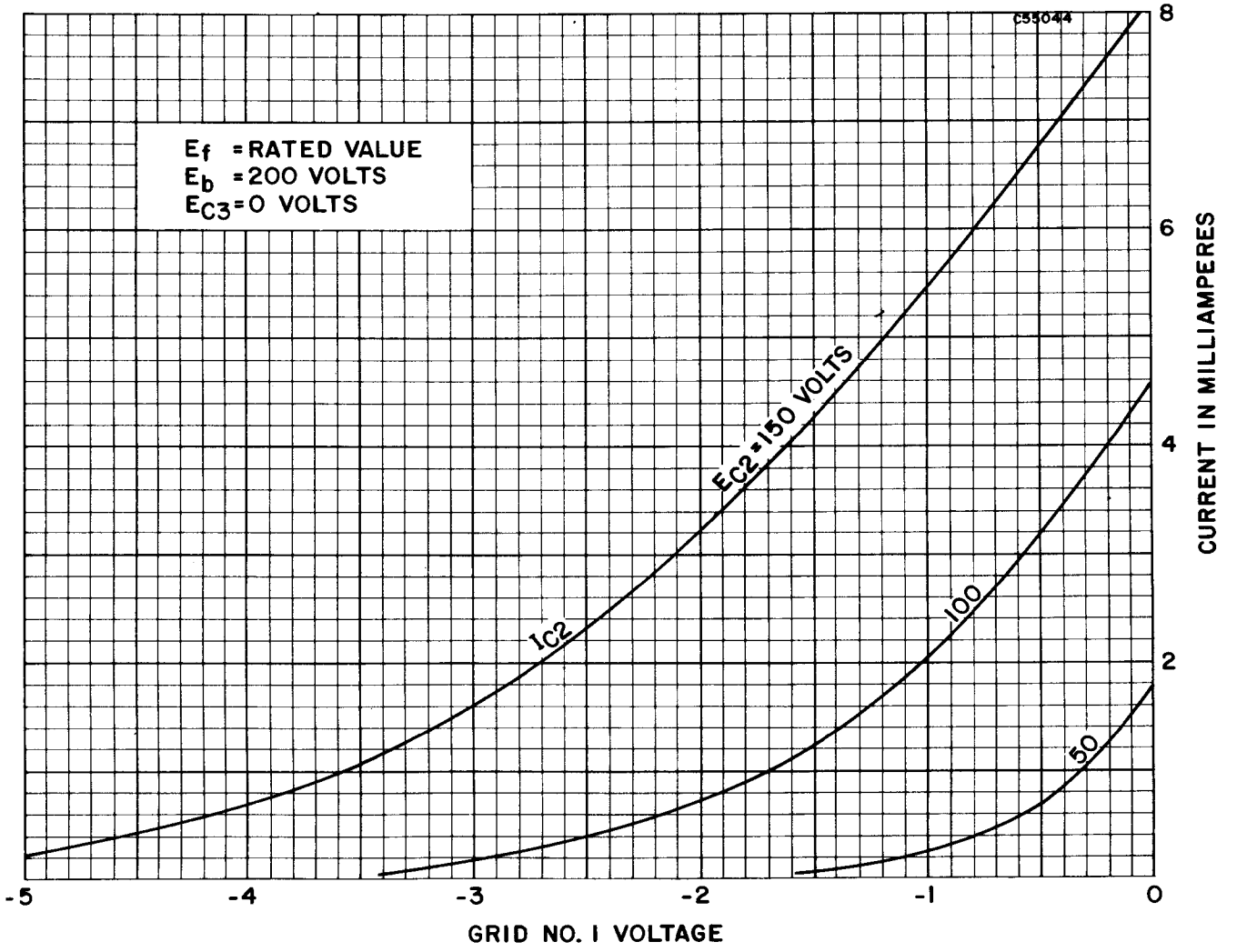
AVERAGE PLATE CHARACTERISTICS



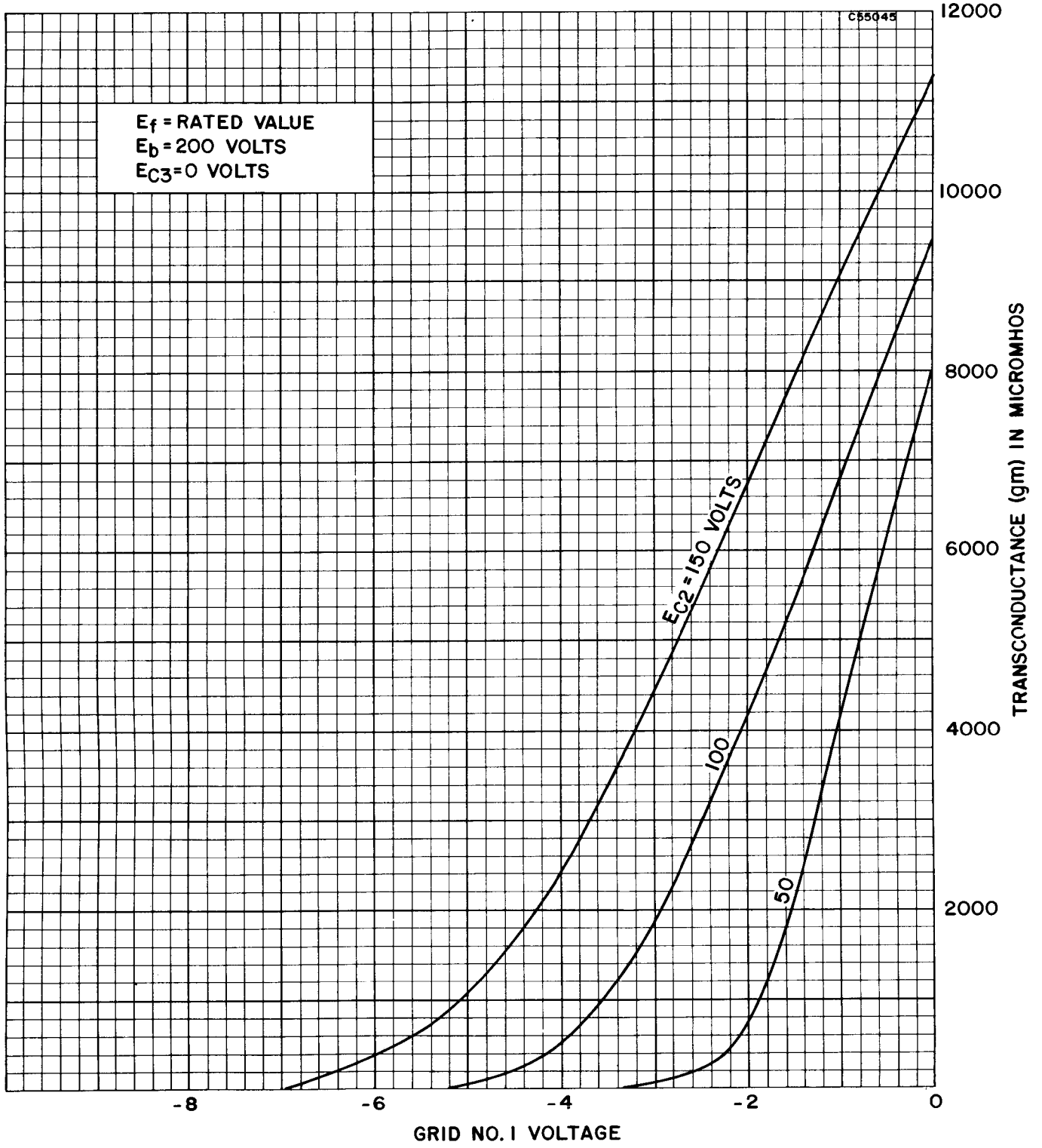
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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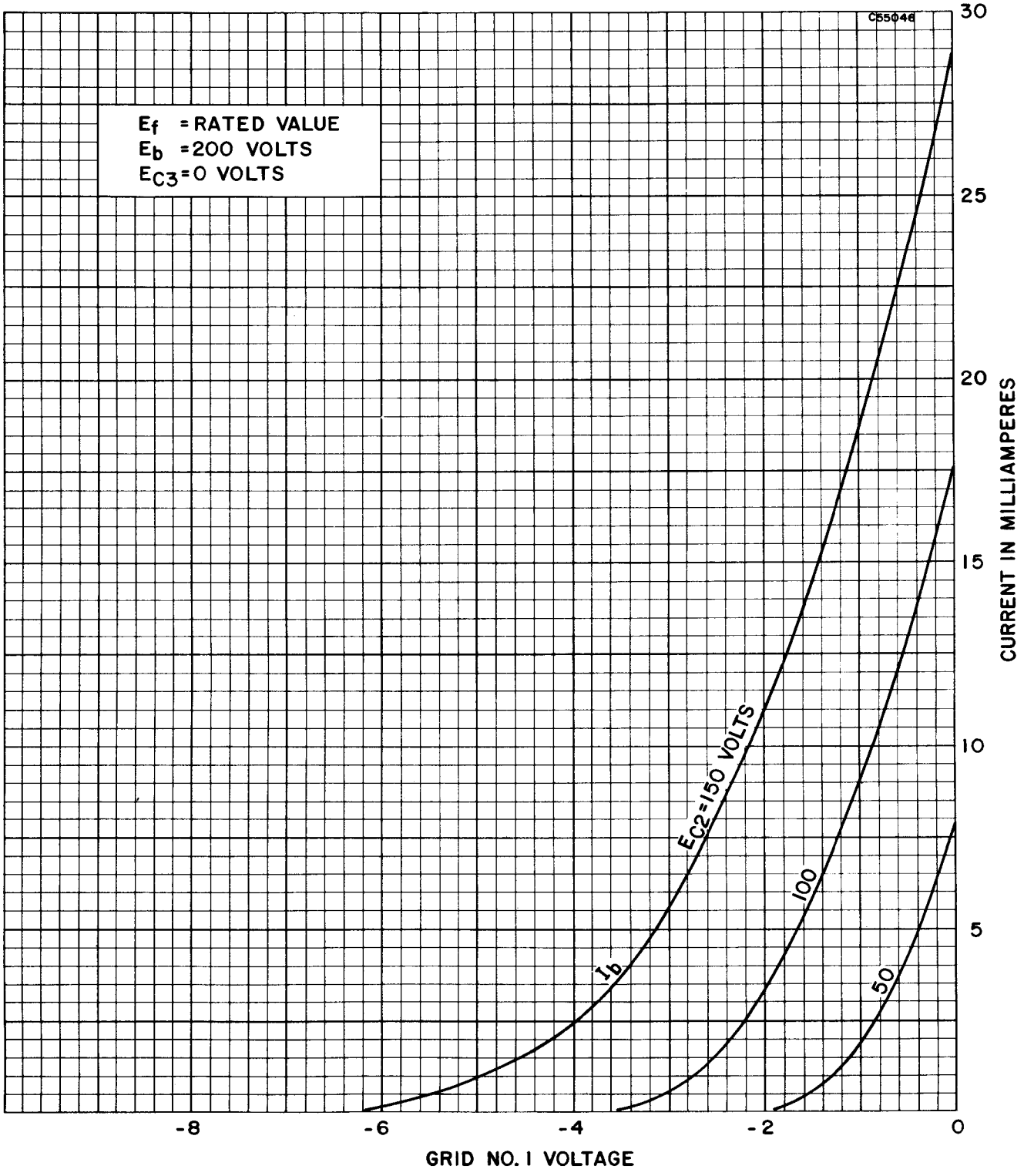
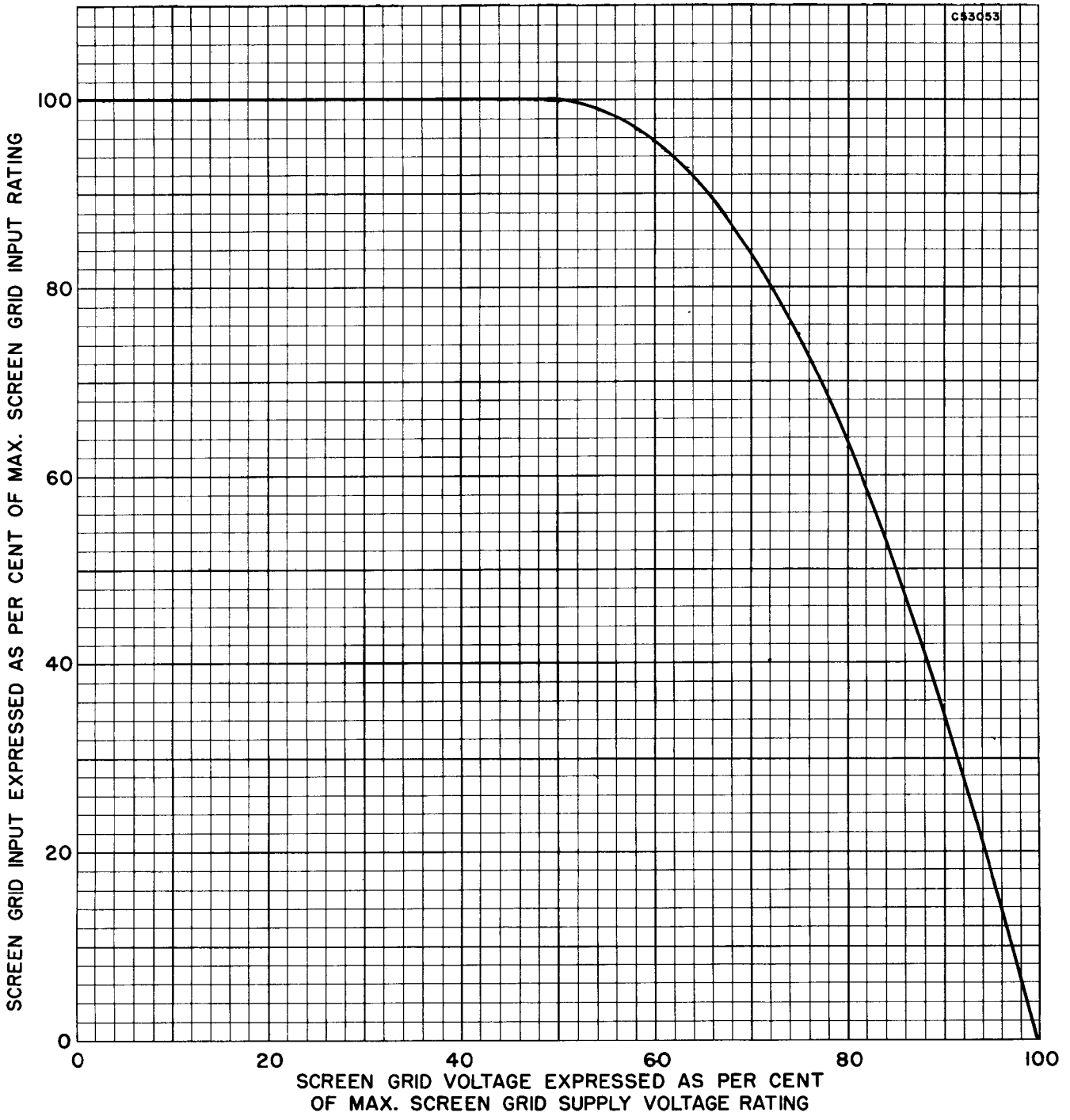


RATING CHART



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	Per Diagram
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage Range	12-15 Volts	
Heater Current for Ef = 13.5 Volts	155 Ma	
Heater-Cathode Voltage (Absolute Maximum Values)		
Heater Negative with Respect to Cathode	120 Volts	Max.
Heater Positive with Respect to Cathode	120 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section 1[1]	Section 2[1]
Grid to Plate	1.7	1.7 μμf
Input g to (h + k)	1.6	1.6 μμf
Output p to (h + k)	0.46	0.34 μμf

RATINGS (Absolute Maximum Values—Each Section)

Plate Voltage	330 Volts	Max.
Plate Dissipation	1.0 Watt	Max.
Positive Grid Voltage	0 Volts	Max.
Negative Grid Voltage	−55 Volts	Max.
Grid Resistance:		
Fixed Bias	0.5 Megohm	Max.
Cathode Bias	1.0 Megohm	Max.

CHARACTERISTICS AND TYPICAL OPERATION

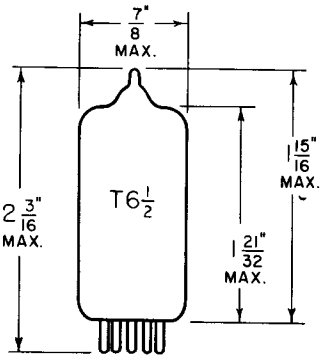
Class A_1 Amplifier (Each Section)

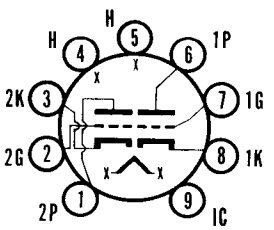
Plate Voltage	250 Volts
Grid Voltage	−2 Volts
Plate Current	1.25 Ma
Plate Resistance	61,000 Ohms
Transconductance	1650 μmhos
Amplification Factor	100
Ec for I_b = 10 μa (Approx.)	−5 Volts

QUICK REFERENCE DATA

The Sylvania Type 7058 is a miniature high mu twin triode having separate cathodes. It is intended for use in mobile communications equipment. Featuring a 13.5 volt heater, the 7058 is designed for dependable operation over the wide range of heater voltage encountered in this service.

Except for heater characteristics, the Type 7058 is similar to the 12AX7.





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SPECIAL TESTS

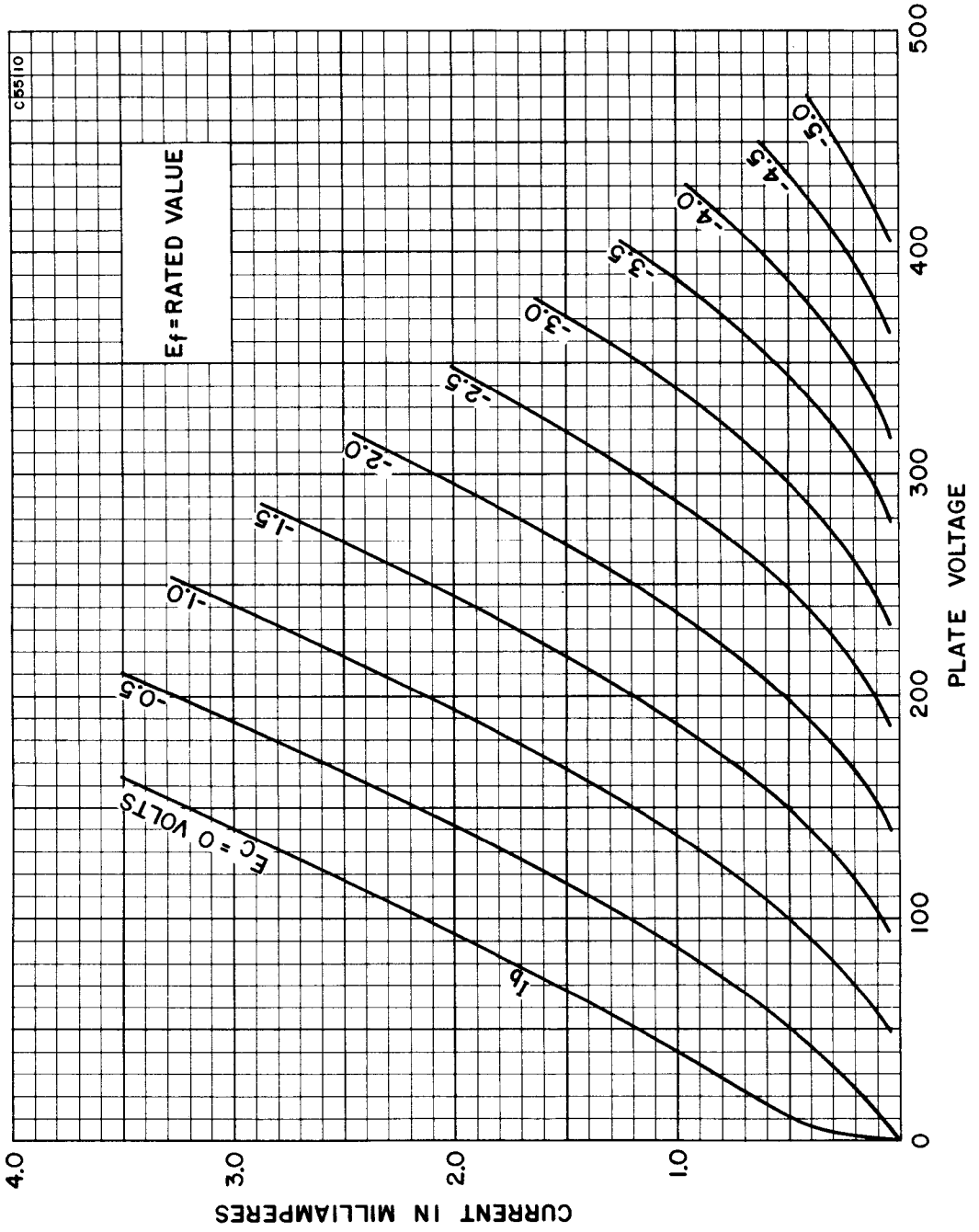
Heater Cycling Life Test
Ef = 17.0 V; 1 min. on, 4 min. off;
Ehk = 150 Vdc . . . . . 2000 Cycles Min.

Low-Frequency Vibration[2]: Ep
G = 2.5 @ 25 cps . . . . . 150 mVac Max.

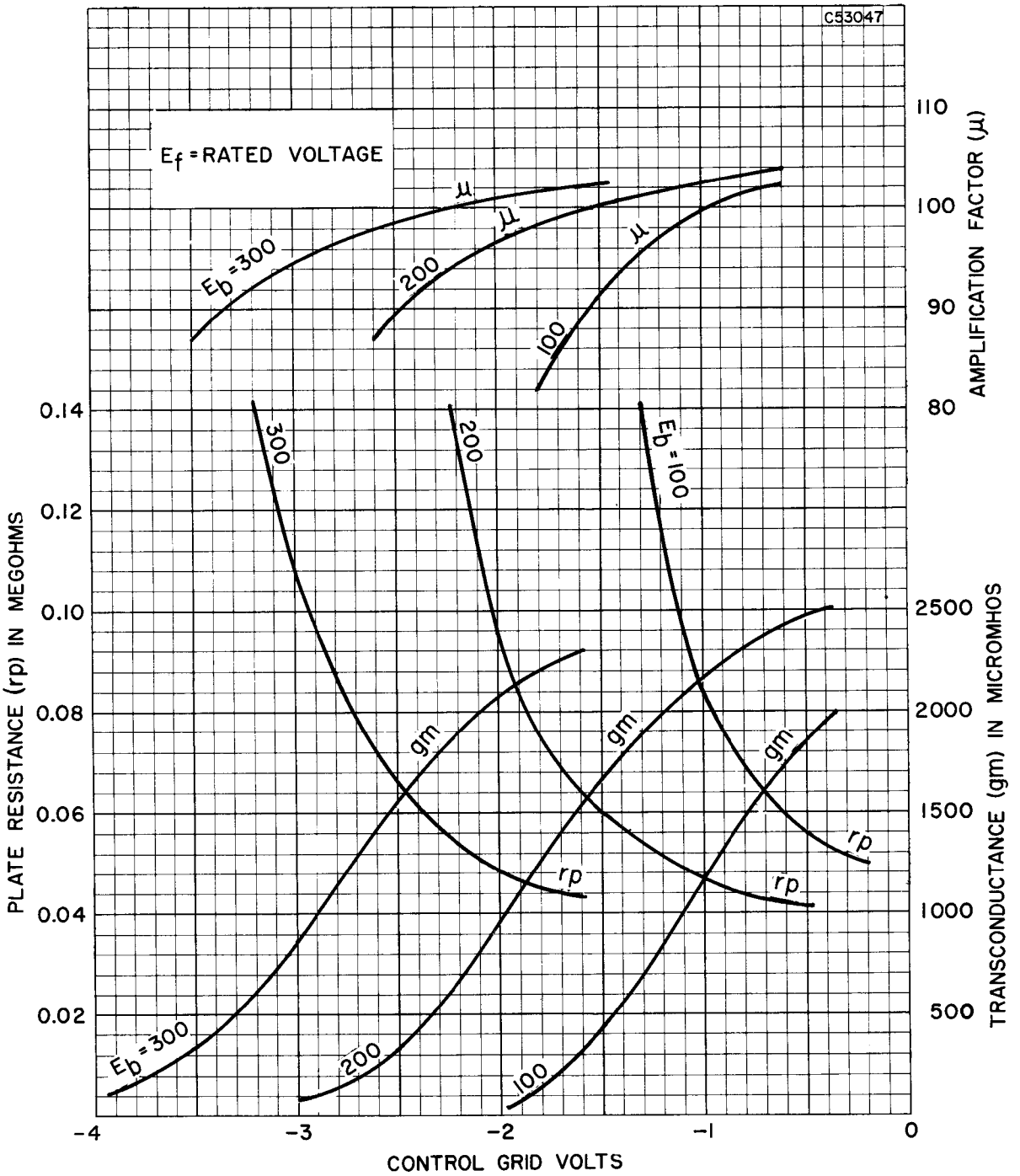
NOTES:

1. *Section No. 1 connects to Pins 6, 7 and 8.*
   Section No. 2 connects to Pins 1, 2 and 3.
2. *Sections connected in parallel.*

AVERAGE PLATE CHARACTERISTICS
(EACH SECTION)



AVERAGE TRANSFER CHARACTERISTICS
(EACH SECTION)



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	Per Diagram
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage Range	12-15 Volts	
Heater Current at Ef = 13.5 Volts	280 Ma	
Heater-Cathode Voltage (Absolute Maximum Values)		
Heater Negative with Respect to Cathode	120 Volts	Max.
Heater Positive with Respect to Cathode	120 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode		
Grid to Plate	2.2 μμf	
Input	2.4 μμf	
Output	0.22 μμf	
Pentode		
Grid to Plate	0.044 μμf	
Input	7.1 μμf	
Output	2.5 μμf	
Coupling: Pentode Grid No. 1 to Triode Plate	0.015 μμf	Max.
Coupling: Triode Grid to Pentode Plate	0.022 μμf	Max.
Coupling: Pentode Plate to Triode Plate	0.16 μμf	Max.

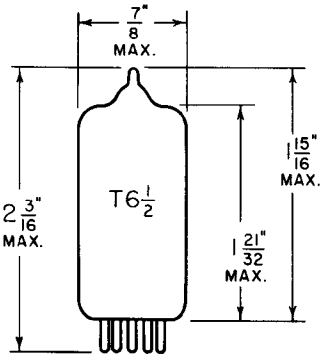
RATINGS (Absolute Maximum Values)

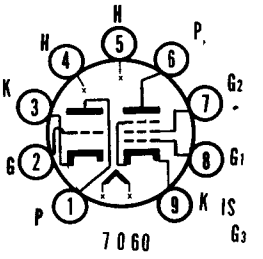
Class A1 Amplifier	Triode Section	Pentode Section		
Plate Voltage	300	300	Volts	Max.
Grid No. 2 Supply Voltage	.....	300	Volts	Max.
Grid No. 2 Voltage	See Rating Chart			
Plate Dissipation	2.5	3.0	Watts	Max.
Grid No. 2 Dissipation	.....	1.0	Watts	Max.
Positive Grid No. 1 Voltage	0	0	Volts	Max.
Grid No. 1 Circuit Resistance				
Fixed Bias	0.5	0.25	Megohm	Max.
Self Bias	1.0	1.0	Megohm	Max.

QUICK REFERENCE DATA

The Sylvania Type 7060 is a miniature medium mu triode sharp cutoff pentode intended for use in mobile communications equipment. Featuring a 13.5 volt heater, the 7060 is designed for dependable operation over the wide range of heater voltage encountered in this service.

Except for heater characteristics, the Type 7060 is similar to the 6AU8.





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(Class C Amplifier)	(CCS) RF Power Amp. & Osc.[1] and FM RF Power Amp.		
Plate Voltage	300	Volts	Max.
Grid No. 3 Voltage	0	Volts	Max.
Grid No. 2 Voltage	150	Volts	Max.
Negative Grid No. 1 Voltage	50	Volts	Max.
Positive Grid No. 1 Voltage	0	Volts	Max.
Plate Current	20	Ma	Max.
Grid No. 2 Current	7	Ma	Max.
Grid No. 1 Current	3	Ma	Max.
Plate Dissipation	2.75	Watts	Max.
Grid No. 2 Dissipation	0.8	Watt	Max.
Grid No. 1 Circuit Resistance	0.1	Megohm	Max.

CHARACTERISTICS AND TYPICAL OPERATION

(Class A1 Amplifier)	Triode Section	Pentode Section	
Plate Voltage	150	200	Volts
Grid No. 2 Voltage	.....	125	Volts
Cathode Bias Resistor	150	82	Ohms
Amplification Factor	40	.....	
Plate Resistance (Approx.)	0.0082	0.15	Megohm
Transconductance	4900	7000	μmhos
Plate Current	9.0	15	Ma
Grid No. 2 Current		3.4	Ma
EC1 for I_b = 100 μa (Approx.)	−6.5	−8.0	Volts

(Class C Amplifier)	RF Power Amp. & Osc.[1] and FM RF Power Amp.			
Plate Voltage	200	250	300	Volts
Grid No. 3	Connected to Cathode			
Grid No. 2 Voltage	85	105	125	Volts
Grid No. 1 Voltage	−7	−9	−11	Volts
Plate Current	11	15	20	Ma
Grid No. 2 Current	3.2	4.5	6	Ma
Grid No. 1 Current (Approx.)	0.9	1.2	1.6	Ma
Driving Power (Approx.)	9	15	25	Mw
Power Output	1.3	2.1	3.5	Watts

SPECIAL TESTS

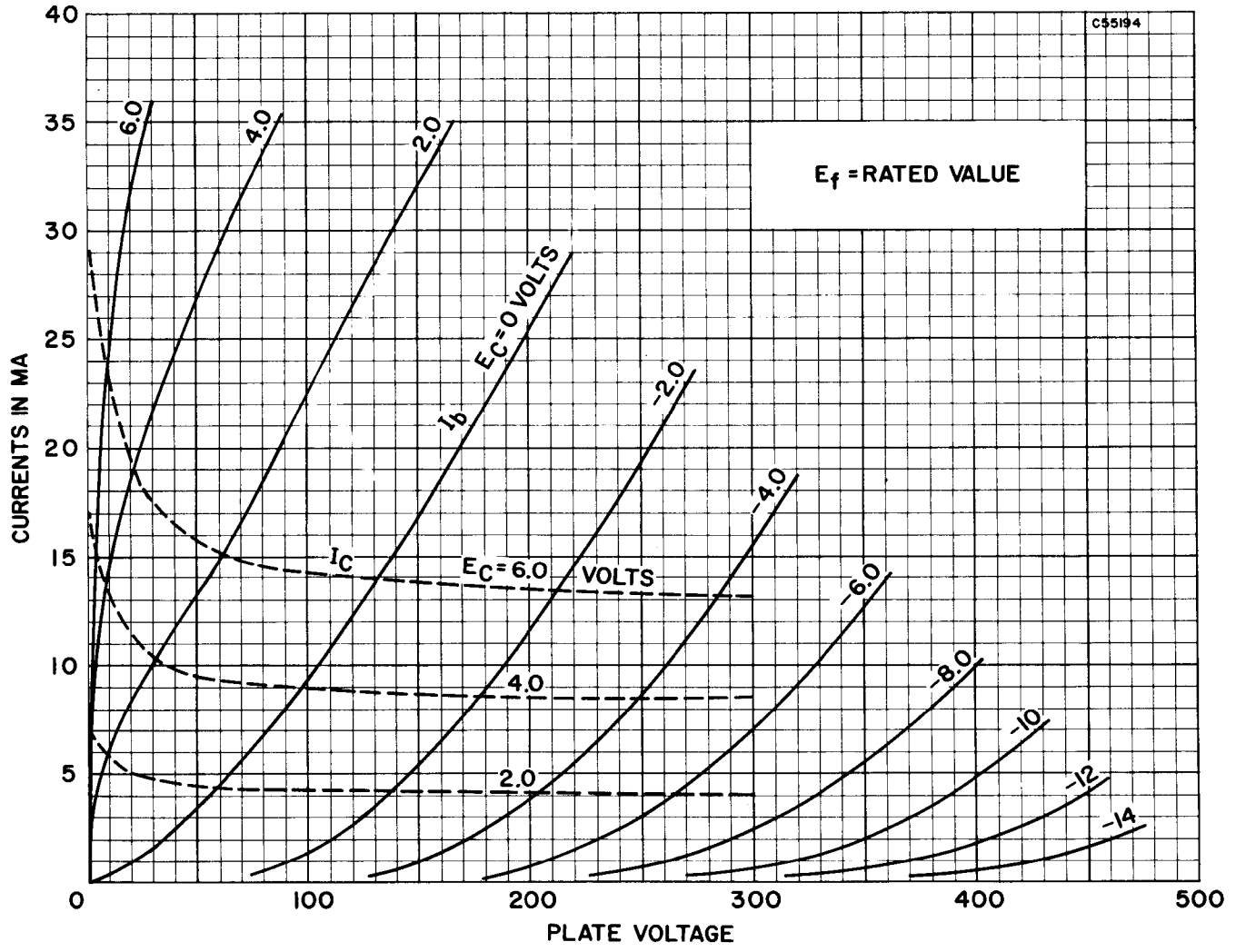
Heater Cycling Life Test
Ef = 17.0 V; 1 min. on, 4 min. off;
Ehk = −150 Vdc . . . . . 2000 Cycles Min.

Low Frequency Vibration: Ep
G = 2.5 @ 25 cps
Triode Section . . . . . 150 mVac Max.
Pentode Section . . . . . 250 mVac Max.

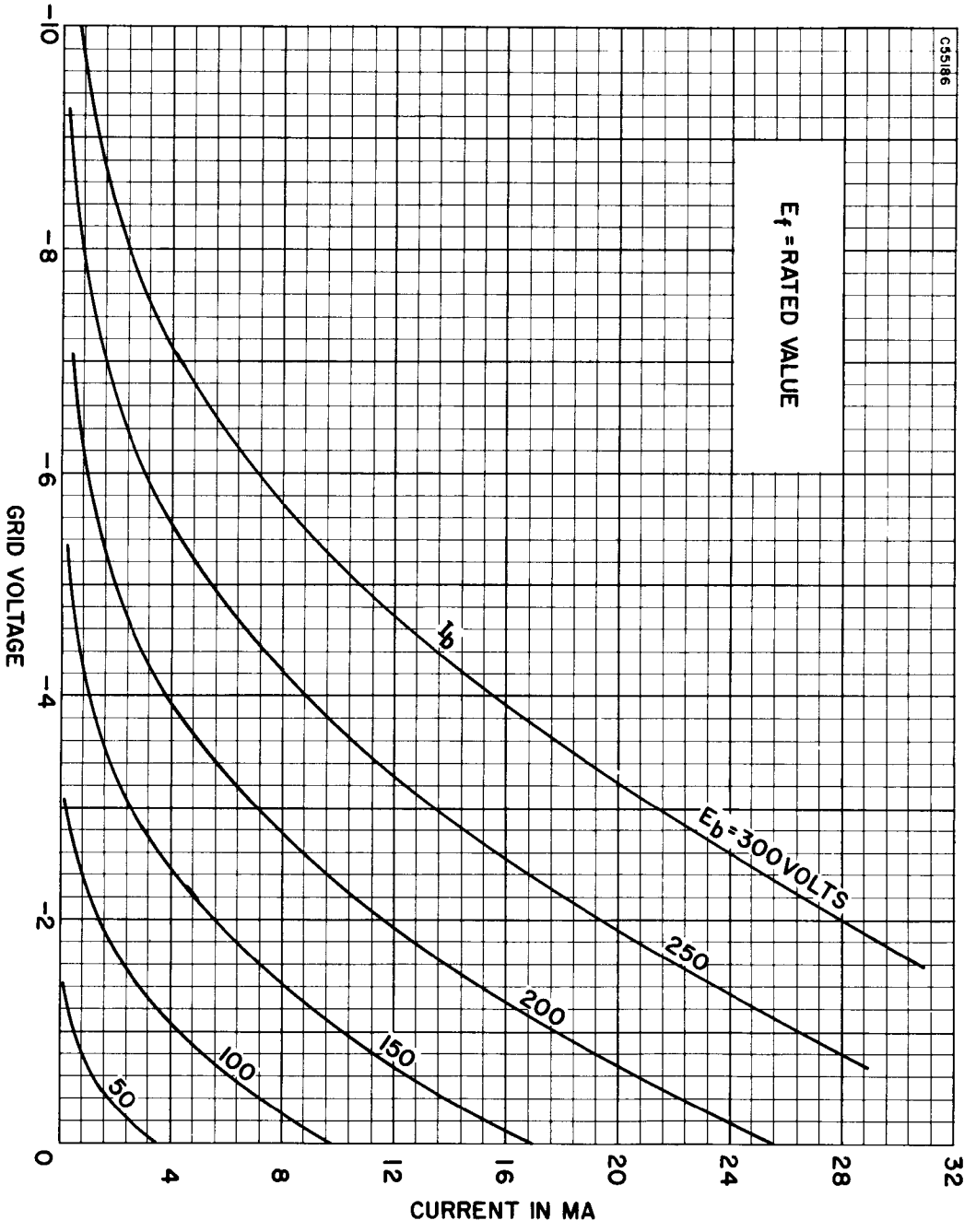
NOTE:

1. *Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.*

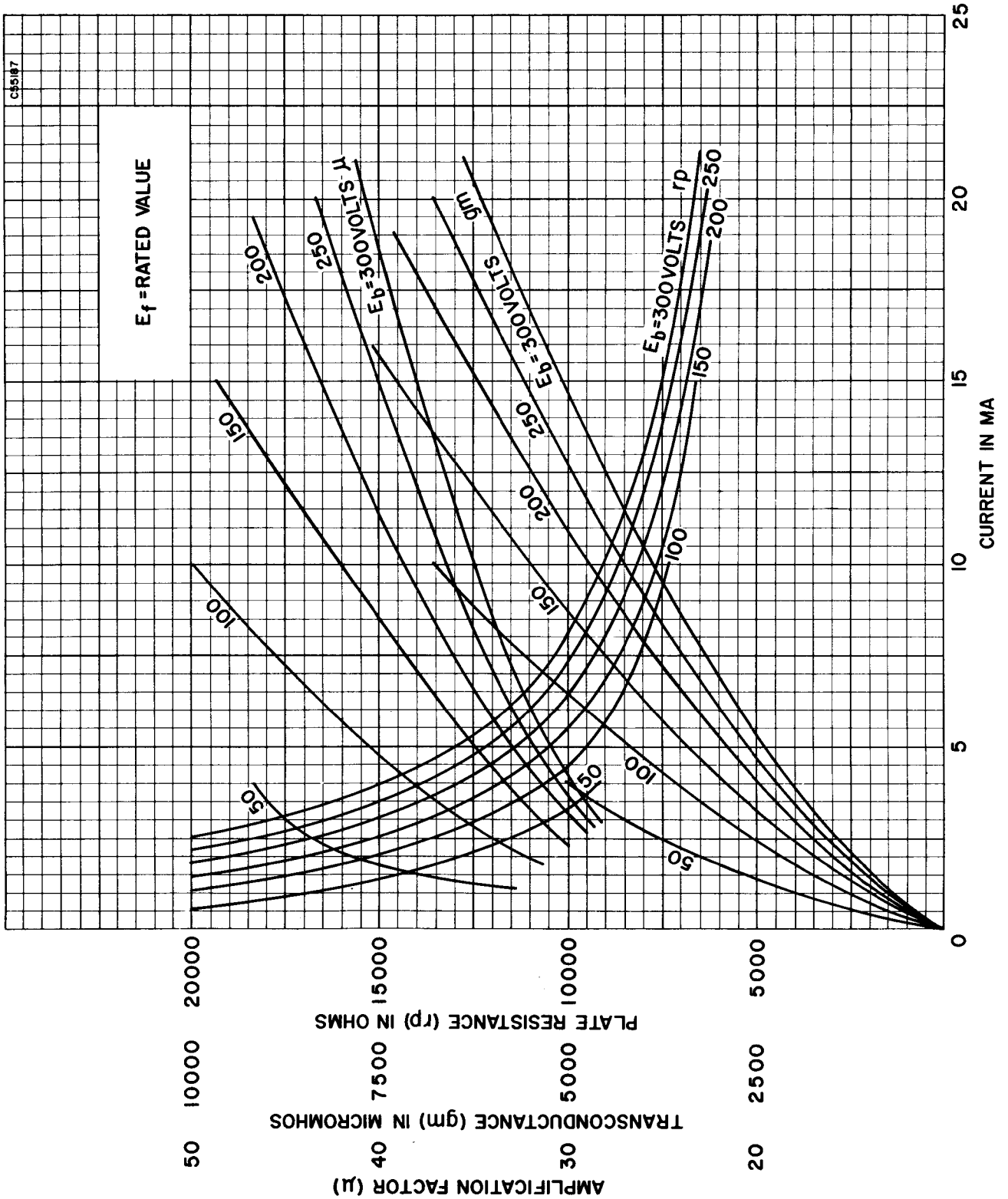
AVERAGE PLATE CHARACTERISTICS
(TRIODE SECTION)



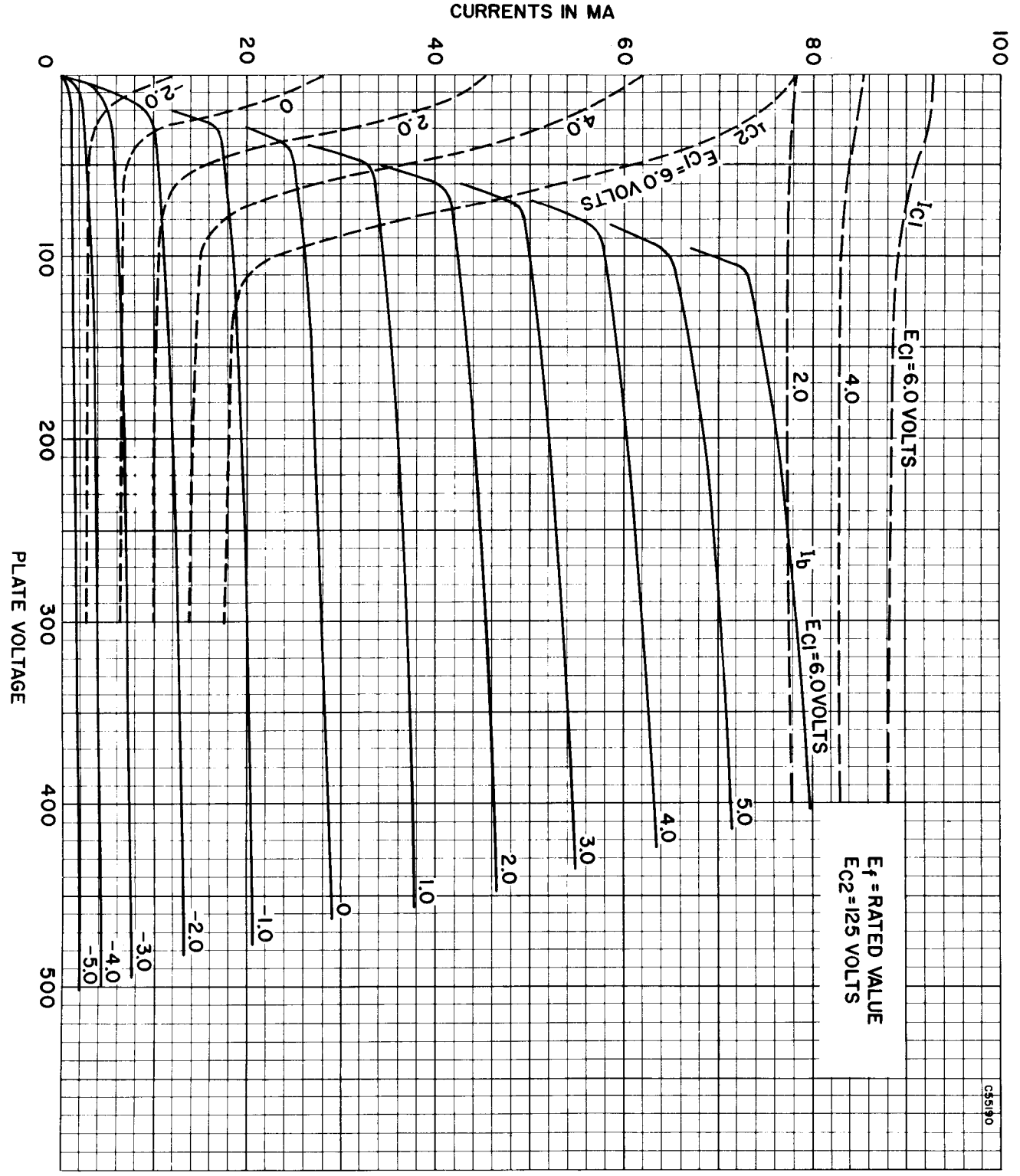
AVERAGE TRANSFER CHARACTERISTICS
(TRIODE SECTION)



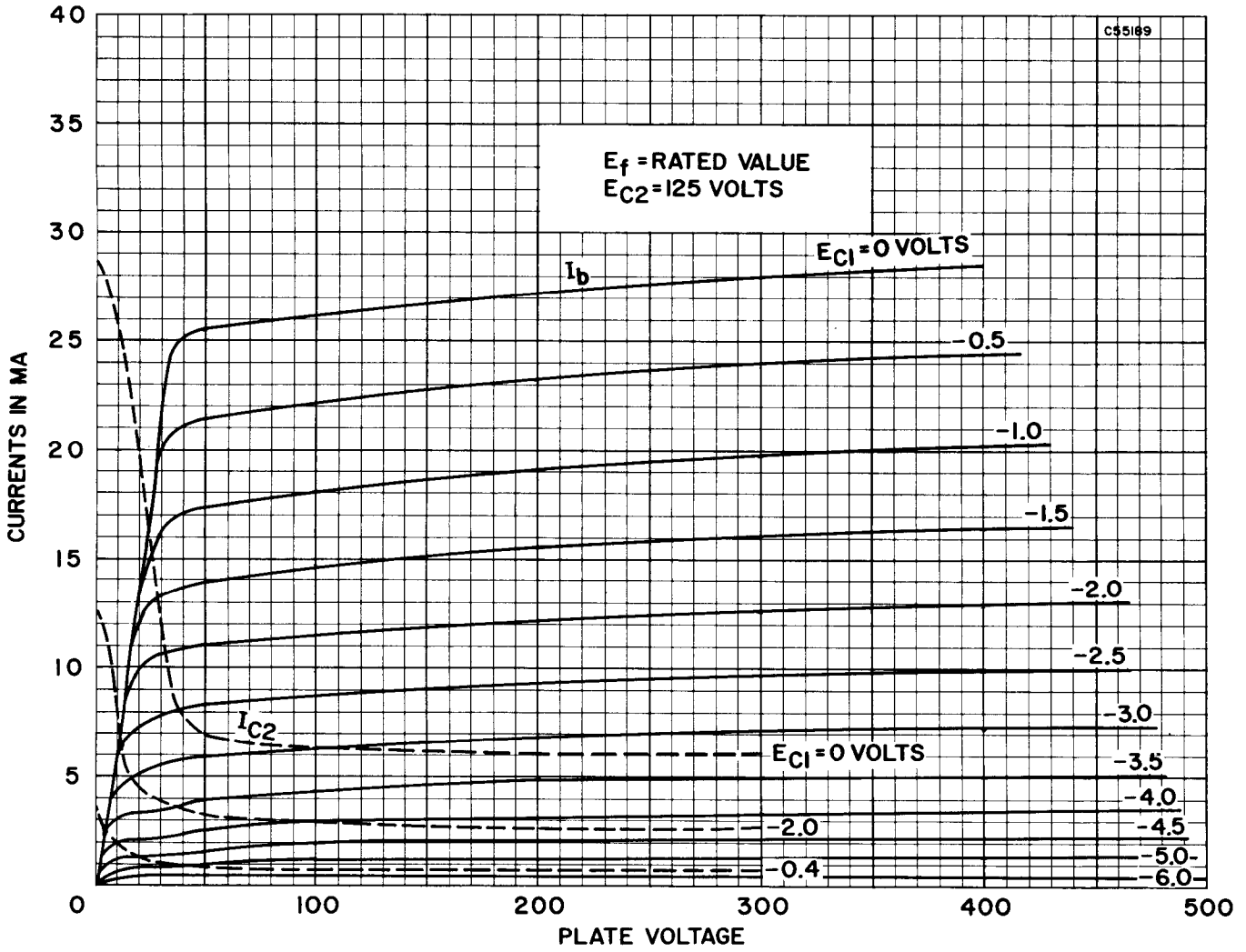
AVERAGE TRANSFER CHARACTERISTICS
(TRIODE SECTION)



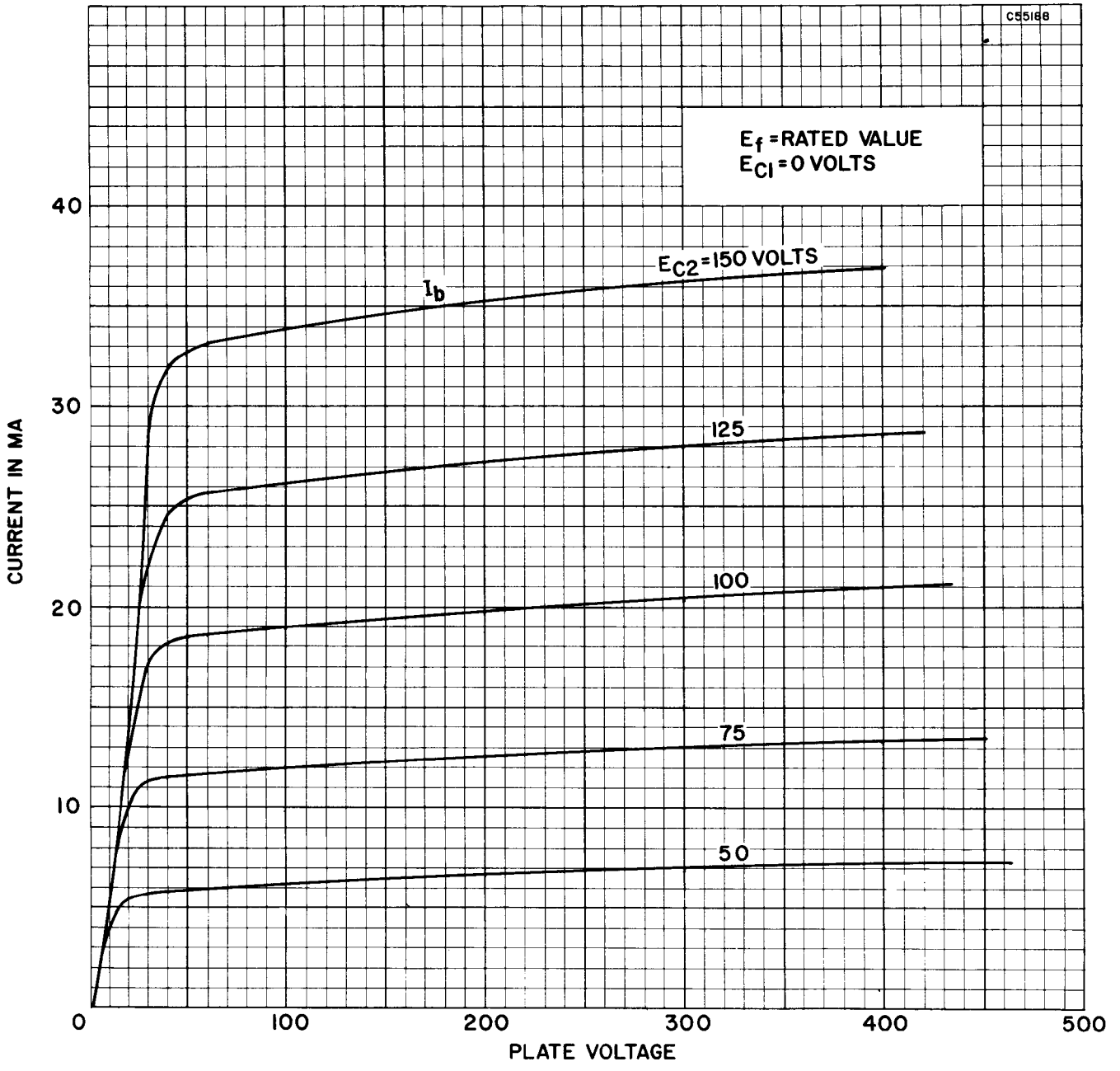
AVERAGE PLATE CHARACTERISTICS
(PENTODE SECTION)



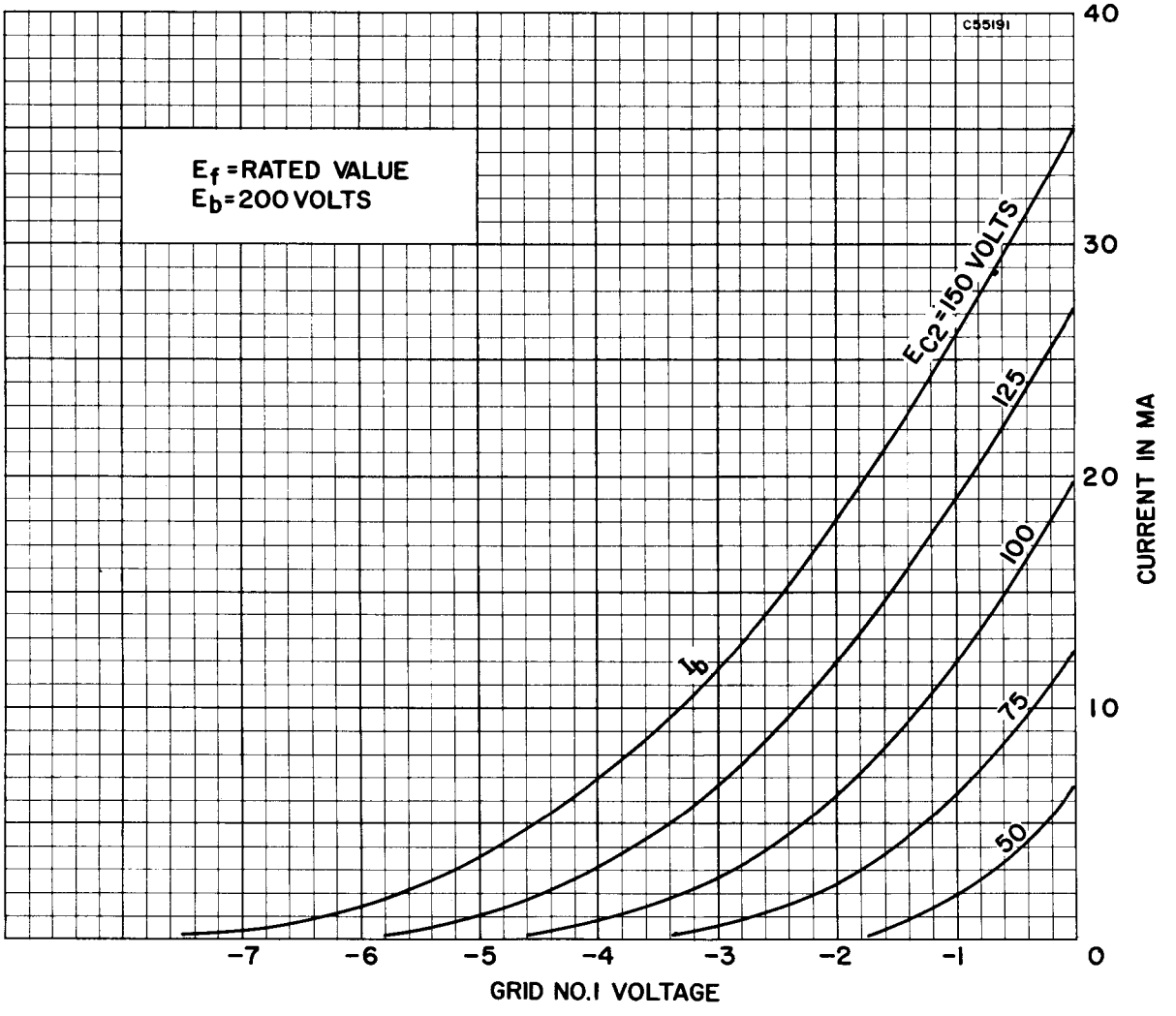
AVERAGE PLATE CHARACTERISTICS
(PENTODE SECTION)



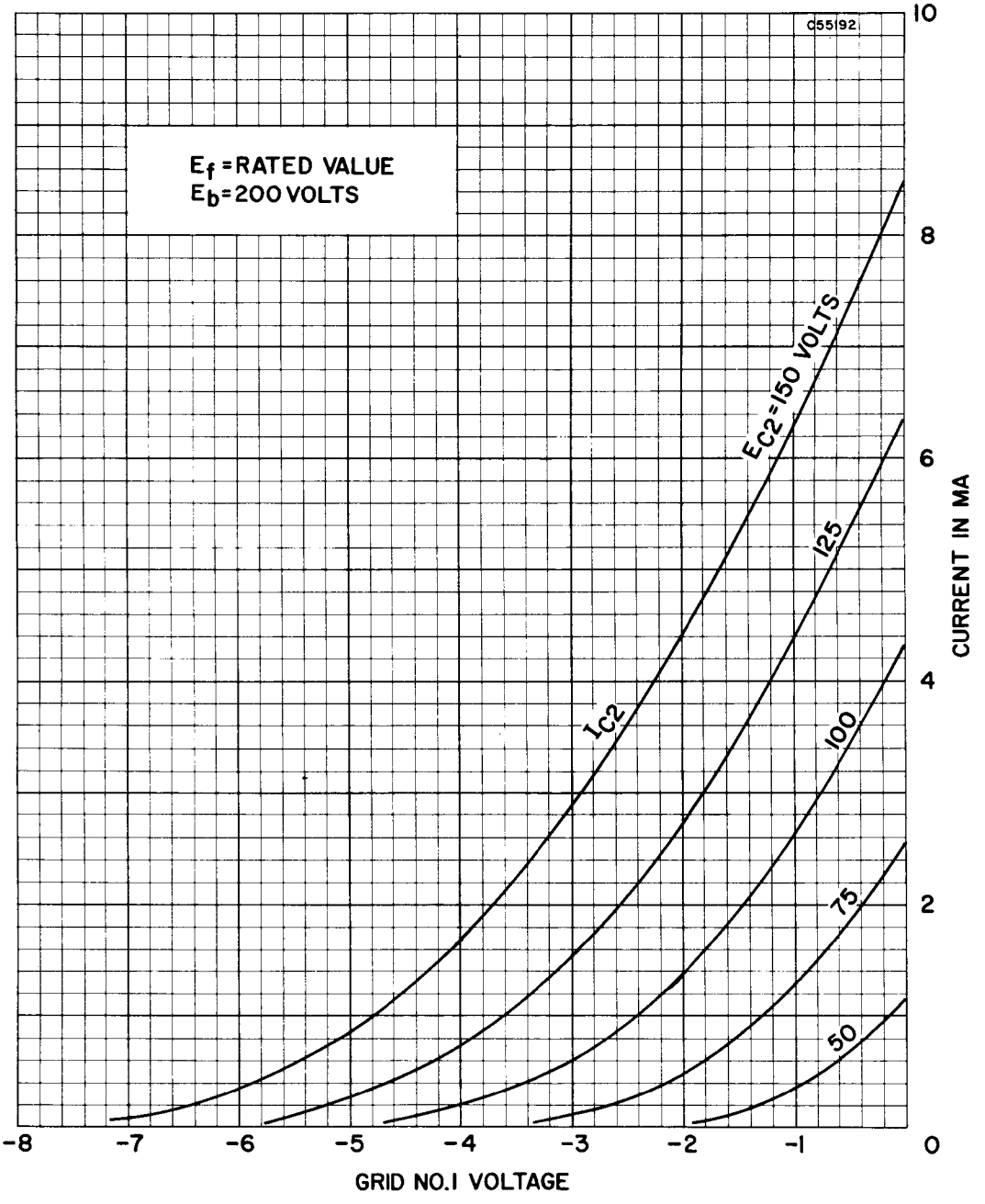
AVERAGE PLATE CHARACTERISTICS
(PENTODE SECTION)



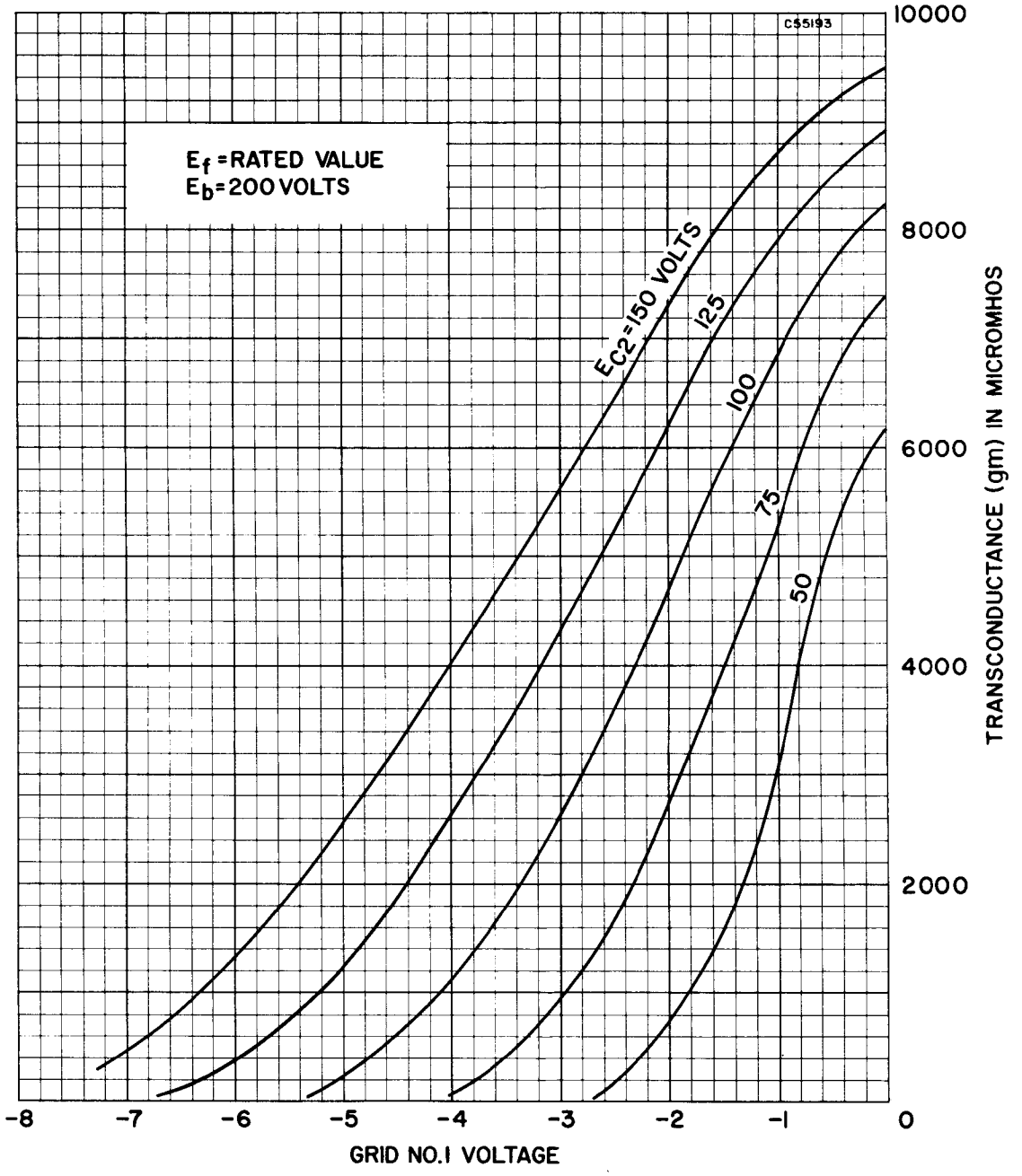
AVERAGE TRANSFER CHARACTERISTICS
(PENTODE SECTION)



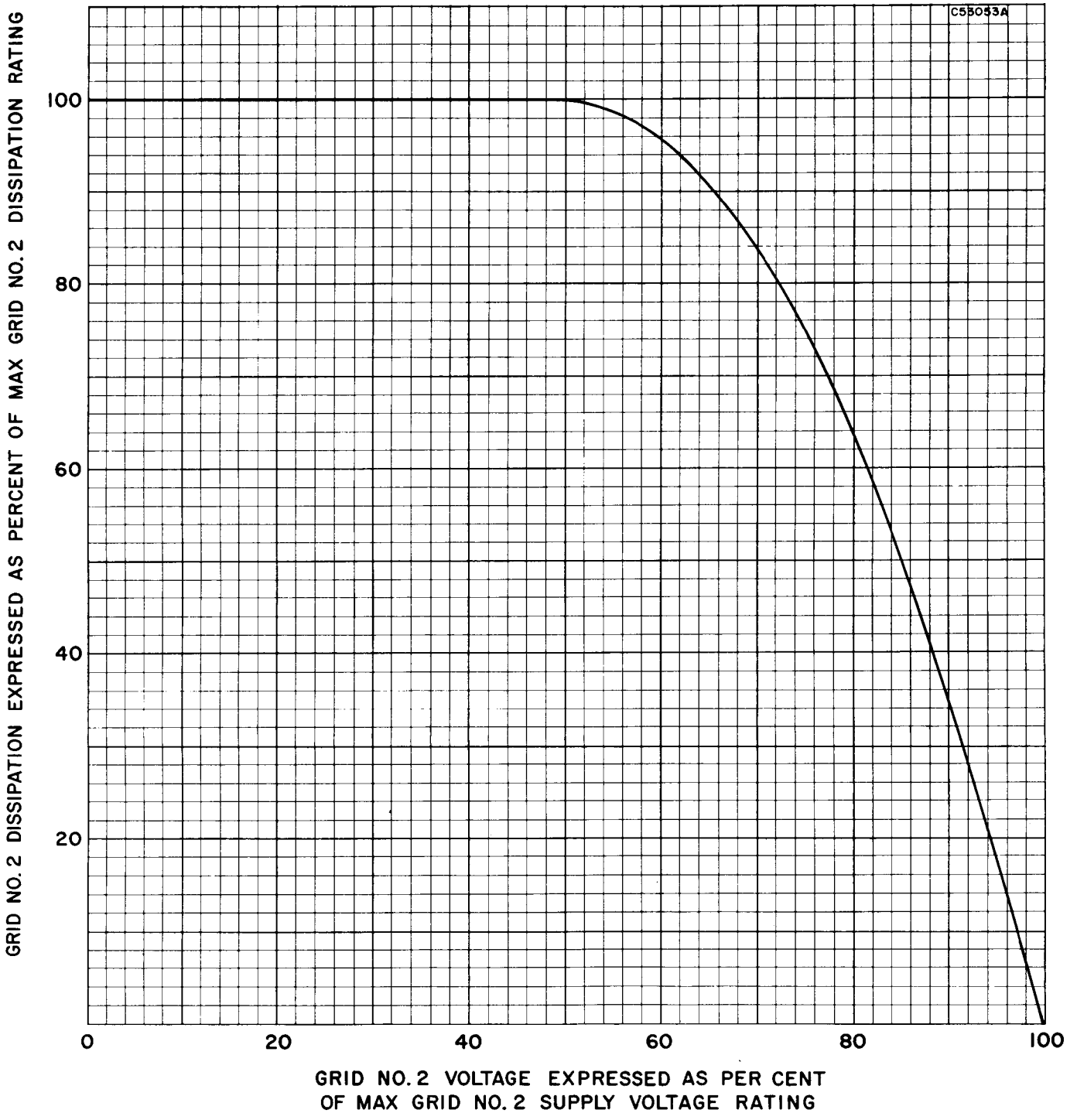
AVERAGE TRANSFER CHARACTERISTICS
(PENTODE SECTION)



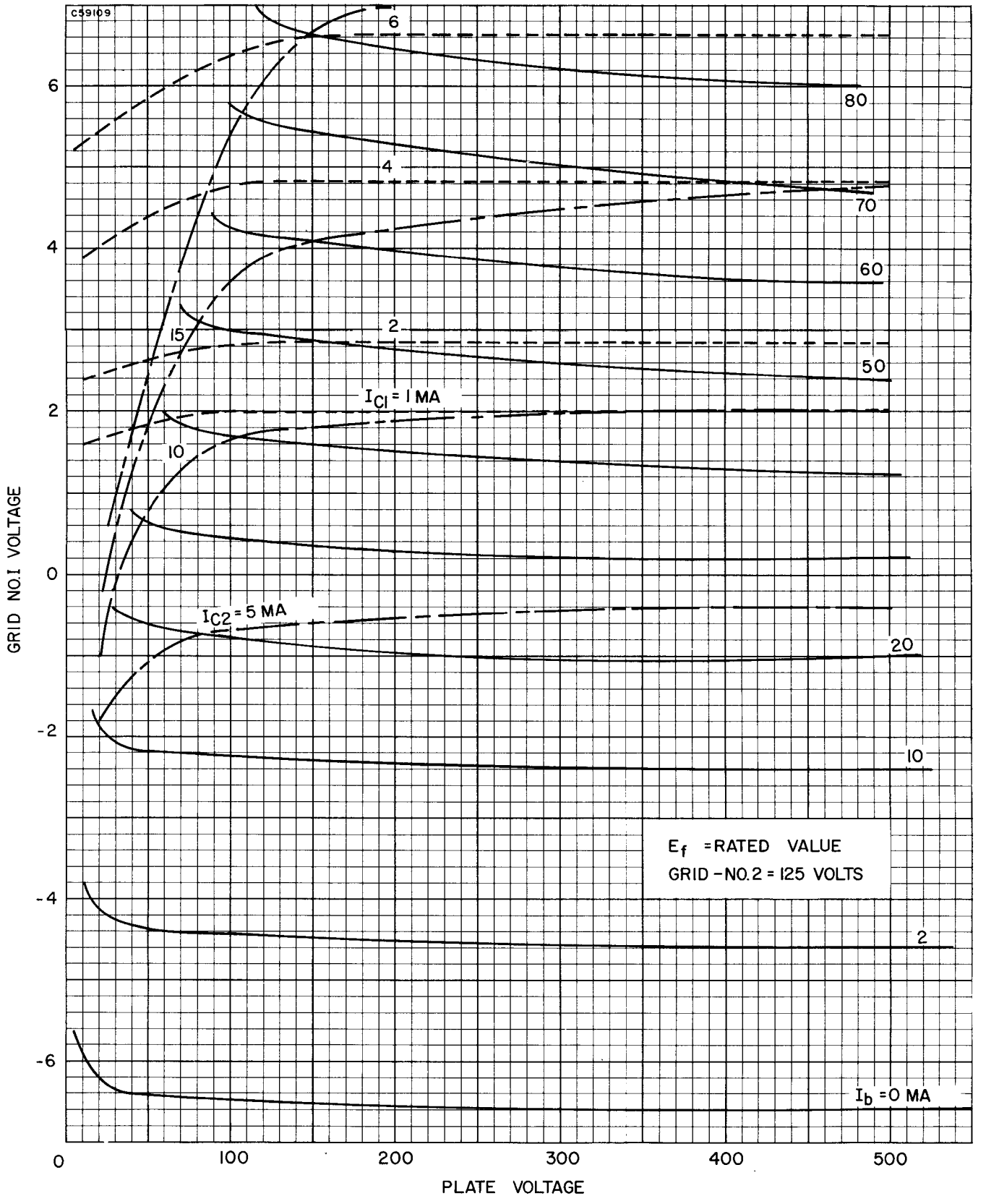
AVERAGE TRANSFER CHARACTERISTICS
(PENTODE SECTION)



GRID NO. 2 RATING CHART



AVERAGE CONSTANT CURRENT CHARACTERISTICS



A Technical Publication of
SYLVANIA ELECTRIC
PRODUCTS INC.
EMPORIUM, PA.



ADVANCE DATA

MECHANICAL DATA

Envelope	Metal Capsule
Power Connector	Winchester PM6S
RF Connectors	Type TNC Jack
Cathode	Philips Impregnated
Focusing [1] [2]	Integral Permanent Magnet
Cooling	Forced Air
Mounting Position	Any
Weight (Approx.)	3 Pounds

ELECTRICAL DATA

HEATER CHARACTERISTICS

Voltage	6.3 ± 10% V
Current (at 6.3 V)	1.1 - 1.5 A

RATINGS (Absolute Maximum) [3]

Collector Voltage with respect to Helix	250 Vdc
Helix Voltage	1000 Vdc
Anode Voltage	800 Vdc
Focus Electrode Voltage Range	-20 to -150 Vdc
Cathode Current	50 mAdc
Helix Current	8 mAdc
Anode Current	1 mAdc
CW rf Input	100 mW
Collector Temperature	150 °C

TYPICAL OPERATION [3]

Conditions

Frequency	2.0 to 4.0 kMc
Collector Voltage with respect to Helix	150 Vdc
Helix Voltage (Approx.) [4]	825 Vdc
Anode Voltage (Approx.) [4]	500 Vdc
Focus Electrode Voltage [4]	-45 Vdc

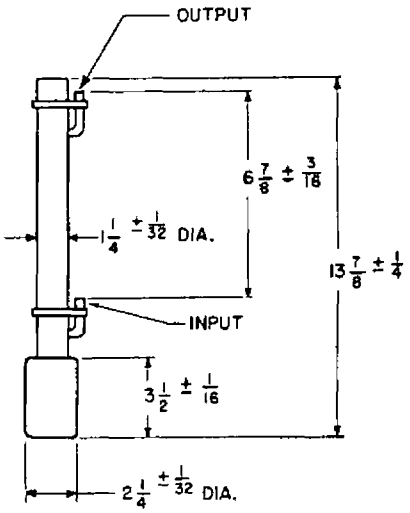
Characteristics	Min.	Max.
Collector Current	-	45 mAdc
Helix Current	-	7 mAdc
Anode Current	-	0.8 mAdc
RF Power Output (1 mW Input)	1	- W
Gain (1 mW Input)	30	- db

CIRCUIT DESIGN INFORMATION [5]

Helix Voltage Range	700 to 900 Vdc
Anode Voltage Range	400 to 650 Vdc
Focus Electrode Voltage Range	-25 to -75 Vdc

QUICK REFERENCE DATA

Traveling-wave Amplifier
Permanent Magnet Focused
2.0 - 4.0 kMc
Over 1 W Power Output
CW or Pulsed
Full Octave Coverage
Lightweight
Rugged
Reliable
Suitable for Airborne Applications



POWER CONNECTIONS

A. Focus Electrode
B. Anode
C. Helix
D. Heater, Cathode
E. Heater
F. Collector, Capsule

SYLVANIA ELECTRIC PRODUCTS INC.
SPECIAL TUBE OPERATIONS
MOUNTAIN VIEW, CALIFORNIA

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

September 11, 1959

from JEDEC release #2685, Jan. 4, 1960

NOTES:

1. The permanent magnet stack is designed to focus the tube properly at operating temperature; therefore, for stable operation and to prevent damaging the tube it is recommended that application of beam current be withheld until 15 minutes after application of the heater potential.

2. To maintain temperatures below the specified maxima it is recommended that a sufficient volume of cooling air (approximately 0.2 lbs/min at 26°C) be directed into one of the openings provided on the collector end of the tube.

3. All voltages given are with respect to cathode except where specified otherwise. For safety, pin F should be grounded.

4. Specific recommended operating voltage values supplied with each tube.

5. Ranges include values required as a result of initial spread in tube characteristics as well as those to accommodate changes throughout life.

ADVANCE DATA

MECHANICAL DATA

Test	Conditions
Dimensions	Fig. 1 (See Note 21)
Weight	Approx. 6 ounces
Vibration	F1 = 9500 Mc, Osc. (1), Note 6
Centrifuge	F1, Osc. (1), Note 7
Shock	F1, Osc. (1), Note 8
Rotation	F1, Osc. (1), Note 19
Magnet Isolation	Note 3
Mounting Support	Note 4
Mounting Position	Any
Tuner Drive Mechanism	Note 9
Output Coupling	Note 4
Input Connections	Note 4
Vibration, Shock	Note 5

RATINGS

DEPENDENT ABSOLUTE RATINGS

Parameters	Ib	ib	Pi	pi	Du	tp	prr
Units	mADc	a	W	kw	.....	μs	kc
Max.	2	1.25	3.75	2.0	.002	1.5	8
Min.	.....	.75	.....	.....	.....	.25	.....

CAUTION: The dependent absolute ratings are interrelated, and it does not necessarily follow that combinations of ratings can be attained simultaneously. The provisions of paragraph 6.5 of MIL-E-1 apply in the selection of the operating point.

INDEPENDENT ABSOLUTE RATINGS

Parameters	Ef	eb	tk	VSWR	Anode T
Units	V	kv	sec	.....	°C
Max.	5.5	2.0	.....	1.5	100
Min.	.....	.....	60	.....	.....
				Note 1	Note 2

CAUTION: The independent absolute ratings must not be exceeded if the specified life is to be obtained. These independent absolute ratings are limiting values beyond which the serviceability of any individual tube may be impaired.

QUICK REFERENCE DATA

Sylvania 7098 magnetron is a mechanically tunable, pulsed, air cooled, integral magnet, unipotential cathode type operating in the frequency range from 9300 to 9500 Mc at 60 watts minimum.

SYLVANIA ELECTRIC PRODUCTS INC.

SPECIAL TUBE OPERATIONS
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

JULY, 1958

from JETEC release #2362, Jan. 19, 1959

ELECTRICAL DATA

MIL-E-1 Ref.	Test	Conditions	Sym.	Min.	Max.	Unit
4.10.8	Heater Current	Ef = 5.0 V	If:	0.6	0.7	A
4.16.3	*Oscillation (1)*		.....	.....	.....	.....
.....	Standing Wave Ratio	VSWR = 1.1 Max.	.....	.....	.....	.....
4.16.3.2	Heater Cathode Warm-up Time	tk = 45 sec at Ef = 5.0 V, Ef = 5.0 V for test	.....	.....	.....	.....
4.16.3.3	Pulse Characteristics	tp = 0.9 to 1.1 μs, Du = .002, trv = 0.1 to 0.2 μs. Notes 10, 11	.....	.....	.....	.....
4.16.3.4	Average Anode Current	Ib = 1.9 mADc	.....	.....	.....	.....
4.16.3.5	Pulse Voltage	F1, F2, F3	epy:	1.35	1.55	kv
4.16.3.6	Power Output	F at Po min, in band, Note 12	Po:	0.12	.....	W
4.16.3.7	R. F. Bandwidth	F1, Notes 12, 13	BW:	.....	3.0/tp	Mc
.....	Minor Lobes		Ratio:	6	.....	db
	R. F. Bandwidth	F1, Notes 12, 13, Ib = 1.7, 2.3 mADc	.....	.....	.....	.....
.....	Heater Voltage	Note 20	.....	.....	.....	.....
4.10.7.3.2	Tunable Frequency	Note 12	F:	9300	9500	Mc
4.16.5	Pulling Factor	F1 = 9500, F2 = 9400, F3 = 9300, Note 12	ΔF:	.....	15	Mc
4.16.6	Pushing Factor	F1, F2, F3, Notes 12, 14	F:	.....	5	Mc
4.16.7.2	Load Stability	VSWR 1.5: F1, Notes 12, 15, 16	M.P.	.....	½	%
.....	Temperature Co-efficient	T = +70 to +110, F1, F2, F3, Notes 2, 12	.....	.....	±0.1	Mc/°C
.....	Thermal Equilibrium	F1, F2, F3, Notes 12, 17	F:	.....	± 5	Mc
4.9.15	Low Temperature Operation	T = -60, Note 12	.....	.....	.....	.....
4.9.16	High Temperature Operation	T = 90, Note 12	.....	.....	.....	.....
4.11.5	Intermittent Life Test	F2: Notes 12, 18, Group D	Cycles	3000	.....	Cycle
4.11.4	Life Test End Point	Note 12	Po:	0.1	.....	W
			BW:	.....	3.0/tp	Mc
			Missing Pulses:	.....	1	%
			epy:	.....	1.65	kv

NOTES

1. *Frequency skipping or unstable operation may be encountered at some phase positions when the mismatch occurs at the end of a "long" line.*
2. *The temperature is to be measured at the point indicated on Figure 1.*
3. *In handling and mounting the magnetron, care must be exercised to prevent demagnetization. Ferromagnetic materials or energized magnets shall not be brought within two inches of the tube.*
4. *See Fig. 1 and Note 21.*
5. *Reasonable care should be used in the storage, installation, and use of the tube to avoid imparting vibration or shock in excess of the values for which it is designed to withstand.*
6. *The tube shall be subjected to vibration of 10 to 60 cps at 0.08 inch total excursion and 60 to 2000 cps at a constant acceleration of 15 g in each of three mutually perpendicular planes. Total test time shall be approximately 45 minutes. The tube shall meet the R. F. Bandwidth requirements on Osc (1) during this test.*
7. *The tube shall withstand a centrifuge test as follows: The tube shall be inserted in a centrifuge and subjected to a 500 g acceleration in the plane parallel to the cathode axis. The acceleration shall be applied gradually so that the maximum acceleration is reached in one minute; shall be maintained at maximum acceleration for one minute, and then decreased to zero acceleration in one minute. The tube shall meet R. F. Bandwidth requirements of Osc 1 during this test and the frequency under conditions of maximum acceleration shall not shift more than 2.5 Mc from the initial frequency.*

8. *With heater and pulse voltages applied, the tube shall be subjected to a linear shock of 500 g for 1.0 millisecond in a plane parallel to the major axis and 250 g in a plane normal to the major axis of the tube. The tube is not required to fulfill all requirements of Osc (1) during this test, but is to be capable of withstanding this test with no permanent damage. The tube shall meet all requirements of Osc (1) after this test.*
9. *The tube shall be tuned by: (1) unlocking the tuner by loosening the set screws on the side of the tuner housing, (2) turning the tuner screw in either direction with a non-magnetic screw driver, (3) tightening the set screws to lock the tuner.*
10. *This test need be conducted only under one set of conditions within the limits stated for the oscillations specified.*
11. *Value of voltage and current fall time, spike, ripple, inverse voltages and post pulse conditions should be minimized.*
12. *All radio frequency measurements are made by the manufacturer with waveguide as the transmission media. The coaxial line to waveguide adaptor shown on Fig. 2, will be used except for tubes having a BNC output connector.*
13. *The R. F. Bandwidth shall be within the limits specified when a VSWR of 1.5/1.0 is introduced in the load at a distance of approximately one-half meter from the magnetron coupling, the phase being adjusted for maximum power output.*
14. *The anode current shall be varied between 1.8 and 2.0 mADc. The frequency difference measured between these currents shall be within the limits specified.*
15. *No more than the specified percentage of pulses shall result in R. F. output pulses, each having less than 70% of the energy content of a normal pulse. The test shall be conducted for a period of two minutes and satisfactory operation must be obtained for each minute of this two minute period.*
16. *Two observations shall be made, those for load phase positions corresponding to maximum power and to minimum power.*
17. *The frequency shall not change in any one direction by more than the specified value in any 30 minute interval of time after the application of voltage. This test shall be made at a constant ambient temperature and with a constant input power.*
18. *The VSWR shall be 1.5/1.0. The interpretation of the value of the VSWR as used by the manufacturer and as used by others shall be as defined in paragraph 4.19.5 of MIL-E-1. The standing wave introducer shall be moved during the test so that operation is obtained for load phase positions corresponding to maximum power output, minimum power output, maximum frequency, and minimum frequency. If automatically driven, the standing wave introducer shall be cycled continuously through a line length, approximately one-half wavelength long, at a maximum rate of four cycles per hour; if manually moved, the standing wave introducer shall be cycled through the four load phase positions corresponding to maximum power, minimum power, maximum frequency, minimum frequency at least once during the specified life of the tube, spending approximately equal periods of time in each position. The application of voltage to the tube during life test shall be done in accordance with the following cycle: (a) heater preheat 45 seconds, (b) higher voltage applied 5 minutes, (c) no voltage 5 minutes. This cycle shall be repeated until the summation of high voltage application equals the specified life.*
19. *The tube shall be capable of withstanding rotation about its longitudinal axis at a rate of 300 RPM without a shift in frequency greater than plus or minus 1.25 megacycles and R. F. Bandwidth shall not exceed the limits specified in Osc (1).*
20. *Under conditions of Osc (1), the tube shall meet the bandwidth requirements when the heater voltage is varied from 5.0 to 5.5 volts.*
21. *Fig. 1 does not apply to tubes having a BNC output connector.*

FIGURE 1

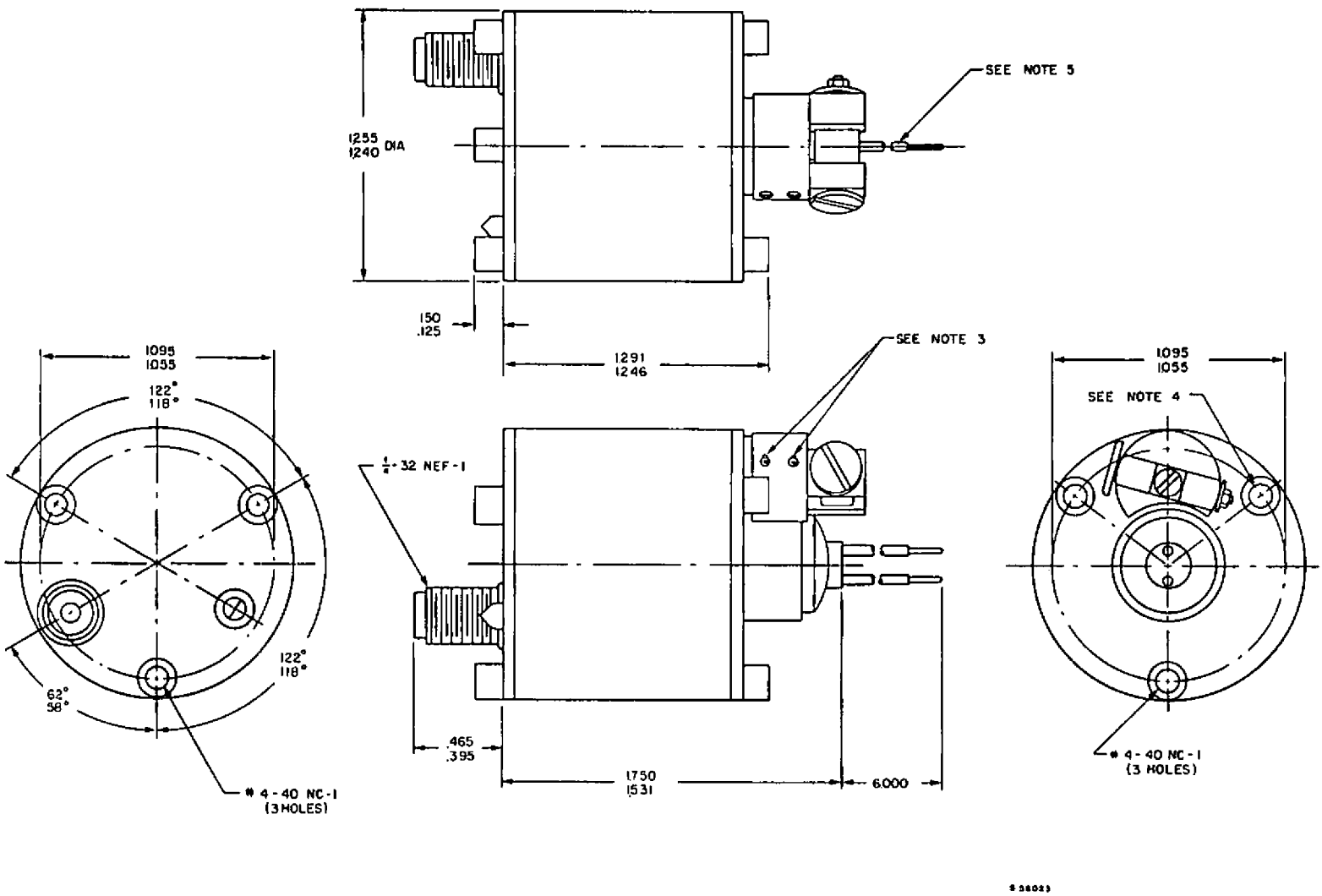
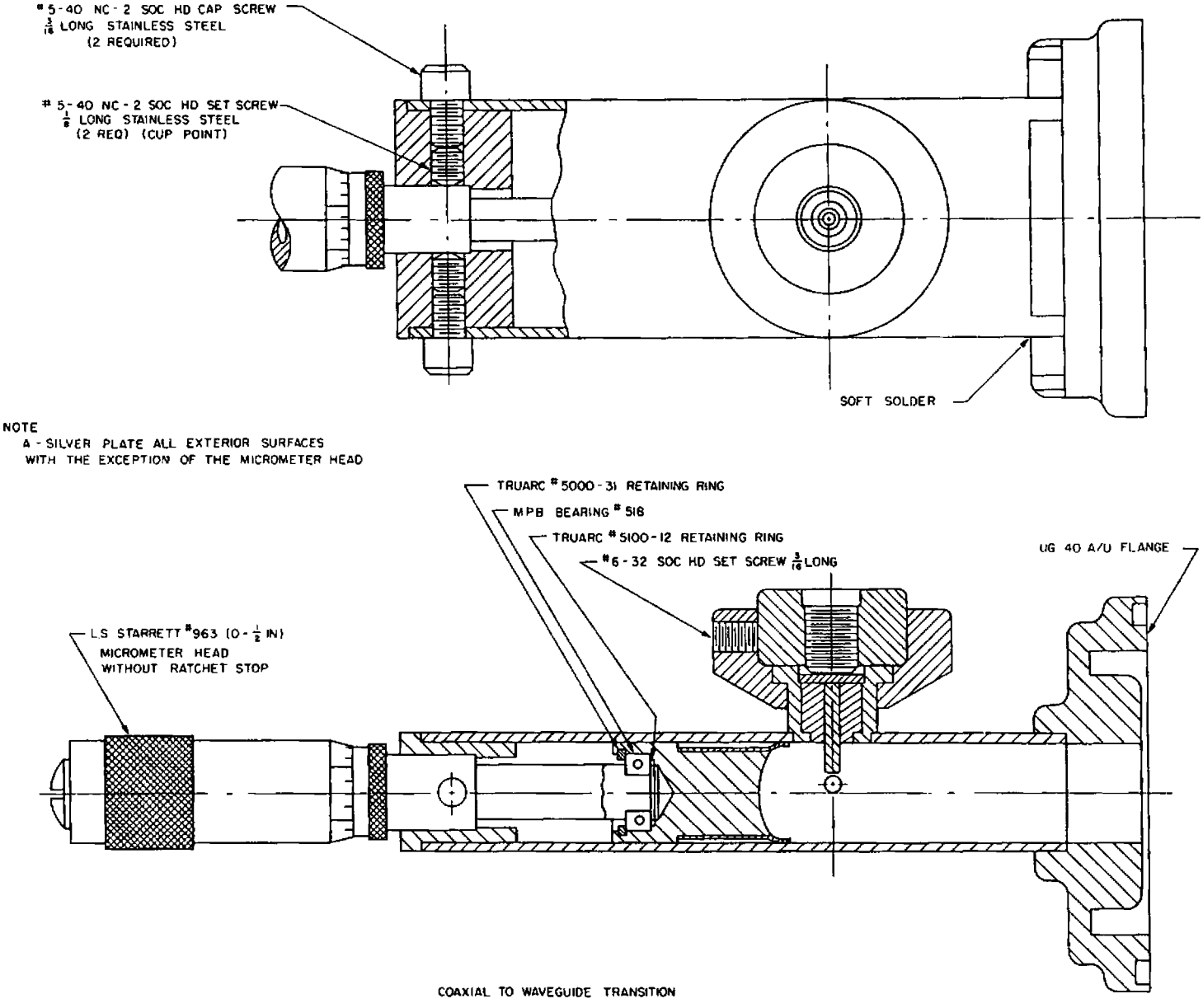


DIAGRAM NOTES

1. *Non-magnetic tools must be used when inspecting this tube.*
2. *A UG-699/U coaxial line connector attaches the load to the magnetron.*
3. *Location of #2-56 set screws (No. 2, 4 flute multiple, spline socket screw to be used).*
4. *Tapped hole in mounting nut to be used for measuring anode temperature.*
5. *Red lead is common cathode connection.*
6. *Center of output to lie on .685 - .747 Dia circle as shown.*

FIGURE 2


#5-40 NC-2 SOC HD CAP SCREW
3/16 LONG STAINLESS STEEL
(2 REQUIRED)
#5-40 NC-2 SOC HD SET SCREW
1/8 LONG STAINLESS STEEL
(2 REQ) (CUP POINT)
SOFT SOLDER
NOTE
A - SILVER PLATE ALL EXTERIOR SURFACES
WITH THE EXCEPTION OF THE MICROMETER HEAD
TRUARC #5000-31 RETAINING RING
MPB BEARING #518
TRUARC #5100-12 RETAINING RING
#6-32 SOC HD SET SCREW 3/16 LONG
UG 40 A/U FLANGE
L.S STARRETT #963 (0-1/2 IN)
MICROMETER HEAD
WITHOUT RATCHET STOP
COAXIAL TO WAVEGUIDE TRANSITION

ADVANCE DATA

MECHANICAL DATA

Bulb	T-5 1/2
Outline	5-2
Base	E7-1, Miniature Button 7-Pin
Basing	7BQ
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS [1]

Bulb Temperature (at hottest point)	120°	C
Operational Altitude	60,000	Ft.

DURABILITY CHARACTERISTICS [2]

Impact Acceleration [3]	450	G
Vibrational Acceleration for an Extended Period [4]	2.5	G
On - Off Heater Cycles [5]	2000	

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage (±10%)	6.3	Volts
Heater Current	225	mA

CONTROLLED DETRIMENTS

Interelectrode Insulation [6]	200	Megohms	Min.
Total Grid Current [7]	-1.0	μAdc	Max.
Heater-Cathode Leakage [8]	15	μAdc	Max.
Vibration Output [9]	50	mVac	Max.

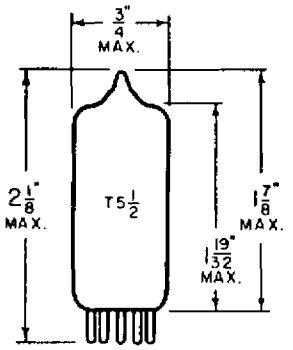
DIRECT INTERELECTRODE CAPACITANCES (Shield No. 316)

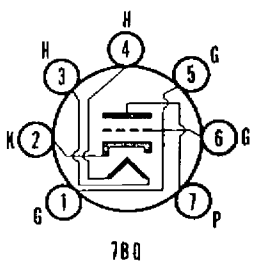
Grid to Plate [10]	1.7	μμf	
Input: k to (h+g+ext.shd.) [11]	6.0	μμf	
Output: p to (h+g+ext.shd.) [11]	4.5	μμf	Max.
Heater to Cathode: [10]	3.0	μμf	
Plate to Cathode: [10]	0.34	μμf	Max.

QUICK REFERENCE DATA

The Sylvania Type 7137 is a miniature medium mu triode designed primarily for use as a grounded grid amplifier at frequencies up to approximately 500 mc. The 7137 is electrically similar to the Type 6J4WA.

The 7137 is characterized by long life and stable performance under conditions of severe shock, vibration, high temperature and high altitude.





SYLVANIA ELECTRIC PRODUCTS INC.
RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

October 24, 1957

from JETEC release #2045, Nov. 25, 1957

RATINGS [1] (Design Maximum System)

UHF Amplifier Service

Plate Voltage	150	Vdc Max.
Plate Dissipation	2.25	Watts Max.
Cathode Current	20	mAdc Max.
Negative Grid Voltage	50	Vdc Max.
External Grid Circuit Resistance		
Fixed Bias	0.1	Megohm Max.
Self Bias	0.5	Megohm Max.
Heater-Cathode Voltage		
Heater Negative with respect to Cathode		
Total DC plus peak	200	Volts
Heater Positive with respect to Cathode:		
Total DC plus peak	200	Volts
Total DC	100	Volts

AVERAGE CHARACTERISTICS (each section)

Plate Voltage	150	Vdc
Cathode Bias Resistor	100	Ohms
Plate Current	13.5	mAdc
Transconductance	8500	µmhos
Amplification Factor	40	
Grid No. 1 Voltage for Ib = 40 µA Max.	-15	Vdc

NOTES:

1. Design-maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions. These values are chosen by the device manufacturer to provide acceptable serviceability of the device; taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no design maximum values for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.

2. Test performed as a measure of the mechanical durability of the tube structure.

3. Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices.

4. Vibrational forces applied in any direction for a period of 96 hours.

5. One cycle consists of the application of Ef = 7.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.

NOTES: (Continued)

6. Measured with Ef = 6.3 V; Eg-all = -100 Vdc; Ep-all = -300 Vdc; Cathode is positive so that no cathode emission occurs.

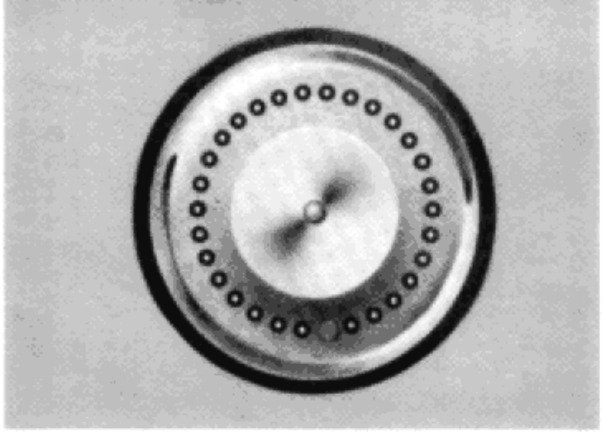
7. Measured with Ef = 6.3 V; Eb = 175 Vdc; Rk = 150 ohms; Rg = 0.25 Meg;

8. Measured with Ef = 6.3 V; Ehk = ±100 Vdc;

9. Measured with Ef = 6.3 V; Eb = 150 Vdc; Ec = 0; Rk = 100 ohms; Ck = 1000 µf; Rp = 2000 ohms; F = 25 cps; Acc = 2.5 G.

10. Shield tied to ground.

11. Shield tied to Grid.



doing new jobs
everywhere in
electronics

SYLVANIA DECADE COUNTER TUBES

Sylvania Decade counter tubes are growing in importance in the electronics industry due to their wide range of applications, including

COMPUTERS AND TABULATING MACHINES
MACHINE CONTROLS
COUNTER DEVICES AND SCALERS
RADIATION MEASURING EQUIPMENT
TIMING DEVICES

The tubes will perform all of these varied functions:

DISTRIBUTING	CODING	MATRIXING
SAMPLING	MODULATING	INDEXING
FREQUENCY DIVIDING	COMMUTATING	MULTIPLEXING

The new high speed tubes, types 6909, 6910, and the miniature 7155, are designed to operate at frequencies up to 100 kilocycles per second. All of Sylvania's decade counter tubes offer these advantages:

1. high reliability
2. electrical and direct visual readout with bright neon glow
3. negligible power dissipation
4. short resolution time
5. simple, low cost circuitry
6. no moving parts

On the following pages you will find complete technical information on the Sylvania line of cold cathode decade counter tubes.

principles of operation

The Sylvania decade counter (glow transfer) tube is a gas-filled device employing 30 pin-like cathodes which surround a disc-shaped anode. The cathodes are identical physically but are electrically connected in three groups, called guide 1 buss, guide 2 buss, and output cathode buss. Conduction occurs in the tube between the anode and the most negative cathode pin, causing a glow on the tip of the pin which permits direct visual read-out, and electrical read-out in the form of voltage developing across a cathode load.

In operation, a negative input pulse is applied to the guide 1 buss, which causes the glow to move from a cathode (the quiescent position) to the nearest guide 1 pin. Near the end of the first input pulse, a second input pulse is applied to guide 2, making it the most negative pin and causing the glow to shift there. Since the guide pins are normally positive with respect to the cathodes, removal of the input pulse from guide 2 causes the glow to move to the nearest cathode, thus completing one counting cycle.

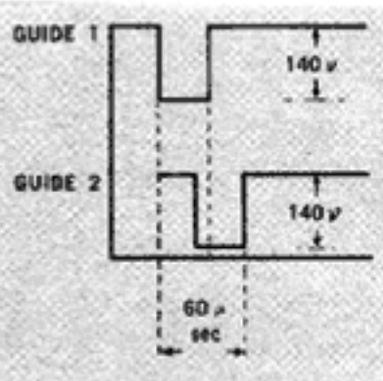


FIG. 1
Idealized Waveforms on Adjacent Guides, Medium Speed Tubes. Pulse widths are 30 to 40 μs min. Overlap is 10 μs min.

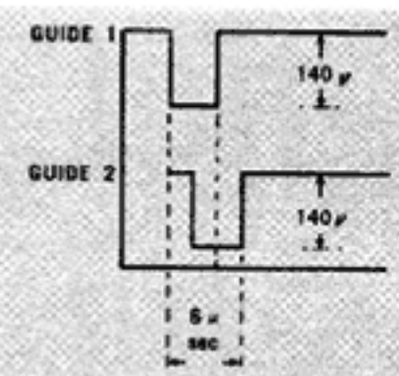


FIG. 2
Idealized Waveforms on Adjacent Guides, High Speed Tubes. Pulse width are 4 μs min. Overlap is 2 μs min.

resetting

Usually, it is a requirement of the equipment that counting starts from a particular initial cathode, and that upon completion of a counting period, the glow be returned to the reference, or zero cathode. This may be accomplished either by opening the negative connection of all cathodes and guides except the zero cathode, or by pulsing the zero cathode negative. In either case, the zero cathode becomes 120 volts or more negative with respect to all other pins, for 50 microseconds or longer in the medium speed tubes and for 2 microseconds or longer in the higher speed tubes.

The maximum pulse duration for the reset pulse is limited by the operating frequency. Commonly, the reset action is made to occur slowly, with a wide reset pulse, but in certain applications it may become necessary to reset the glow rapidly to a reference cathode to avoid loss of count during the resetting operation. Therefore, the reset pulse-width in this case should be consistent with the speed at which the counted signal is being received from the drivers.

When several tubes are cascaded, it is recommended that resetting be made to the zero cathode in the first stage, and the number 9 cathode in succeeding stages. This is to absorb the counting pulse which is passed to the other tubes when the first tube is reset.

phase relationships

Proper timing of the ignition and extinction of adjacent guides is the key to reliable operation. Four steps must occur in order : ignition of guide 1, ignition of guide 2, extinction of guide 1, and extinction of guide 2. This is shown by the voltage waves in Figures 1 and 2, the values of 1 being for medium speed tubes and those of 2 for high speed tubes. Note that in order to satisfy the basic requirement, an overlap of guide pulses is necessary. The minimum overlap is 10 microseconds for the medium speed tube and 2 microseconds for the high speed tube.

The idealized waveforms of figures 1 and 2 are encountered only in test equipment; waveforms similar to those of Figure 3 are more common. Here, not only is the overlap time of importance, but also the time between leading edges, and the time between trailing edges. The minimum value of overlap is 10 microseconds for the medium speed tube, and 2 microseconds for the high speed. These are also the minimums for the time between leading edges, and the time between trailing edges.

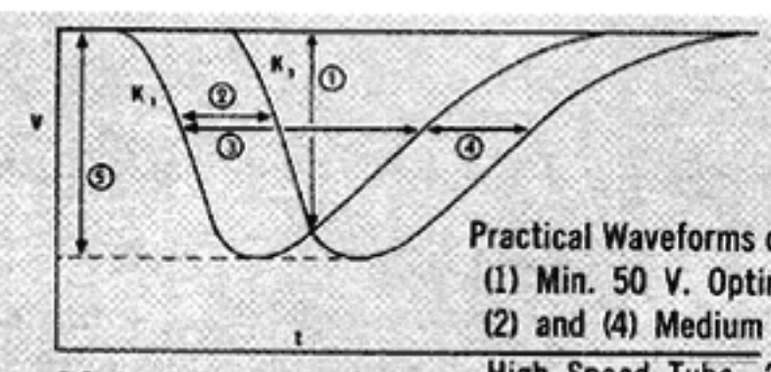
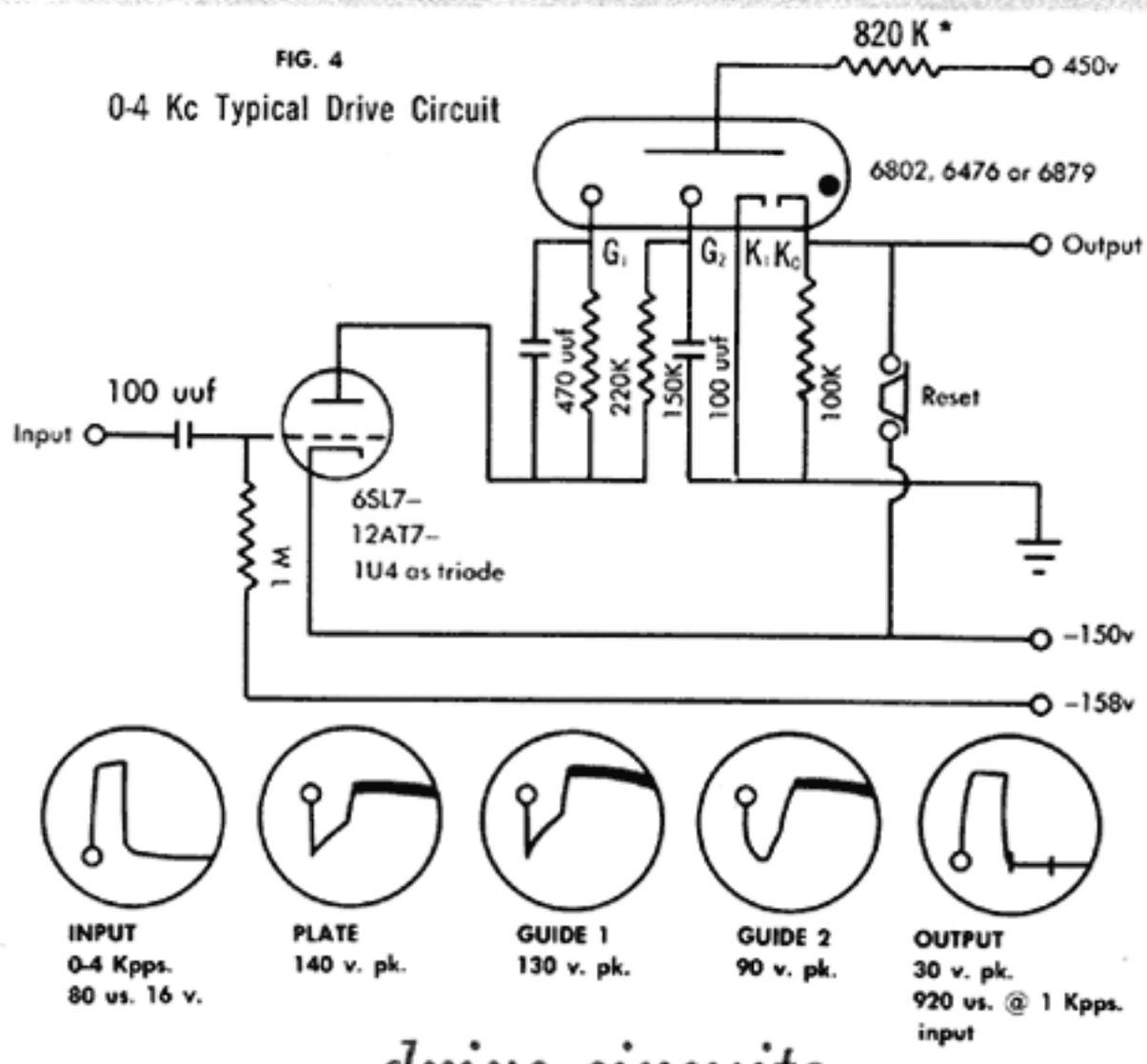


FIG. 3
Practical Waveforms on Adjacent Guides.
(1) Min. 50 V. Optimum 120 V.
(2) and (4) Medium Speed Tube: 10 μs min.
High Speed Tube: 2 μs min.
(3) Medium Speed Tube: 50 μs min.
High Speed Tube: 4 μs min.
(5) 120-180 V.
(2), (3) and (4) are measured at the half-voltage point.

FIG. 4
0-4 Kc Typical Drive Circuit



drive circuits

0-4 Kc—The circuit of Figure 4 employs a minimum number of components for use with the medium speed (4 Kc) tubes, types 6476, 6476A, 6802 and 6879. It gives excellent, reliable response from slow random pulses and up to 4000 pulses per

(*cont'd on Page* 4)

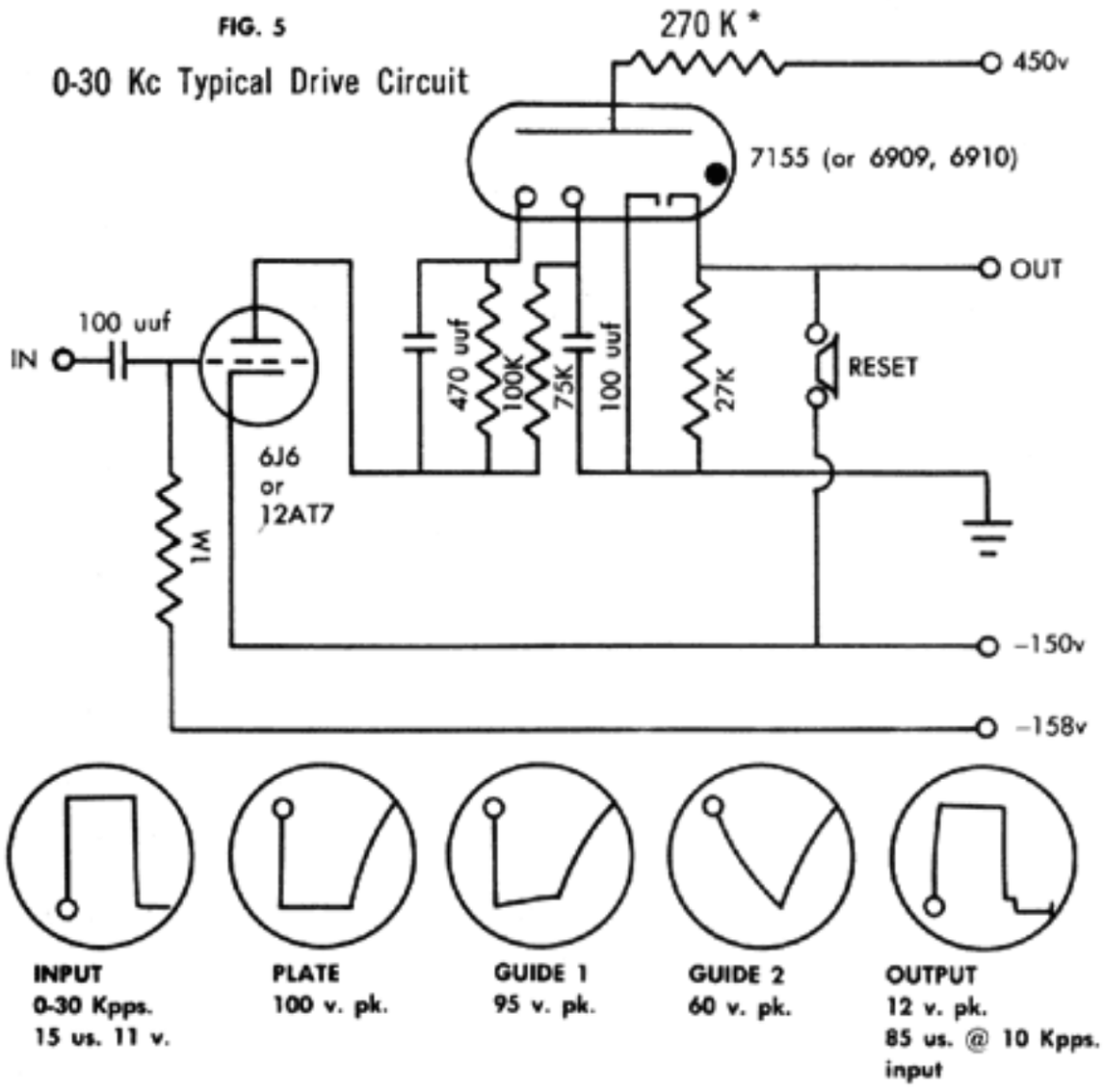
116dpi

(*cont'd from Page* 3)

second, especially where the information pulse has a short rise time but is otherwise not an ideal square wave. With a sin wave or other inputs not exhibiting a short rise time, upward adjustment of capacitance values in the input and the time delay RC network will insure more reliable operation at frequencies below 500 cps. Generally, high reliability will be achieved with this circuit if the pulse supplied to the guides has sharp rate of rise and sufficient amplitude and width, as indicated.

FIG. 5

0-30 Kc Typical Drive Circuit



0-30 Kc—This circuit (Figure 5) is designed for the high speed tubes, types 6909, 6910 and 7155, in applications where speeds over 30 Kc will not be encountered.

0-100 Kc—Figure 6 gives a typical circuit for use with the high speed tubes, types 6909, 6910 and 7155, at any counting rate between 0 and 100 Kc. In the 50 to 100 Kc range the variable plate resistor should be adjusted for best operation.

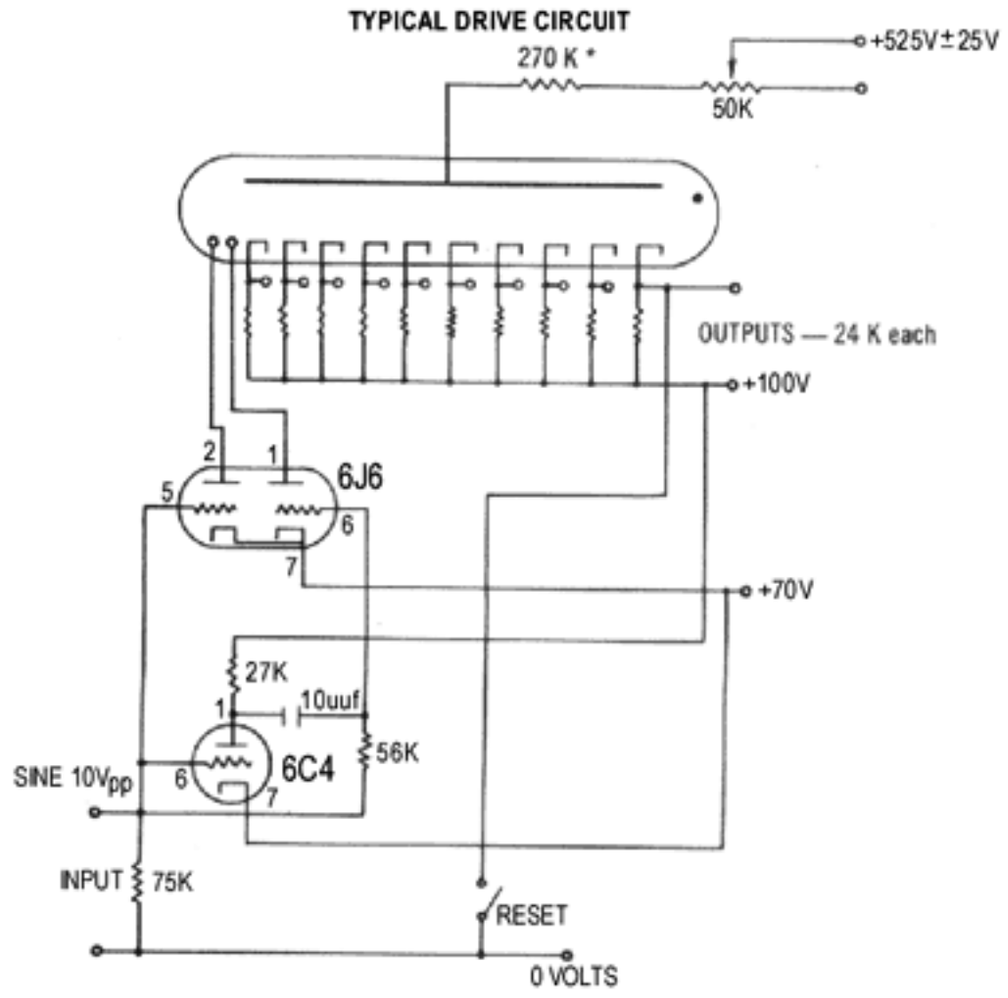


FIG. 6

0-100 Kc Typical Drive Circuit

*Locate anode resistor within ½" of anode pin.

100 KC. 4 OUTPUT CATHODES. T5½ BULB 7155

MECHANICAL DATA

Mounting Position	Any (Count is read from top of tube)
Zero Position (Cathode No. 10)	Aligned with Pin No. 5 ±10°
Bulb	T5½
Base	7-pin

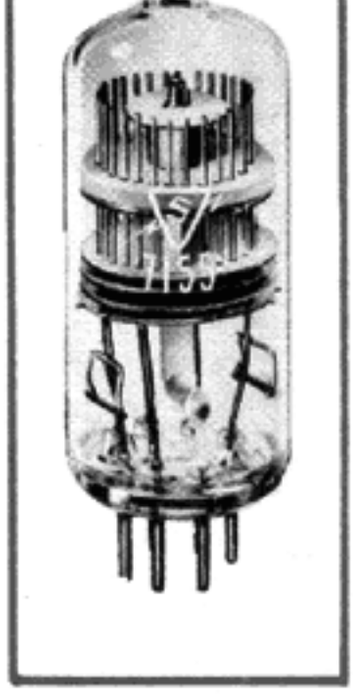
ELECTRICAL DATA

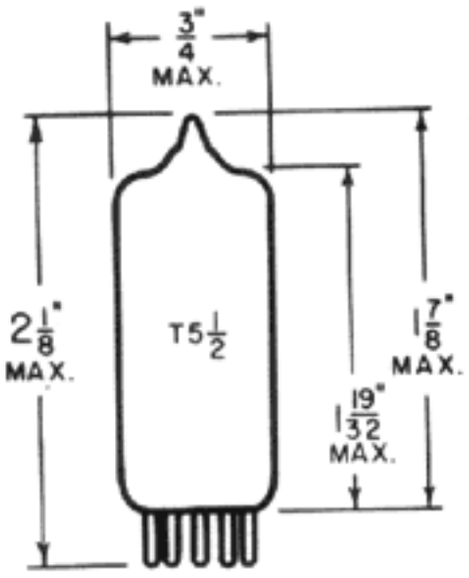
RATINGS (Absolute Values)

Total Anode Current	1.2 Ma max.
Voltage Between Electrodes (other than anode)	140 Volts max.
Supply Voltage (anode to cathode)	425 Volts min.
Input Frequency	100,000 P.P.S. max.

TYPICAL OPERATION

DC Supply Voltage	450 Volts
Anode Resistor	0.27 Megohms
Nominal Tube Drop (under these conditions)	235 Volts
Cathode Resistor	27 Kohms
Output Voltage (developed across cathode resistor)	12 Volts





Outline Drawing

Pin No. 1 Cathode No. 8
Pin No. 2 Guide No. 1
Pin No. 3 Common Cathode
Pin No. 4 Guide No. 2
Pin No. 5 Cathode No. 0
Pin No. 6 Cathode No. 9
Pin No. 7 Anode

6476 - 6476 A

4 KC. 10 OUTPUT CATHODES. T11 BULB

MECHANICAL DATA

Mounting Position	Any (Count is read from top of tube)
Zero Position (Cathode No. 10)	Aligned with pin No. 12 ±10°
Bulb	T11
Base	Modified Duo-decal*

*Part No. 7460-0008, available from Sylvania Parts Div., Warren, Pa.

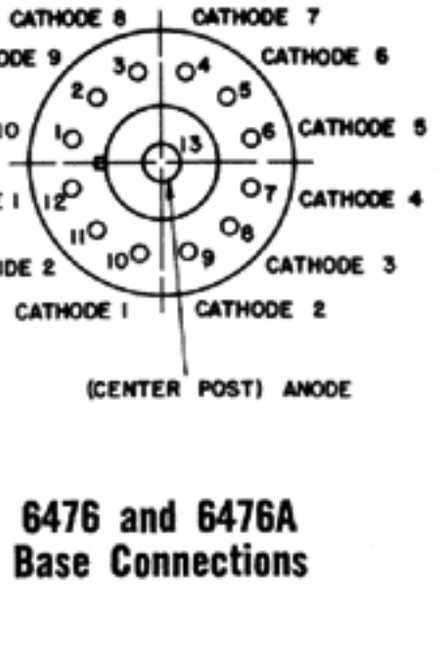
ELECTRICAL DATA

RATINGS (Absolute Values)

Total Anode Current	0.60 Ma	max.
Voltage Between Electrodes (other than anode)		
6476	140 Volts	max.
6476A	200 Volts	max.
Supply Voltage (anode to cathode)	350 Volts	min.
Input Frequency	4,000 P.P.S.	max.

TYPICAL OPERATION

DC Supply Voltage	400-450 Volts
Anode Resistor	0.82 Megohms
Nominal Tube Drop (under these conditions)	191 Volts
Cathode Resistor	100 Kohms
Output Voltage (developed across cathode resistor)	30 Volts



6476 and 6476A
Base Connections

6802

4 KC. 4 OUTPUT CATHODES. T9 BULB

MECHANICAL DATA

Mounting Position	Any (Count is read from top of tube)
Zero Position (Cathode No. 10)	Aligned with pin No. 6 ±10°
Bulb	T9
Base	Octal

ELECTRICAL DATA

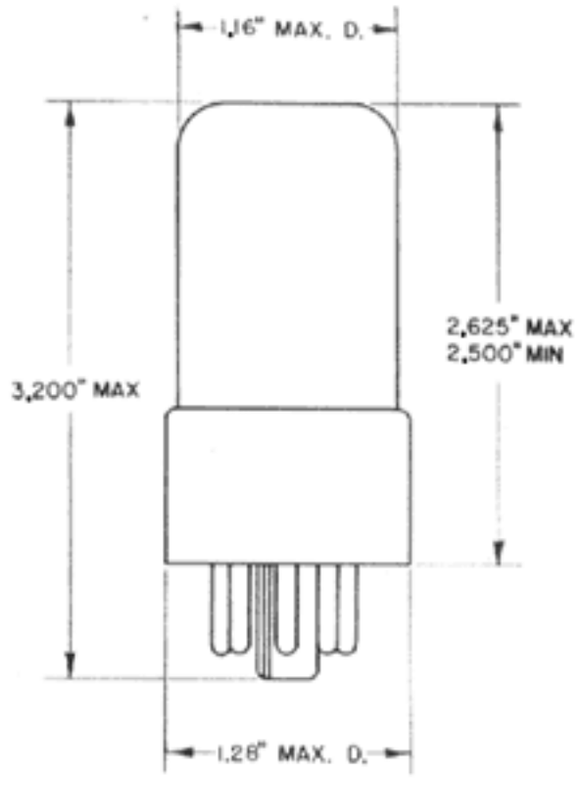
RATINGS (Absolute Values)

Total Anode Current	0.60 Ma	max.
Voltage Between Electrodes (other than anode)	140 Volts	max.
Supply Voltage (anode to cathode)	350 Volts	min.
Input Frequency	4,000 P.P.S.	max.

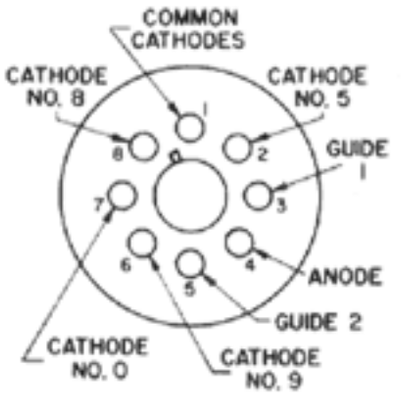
TYPICAL OPERATION

Supply Voltage	425 Volts
Anode Resistor	0.82 Megohms
Nominal Tube Drop (under these conditions)	195 Volts
Cathode Resistor	100 Kohms
Output Voltage (developed across cathode resistor)	30 Volts





Outline Drawing



Base Connections

6879

5 KC. 3 OUTPUT CATHODES. T5½ BULB

MECHANICAL DATA

Mounting Position	Any (Count is read from top of tube)
Zero Position (Cathode No. 10)	Aligned with pin No. 5±10°
Bulb	T5½
Base	7-pin

ELECTRICAL DATA

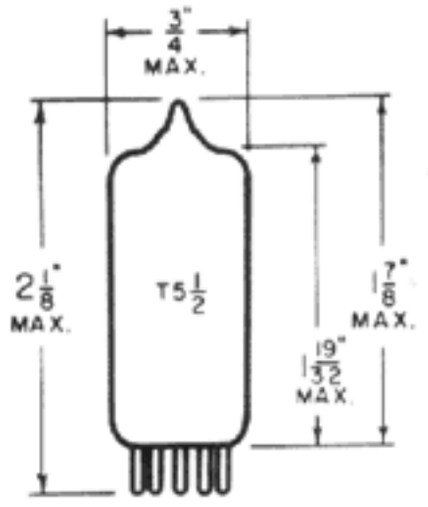
RATINGS (Absolute Values)

Total Anode Current	0.60 Ma	max.
Voltage Between Electrodes (other than anode)	140 Volts	max.
Supply Voltage (anode to cathode)	320 Volts	min.
Input Frequency	5,000 P.P.S.	max.

TYPICAL OPERATION

DC Supply Voltage	450 Volts
Anode Resistor	0.82 Megohms
Nominal Tube Drop (under these conditions)	195 Volts
Cathode Resistor	100 Kohms
Output Voltage (developed across cathode resistor)	30 Volts





Outline Drawing

Pin No. 1 Cathode No. 8
Pin No. 2 Guide No. 1
Pin No. 3 Common Cathode
Pin No. 4 Guide No. 2
Pin No. 5 Cathode No. 0
Pin No. 6 Cathode No. 9
Pin No. 7 Anode

6909-6910

6909: 100 KC.
4 OUTPUT CATHODES. T9 BULB

6910: 100 KC.
10 OUTPUT CATHODES. T11 BULB



MECHANICAL DATA

Mounting Position	Any (Count is ready from top of tube)
Zero Position (Cathode No. 10)	
6909	Aligned with pin No. 6 ±10°
6910	Aligned with pin No. 12 ±10°
Bulb	
6909	T9
6910	T11
Base	
6909	Octal
6910	Modified Duo-decal*

*Part No. 7460-0008, available from Sylvania Parts Div., Warren, Pa.

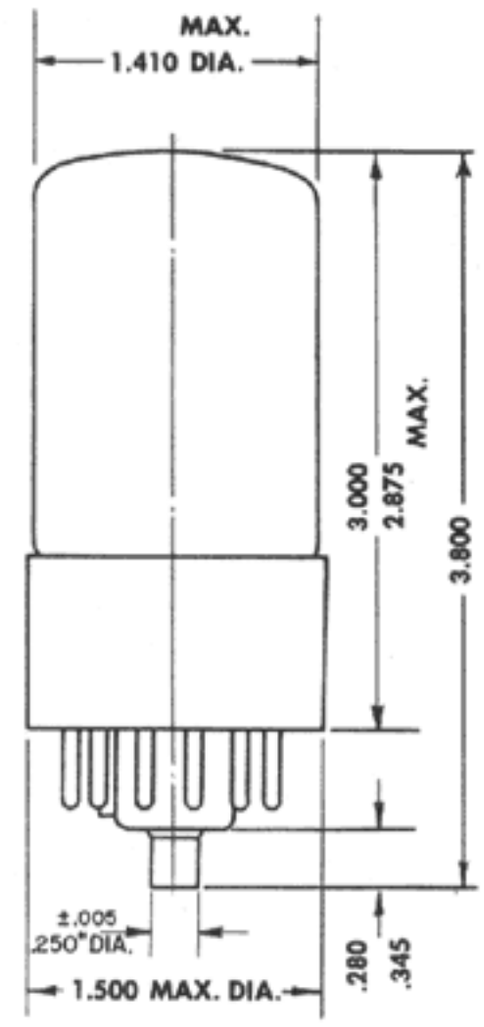
ELECTRICAL DATA

RATINGS (Absolute Values)

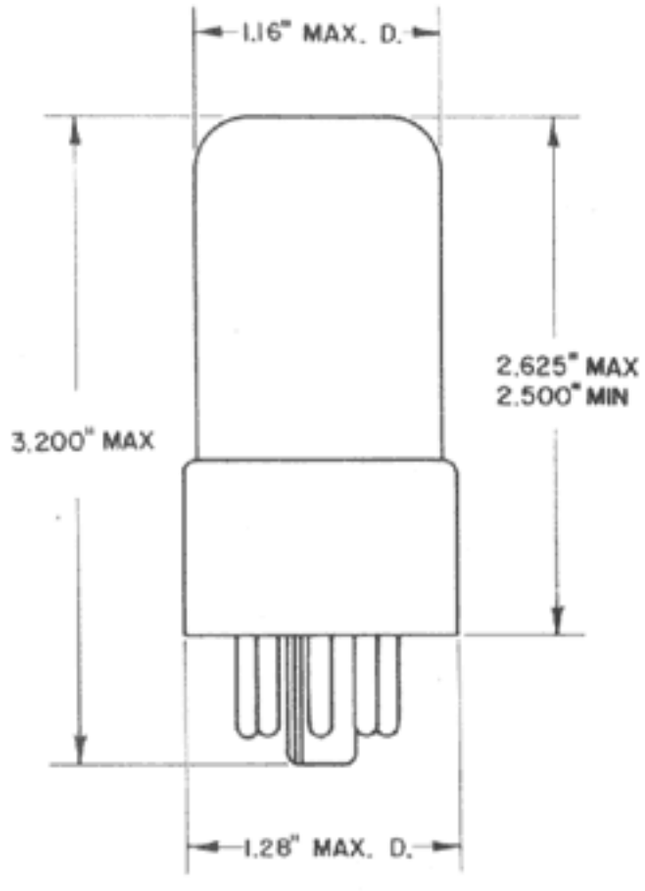
Total Anode Current	1.2 Ma	max.
Voltage Between Electrodes (other than anode)	140 Volts	max.
Supply Voltage (anode to cathode)	400 Volts	max.
Input Frequency	100,000 P.P.S.	max.

TYPICAL OPERATION

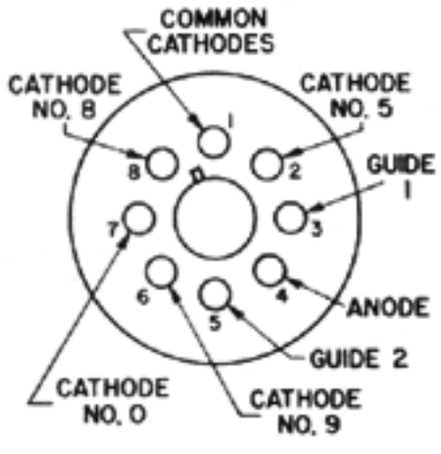
DC Supply Voltage	450 Volts
Anode Resistor	0.27 Megohms
Nominal Tube Drop (under these conditions)	235 Volts
Cathode Resistor	24 Kohms
Output Voltage (developed across cathode resistor)	15 Volts



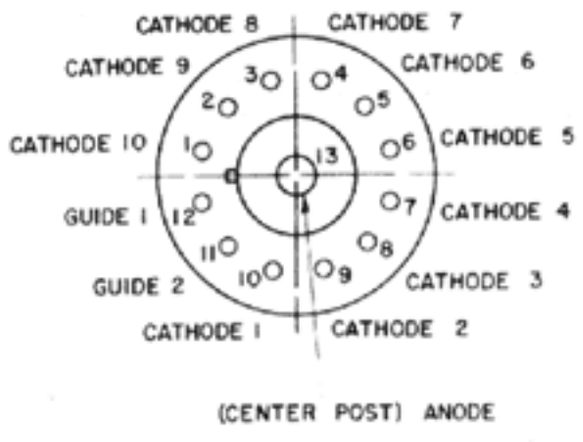
6910 Outline Drawing



6909 Outline Drawing



6909 Base Connections



6910 Base Connections

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7EW
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage Range	12-15 Volts	
Heater Current at Ef = 13.5 Volts	90 Ma	
Heater-Cathode Voltage (Design Maximum Values)		
Heater Negative with Respect to Cathode		
Total DC and Peak	100 Volts	Max.
Heater Positive with Respect to Cathode		
DC	50 Volts	Max.
Total DC and Peak	100 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[1]

Grid No. 1 to Plate	0.03 $\mu\mu f$	Max.
Input	4.4 $\mu\mu f$	
Output	2.74 $\mu\mu f$	

RATINGS (Design Maximum Values)

Plate Voltage	180 Volts	Max.
Grid No. 2 Supply Voltage	180 Volts	Max.
Grid No. 2 Voltage	See Rating Chart	
Plate Dissipation	2.0 Watts	Max.
Grid No. 2 Dissipation	0.5 Watts	Max.
Positive Grid No. 1 Voltage	0 Volts	Max.
Cathode Current	20 Ma	Max.
Grid No. 1 Circuit Resistance	0.5 Megohm	Max.

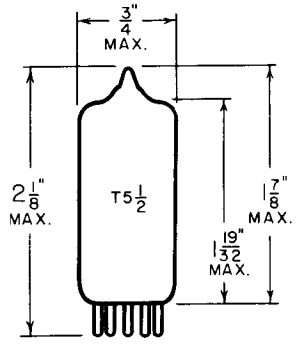
CHARACTERISTICS AND TYPICAL OPERATION

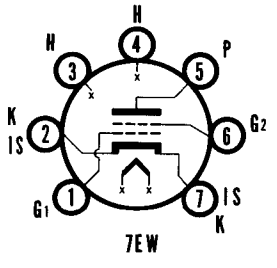
Plate Voltage	125 Volts
Grid No. 2 Voltage	80 Volts
Grid No. 1 Voltage	−1.0 Volt
Plate Current	10 Ma
Grid No. 2 Current	1.4 Ma
Transconductance	8000 μmhos
Plate Resistance	0.125 Megohm
EC[1] for Gm = 100 μmhos (approx.)	−5 Volts

QUICK REFERENCE DATA

The Sylvania Type 7167 is a miniature, sharp cutoff tetrode intended for use in mobile communications equipment. Featuring a 13.5 volt heater, the 7167 is designed for dependable operation over the wide range of heater voltage encountered in this service.

Except for heater characteristics, the Type 7167 is similar to the 6CY5.





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

NOVEMBER, 1959

File Under
RECEIVING TUBES

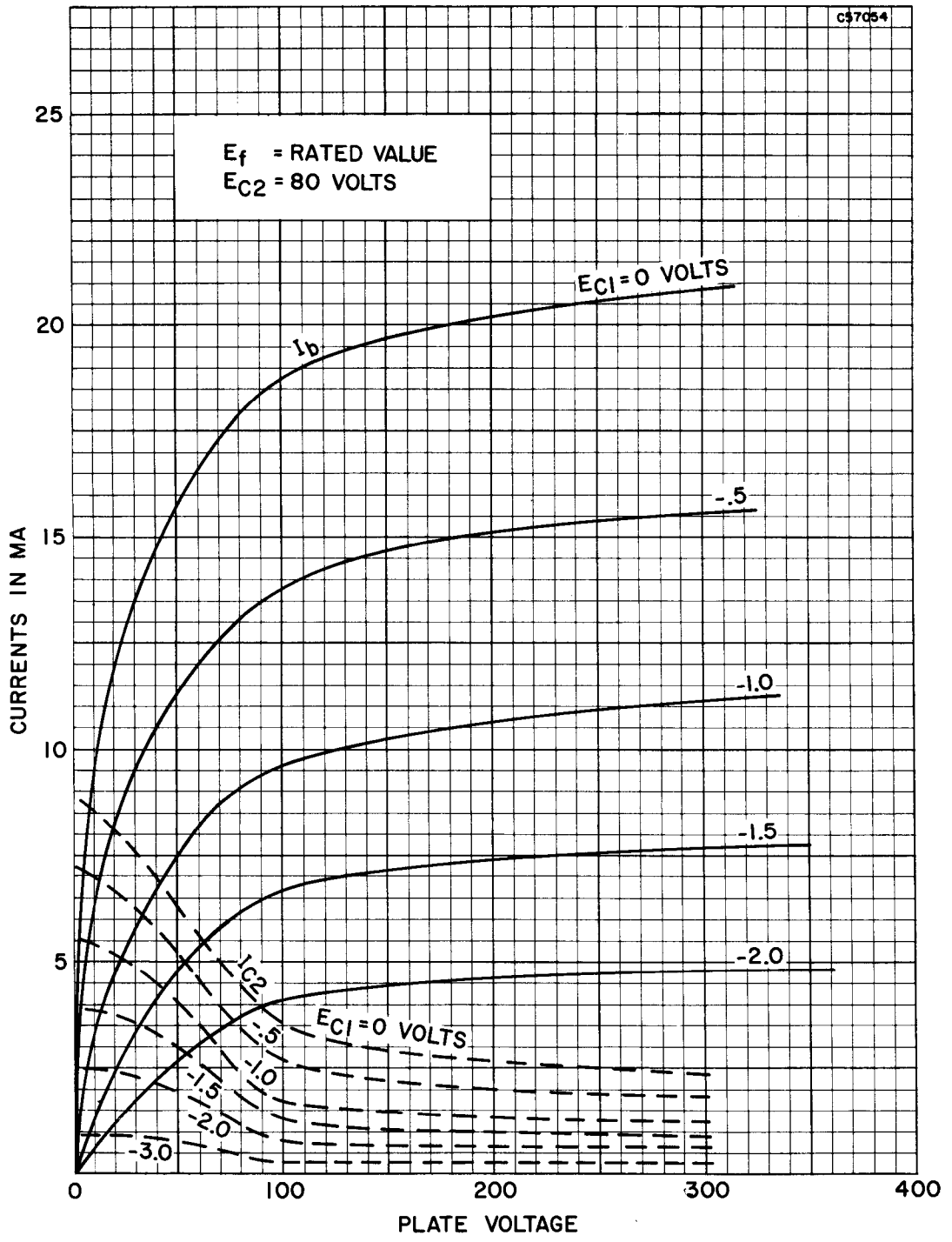
SPECIAL TESTS

Heater Cycling Life Test
Ef = 17.0 V; 1 min. on, 4 min. off;
Ehk = –150 Vdc . . . . . 2000 Cycles Min.

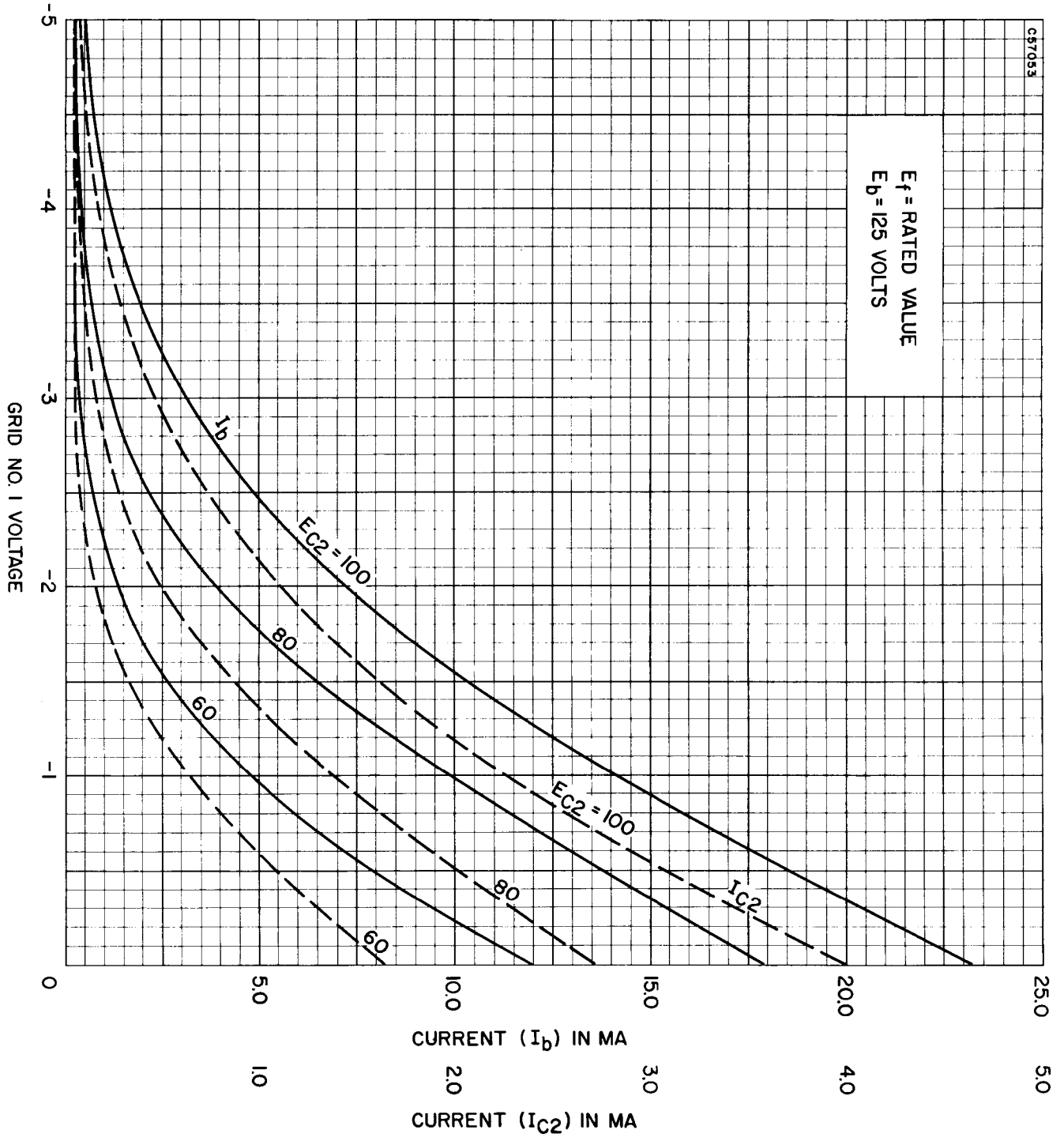
NOTE:

1. *Shield No. 316 connected to cathode.*

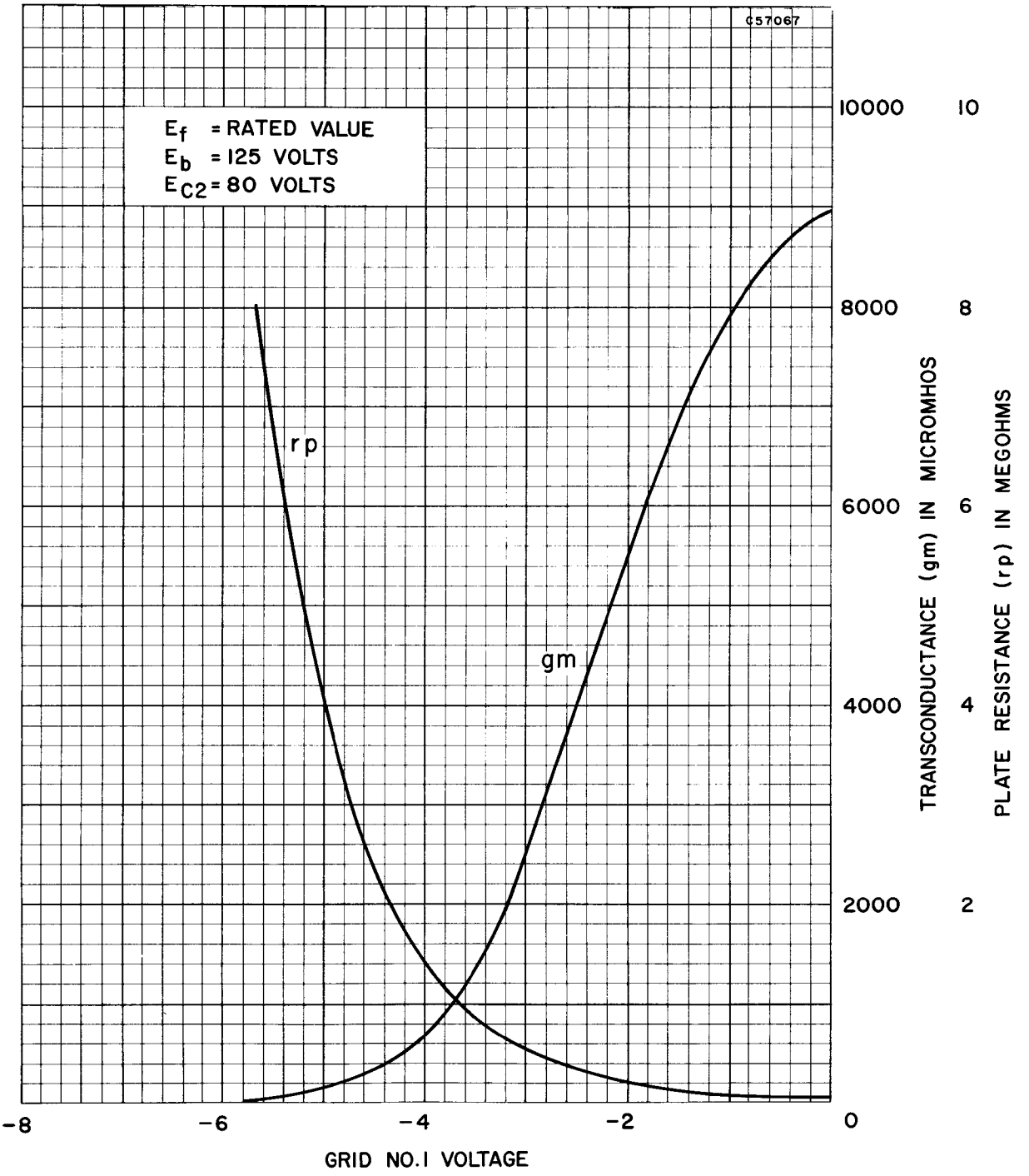
AVERAGE PLATE CHARACTERISTICS



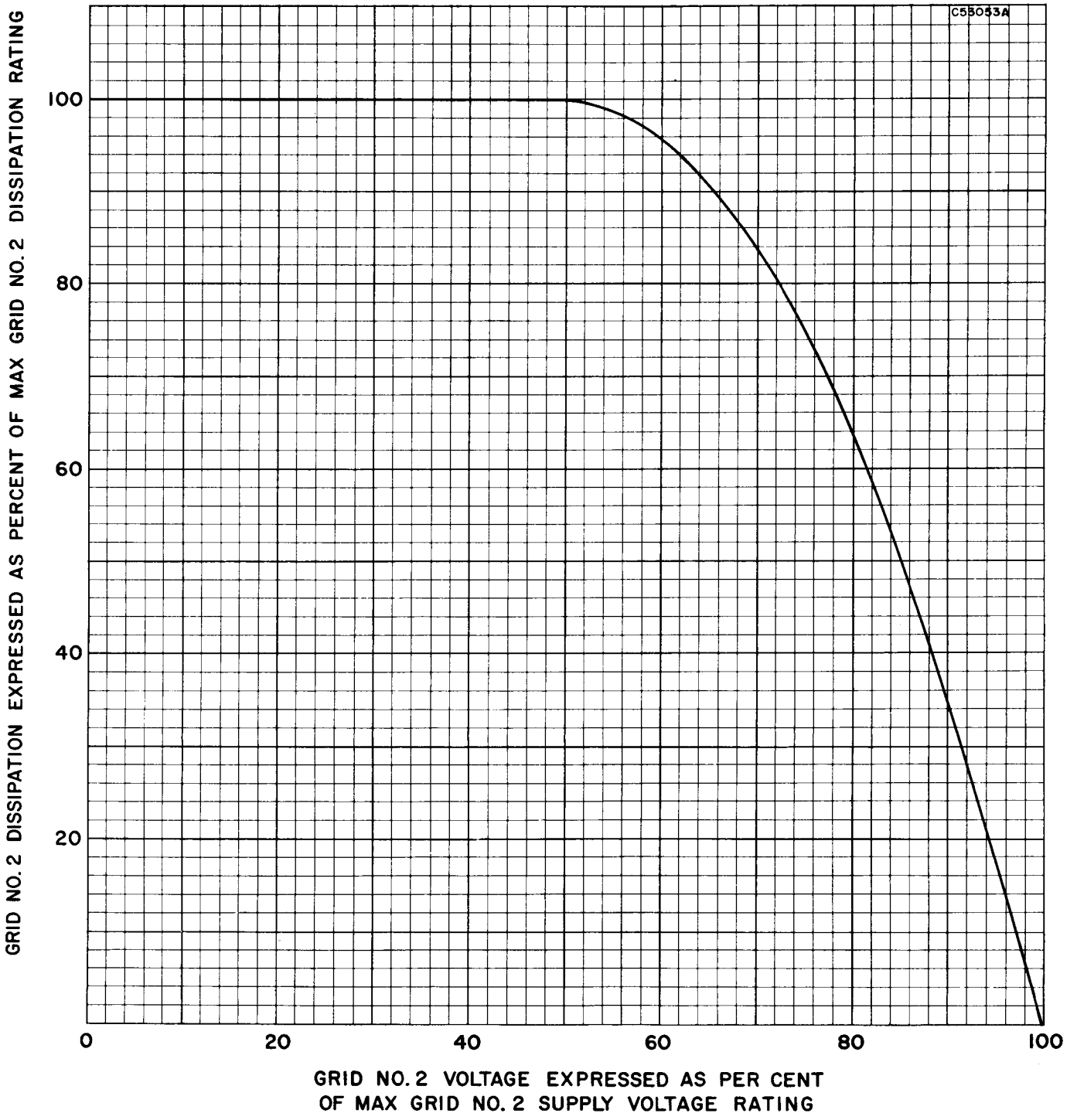
AVERAGE TRANSFER CHARACTERISTICS

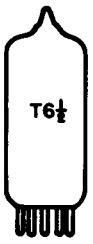


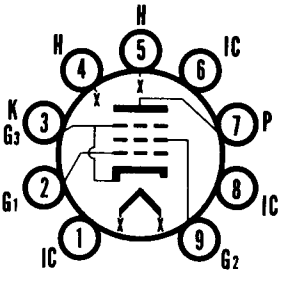
AVERAGE TRANSFER CHARACTERISTICS



RATING CHART

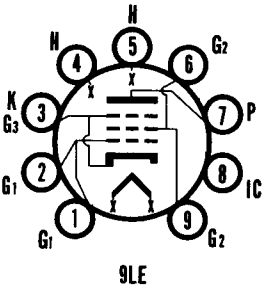






9CV

TYPES 7189
7189A



9LE

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-4
Basing	(7189A)-9LE, (7189)-9CV
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	760 Ma
Maximum Heater Voltage Range[1]	5.7-6.9 Volts
Heater-Cathode Voltage (Design Maximum Values)	
Heater Negative with Respect to Cathode	100 Volts Max.
Heater Positive with Respect to Cathode	100 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

Grid No. 1 to Plate	0.5 μμf Max.
Input	10.8 μμf
Output	6.5 μμf
Grid No. 1 to Heater	0.25 μμf Max.

RATINGS (Design Maximum Values)[1]

	Class AB_1 Pentode Conn.	Class AB_1 Ultra-linear Conn.
Plate Voltage	440	415 Volts Max.
Grid No. 2 Voltage (400V-7189A)	330	... Volts Max.
Plate Dissipation	13.2	13.2 Watts Max.
Grid No. 2 Dissipation (Zero Signal)	2.2	2.2 Watts Max.
Grid No. 2 Dissipation (Max. Signal)	4.4	4.4 Watts Max.
Cathode Current	72	72 Ma Max.
Grid No. 1 Circuit Resistance		
Fixed Bias	0.3	0.3 Megohm Max.
Cathode Bias	1.0	1.0 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

	Pentode Conn.		Ultra-linear Conn.
	Single Tube Class A_1	Class AB_1 Push-pull	Class AB_1 Push-pull
Plate Voltage	250	400	375 Volts
Grid No. 2 Voltage	250	300	Note 3 Volts
Grid No. 1 Voltage	−7.3	−15	... Volts
Cathode Resistor	...	...	220 Ohms
Grid Voltage (RMS)[4]		10.5	12.5 Volts
Plate Current (Zero Signal)	48	15	70 Ma
Plate Current (Max. Signal)	...	105	81 Ma

CHARACTERISTICS AND TYPICAL OPERATION (cont'd)

Grid No. 2 Current (Zero Signal)	5.5	1.6	... Ma
Grid No. 2 Current (Max. Signal)	...	25	... Ma
Transconductance	11.3K	...	... μmhos
Amplification Factor[5]	19.5	...	...
Plate Resistance	40K	...	... Ohms
Load Resistance (P to P)	...	8K	11K Ohms
Max. Signal Power Output	...	24	16.5 Watts
Total Harmonic Distortion	...	4.0	3 Percent

NOTES:

1. Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.
   The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.
2. Type 7189A Grid No. 2 is rated at 400 volts and Type 7189 Grid No. 2 is rated at 330 volts for pentode connected operation. Type 7189A is rated at 415 volts when used in an ultra-linear circuit.
3. Grid No. 2 voltage is obtained from taps located at 43 percent of the output transformer windings.
4. Per grid.
5. Measured from Grid No. 1 to Grid No. 2.

APPLICATION

The Types 7189 and 7189A are beam power pentode audio amplifiers designed for service in the output stage of high quality audio amplifiers or other equipment requiring high power output at relative low distortion.
Type 7189A differs from Type 7189 in having a higher Grid No. 2 voltage rating and in specifying the internal connections to Pin No. 1 and No. 6.

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9JT
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts	
Heater Current	450 Ma	
Heater-Cathode Voltage (Design Maximum Values)[1]		
Heater Negative with Respect to Cathode		
Total DC and Peak	200 Volts	Max.
Heater Positive with Respect to Cathode		
DC	100 Volts	Max.
Total DC and Peak	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section		
Grid to Plate	2.0 μμf	
Input: g to (h + k)	2.3 μμf	
Output: p to (h + k)	0.3 μμf	
Pentode Section		
Grid No. 1 to Plate	.06 μμf	Max.
Input: g1 to (h+k+g2+g3+Is)	5.0 μμf	
Output: p to (h+k+g2+g3+Is)	2.0 μμf	

RATINGS (Design Maximum Values)[1]

	Triode Section	Pentode Section	
Plate Voltage	330	330 Volts	Max.
Grid No. 2 Supply Voltage	—	330 Volts	Max.
Grid No. 2 Voltage	See Rating Chart		
Positive Grid No. 1 Voltage	0	0 Volts	Max.
Plate Dissipation	2.4	3.0 Watts	Max.
Grid No. 2 Dissipation	—	0.6 Watt	Max.
Grid Circuit Resistance			
Fixed Bias	0.5	0.25 Megohm	Max.
Cathode Bias	1.0	1.0 Megohm	Max.

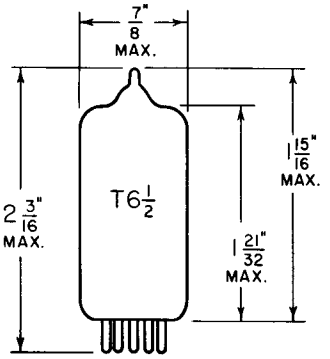
CHARACTERISTICS AND TYPICAL OPERATION

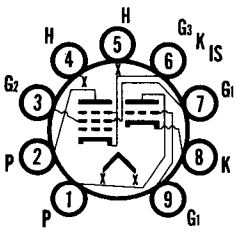
	Triode Section	Pentode Section	
Plate Voltage	215	100	220 Volts
Grid No. 2 Voltage	—	50	130 Volts
Grid No. 1 Voltage	-8.5	—	— Volts
Cathode Bias Resistor	—	1000	62 Ohms

QUICK REFERENCE DATA

The Sylvania Type 7199 is a triode-pentode designed primarily for High Fidelity audio applications. The pentode section is particularly suited to preamplifier service while the triode section is intended for use as a phase inverter.

Type 7199 features exceptionally low hum and noise output.





9JT

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Prepared and Released By The
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AUGUST, 1959

CHARACTERISTICS AND TYPICAL OPERATION (Cont'd)

	Triode Section	Pentode Section		
Plate Current	9.0	1.1	12.5	Ma
Grid No. 2 Current	—	0.35	3.5	Ma
Transconductance	2100	1500	7000	μmhos
Amplification Factor	17	—	—	
Plate Resistance	.0081	1.0	0.4	Megohms
Ec1 for Ib = 10 μa (Approx.)	−40	−4	—	Volts

EQUIVALENT NOISE AND HUM VOLTAGE (Referenced to Grid)

	Triode Section[2]	Pentode Section[3]	
Average Value	10	35	μVolts rms
Maximum Value	150	100	μVolts rms

NOTES:

1. *Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.*

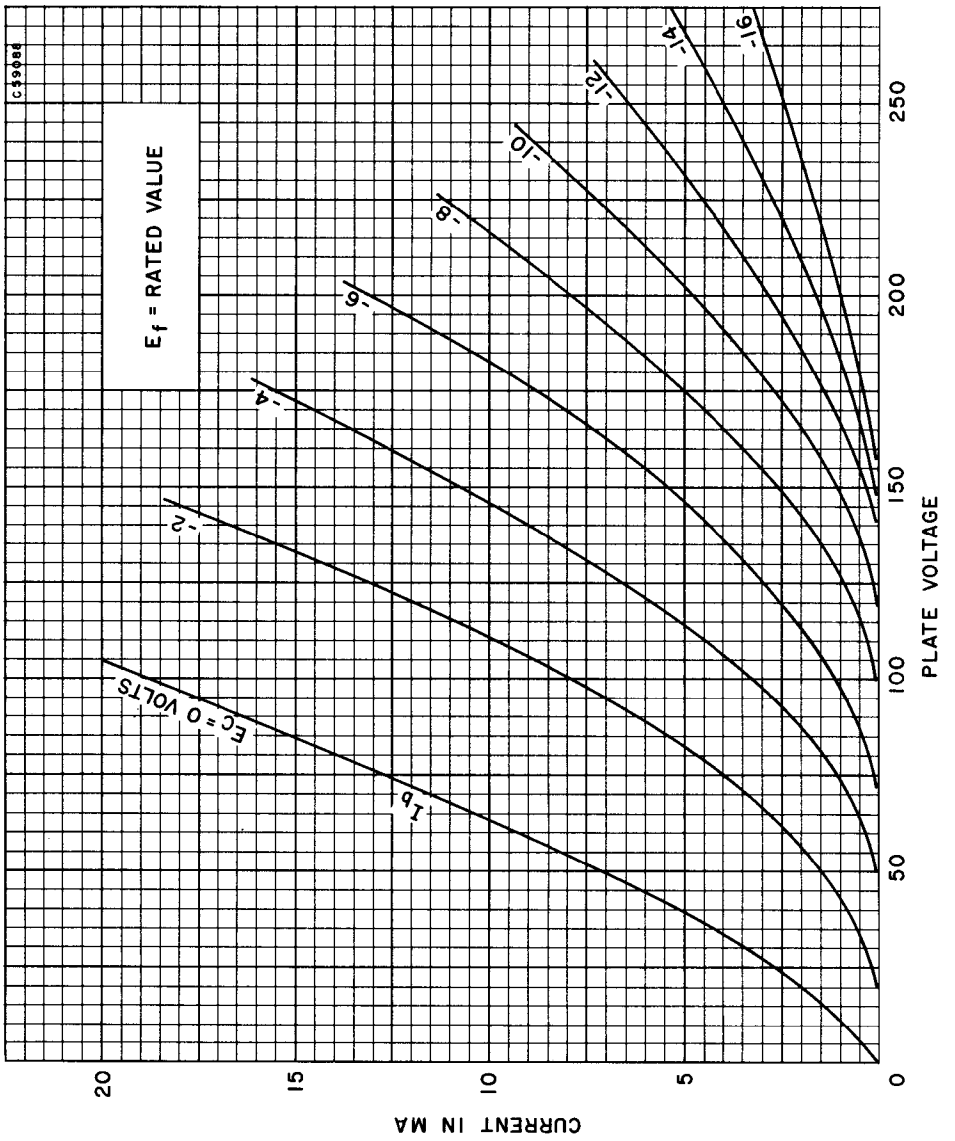
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.

   The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.

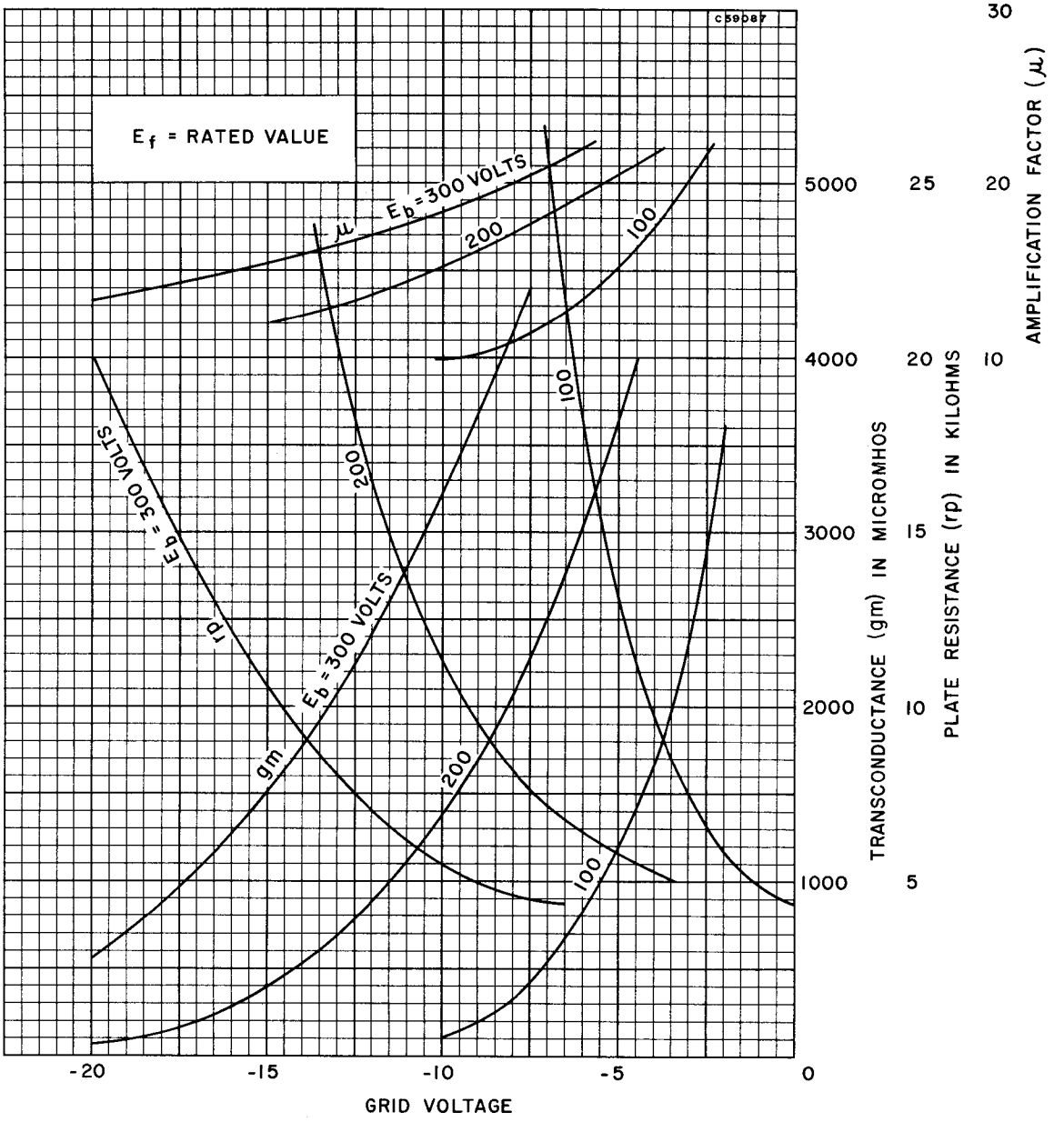
2. *Measured under the following conditions: Ef = 6.3 Vac; center-tap of heater transformer grounded; Ebb = 250 Vdc; R_L = 0.1 Megohm; R_k = 1500 ohms; R_g = 50,000 ohms; F = 25 to 10,000 cps.*

3. *Measured under the following conditions: Ef = 6.3 Vac; Center-tap of heater transformer grounded; Ebb = 250 Vdc; R_L = 0.1 Megohm; Ecc2 = 250 Vdc; Rg2 = 330,000 ohms; Cg2 = 0.22 μf; Rk = 1200 ohms; Rg1 = 50,000 ohms; F = 25 to 10,000 cps.*

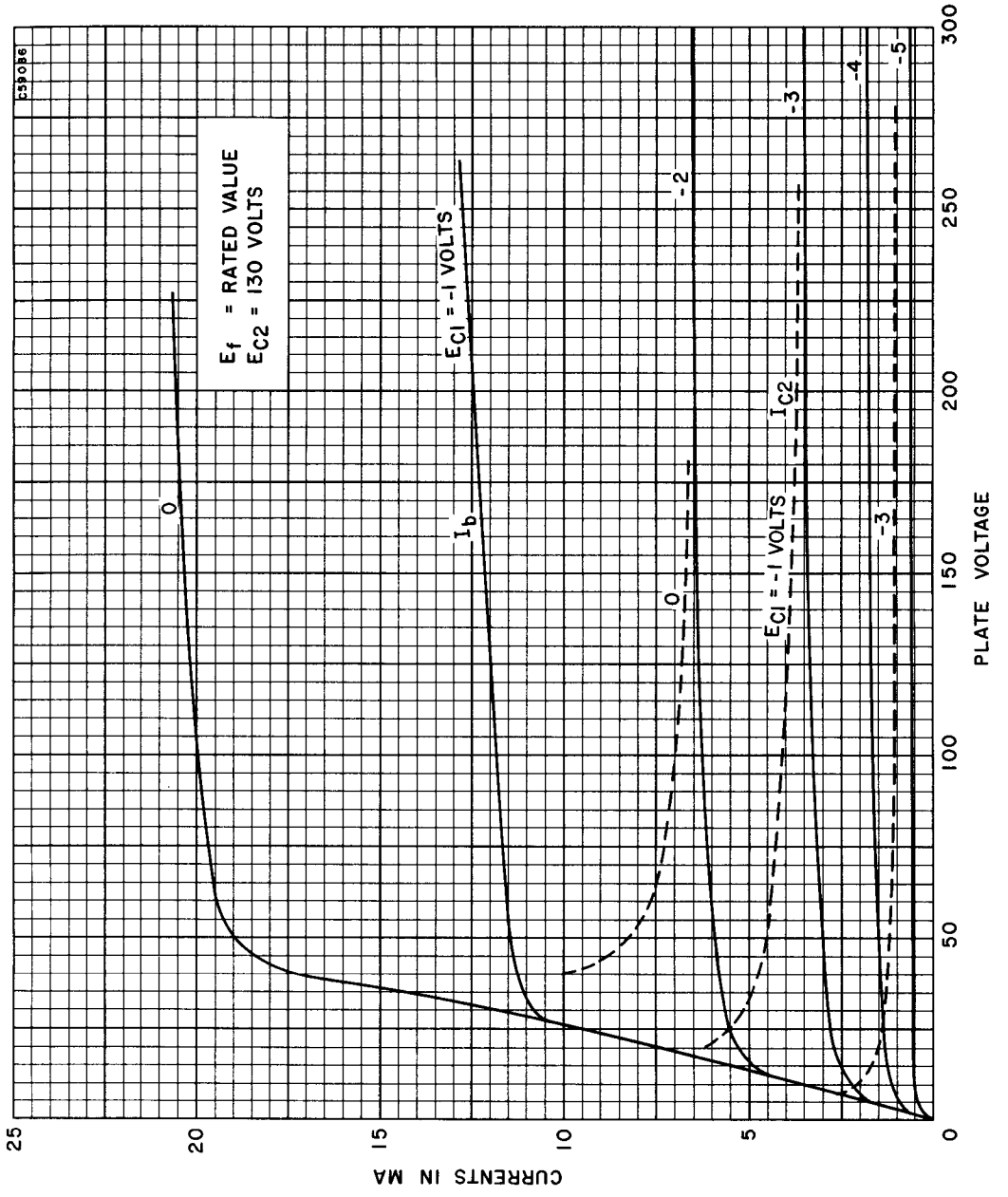
AVERAGE PLATE CHARACTERISTICS
(Triode Section)



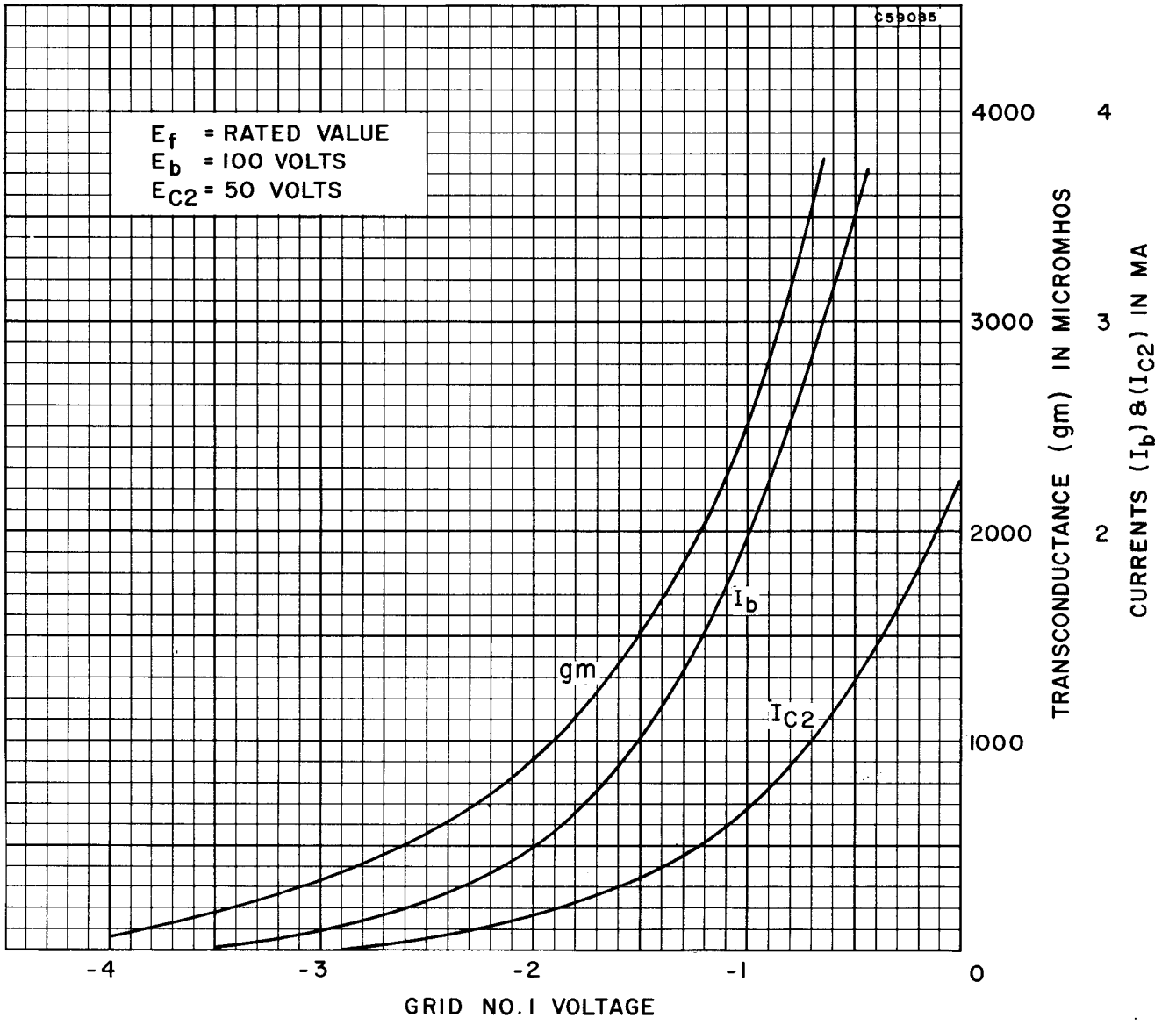
AVERAGE TRANSFER CHARACTERISTICS
(Triode Section)



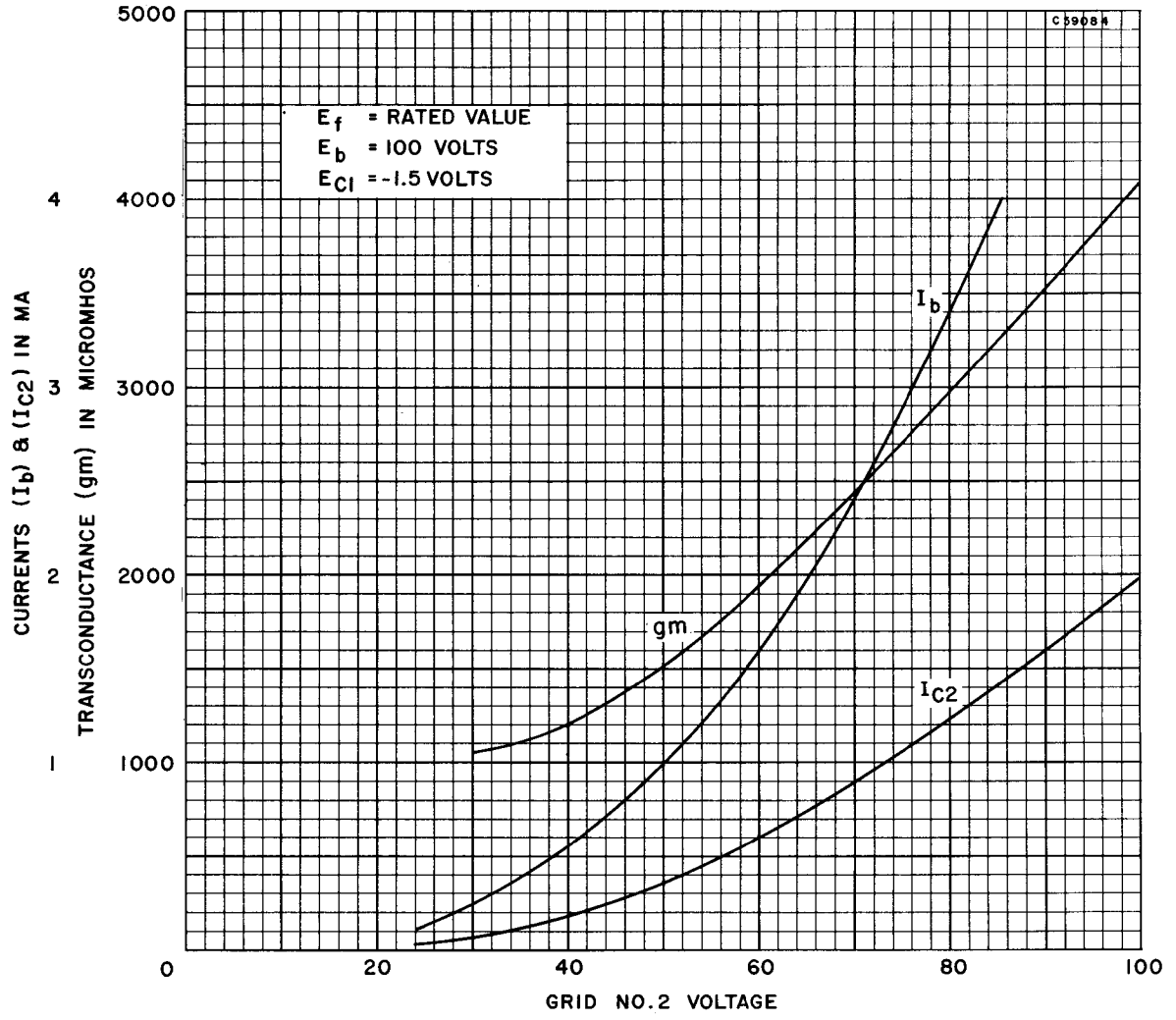
AVERAGE PLATE CHARACTERISTICS
(Pentode Section)



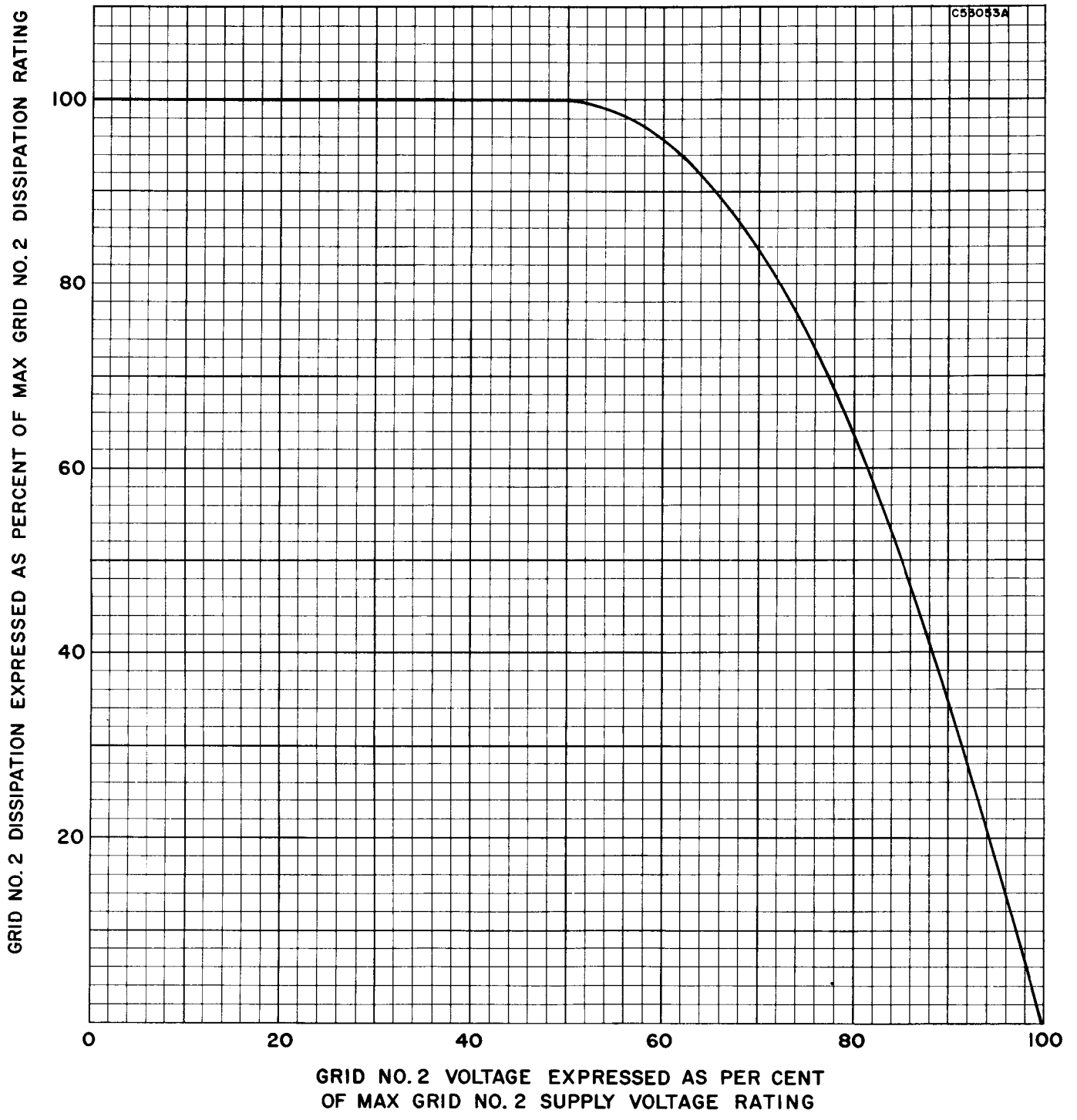
AVERAGE TRANSFER CHARACTERISTICS
(Pentode Section)



AVERAGE TRANSFER CHARACTERISTICS
(Pentode Section)



RATING CHART



MECHANICAL DATA

Bulb	T-5 1/2
Base	E7-1, Miniature Button 7-Pin
Outline	JETEC 5-1
Basing	7BF
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS [1] (Design Maximum)

Bulb Temperature (At Hottest Point)	165	°C
Operational Altitude [2]	60,000	Ft

DURABILITY CHARACTERISTICS [3]

Impact Acceleration [4]	450	G Max.
Fatigue (Vibrational Acceleration for Extended Periods) [5]	2.5	G Max.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3	V
Heater Current	450	mA

CONTROLLED DETRIMENTS

Interelectrode Insulation [6]	100	Meg	Min.
Total Grid Current [7]	-0.5	μAdc	Max.
Vibration Output [8]	15	mVac	Max.

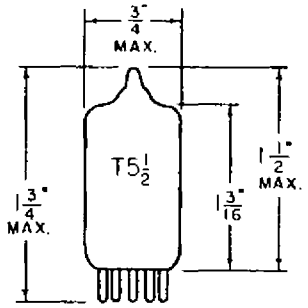
DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

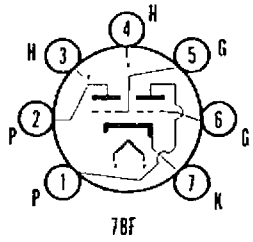
	Section 1	Section 2	
Grid to Plate	1.4	1.4	μμf
Input	3.0	3.0	μμf
Output	0.34	0.28	μμf
Heater to Cathode	4.8	4.8	μμf

from JETEC release #2249, July 14, 1958

QUICK REFERENCE DATA

The reliable Type 7244 is a medium-mu double triode featuring stacked mount design and frame type grid construction. It is characterized by long life and stable performance under conditions of severe shock, vibration, high temperature and high altitude.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

June 10, 1958

RATINGS [1] (Design Maximum - Each Section)

Heater Voltage	6.3 (±10%)	V
Plate Voltage	300	Vdc
Plate Dissipation	1.1	W
Cathode Current	12.5	mAdc
Heater Cathode Voltage		
Heater Positive with Respect to Cathode		
Total DC and Peak	200	v
Heater Negative with Respect to Cathode		
Total DC and Peak	200	v
Total DC	100	v
Grid Circuit Resistance (Each Grid)	.25	Meg

CHARACTERISTICS (Each Section - Except as Noted) [9]

Plate Voltage	100	Volts
Cathode Bias Resistor [10]	50	Ohms
Plate Current	9.0	mA
Transconductance	6,000	µmhos
Amplification Factor	38	
Plate Resistance	6,300	Ohms

NOTES:

1. Design Maximum Definition: Design Maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions. These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.

   The equipment manufacturer should design so that initially and throughout life no design maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.

2. If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.

3. Test performed as a measure of the mechanical durability of the tube structure

4. Force as applied in any direction by the Nave type High Impact (Flyweight) Shock Machine for Electronic Devices.

5. Measured at F = 25 cps, 60 Max. Fixed Frequency.

6. Measured with Ef = 6.3 V; Eg-all = -100 Vdc; Ep-all = -300 Vdc; cathode is positive so that no cathode emission occurs.

7. Measured with Ef = 6.3 V; Eb = 250 Vdc; Rk = 500 Ohms; Rg = 1.0 Meg. Tie 1g to 2g; and 1p to 2p.

NOTES (Continued)

8. Measured with Eb = 250 Vdc; Ec = -8 Vdc; Rp = 2000 Ohms; Rk = 0; F = 40 cps; Acc = 15 G.

9. Characteristics are measured on each section separately but with test voltages applied to both section.

10. Value is common to both sections.

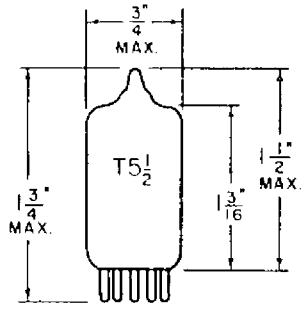
ADVANCE DATA

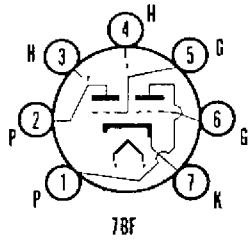
MECHANICAL DATA

Bulb	**T-5 1/2**
Base	**E7-1, Miniature Button 7-Pin**
Outline	**JETEC 5-1**
Basing	**7BF**

QUICK REFERENCE DATA

The reliable Type 7244A is a medium-mu double triode featuring stacked mount design and frame type grid construction. It is characterized by long life and stable performance under conditions of severe shock, vibration, high temperature and high altitude. The 7244A is identical to the 7244 as defined under EIA Release No. 2249 except that the former employs a shorter bulb.





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EMPORIUM, PENNSYLVANIA

December 16, 1958
Page 1 of 1

from JETEC release #2366, Jan. 26, 1959

ADVANCE DATA

MECHANICAL DATA

Bulb	T-5 1/2
Base	E7-1, Miniature Button 7-Pin
Outline	JETEC 5-2
Basing	7BQ
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS [1] (Design Maximum)

Bulb Temperature (At Hottest Point)	120	°C
Operational Altitude [2]	60,000	Ft

DURABILITY CHARACTERISTICS [3]

Impact Acceleration [4]	450	G Max.
Fatigue (Vibrational Acceleration for Extended Periods)	2.5	G Max.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3	V
Heater Current	400	mA

CONTROLLED DETRIMENTS

Interelectrode Insulation [5]	200	Meg Min.
Total Grid Current [6]	-0.5	μAdc Max.
Vibration Output [7]	200	mVac Max.

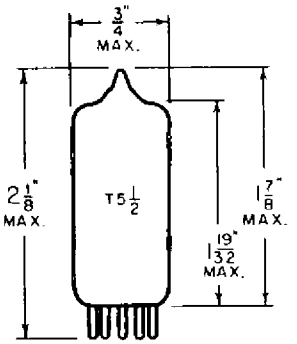
DIRECT INTERELECTRODE CAPACITANCES (Shielded) [8]

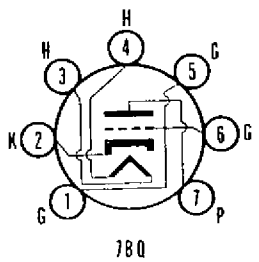
Grid to Plate	2.8	μμf
Input: k to (g+h+Shd)	9.5	μμf
Output: p to (g+h+Shd)	3.0	μμf
Heater to Cathode	5.5	μμf
Plate to Cathode	0.2	μμf Max.

from JETEC release #2287, Oct. 13, 1958

QUICK REFERENCE DATA

The reliable Type 7245 is a high-mu triode featuring stacked mount design and frame type grid construction. It is characterized by long life and stable performance under conditions of severe shock, vibration, high temperature and high altitude.





7BQ

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September 24, 1958

RATINGS[1] (Design Maximum)

Heater Voltage	6.3 (±10%)	V
Plate Voltage	150	Vdc
Plate Dissipation	2.25	W
Cathode Current	20	mAdc
DC Grid Voltage		
Positive Value	0	Vdc
Negative Value	50	Vdc
Heater Cathode Voltage		
Heater Positive with Respect to Cathode		
Total DC and Peak	200	v
Heater Negative with Respect to Cathode		
Total DC and Peak	200	v
Total DC	100	v
Grid Circuit Resistance		
Fixed Bias	0.1	Meg
Self Bias	0.5	Meg

AVERAGE CHARACTERISTICS

Conditions:		
Heater Voltage	6.3	V
Plate Voltage	150	Vdc
Cathode Bias Resistor	100	Ohms
Plate Current	13.5	mAdc
Transconductance	11,000	µmhos
Amplification Factor	50	
Grid No. 1 Voltage for Ib = 10 µA Max.	-15	Vdc

NOTES:

1. Design Maximum Definition: Design Maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions. These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.

   The equipment manufacturer should design so that initially and throughout life no design maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.

2. If altitude rating is exceeded, reduction of instantaneous voltage (Ef excluded) may be required.

3. Test performed as a measure of the mechanical durability of the tube structure.

4. Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices.

5. Measured with Ef = 6.3 V; Eg-all = -100 Vdc; Ep-all = -300 Vdc; cathode is positive so that no cathode emission occurs.

NOTES (Continued)

6. Measured with Ef = 6.3 V; Eb = 175 Vdc; Rk = 150 Ohms; Rg = 0.25 Meg.

7. Eb = 150 Vdc; Ec = 0 Vdc; Rp = 2000 Ohms; Rk = 100 Ohms; F = 40 cps; Acc = 15 G.

8. With Shield 316 to ground, excepting for Cin and Cout where Shield 316 is tied to grid.

ADVANCE DATA

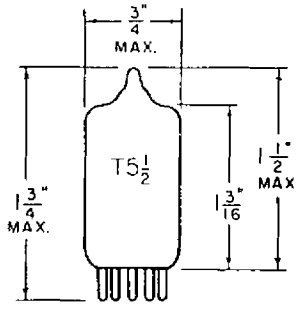
MECHANICAL DATA

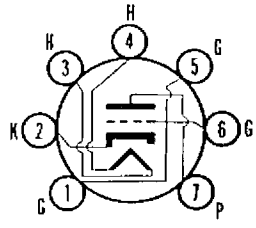
Bulb	T-5 1/2
Base	E7-1, Miniature Button 7-Pin
Outline	JETEC 5-1
Basing	7BQ

from JETEC release #2366, Jan. 26, 1959

QUICK REFERENCE DATA

The reliable Type 7245A is a high-mu triode featuring stacked mount design and frame type grid construction. It is characterized by long life and stable performance under conditions of severe shock, vibration, high temperature and high altitude. The 7245A is identical to the 7245 as defined under EIA Release No. 2287 except that the former employs a shorter bulb.





7BQ

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Prepared and Released By The
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EMPORIUM, PENNSYLVANIA

December 16, 1958

FORM 146 (10-58)

SYLVANIA

engineering data service

SYLVANIA
7258

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9DA
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage Range	12-15 Volts
Heater Current at EF = 13.5 Volts	210 Ma
Heater-Cathode Voltage (Design Maximum Values)	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
DC	100 Volts Max.
Total DC and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

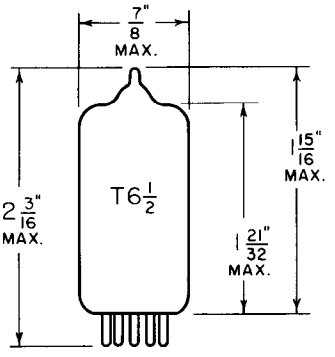
	Pentode Section	Triode Section	
Grid No. 1 to Plate	0.4 Max.	1.5	μμf
Input	7.0	2.0	μμf
Output	2.4	0.26	μμf
Coupling:			
Triode Grid to Pentode Plate	.02		μμf Max.
Pentode Grid No. 1 to Triode Plate	.02		μμf Max.
Pentode Plate to Triode Plate	0.15		μμf Max.

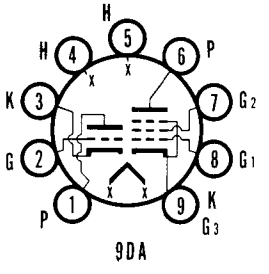
RATINGS (Design Maximum Values)[1]

	Triode Section	Pentode Section	
Plate Voltage	330	330	Volts Max.
Grid No. 2 Supply Voltage		330	Volts Max.
Grid No. 2 Voltage	See Rating Chart		
Positive Grid No. 1 Voltage	0	0	Volts Max.
Plate Dissipation	2.8	2.3	Watts Max.
Grid No. 2 Dissipation		0.55	Watts Max.
Grid No. 1 Circuit Resistance			
Fixed Bias	0.5	0.25	Meg. Max.
Cathode Bias	1.0	1.0	Meg. Max.

QUICK REFERENCE DATA

The Sylvania Type 7258 has a sharp cutoff pentode and medium mu triode contained in a miniature envelope. It is designed to operate over the wide range of heater voltages normally encountered in mobile applications. The pentode section may be used as an RF, IF or reactance tube. The triode section may be used as a low frequency oscillator or general purpose amplifier. Type 7258 is similar to Type 6AN8.





9DA

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EMPORIUM, PENNSYLVANIA

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

DECEMBER 1958

CHARACTERISTICS AND TYPICAL OPERATION

NOTES:

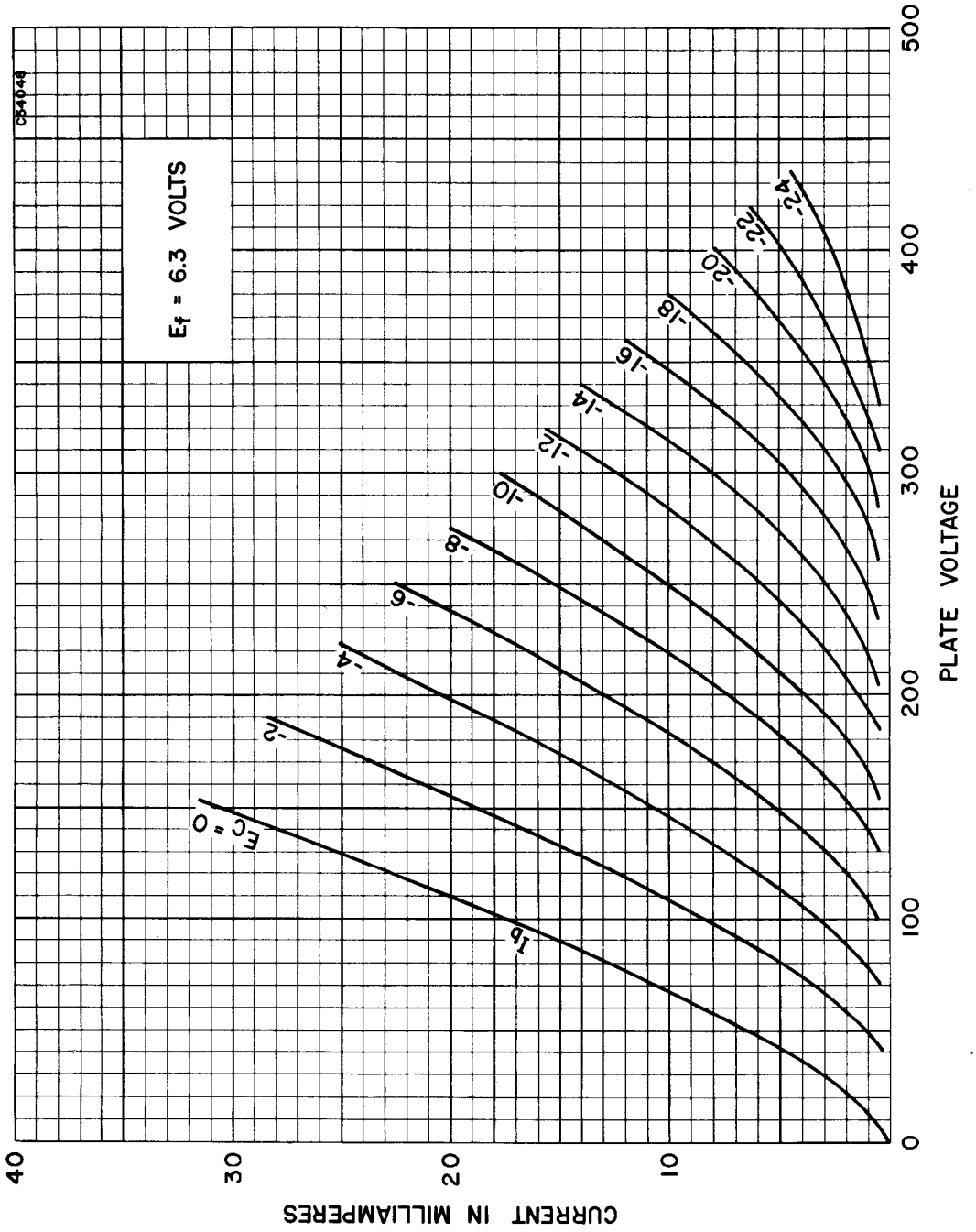
	Triode Section	Pentode Section
Plate Voltage	150	125 Volts
Grid No. 2 Voltage		125 Volts
Grid No. 1 Voltage	−3	Volts
Cathode Bias Resistor		56 Ohms
Plate Current	15	12 Ma
Grid No. 2 Current		3.8 Ma
Transconductance	4500	7800 μmhos
Amplification Factor	21	
Plate Resistance (Approx.)	4700	170,000 Ohms
Grid No. 1 Voltage for Ib = 20 μa (approx.)	−17	−6 Volts
Plate Current at Ec1 = −3 Vdc, RK = 0		1.6 Ma

1. *Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.*

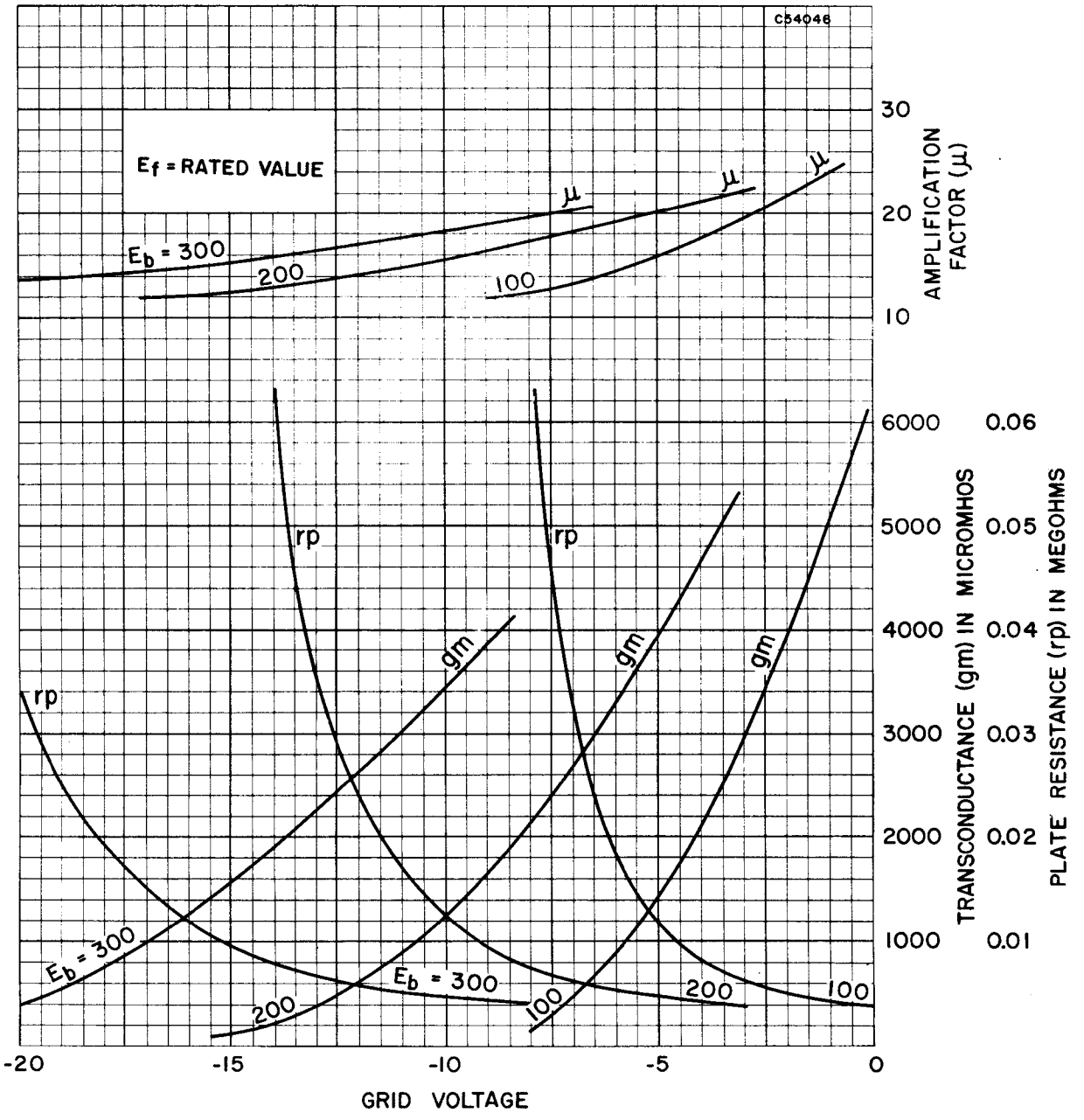
   The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.

   The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.

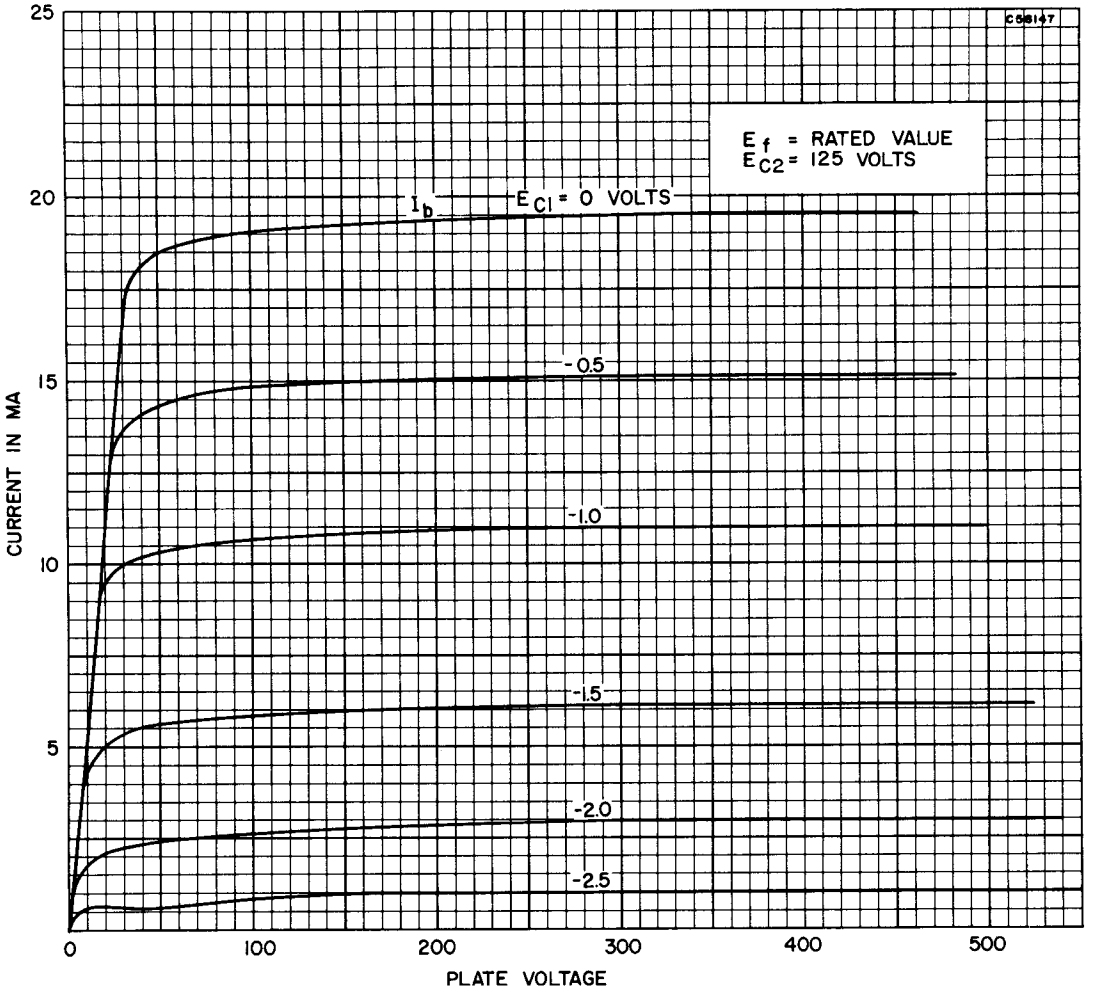
AVERAGE PLATE CHARACTERISTICS
(TRIODE SECTION)



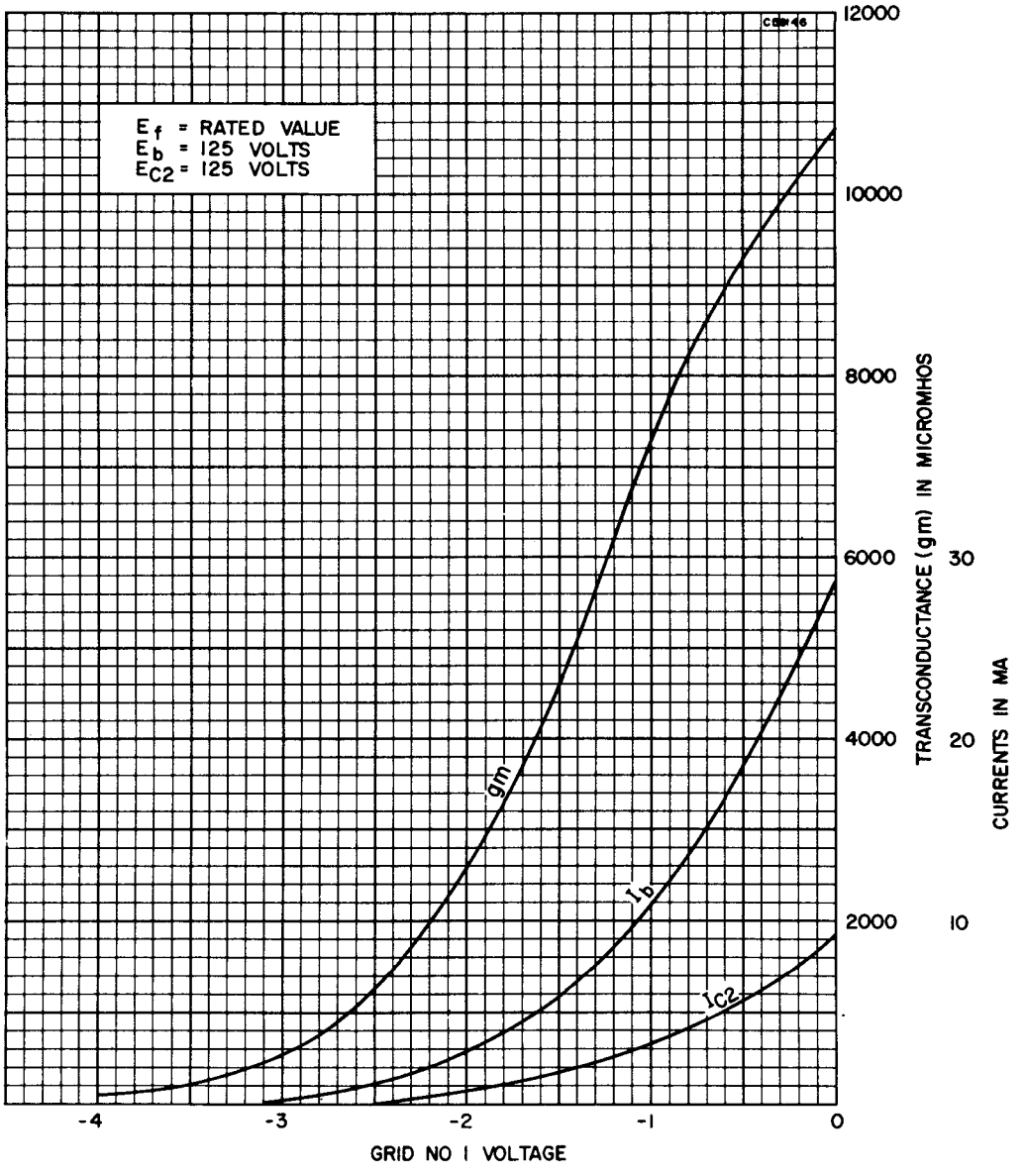
AVERAGE TRANSFER CHARACTERISTICS
(TRIODE SECTION)



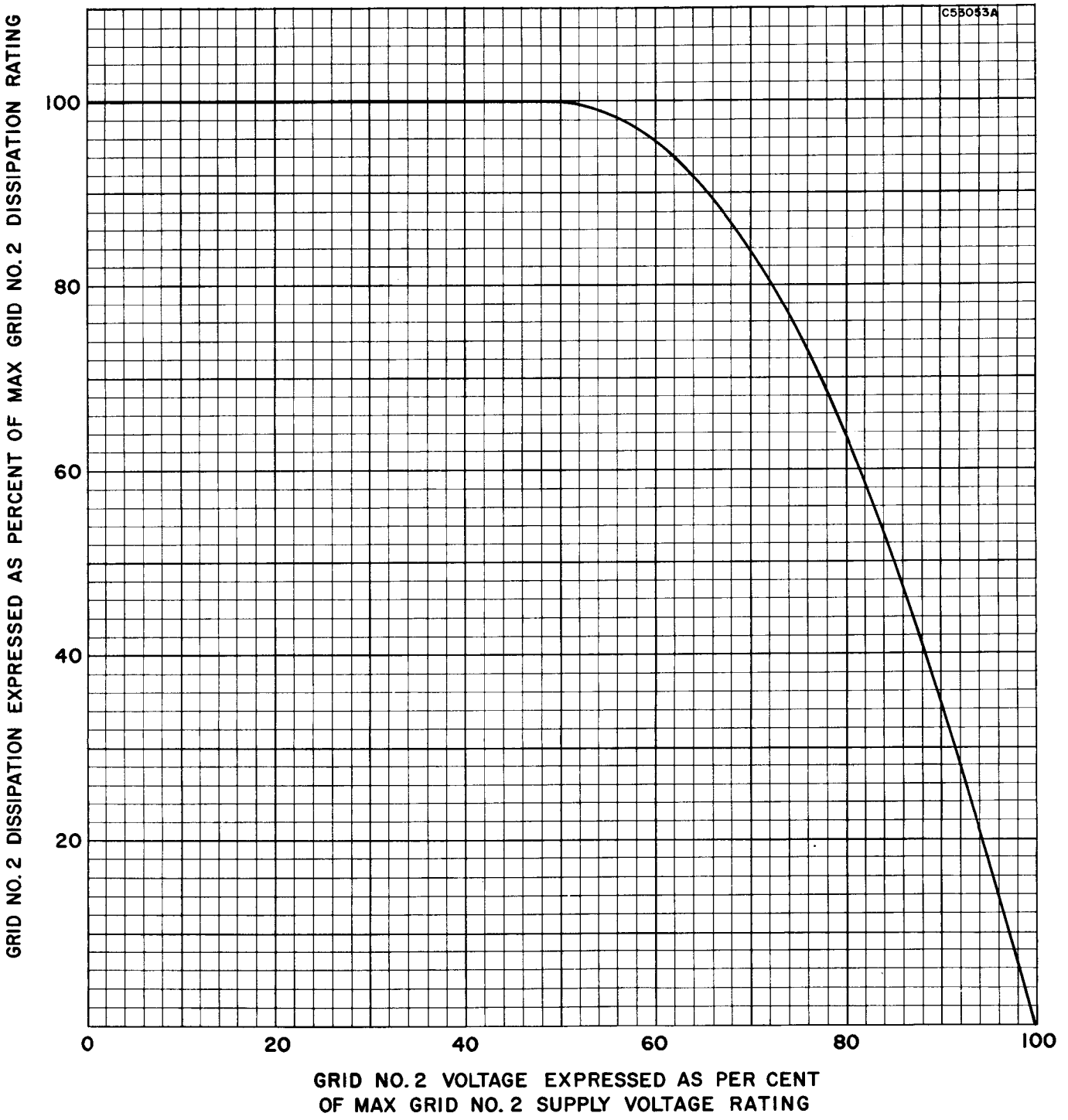
AVERAGE PLATE CHARACTERISTICS
(PENTODE SECTION)



AVERAGE TRANSFER CHARACTERISTICS
(PENTODE SECTION)



RATING CHART



A Technical Publication of
SYLVANIA ELECTRIC
PRODUCTS INC.
EMPORIUM, PA.



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9DE
Cathode	Coated Unipotential
Mounting Position	Any
Shock and Vibration	Note 1

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	335 Ma
Maximum Heater-Cathode Voltage (Absolute Maximum Values)	
Heater Negative with Respect to Cathode	
Total DC and Peak	120 Volts
Heater Positive with Respect to Cathode	
Total DC and Peak	60 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

	Section 1	Section 2
Grid to Cathode + Heater	3.1	3.1 pf
Plate to Cathode + Heater	0.5	0.4 pf
Grid to Cathode + Heater + Shield	3.1	3.1 pf
Plate to Cathode + Heater + Shield	1.75	1.65 pf
Plate to Grid	1.4	1.4 pf
Plate to Cathode	0.18	0.18 pf
Plate to Shield	1.3	1.3 pf
Cathode to Heater	2.6	2.7 pf

	Between Sections
Plate to Plate	.045 pf
Grid to Grid	.005 pf
Plate to Grid (Either Section)	.005 pf
Grid to Cathode (Either Section)	.005 pf

Grounded Grid Operation

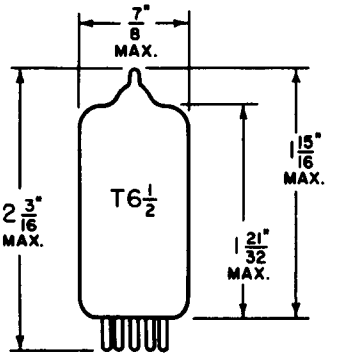
	Section 1	Section 2
Plate to Grid + Heater + Shield	3.0	2.9 pf
Cathode to Grid + Heater + Shield	6.0	6.0 pf

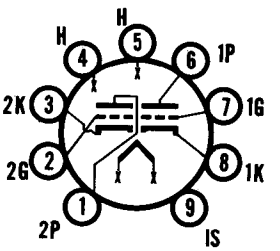
RATINGS (Absolute Maximum Values—Each Section)

Plate Voltage (Cold Cathode)	550 Volts
Plate Voltage (Ib = 0 Ma)	400 Volts
Plate Voltage	250 Volts
Plate Dissipation (Both Plates) Maximum	2.2 Watts
Plate Dissipation (Both Plates)	2.0 Watts
Plate Dissipation	1.65 Watts
Grid Dissipation	.03 Watts
Cathode Current	22 Ma
Peak Cathode Current[2]	110 Ma
Negative Grid Voltage	110 Volts
Peak Negative Grid Voltage[2]	200 Volts
Bulb Temperature	165 °C
Grid Circuit Resistance	
Fixed Bias	0.5 Megohm
Self Bias	1.0 Megohm

QUICK REFERENCE DATA

The Sylvania Type 7308 is a T-6½ duo triode designed for use as a multivibrator, cathode follower, VHF amplifier and VHF cascode amplifier.
Special features of the tube are: long life, ruggedized construction, high transconductance, and low noise and microphonics.
The Sylvania 7308 is a special quality twin triode similar to the Sylvania Type 6922.





9DE

SYLVANIA ELECTRONIC TUBES
A Division of Sylvania Electric Products Inc.
RECEIVING TUBE OPERATIONS
EMPORIUM, PA.
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JUNE, 1963

File Under
RECEIVING TUBES

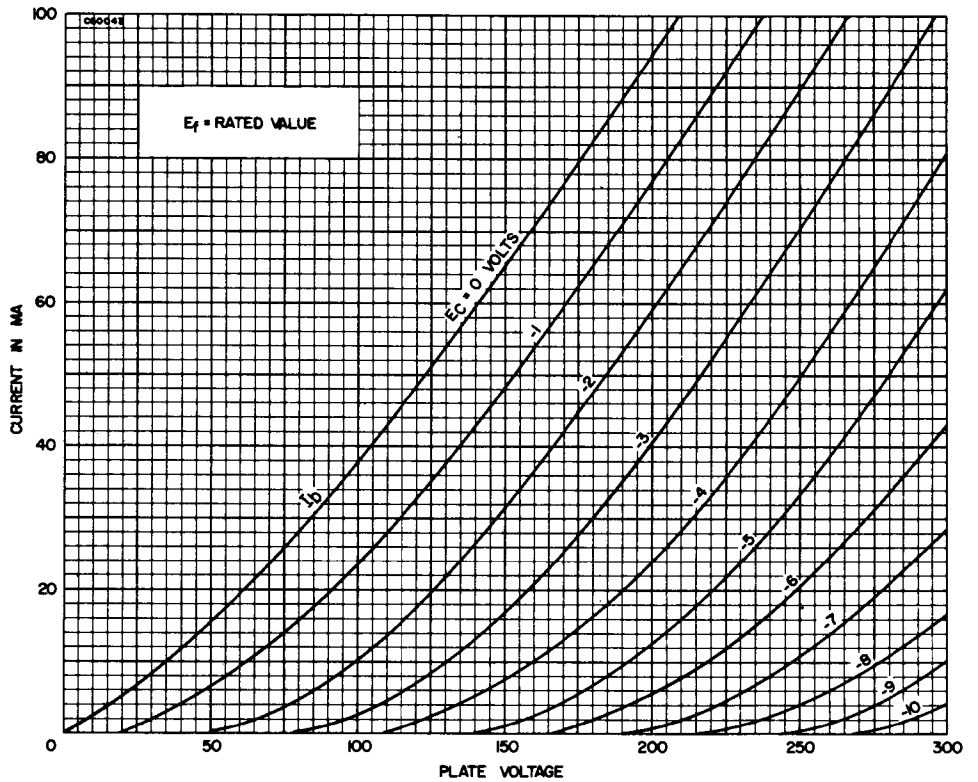
CHARACTERISTICS AND TYPICAL OPERATION

Plate Voltage	100[3]	90 Volts
Grid Voltage	+9	0 Volts
Plate Current	15	12 Ma
Cathode Resistor	680	120 Ohms
Transconductance	12,500	11,500 μmhos
Amplification Factor	33	—
Equivalent Noise Resistance[4]	250	— Ohms
Noise Factor[5]	4.6	— db
Input Damping (F = 100 mc/s)	3000	— Ohms

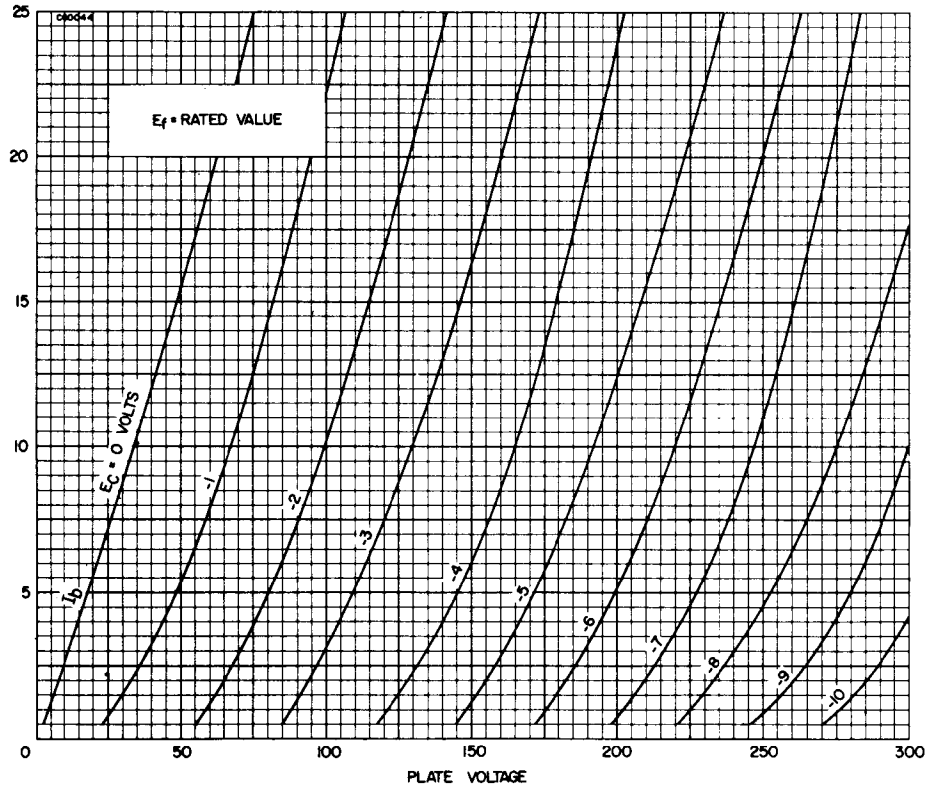
NOTES:

1. *A shock rating of about 500 g was obtained by using the NRL impact machine to deliver 5 blows to the tube at an angle of 30° in each of four different directions.*
   A fatigue rating of 2.5 g was obtained by applying vibrational forces for 32 hours in each of three directions at a frequency of 50 cps. These conditions are given for evaluation of mechanical ruggedness. They are not to be interpreted as suitable operating conditions.
2. *Pulse Duration, 200 μ sec. Max.; duty cycle 10 %.*
3. *Operation under conditions listed in this column is recommended because of the small spread in characteristics.*
4. *Measured at frequency = 45 mc/s.*
5. *Measured in a cascode circuit at frequency = 200 mc/s and matched for minimum noise.*

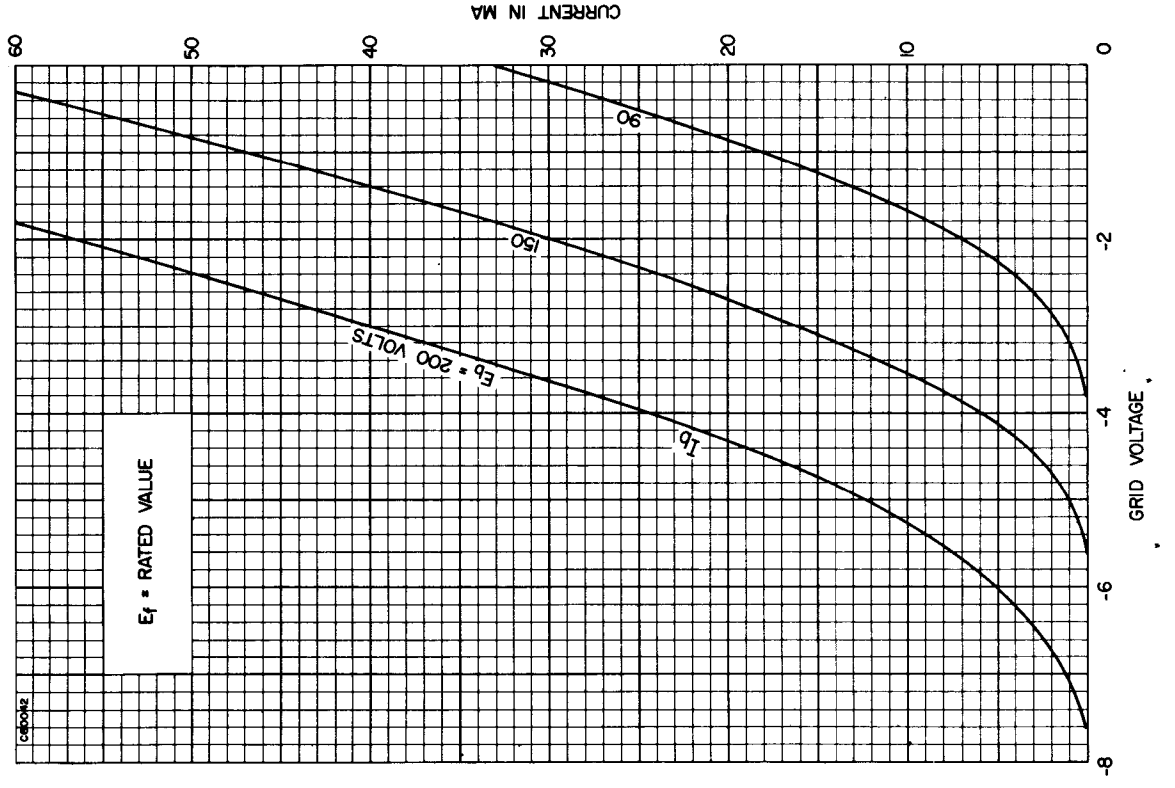
AVERAGE PLATE CHARACTERISTICS



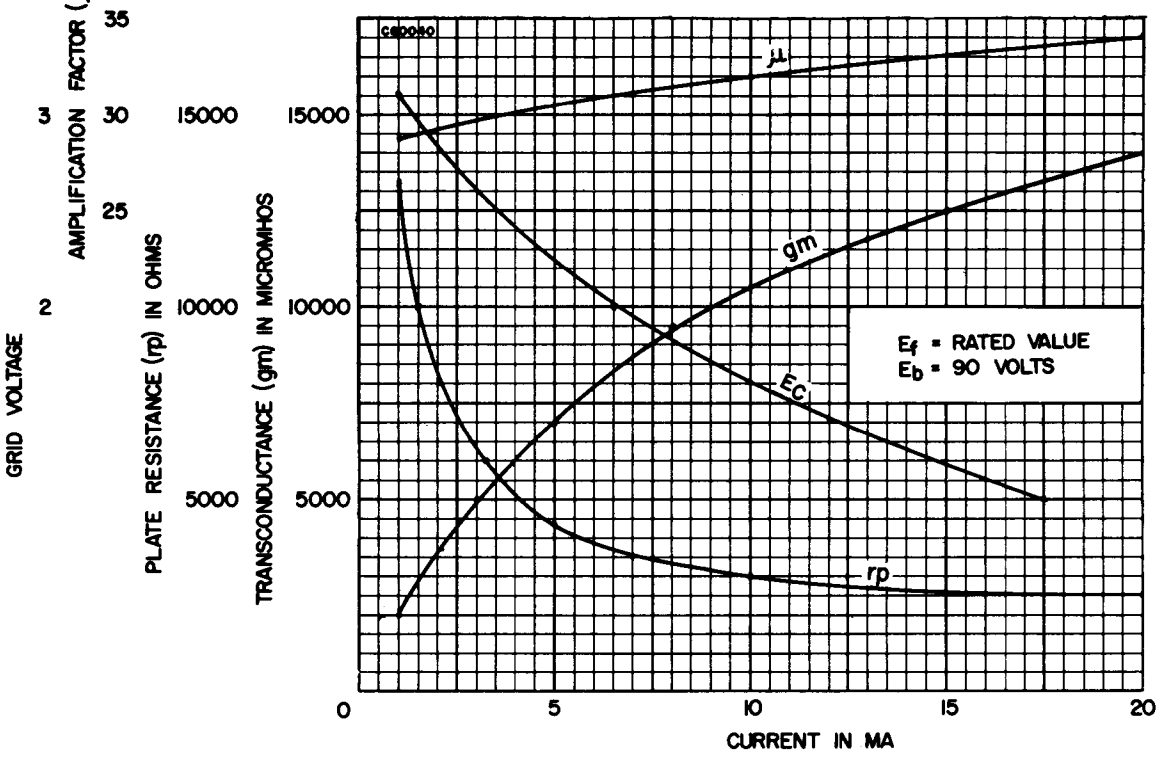
AVERAGE PLATE CHARACTERISTICS



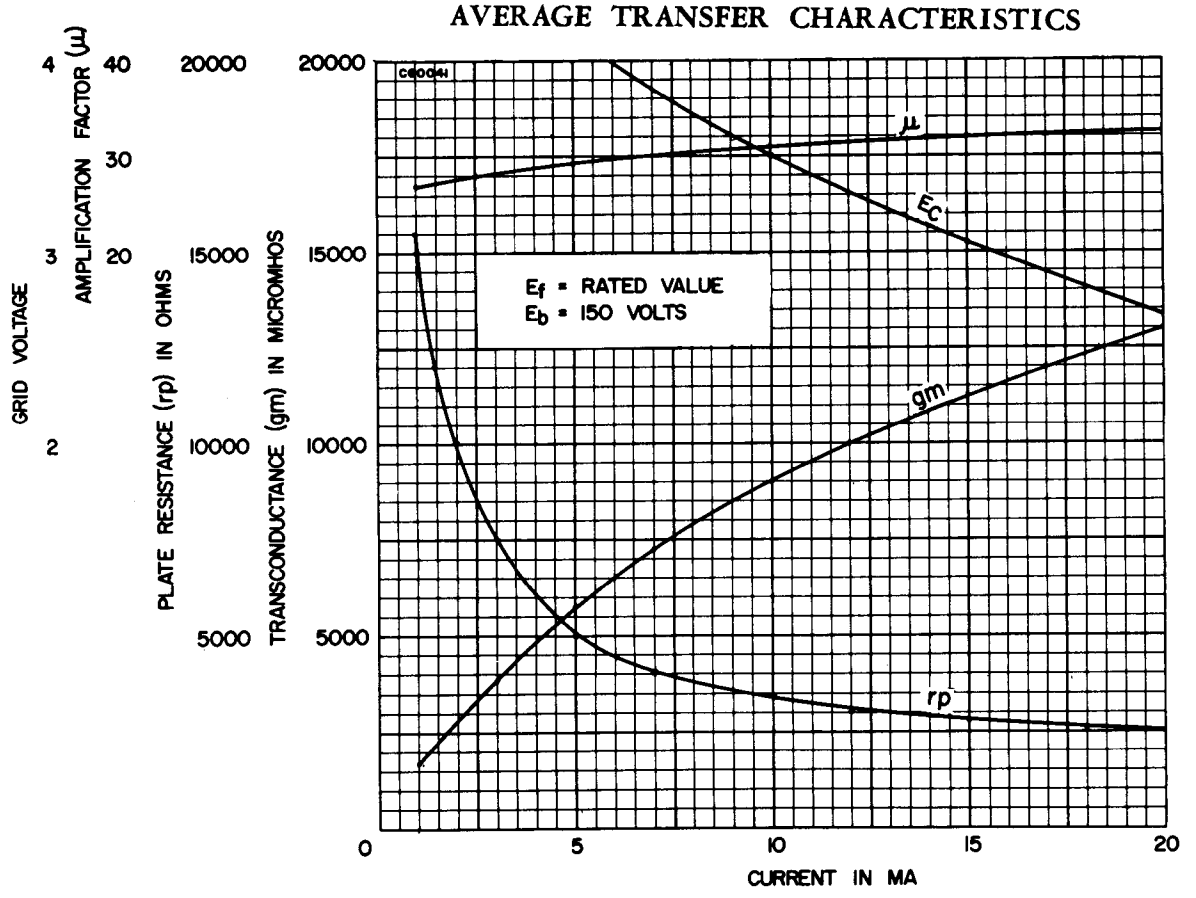
AVERAGE TRANSFER CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA

engineering data service

SYLVANIA

7449A

from JEDEC release #3884,
Sept. 17, 1962

ADVANCE DATA

MECHANICAL DATA

Mounting Position	Any
Weight	7.3 lbs.
Cooling	Forced Air
Output Pressurization	50 psia
Minimum Magnet Isolation	4 Inches
Output Coupling	See Outline
Shock	50 G for 11 Milliseconds
Vibration	20-54 cps 0.2 Inch Max. Excursion 54-2000 cps, 30 G

ELECTRICAL DATA

Voltage	5.0 V
Current	3.1 A
Minimum Preheat Time	2 Minutes

RATINGS (Absolute Maximum)[1]

Heater Voltage	6.0 V
Heater Surge Current	12 A
Peak Anode Voltage	16 Kv
Average Power Input	200 W
Anode Temperature	150 °C
Voltage Standing Wave Ratio	1.5:1
Duty Cycle	0.001
Pulse Width	1.0 usec
Peak Anode Current	See Figure 1

TYPICAL OPERATION

	Osc. I	Osc. II	Osc. III	
Duty Cycle	0.0005	0.0004	.0004	
Pulse Width	1.0	0.1	.02	usec
Rate of Rise of Voltage	150	250	400	Kv/usec
Average Anode Current	6.0	10	12	Ma
Peak Anode Voltage	14.5	15.0	15.2	Kv
Average Power Output	18.0	28.0	32	Watts
Pulling Factor	25	25	25	Mc
Pushing Factor	1.0	1.0	1.0	Mc/amp

NOTES:

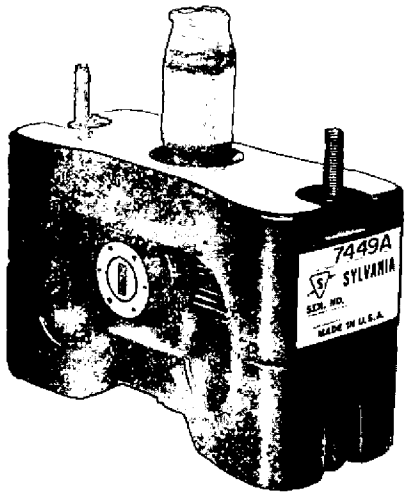
1. If the independent absolute ratings are exceeded, serviceability of the tube may be impaired. Refer to MIL-E-1D; Para. 6.5.

2. Dependable operation and maximum magnetron life can be realized only if the complete system is designed with the magnetron characteristics clearly in mind. This data sheet is intended to acquaint the reader with the basic characteristics of the magnetron and should not be used as an absolute guide. Additional information and assistance with specific applications may be obtained by contacting Sylvania Microwave Device Division, Williamsport, Pennsylvania.

FORM 146 (10-58)

QUICK REFERENCE DATA

K band magnetron
23,800 to 24,200 Mc fixed
70 Kw peak power output
Pulsed operation
Integral magnets
Ruggedized - FM less than
0.5 Mc during vibration



SYLVANIA ELECTRIC PRODUCTS INC.

MICROWAVE DEVICE DIVISION

WILLIAMSPORT, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

August 2, 1962

File Under
MAGNETRONS

OUTLINE

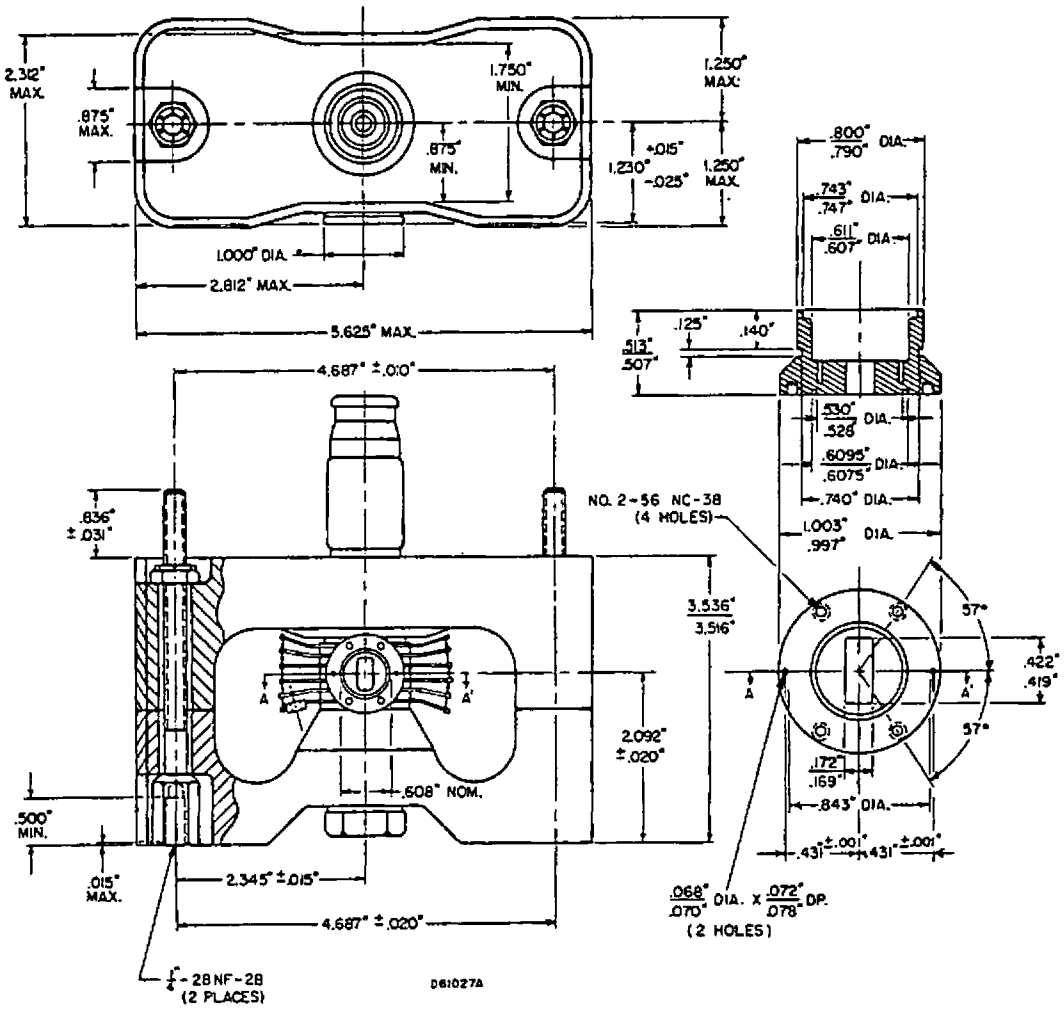
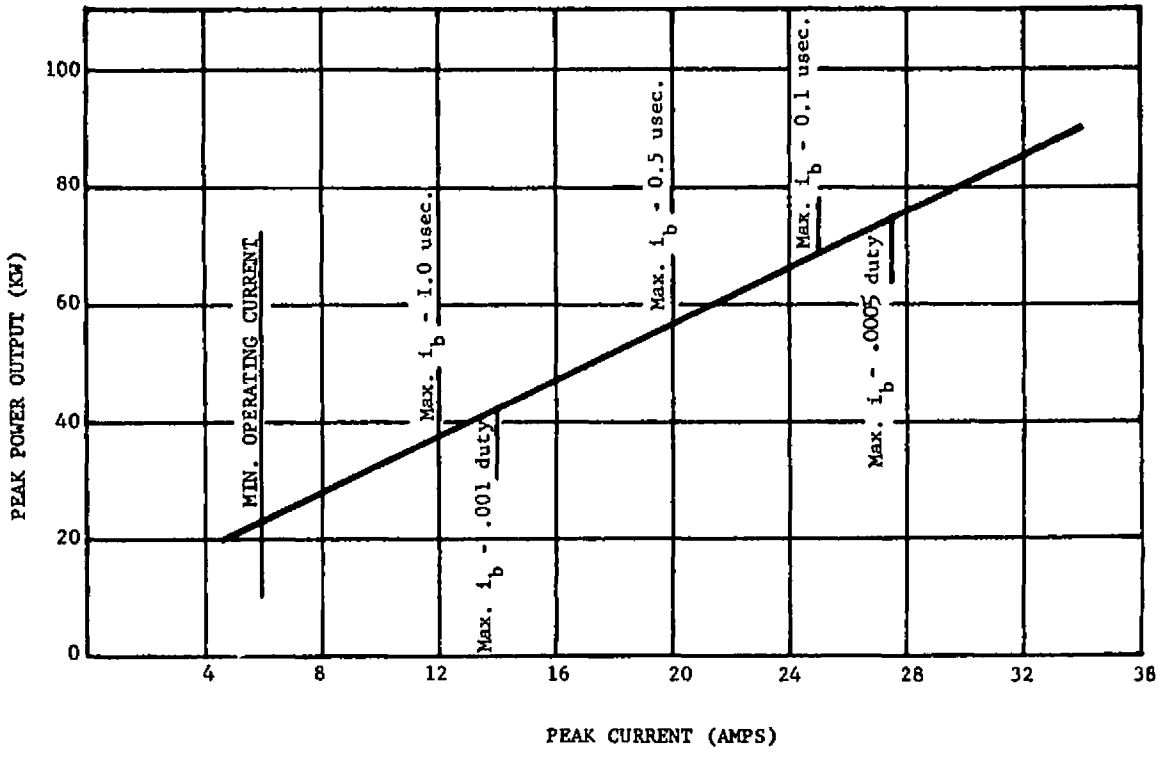


FIGURE 1



ADVANCE DATA

QUICK REFERENCE DATA

Tunable Beacon Magnetron
9300-9500 Mc
100 watts Peak Power
Pulsed Operation
Integral Magnets

MECHANICAL DATA

Mounting Position	Any	
Weight	Approx. 6	oz.
Cooling	Convection and Conduction	
Minimum Magnet Isolation	2	Inches
Output Coupling	TNC connector	
Tuner Drive Mechanism	See Note	
Shock and Vibration	500	g

ELECTRICAL DATA

HEATER CHARACTERISTICS

Voltage	5.0	V
Current (at 5.0 V)	0.6 to 0.7	A
Min. Preheat Time	45	Sec.

RATINGS (Absolute Maximum)[1]

Heater Voltage	5.5	V
Heater Current	1.15	A
Peak Anode Voltage	2.0	kv
Average Power Input	3.75	W
Anode Temperature	100	°C
VSWR	1.5 : 1	
Duty Cycle	0.002	

[1] The independent absolute ratings must not be exceeded. These ratings are limiting values beyond which the serviceability of any tube may be impaired. It does not necessarily follow that combinations of ratings can be attained simultaneously.

TYPICAL OPERATION

	Osc. 1	Osc. 2
Duty Cycle	0.002	0.0001
Pulse Width	1.0 μsec	0.4 μsec
Voltage Rise Time	0.1 to 0.2 μsec	0.1 to 0.2 μsec
Average Anode Current	1.9 mAdc	0.095 mAdc
Peak Anode Voltage	1.45 kv (norm)	1.45 kv (norm)
Average Power Output	0.2 W (min.)	0.0060 W (min.)*
Pulling Factor	15 Mc (max.)	15 Mc (max.)
Pushing Factor	3 Mc (max.)	3 Mc (max.)
Tunable Frequency	F1 = 9500 Mc F2 = 9400 Mc F3 = 9300 Mc	F1 = 9500 Mc F2 = 9400 Mc F3 = 9300 Mc

* The power output is measured at worst phase of a 1.5 VSWR mismatch.

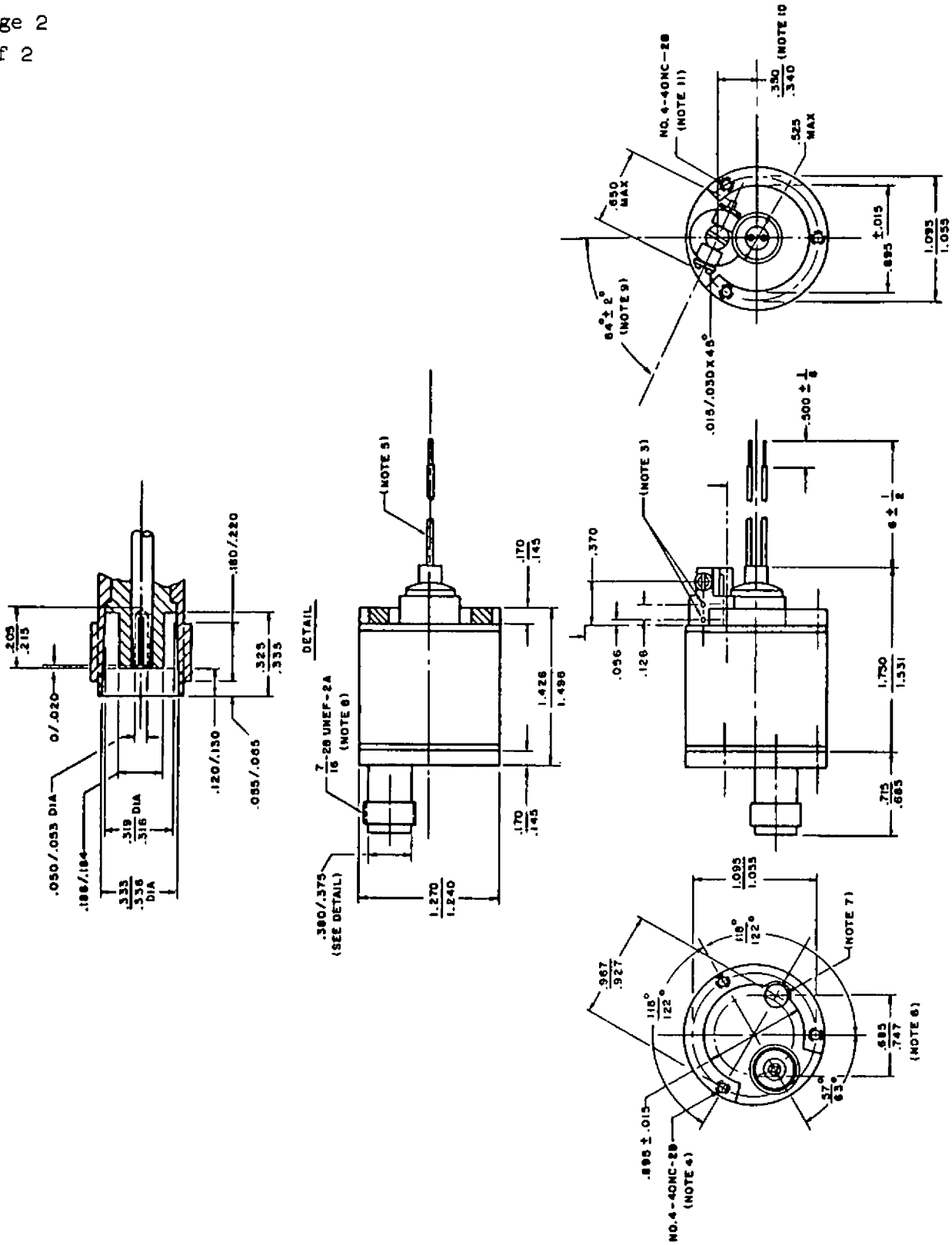
Note: The tube is tuned by: (1) Unlocking the tuner by loosening the set screws on the side of the tuner housing, (2) turning the tuner screw in either direction with a non-magnetic screw driver, and (3) tightening the set screw to lock the tuner.

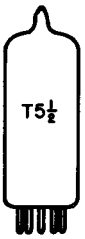
from JEDEC release #2687, Feb. 7, 1960

SYLVANIA ELECTRIC PRODUCTS INC.
SPECIAL TUBE OPERATIONS
Mountain View, California

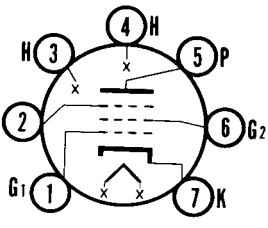
SYLVANIA

7503





SYLVANIA TYPE 7543



7BK

HUM CRITERIA

The hum level at the plate averages 1.2 millivolts when used as a normal voltage amplifier with a stage gain of 340 and the 6.3 Vac heater supply balanced to ground for minimum hum.

The stage gain of 340 is obtained with a supply voltage of 250 volts, a plate resistor of 270,000 ohms, a grid No. 2 resistor of 680,000, a grid No. 1 resistor of 100,000 ohms, a cathode resistor (bypassed) of 1000 ohms and a following stage loading resistor of 10 megohms. (Loading resistance of VTVM.)

When utilizing the R-C data specified, removal of the cathode bypass condenser will reduce the hum level at the plate to 0.9 millivolts and the stage gain to 110.

MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-2
Basing	7BK
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	300 Ma
Heater-Cathode Voltage (Design-Center Values)	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
D C	100 Volts Max.
Total D C and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[1]	Unshielded
Pentode Connection		
Grid No. 1 to Plate	.0035	.0035 μμf Max.
Input: g1 to (h+k+g2+g3+I.S.)	5.5	5.5 μμf
Output: p to (h+k+g2+g3+I.S.)	5.0	5.0 μμf
Triode Connection[2]		
Grid to Plate: g1 to (p+g2+g3+I.S.)	2.6	2.6 μμf
Input: g1 to (h+k)	3.2	3.2 μμf
Output: p+g2+g3+I.S. to (h+k)	8.5	1.2 μμf

RATINGS (Design-Center Values)

	Triode Conn.[2]	Pentode Conn.
Plate Voltage	250	300 Volts Max.
Grid No. 2 Supply Voltage		300 Volts Max.
Grid No. 2 Voltage	See Rating Chart	
Plate Dissipation	3.2	3.0 Watts Max.
Grid No. 2 Dissipation		0.65 Watts Max.
Positive Grid No. 1 Voltage	0	0 Volts Max.

CHARACTERISTICS AND TYPICAL OPERATION

	Triode Conn.[2]	Pentode Connected		
Plate Voltage	250	100	250	250 Volts
Grid No. 3 Voltage		Connected to Cathode at Socket		
Grid No. 2 Voltage		100	125	150 Volts
Cathode Bias Resistor	330	150	100	68 Ohms
Plate Current	12.2	5.0	7.6	10.6 Ma
Grid No. 2 Current		2.1	3.0	4.3 Ma
Transconductance	4800	3900	4500	5200 μmhos
Amplification Factor	36			
Plate Resistance (approx.)		0.5	1.5	1.0 Megohms
Ec1 for Ib = 10 μa (approx.)		−4.2	−5.5	−6.5 Volts

NOTES:

1. Shield No. 316 connected to Cathode Pin No. 7.
2. When operated as a triode Grid No. 2 and Grid No. 3 should be tied to the plate.
   See Resistance Coupled data section (Chart XXI) for R-C data. See Type 6AU6 for curve information.

APPLICATION

The Sylvania Type 7543 is designed to provide low hum, non-microphonic operation through the incorporation of a helical wound heater and rigid mounting of the internal components.
The 7543 is otherwise similar to, and a replacement for, the Type 6AU6.

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-3
Basing	9LK
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

	7551	7558	
Heater Voltage	12 to 15	6.3 ± 5 %	Volts
Heater Current	—	800	Ma
Heater Current at 13.5 Volts	360	—	Ma
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode		100	Volts
Heater Positive with Respect to Cathode		100	Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.15 pf	Max.
Input: g1 to (k+g3+g2+h)	10 pf	
Output: p to (k+g3+g2+h)	5.5 pf	

MAXIMUM RATINGS (Absolute Maximum Values)

RF Power Amplifier Service—Class "C"

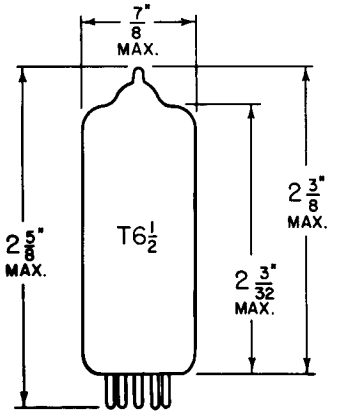
	Telephony[1]		Telegraphy F.M. Telephony		
	CCS	ICAS	CCS	ICAS	
Plate Voltage	250	250	300	300	Volts
Grid No. 3 Voltage	0	0	Tied to Cathode		
Grid No. 2 Voltage	250	250	250	250	Volts
Grid No. 1 Voltage	−125	−125	−125	−125	Volts
Plate Current	60	70	70	80	Ma
Grid No. 2 Current	10	10	15	15	Ma
Grid No. 1 Current	5	5	5	5	Ma
Plate Input	15	17.5	21	24	Watts
Plate Dissipation	7	8	10	12	Watts
Grid No. 2 Input	1.4	1.4	2	2	Watts
Grid No. 1 Circuit Resistance	0.1	0.1	0.1	0.1	Megohm
Bulb Temperature (at Hottest Point)	225	225	225	225	Cent.

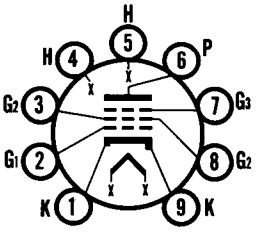
RF FREQUENCY MULTIPLIER AND AF AB1 AMPLIFIER SERVICE

	Class AB1 AF Amplifier	Class "C" Freq. Multiplier		
	CCS	CCS	ICAS	
Plate Voltage	300	300	300	Volts
Grid No. 3 Voltage	0	0	0	Volts
Grid No. 2 Voltage	250	250	250	Volts
Grid No. 1 Voltage	—	−125	−125	Volts
Plate Current	70	50	60	Ma
Grid No. 2 Current	—	15	15	Ma
Grid No. 1 Current	—	5	5	Ma
Plate Input	21	13	15	Watts
Plate Dissipation	10	10	12	Watts
Grid No. 2 Input	2	2	2	Watts
Grid No. 1 Circuit Resistance	0.1	0.1	0.1	Megohm
Bulb Temperature (at Hottest Point)	225	225	225	° Cent.

QUICK REFERENCE DATA

The Sylvania Types 7551 and 7558 are T-6½ beam pentodes designed for use as a Class "C" RF amplifier, oscillator, or frequency multiplier up to 175 Mc. They can also be used as a modulator or AF amplifier.
Type 7551 is designed for mobile equipment and Type 7558 is designed for fixed station equipment.





9LK

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ELECTRONIC TUBES
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RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.
Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
JUNE, 1963

File Under
RECEIVING TUBES

CHARACTERISTICS

Plate Voltage	250 Volts
Grid No. 3	Tied to Cathode
Grid No. 2 Voltage	250 Volts
Grid No. 1 Voltage	−18 Volts
Plate Current	40 Ma
Grid No. 2 Current	3 Ma
Transconductance	5300 μmhos
Amplification Factor (G2 to G1)	8.7

TYPICAL OPERATION (Class "C")

RF Power Amplifier—Up to 175 Mc.

	Telephony[1]		Telegraphy or F.M. Telephony		
	CCS	ICAS	CCS	CCS	ICAS
Plate Voltage	250	250	250	300	300 Volts
Grid No. 3 Voltage	Tied to Cathode				
Grid No. 2 Voltage	250[2]	250[2]	200	200	250 Volts
For Grid No. 1 Voltage[3]	−70	−75	−40	−42	−55 Volts
Use Grid No. 1 Resistor[3]	33K	33K	—	—	— Ohms
Peak RF Grid No. 1 Voltage	75	80	47	52	62 Volts
Grid No. 1 Current (Approx.)	2.1	2.3	1.5	2.1	1.6 Ma
Plate Current	60	70	60	70	80 Ma
Grid No. 2 Current	2.5	3.0	3.7	3.7	5.1 Ma
Driving Power (Approx.)	1.0	1.0	1.0	1.0	1.5 Watt
Power Output (Approx.)[4]	6.5	7.5	6.5	8.5	10 Watts

RF Frequency Multiplier—Up to 175 Mc.

	Doubler to 175 Mc		Tripler to 175 Mc	
Plate Voltage	250	300	200	250 Volts
Grid No. 3 Voltage	Tied to Cathode			
Grid No. 2 Voltage	200	250	200	250 Volts
For Grid No. 1 Voltage	−53	−66	−90	−120 Volts
Use Grid No. 1 Resistor[3]	53K	44K	50K	70K Ohms
Peak RF Grid No. 1 Voltage	60	74	105	130 Volts
Grid No. 1 Current (Approx.)	1.0	1.5	1.85	1.7 Ma
Plate Current	50	60	50	60 Ma
Grid No. 2 Current	2.6	3.5	3.0	3.9 Ma
Driving Power (Approx.)	0.4	0.6	0.4	0.6 Watts
Power Output (Approx.)[4]	3.0	4.5	1.4	2.3 Watts

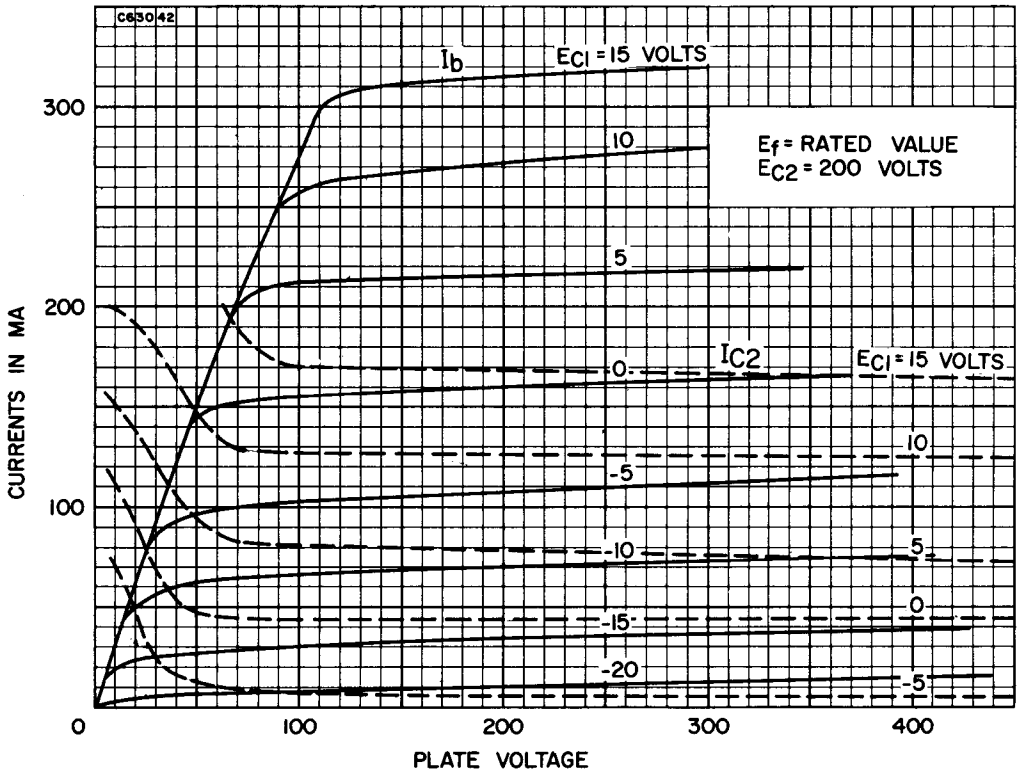
AF POWER AMPLIFIER (Class "AB1"—Push Pull)

Plate Voltage	300 Volts
Grid No. 3	Tied to Cathode
Grid No. 2 Voltage[5]	250 Volts
Grid No. 1 Voltage[5]	−21 Volts
Peak AF Grid No. 1 Voltage	20 Volts
Zero Signal Plate Current	40 Ma
Maximum Signal Plate Current	125 Ma
Zero Signal Grid No. 2 Current	2 Ma
Maximum Signal Grid No. 2 Current	14 Ma
Plate to Plate Load Resistance	5000 Ohms
Power Output (Approx.)	20.5 Watts
Total Harmonic Distortion	5 Percent

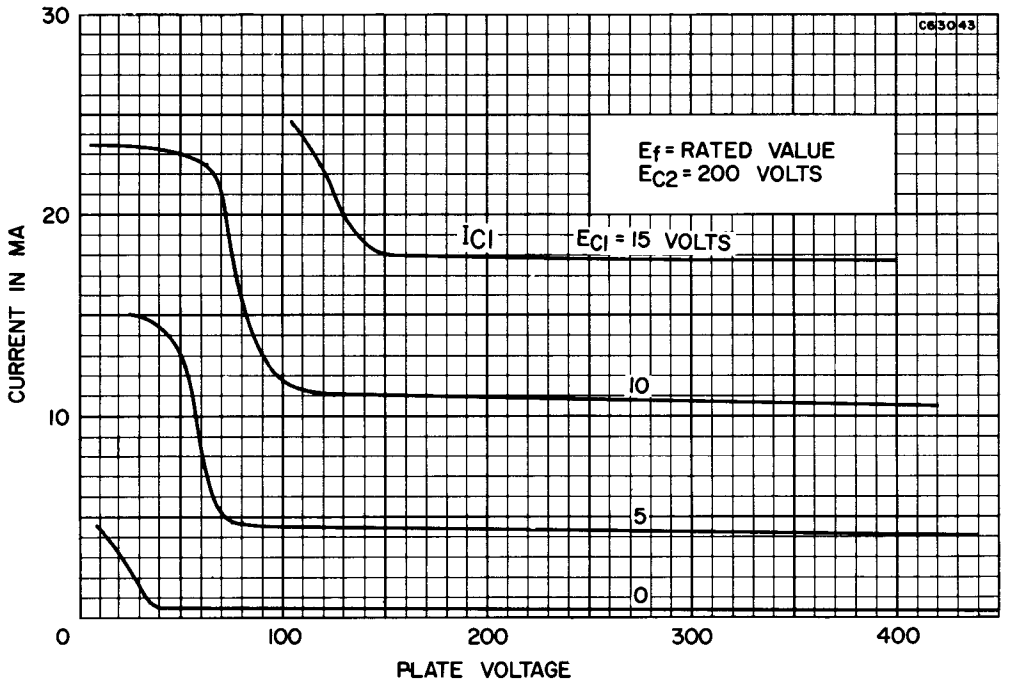
NOTES:

1. *Carrier conditions for use with a maximum modulation factor of 1.0.*
2. *Obtained preferably from a separate source-modulated with the plate supply or from the modulated plate supply through a series resistance.*
3. *Value of grid resistor needed to develop the recommended grid bias voltage. Grid No. 1 bias voltage can also be obtained from a combination of Grid No. 1 resistor with either fixed supply or cathode resistor.*
4. *This value of useful power is measured at load of output circuit.*
5. *Obtained preferably from a separate source.*

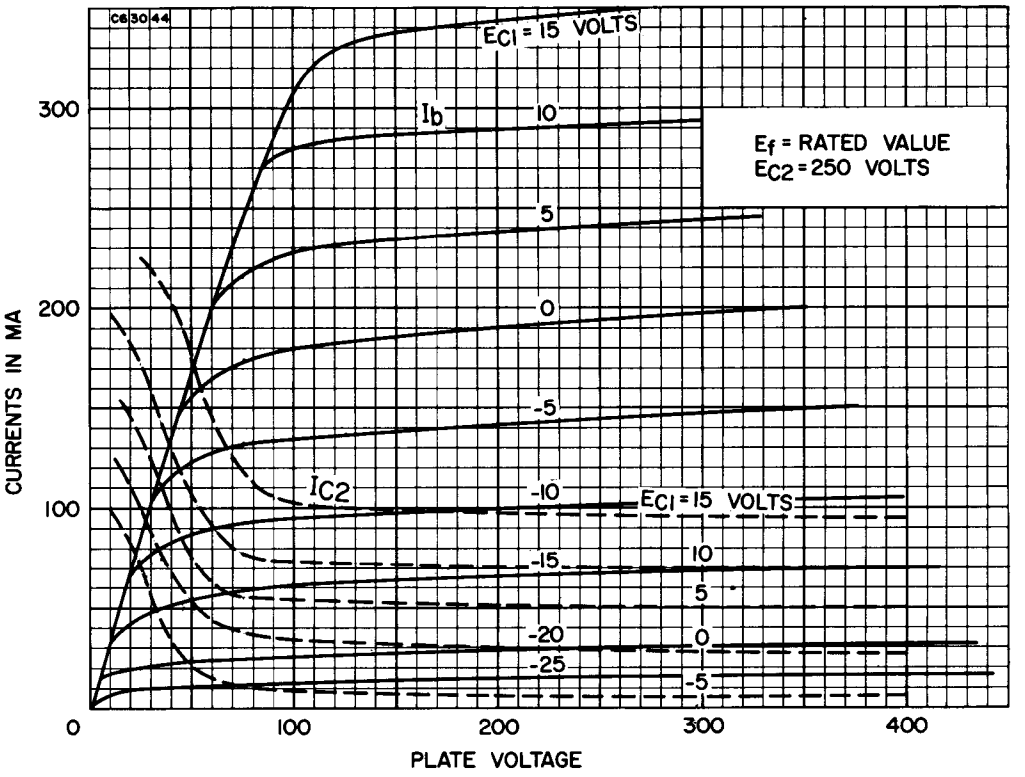
AVERAGE PLATE CHARACTERISTICS



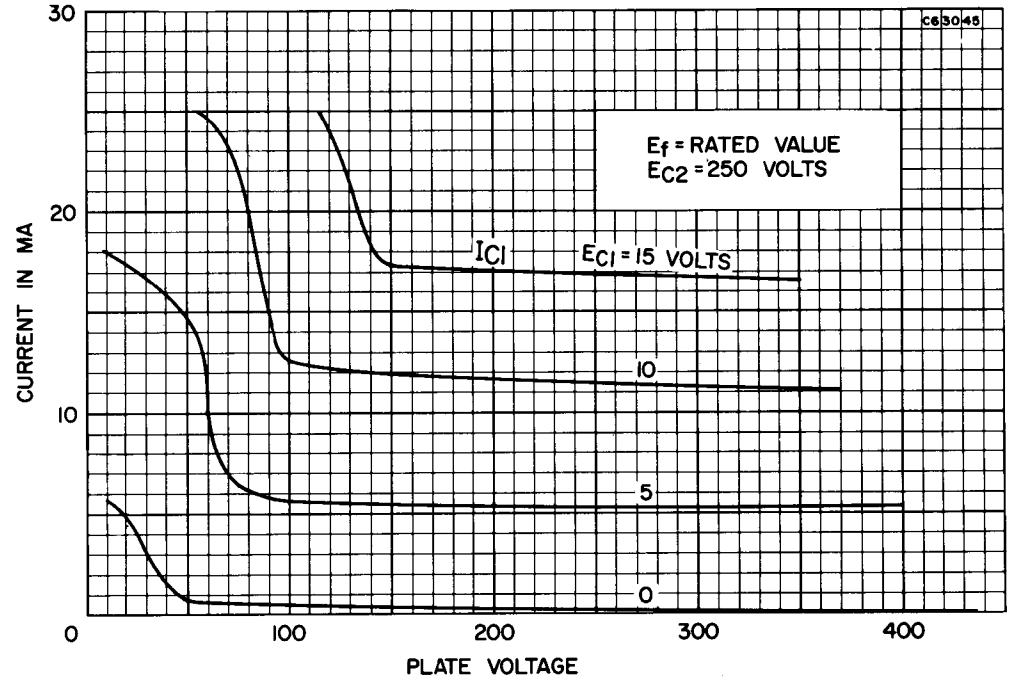
AVERAGE GRID CURRENT



AVERAGE PLATE CHARACTERISTICS



AVERAGE GRID CURRENT



MECHANICAL DATA

Bulb	T-9
Base	Intermediate Shell Octal 7-Pin (B7-233 or B8-142)
Outline	9-11
Basing	8KG
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	0.8 Amperes
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.25 $\mu\mu$f
Input	10 $\mu\mu$f
Output	5.0 $\mu\mu$f

RATINGS (Design Maximum Values)

Plate Voltage	550 Volts
Grid No. 2 Voltage	440 Volts
Plate Dissipation	19 Watts
Grid No. 2 Dissipation[1]	3.3 Watts
Cathode Current	85 Ma
Grid No. 1 Circuit Resistance	
Fixed Bias	0.3 Megohms
Self Bias	1.0 Megohms

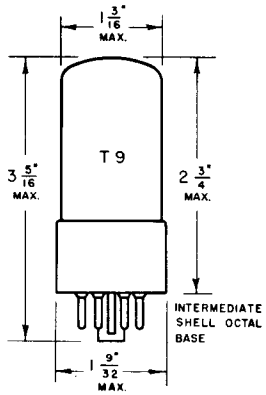
CHARACTERISTICS AND TYPICAL OPERATION

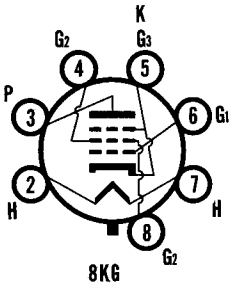
	Pentode Operation S.T. — Class A1 Amp	Ultra-Linear Operation[2] Class AB1 — Push-Pull	
Plate Voltage	300	400	425 Volts
Grid No. 2 Voltage	300	Note 2	Note 2 Volts
Grid No. 1 Voltage	−10	−20.5	— Volts
Cathode Resistor	—	—	185 Ohms
Peak AF Grid Voltage	10	20.5	21 Volts
Zero Signal Plate Current	60	80	88 Ma
Max. Signal Plate Current	75	138	104 Ma
Zero Signal Grid No. 2 Current	8	11.5	13 Ma
Max. Signal Grid No. 2 Current	15	26.4	17.5 Ma
Transconductance	10.2K	—	— μmhos
Plate Resistance (Approx.)	29K	—	— Ohms
Load Resistance	3K	—	— Ohms
Load Resistance (PL to PL)	—	6600	6600 Ohms
Power Output	11	32	26 Watts
Total Harmonic Distortion	13	1.0	2 Percent

QUICK REFERENCE DATA

Sylvania Type 7591 is a power output tube, contained in a T-9 envelope, capable of furnishing 43 watts of power output at very low distortion when operated as a Push-Pull Class AB1 Amplifier.

In ultra-linear operation a power output of 32 watts is available with a 400 volt plate voltage.





SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

RECEIVING TUBE OPERATIONS

EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

OCTOBER, 1961

File Under
RECEIVING TUBES

CHARACTERISTICS AND TYPICAL OPERATION (Con't.)

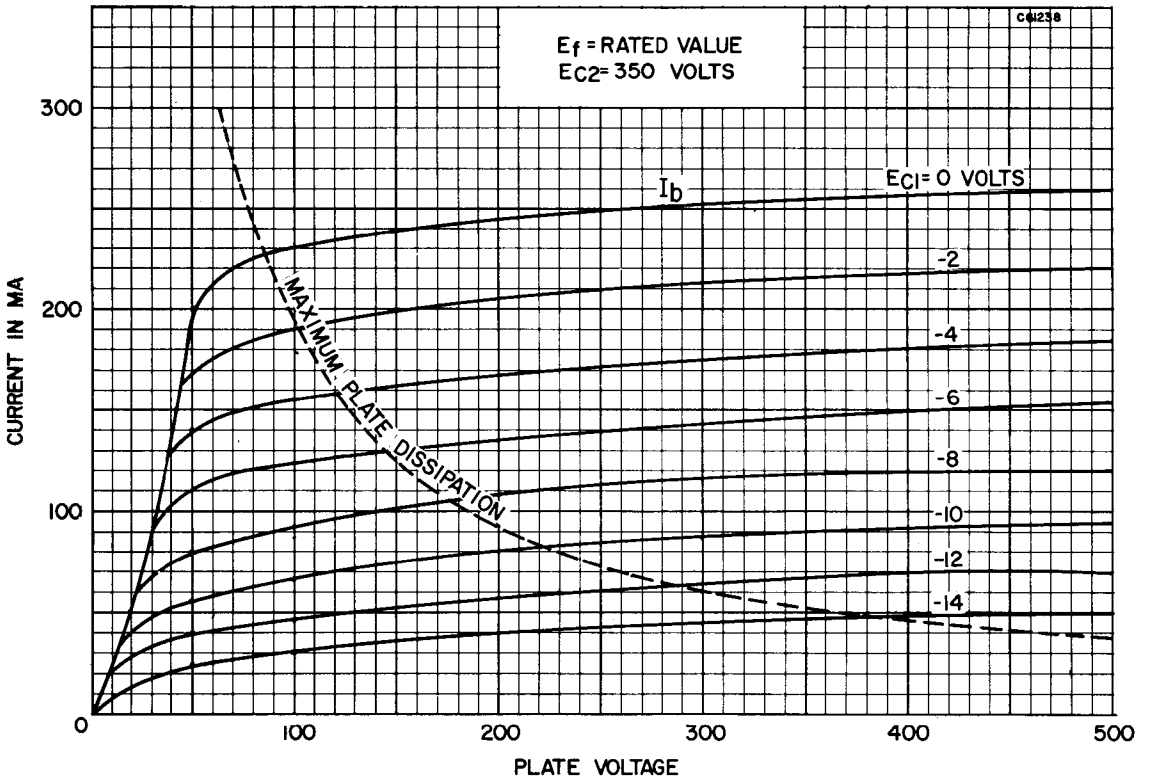
Pentode Operation (Class AB1 Push-Pull Amp.)

Plate Voltage	300	350	400	450	450	450 Volts
Grid No. 2 Voltage	300	350	350	350	400	400 Volts
Grid No. 1 Voltage	-12.5	-15.5	-16	-16.5	-21	— Volts
Cathode Resistor	—	—	—	—	—	200 Ohms
Peak AF Grid to Grid Voltage	25	31	32	33	42	28 Volts
Zero Signal Plate Current	86	92	85	77	66	82 Ma
Max. Signal Plate Current	116	130	143	153	144	94 Ma
Zero Signal Grid No. 2 Current	12.6	13	11	9.6	9.4	11.5 Ma
Max. Signal Grid No. 2 Current	26	28.6	27	27	30	22 Ma
Load Resistance (PL to PL)	6600	6600	6600	6600	6600	9000 Ohms
Power Output	23	30	37	43	45	28 Watts
Total Harmonic Distortion	2.5	2	1.5	1.5	1.5	2 Percent

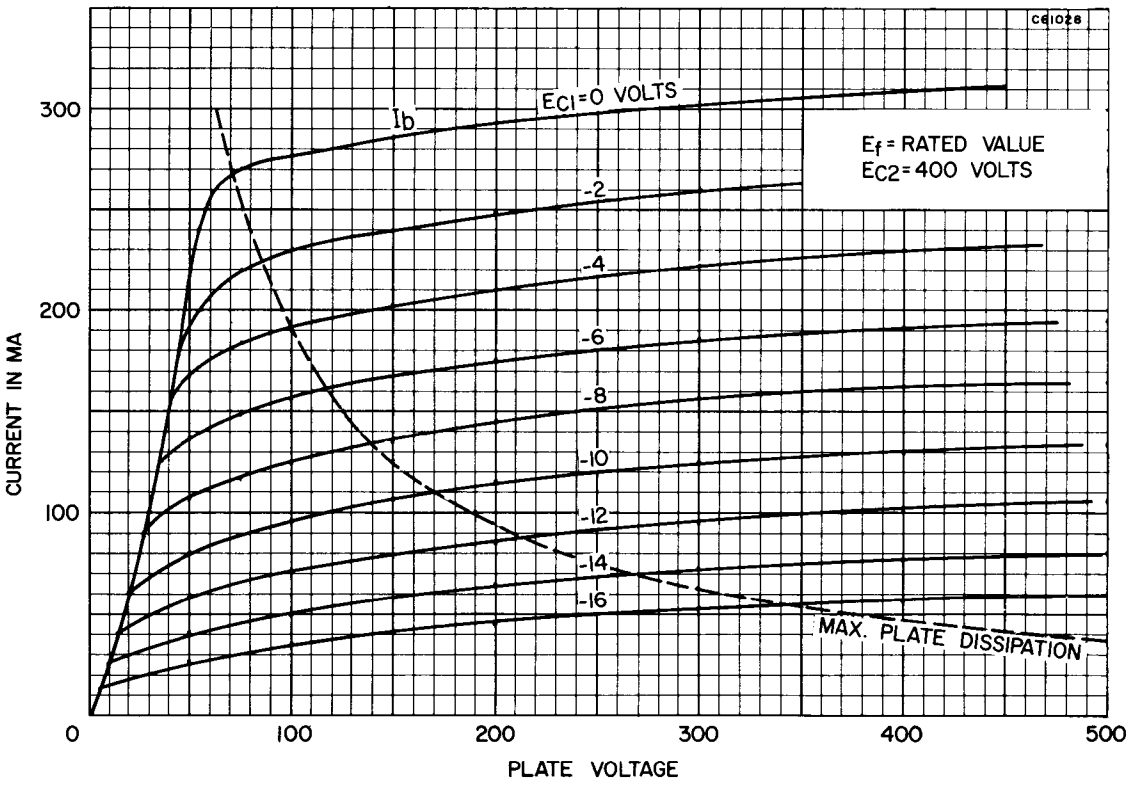
NOTES

1. *Grid No. 2 Dissipation may be permitted to reach 6 watts during the periods of maximum input of speech and music signals. For efficient operation of Grid No. 2, the two Grid No. 2 connections, Pins 4 and 8, should be externally tied together.*
2. *Grid No. 2 tapped at 40% of the primary winding.*

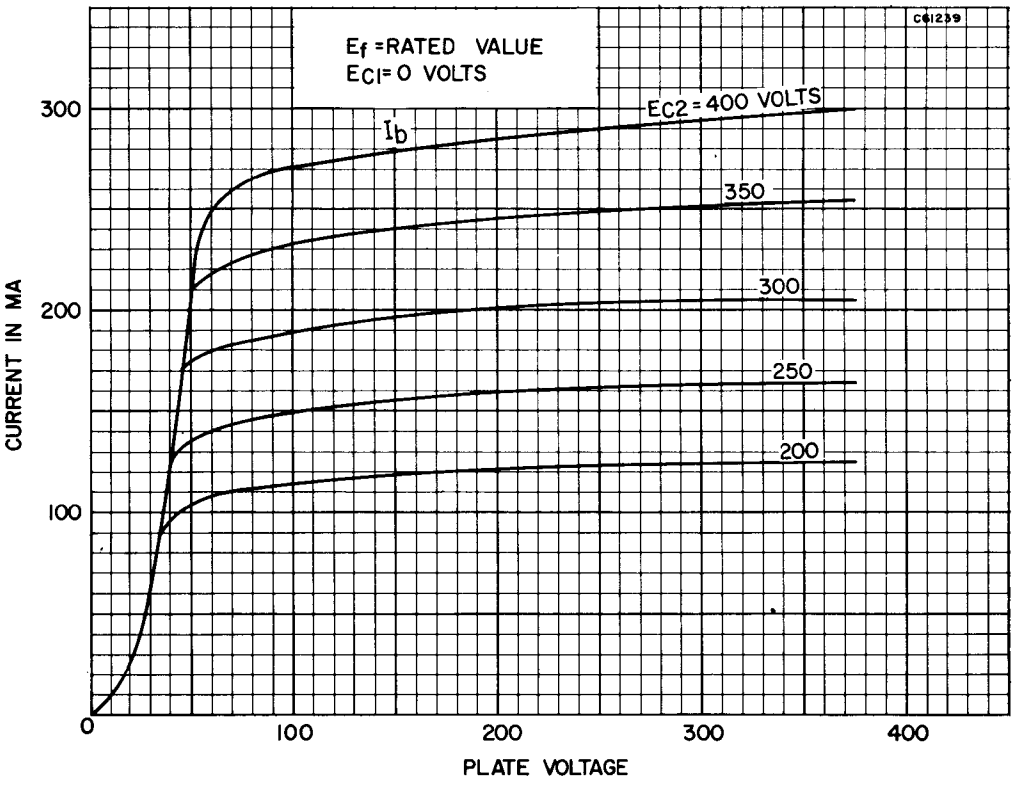
AVERAGE PLATE CHARACTERISTICS



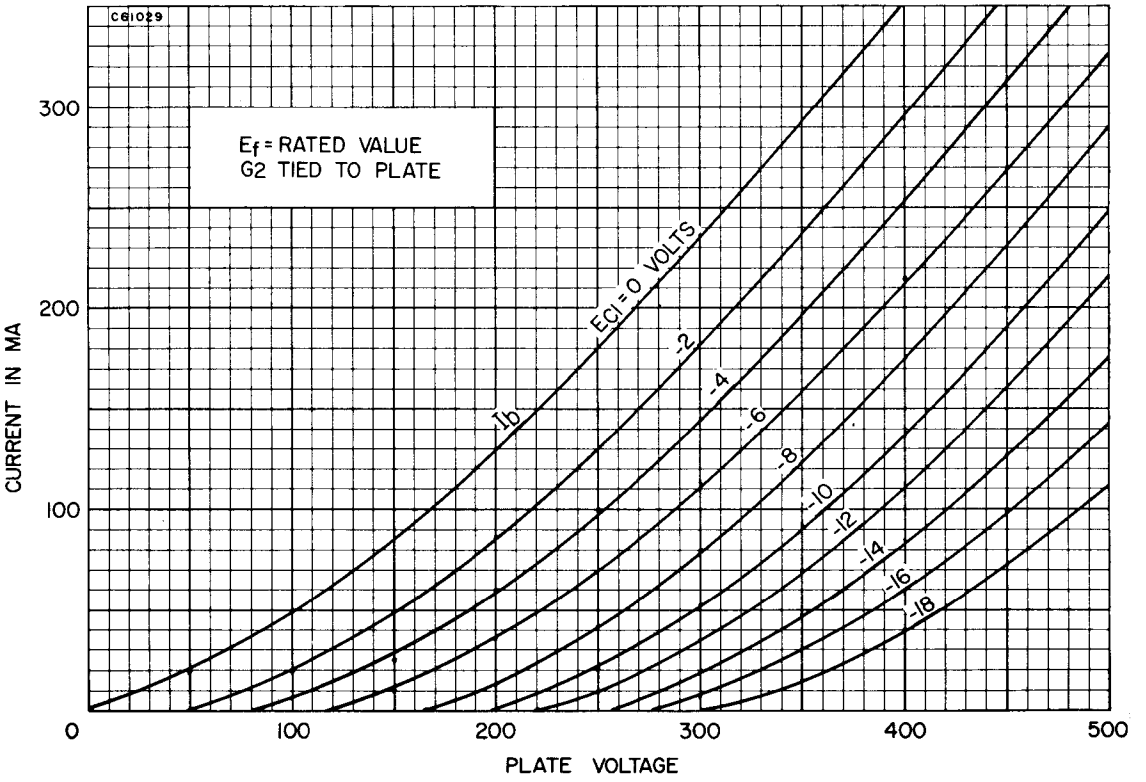
AVERAGE PLATE CHARACTERISTICS



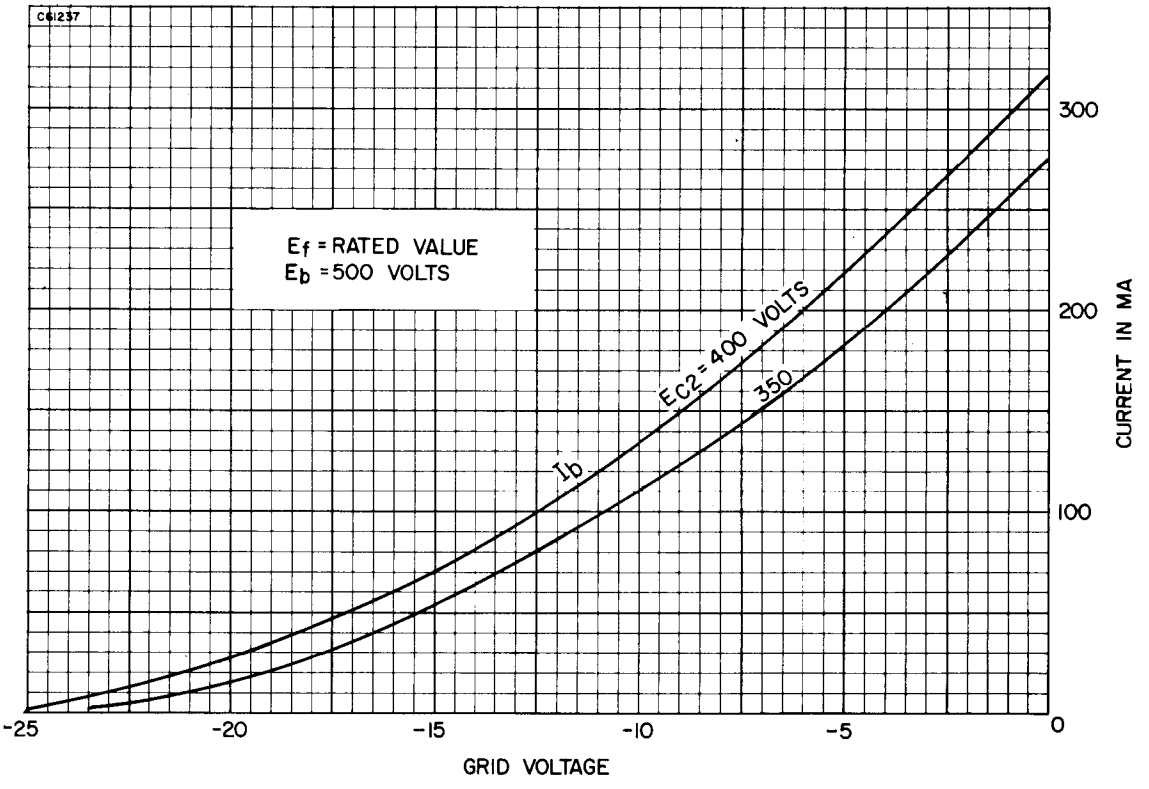
AVERAGE PLATE CHARACTERISTICS



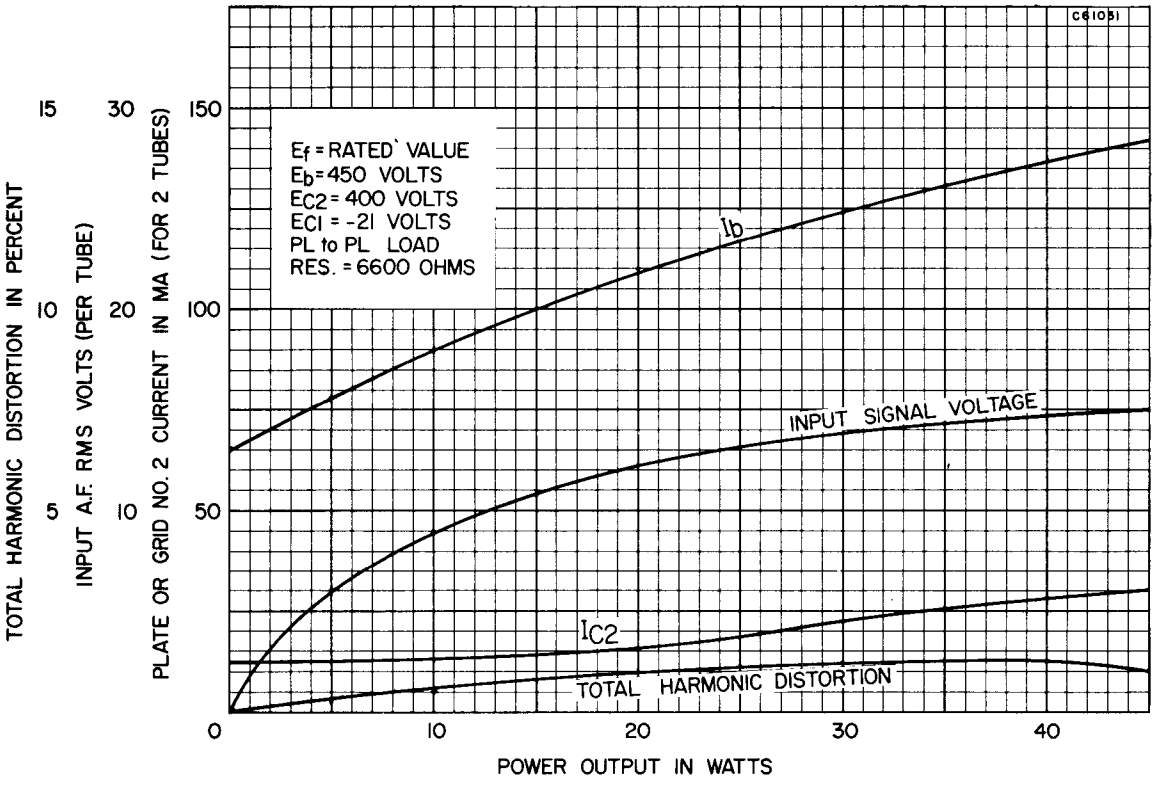
AVERAGE PLATE CHARACTERISTICS
(Triode Connected)



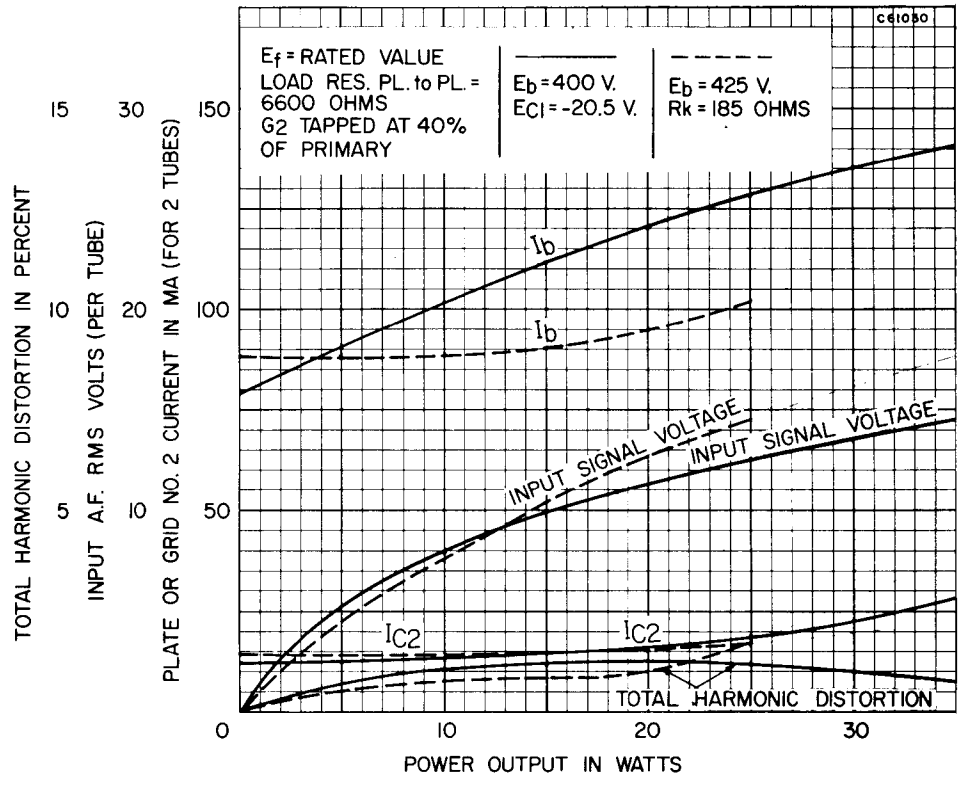
AVERAGE TRANSFER CHARACTERISTICS



OPERATIONAL CHARACTERISTICS



OPERATIONAL CHARACTERISTICS
(Ultra-Linear Operation)



SYLVANIA

engineering data service

SYLVANIA

7619

ADVANCE DATA

Ka band Magnetron
34,512 to 35,208 Mc fixed
40 Kw peak power output
Integral magnets
Ruggedized
Pulsed operation

MECHANICAL

Mounting position	Any
Weight	9 lbs.
Cooling	Forced air
Output pressurization	45 psi. gage
Minimum magnet isolation	4"
Output coupling	Mates with UG-600/U flange
Shock	15 G
Vibration	20 G - 54 to 2000 cps.

ELECTRICAL

HEATER CHARACTERISTICS

Voltage	12.6V
Current	2.8A
Minimum preheat time	4 Min.

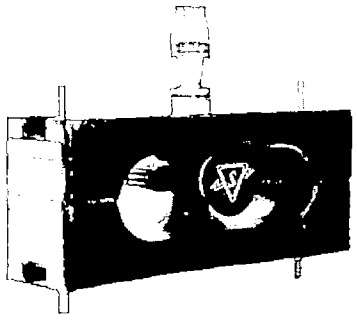
RATINGS (absolute maximum)[1]

Heater voltage	14.0 V
Heater surge current	10 A
Peak anode voltage	13 Kv
Average power input	110 W
Anode temperature	135°C
Voltage standing wave ratio	1.5/1
Duty cycle	.0006
Pulse width	1.0 usec.

TYPICAL OPERATION	Osc. I	Osc. II	Osc. III
Duty cycle	.00025	.0006	.0004
Pulse width	.25 usec.	1.0 usec.	.1 usec.
Rate of rise of voltage	200 Kv/usec.	150 Kv/usec.	200 Kv/usec.
Average anode current	5.0 mAdc	6 mAdc	8 mAdc
Peak anode voltage	11.5 Kv	12.5 Kv	11.5 Kv
Average power output	11 W	12 W	15 W
Pulling factor	30 Mc	30 Mc	30 Mc
Pushing factor	2 Mc/A	2 Mc/A	1 Mc/A

[1] If the independent absolute ratings are exceeded, serviceability of the tube may be impaired. Refer to MIL-E-1D. para. 6.5

NOTE: Dependable operation and maximum magnetron life can be realized only if the complete system is designed with the magnetron characteristics clearly in mind. This preliminary data sheet is intended to acquaint the reader with the basic characteristics of the magnetron and should not be used as an absolute guide. Additional information and assistance with specific applications may be obtained by contacting Sylvania Microwave Device Operations, Williamsport, Pennsylvania.

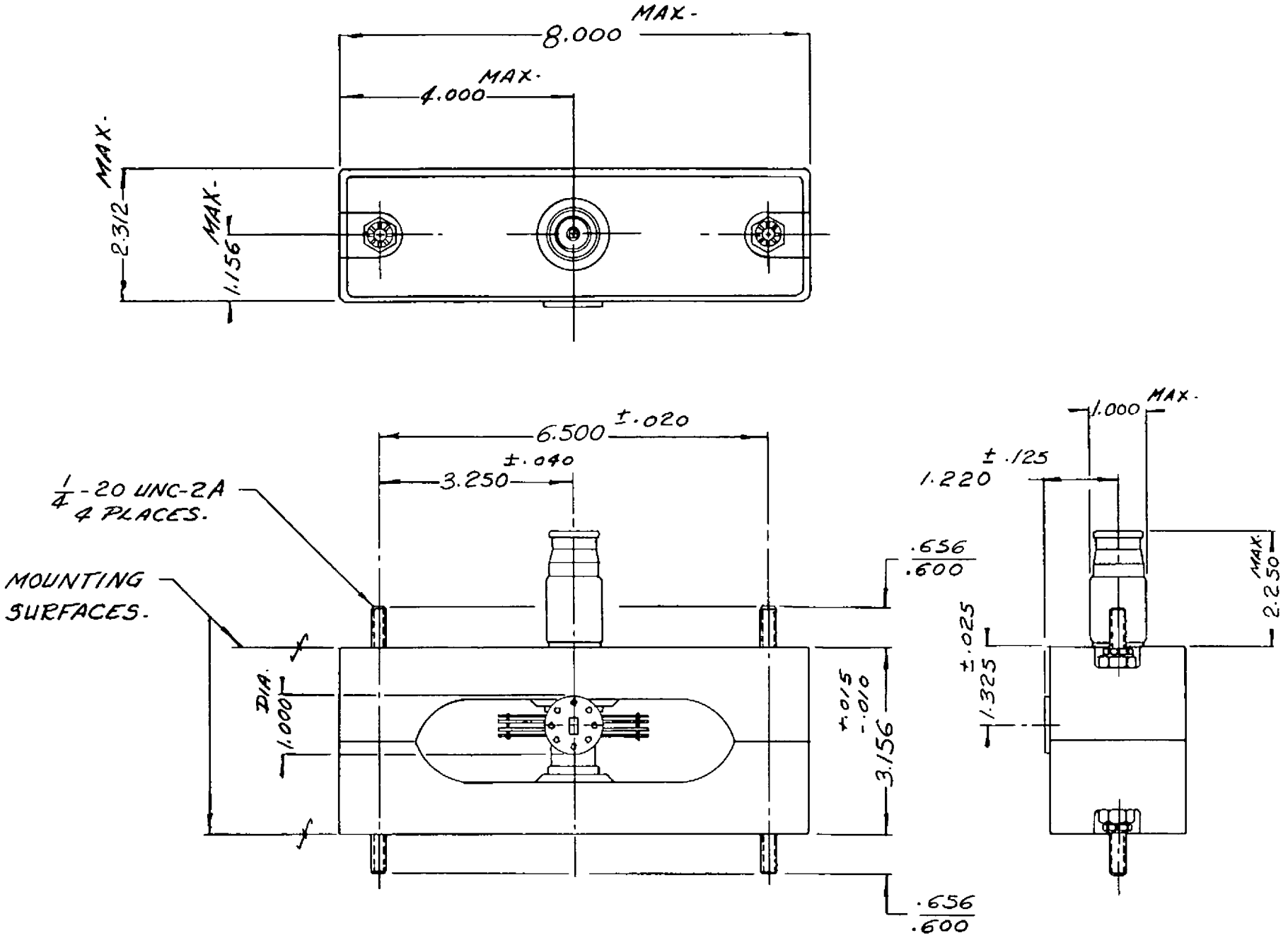


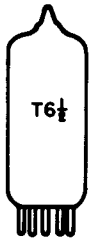
This improved replacement for the 5789 eliminates vibration-induced frequency modulation. In addition, extensive redesigning permitted a reduction in dimensions and a 30% conservation of weight. Heat dissipation is vastly improved allowing twice the original rating duty factor.

SYLVANIA ELECTRIC PRODUCTS, INC.
MICROWAVE DEVICE OPERATIONS
WILLIAMSPORT, PA.

November 18, 1960

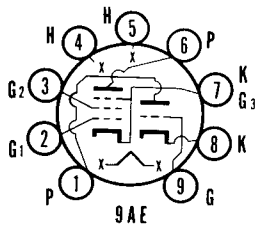
from JEDEC release #3182, March 6, 1961


8.000 MAX.
4.000 MAX.
2.312 MAX.
1.156 MAX.
6.500 ±.020
±.040
3.250
1/4-20 UNC-2A
4 PLACES.
MOUNTING
SURFACES.
DIA.
1.000
.656
.600
+.015
-.010
3.156
.656
.600
1.000 MAX.
±.125
1.220
±.025
1.325
2.250 MAX.



SYLVANIA TYPE 7687

LO-NOISE AUDIO TRIODE-PENTODE



MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-3
Basing	9AE
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[1]	6.3 Volts
Heater Current	500 Ma
Maximum Heater Voltage Range	5.7-6.9 Volts
Heater-Cathode Voltage (Design Maximum Values)	
Heater Negative with Respect to Cathode	
Total D C and Peak	200 Volts Max.
Heater Positive with Respect to Cathode	
D C	100 Volts Max.
Total D C and Peak	200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Triode Section	
Grid to Plate	2.4 μμf
Input: g to (h+Tk+Pk, G3, I.S.)	2.2 μμf
Output: p to (h+Tk+Pk, G3, I.S.)	0.3 μμf
Pentode Section	
Grid No. 1 to Plate	0.15 μμf Max.
Input: g1 to (h+k+g2+g3+I.S.)	7.0 μμf
Output: p to (h+k+g2+g3+I.S.)	2.8 μμf

RATINGS (Design Maximum Values)

	Triode Section	Pentode Section
Plate Voltage	330	330 Volts Max.
Grid No. 2 Supply Voltage	—	330 Volts Max.
Grid No. 2 Voltage	See 6AM8 Rating Chart	
Positive Grid No. 1 Voltage	0	0 Volts Max.
Plate Dissipation	2.4	3.0 Watts Max.
Grid No. 2 Dissipation	—	0.6 Watt Max.
Grid Circuit Resistance		
Fixed Bias	0.5	0.25 Megohm Max.
Cathode Bias	1.0	1.0 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

	Triode Section	Pentode Section
Plate Voltage	215	220 Volts
Grid No. 2 Voltage	—	130 Volts
Grid No. 1 Voltage	-8.5	— Volts
Cathode Bias Resistor	—	62 Ohms
Plate Current	7.5	10 Ma
Grid No. 2 Current	—	3.4 Ma
Transconductance	2500	5800 μmhos
Amplification Factor	18	—
Plate Resistance	.0072	0.5 Megohms
Ec1 for Ib = 10 μa (approx.)	-21	— Volts

EQUIVALENT NOISE AND HUM VOLTAGE

(Referenced to Grid, Average Values)

	Triode Section	Pentode Section
Cathode Resistor (Bypassed 50 μ fd)	7.5[2]	10.5[3] μ Volts RMS
Cathode Resistor (Unbypassed)	8[2]	20[4] μ Volts RMS

NOTES:

1. For parallel heater operation, equipment should be designed so that at normal supply voltage tubes will operate at this value of heater voltage.

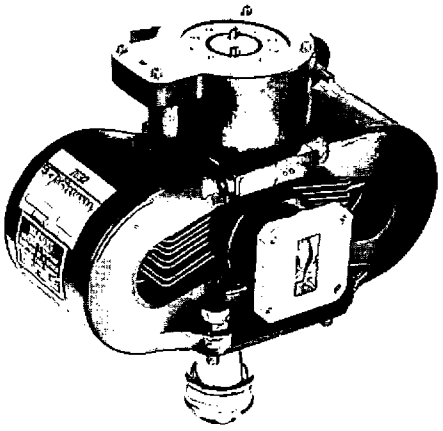
2. Measured under the following conditions: Ef = 6.3 Vac; center-tap of heater transformer grounded; Ebb = 250 Vdc; R1 = 0.1 Megohm; Rk = 1500 ohms; Rg = 47,000 ohms; F = 25 to 10,000 cps.
3. Measured under the following conditions: Ef = 6.3 Vac; Center-tap of heater transformer grounded; Ebb = 250 Vdc; R1 = 0.22 Megohm; Ecc2 = 250 Vdc; Rg2 = 1.0 megohms; Cg2 = 0.1 μf; Rk = 1000 ohms; Rg1 = 100,000 ohms; F = 25 to 10,000 cps.

APPLICATION

The Sylvania Type 7687 is a triode-pentode designed primarily for High Fidelity audio applications. The pentode section is particularly suited to preamplifier service while the triode section is intended for use as a phase splitter.
Type 7687 features exceptionally low hum and noise output. Although basings differ, Type 7687 is similar to Type 7199. Type 7687 is an improved low noise version of Type 7199.

QUICK REFERENCE FACTS

X-band tunable magnetron
9,200 to 9,550 Mc tunable
220 kw peak power output
Ruggedized
Pulsed operation
Integral magnets



Navigational and search radar systems utilize this high-power, ruggedized magnetron.

MECHANICAL

Mounting position	Any
Weight	Approx. 12 lbs.
Cooling	Forced air by directional ducts
Output pressurization	45 psia max.
Minimum magnet isolation	4 inches
Output coupling	Couples to UG-52A/U
Tuner drive mechanism	Rotating shaft*
Shock	30 G for 11 millisec.
Vibration	5 G, 5-500 cps
Tuner torque	Approx. 20 in. oz.

*Manual or servo tuned

ELECTRICAL

HEATER CHARACTERISTICS

Voltage	13.75 V
Current	3.2 A
Minimum preheat time	2.5 Minutes

RATINGS (Absolute maximum)[1]

Heater voltage	15 V
Heater surge current	12 A
Average power input	690 W
Anode temperature	150 °C
Voltage standing wave ratio	1.5:1
Duty cycle	0.0013
Pulse width	3.3 usec.

TYPICAL OPERATION	Osc. 1	Osc. 2
Duty cycle	0.001	0.001
Pulse width	0.60 usec	1.0 usec
Rate of rise of voltage	225 kv/usec	225 kv/usec
Average anode current	27.5 mAdc	27.5 mAdc
Peak anode voltage	22.5 kv	22.5 kv
Pulling factor	12 Mc	12 Mc
Average power output	220 W	220 W
Pushing factor (max.)	0.5 Mc/A	0.5 Mc/A

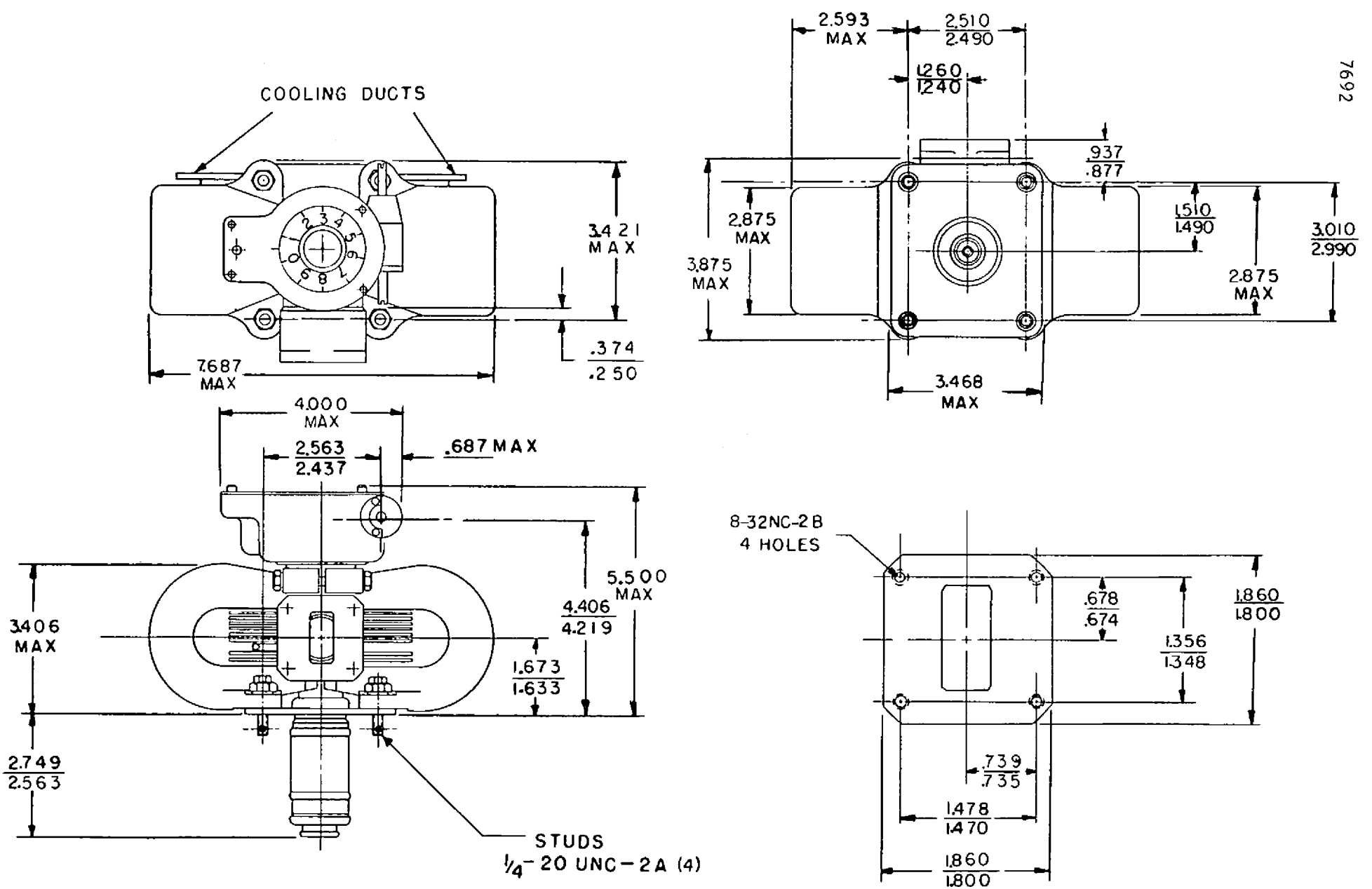
[1]If the independent absolute ratings are exceeded, serviceability of the tube may be impaired. Refer to MIL-E-1D, paragraph 6.5

NOTE: Dependable operation and maximum magnetron life can be realized only if the complete system is designed with the magnetron characteristics clearly in mind. This preliminary data sheet is intended to acquaint the reader with the basic characteristics of the magnetron and should not be used as an absolute guide. Additional information and assistance with specific applications may be obtained by contacting Sylvania Microwave Device Operations, Williamsport, Pa.

SYLVANIA ELECTRIC PRODUCTS, INC.
MICROWAVE DEVICE OPERATIONS
WILLIAMSPORT, PA.

May 5, 1961

from JEDEC release #3276, May 22, 1961


COOLING DUCTS
3.421 MAX
.374 / .250
7.687 MAX
2.593 MAX
2.510 / 2.490
1.260 / 1.240
.937 / .877
2.875 MAX
3.875 MAX
1.510 / 1.490
2.875 MAX
3.010 / 2.990
3.468 MAX
4.000 MAX
2.563 / 2.437
.687 MAX
5.500 MAX
4.406 / 4.219
3.406 MAX
1.673 / 1.633
2.749 / 2.563
STUDS
1/4-20 UNC-2A (4)
8-32NC-2B
4 HOLES
.678 / .674
1.860 / 1.800
1.356 / 1.348
.739 / .735
1.478 / 1.470
1.860 / 1.800

7692

SYLVANIA

engineering data service

SYLVANIA

7692A

ADVANCE DATA

MECHANICAL

Mounting position	Any
Weight	Approx. 11 lbs.
Cooling	Forced air
Output pressurization	45 psia max.
Minimum magnet isolation	4 inches
Output coupling	Couples to UG-52A/U
Tuner drive mechanism	Rotating shaft*
Shock	30 G for 11 millisec.
Vibration	5 g, 5-500 cps
Tuner torque	Approx. 20 in. oz.

*Manual or servo tuned

ELECTRICAL

HEATER CHARACTERISTICS

Voltage	13.75 V
Current	3.2 A
Minimum preheat time	2.5 Minutes

RATINGS (absolute maximum)[1]

Heater voltage	15 V
Heater surge current	12 A
Average power input	690 W
Anode temperature	150°C
Voltage standing wave ratio	1.5:1
Duty cycle	0.0013
Pulse width	3.3 usec

TYPICAL OPERATION	Osc.1	Osc.2	Osc.3
Duty cycle	0.0005	0.00075	0.001
Pulse width	0.275 usec	1.0 usec	3.15 usec
Rate of rise of voltage	200 kv/usec	200 kv/usec	200 kv/usec
Average anode voltage	14 mAdc	21 mAdc	27.5 mAdc
Peak anode voltage	22 kv	22 kv	22 kv
Average power output	110 W	165 W	220 W
Pulling factor	12 Mc	12 Mc	12 Mc
Pushing factor	0.25 Mc/A	0.25 Mc/A	0.25 Mc/A

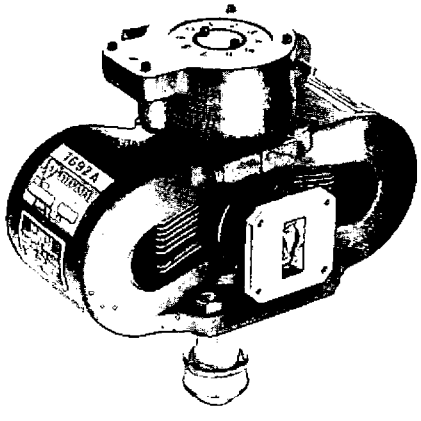
[1] If the independent absolute ratings are exceeded, serviceability of the tube may be impaired. Refer to MIL-E-1D, para. 6.5.

NOTE: Dependable operation and maximum magnetron life can be realized only if the complete system is designed with the magnetron characteristics clearly in mind. This preliminary data sheet is intended to acquaint the reader with the basic characteristics of the magnetron and should not be used as an absolute guide. Additional information and assistance with specific applications may be obtained by contacting Sylvania Microwave Device Operations, Williamsport, Pennsylvania.

from JEDEC release #3306, June 19, 1961

QUICK REFERENCE FACTS

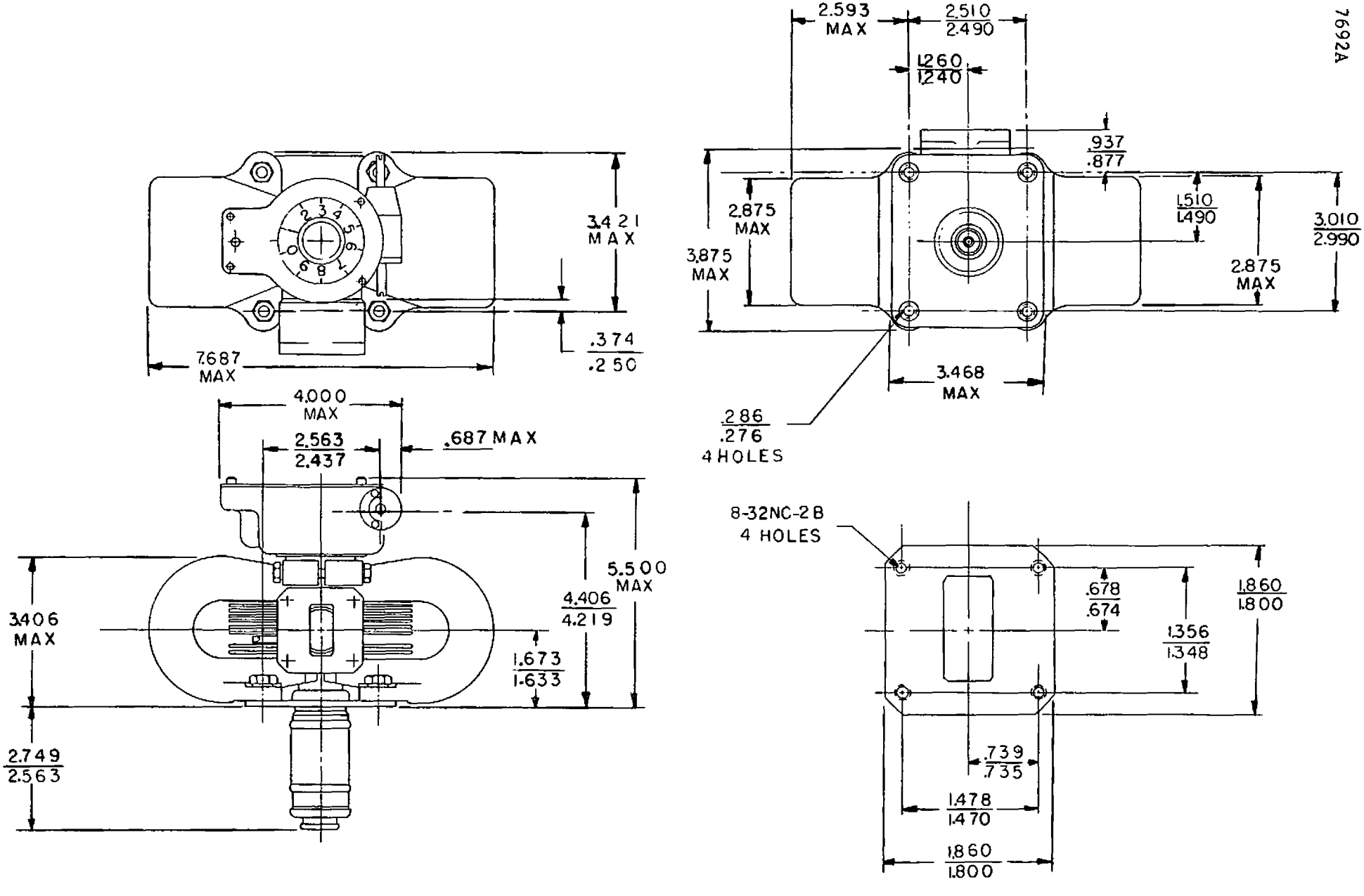
X-band tunable magnetron
8,550 to 9,650 Mc tunable
220 kw peak power output
Ruggedized
Pulsed operation
Integral magnets



Used in airborne fire-control systems with MTI capabilities.

SYLVANIA ELECTRIC PRODUCTS, INC.
MICROWAVE DEVICE OPERATIONS
WILLIAMSPORT, PA.

May 29, 1961


7692A
2.593 MAX
2.510 / 2.490
1.260 / 1.240
.937 / .877
2.875 MAX
3.875 MAX
1.510 / 1.490
2.875 MAX
3.010 / 2.990
3.468 MAX
.286 / .276 4 HOLES
3.421 MAX
.374 / .250
7.687 MAX
4.000 MAX
2.563 / 2.437
.687 MAX
5.500 MAX
4.406 / 4.219
3.406 MAX
1.673 / 1.633
2.749 / 2.563
8-32NC-2B 4 HOLES
.678 / .674
1.356 / 1.348
1.860 / 1.800
.739 / .735
1.478 / 1.470
1.860 / 1.800

SYLVANIA

engineering data service

SYLVANIA
7695
7754

The 9T9 design utilizes a T-9 (1⅛" Dia.) bulb based to fit a standard 9-pin miniature socket. Advantages of the 9T9 include an increase in the heat dissipation safety margin, as compared to 9-pin miniature tubes employing T-6½ ($^{13}/_{16}$" Dia.) bulbs.

MECHANICAL DATA

Bulb	Special, T-9
Base	9-Pin, Same as E9-1, except Bulb Diameter
Outline	See Drawing
Basing	9MQ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS	7754	7695		
Heater Voltage	6.3	50	Volts	
Heater Current[1]	1200	150	Ma	
Heater-Cathode Voltage (Design Maximum Values)				
Heater Negative with Respect to Cathode				
Total DC and Peak	200	200	Volts	Max.
Heater Positive with Respect to Cathode				
DC	100	100	Volts	Max.
Total DC and Peak	200	200	Volts	Max.

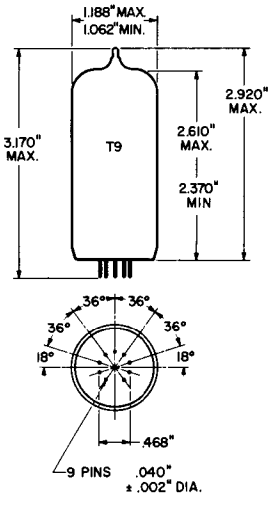
DIRECT INTERELECTRODE CAPACITANCES (Approx.)		
Grid No. 1 to Plate	0.75	μμf
Input: g1 to (h+k, g3+g2)	14	μμf
Output: p to (h+k, g3+g2)	9	μμf

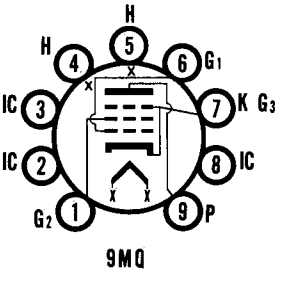
RATINGS (Design Maximum Values)			
Plate Voltage	150	Volts	Max.
Grid No. 2 Voltage	150	Volts	Max.
Plate Dissipation	16	Watts	Max.
Grid No. 2 Dissipation	2.5	Watts	Max.
Grid No. 1 Circuit Resistance			
Fixed Bias	0.1	Megohm	Max.
Cathode Bias	0.5	Megohm	Max.

CHARACTERISTICS AND TYPICAL OPERATIONS			
Class A1 Amplifier (Single Tube)			
Plate Voltage	130	140	Volts
Grid No. 2 Voltage	130	140	Volts
Grid No. 1 Voltage	−11	—	Volts
Cathode Resistor	—	100	Ohms
Peak AF Grid No. 1 Voltage	11	11.3	Volts
Zero Signal Plate Current	100	100	Ma
Max. Signal Plate Current	108	100	Ma
Zero Signal Grid No. 2 Current	5	5	Ma
Max. Signal Grid No. 2 Current	15	14	Ma
Transconductance	11,000	—	μmhos
Plate Resistance (Approx.)	7,000	—	Ohms
Load Resistance	1,100	1,100	Ohms
Max. Signal Power Output	4.5	4.5	Watts
Total Harmonic Distortion (Approx.)	11	11	Percent
Class AB1 Push-Pull Amplifier (Values are for two tubes)			
Plate Voltage	130	140	Volts
Grid No. 2 Voltage	130	140	Volts
Grid No. 1 Voltage	−12	—	Volts
Cathode Resistor	—	50	Ohms
Peak AF Grid No. 1 to Grid No. 1 Voltage	22.6	22.6	Volts
Zero Signal Plate Current	195	210	Ma
Max. Signal Plate Current	220	220	Ma
Zero Signal Grid No. 2 Current	9	9	Ma
Max. Signal Grid No. 2 Current	24	20	Ma
Load Resistance (P1 to P1)	1,800	1,500	Ohms
Maximum Signal Power Output	10	10	Watts
Total Harmonic Distortion (Approx.)	6.0	4.0	Percent

QUICK REFERENCE DATA

The Sylvania Types 7695 and 7754 are beam power pentodes featuring remarkably high power sensitivity as audio power amplifiers. In Class A1 operation, they can deliver 4.5 watts of power with a B+ voltage of only 130 volts. As a result, the 7695 and 7754 make possible economies in power supply requirements.





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RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
AUGUST, 1960

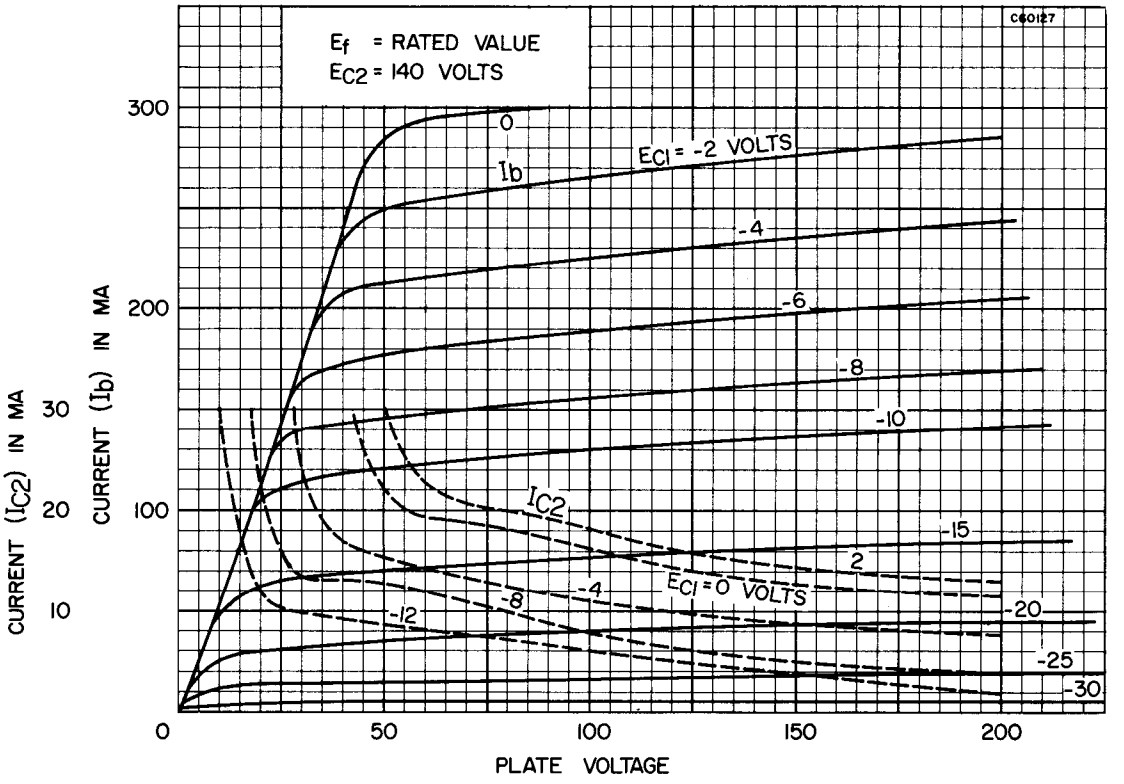
File Under
RECEIVING TUBES

SINGLE ENDED PUSH-PULL, CLASS A

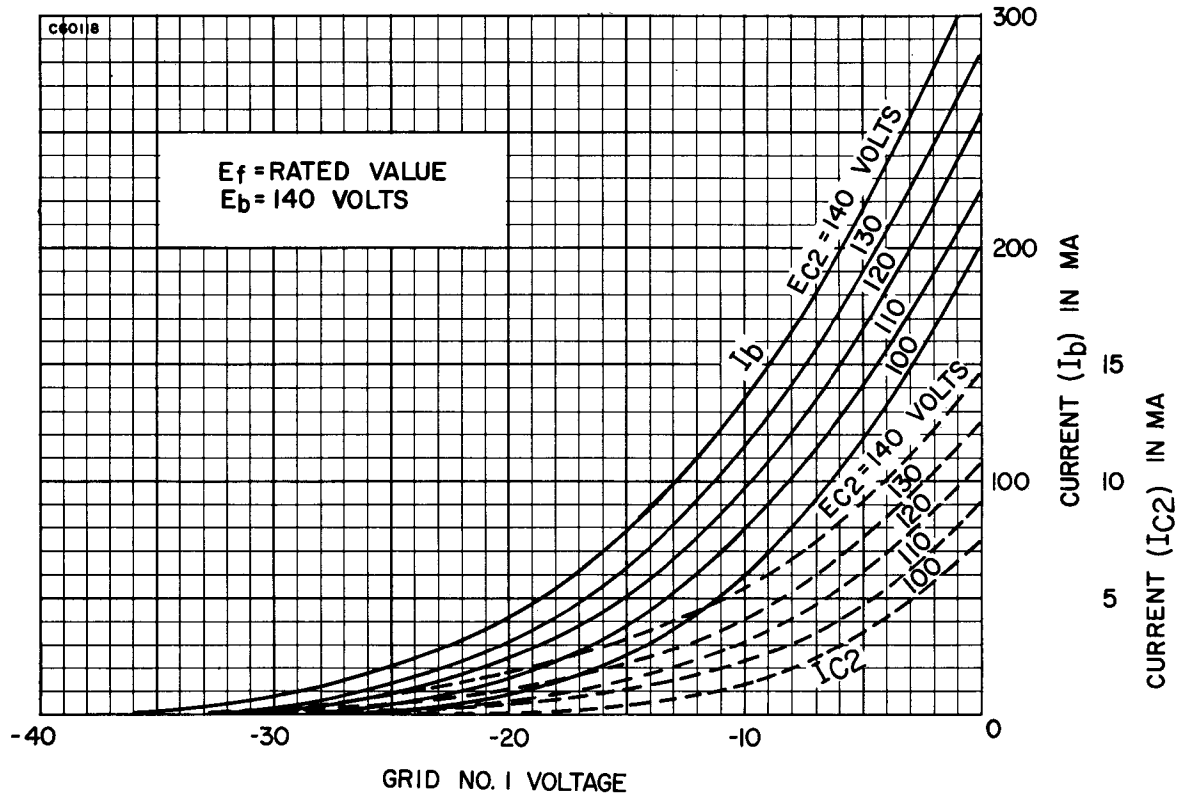
Transformerless Operation (See Circuit and Curve)

Supply Voltage	280 Volts
Plate Load Resistance	500 Ohms
Grid No. 2 Resistors (Rc2)	4000 Ohms
Peak AF Grid No. 1 Voltage	10.5 Volts
Power Output	5 Watts
Distortion	10 Percent

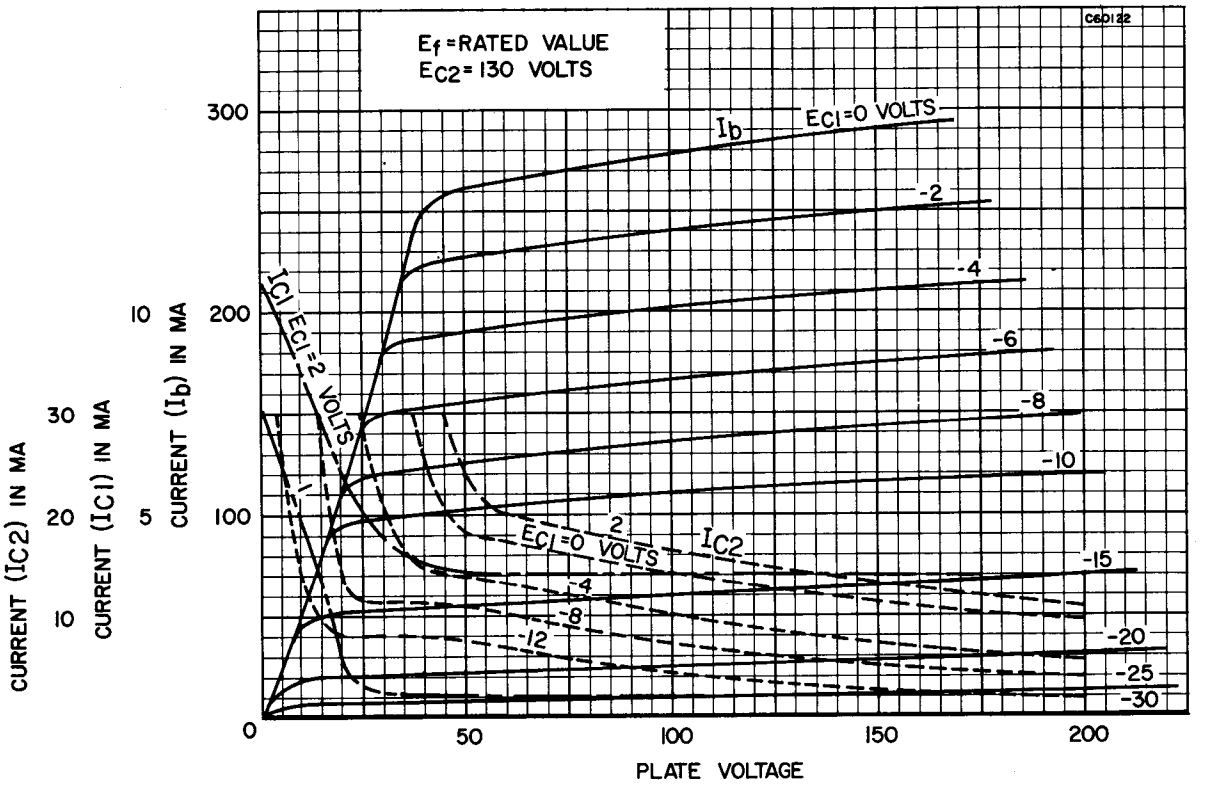
AVERAGE PLATE CHARACTERISTICS



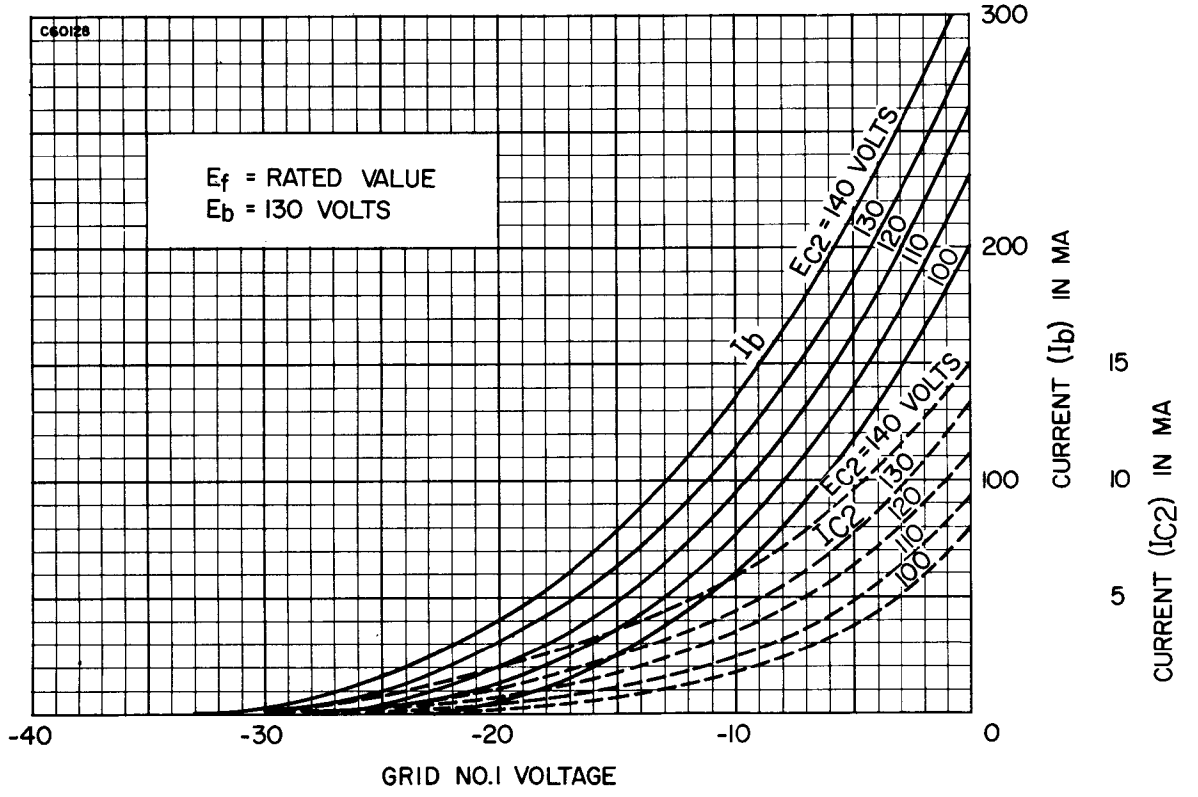
AVERAGE TRANSFER CHARACTERISTICS



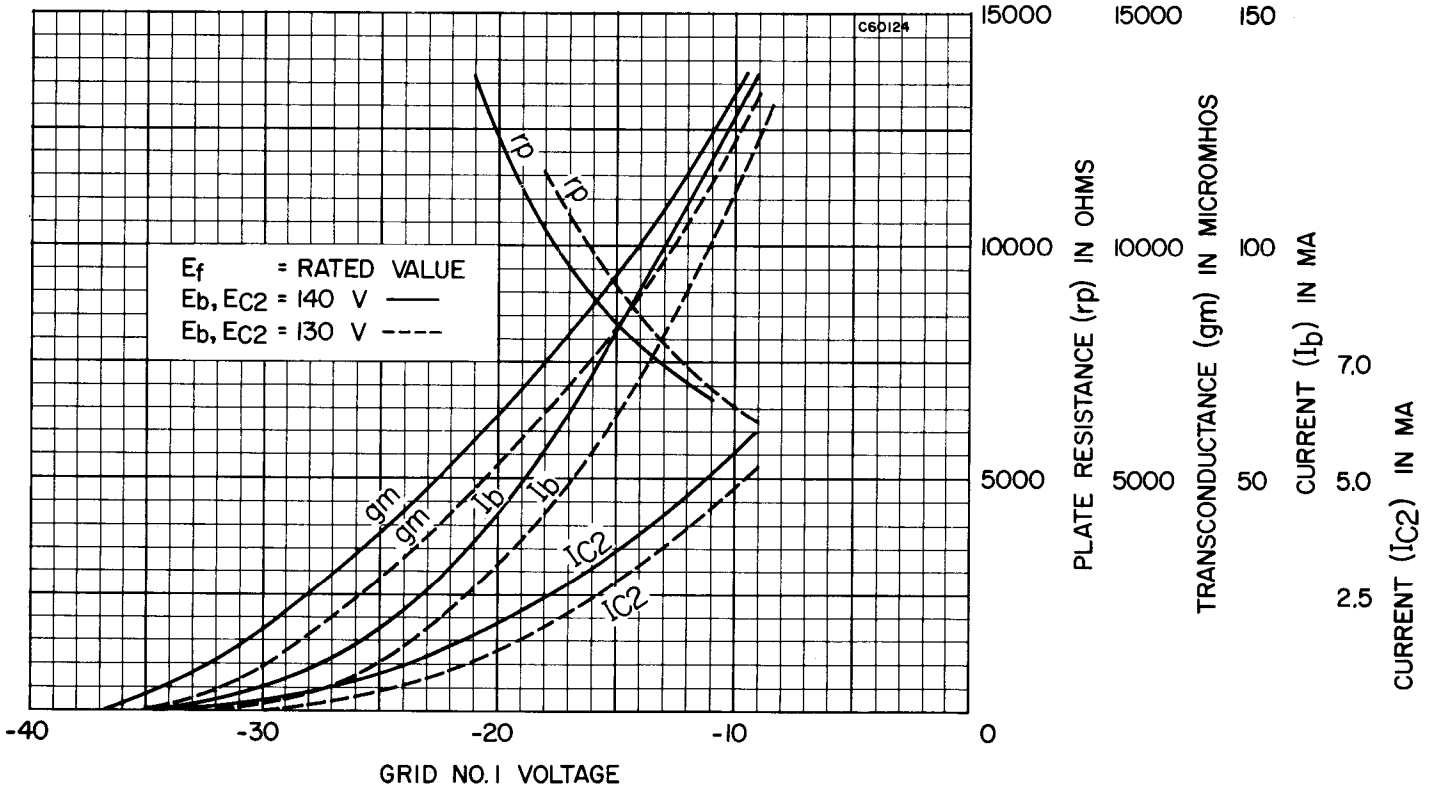
AVERAGE PLATE CHARACTERISTICS



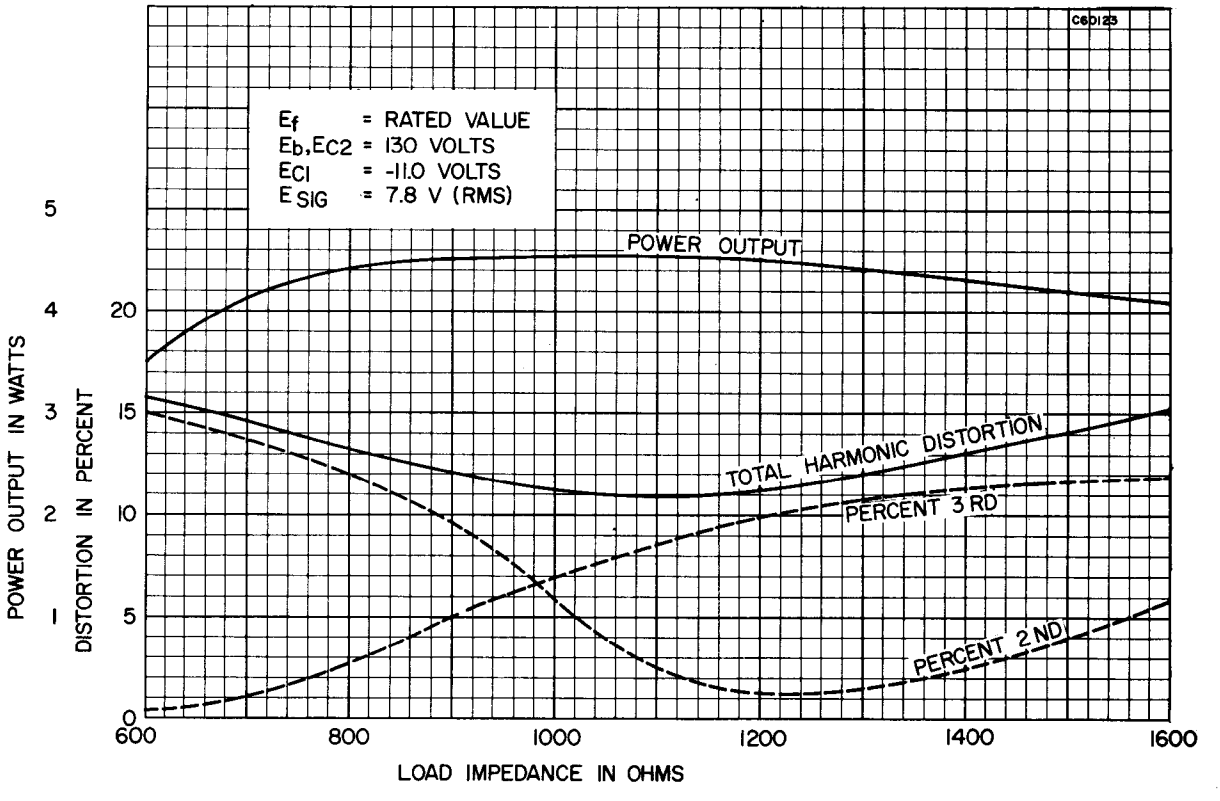
AVERAGE TRANSFER CHARACTERISTICS



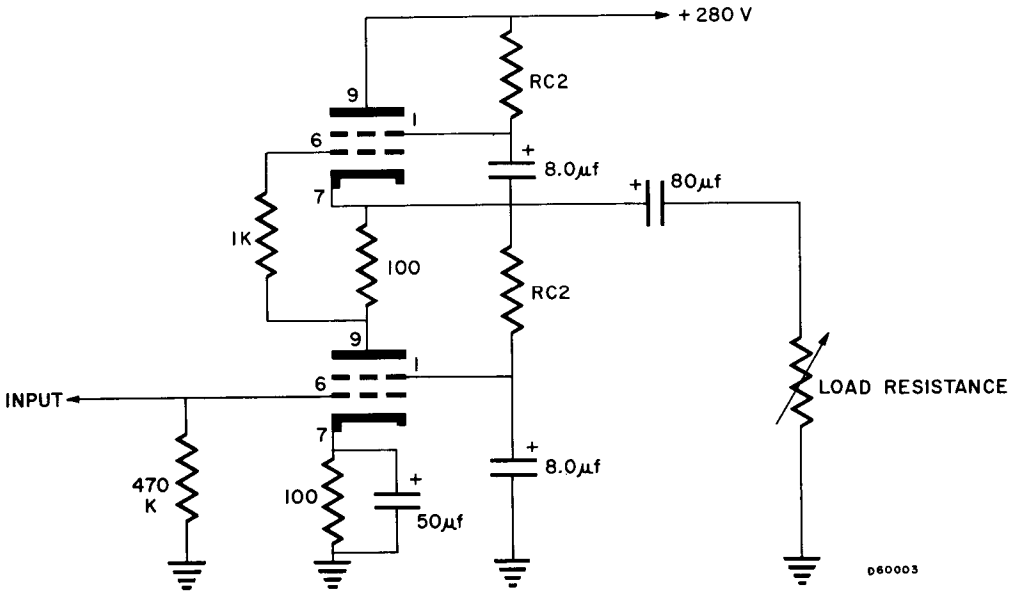
AVERAGE TRANSFER CHARACTERISTICS



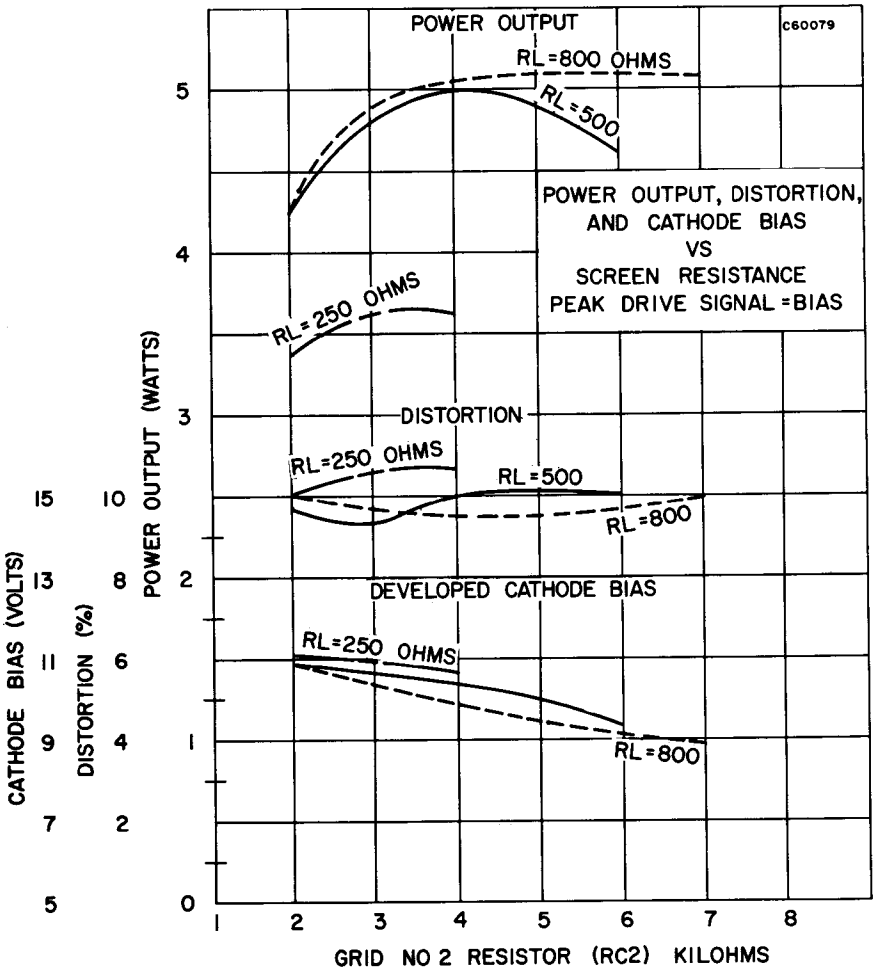
AVERAGE OPERATION CHARACTERISTICS
(Class A1 Amplifier)



SINGLE ENDED PUSH-PULL CIRCUIT
(Transformerless)



SINGLE ENDED PUSH-PULL
(Transformerless Operation (See Circuit))



MECHANICAL DATA

Bulb	T-5½
Base	E7-1, Miniature Button 7-Pin
Outline	5-1
Basing	7DK
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Characteristics		
Heater Voltage[1]	6.3 Volts	
Heater Current[2]	225 Ma	
Ratings (Design Maximum Values)		
Heater Voltage[3]	6.3 ± 0.6 Volts	
Maximum Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
Total DC and Peak	200 Volts	Max.
Heater Positive with Respect to Cathode		
DC	100 Volts	Max.
Total DC and Peak	200 Volts	Max.

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[4]

Grid to Plate	1.7 μμf
Input: g to (h+k)	3.0 μμf
Output: p to (h+k)	1.8 μμf
Heater to Cathode	3.0 μμf

RATINGS (Design Maximum Values)
Continuous Class C Service at 175 mc.

Plate Voltage	330 Volts	Max.
Plate Dissipation	5.0 Watts	Max.
Plate Input	7.5 Watts	Max.
Cathode Current[5]	40 mAdc	Max.
Grid Current[5]	10 mAdc	Max.
Negative Grid Voltage	50 Volts	Max.
Grid Circuit Resistance		
Fixed Bias	0.1 Megohm	Max.
Cathode Bias	0.5 Megohm	Max.

CHARACTERISTICS AND TYPICAL OPERATION

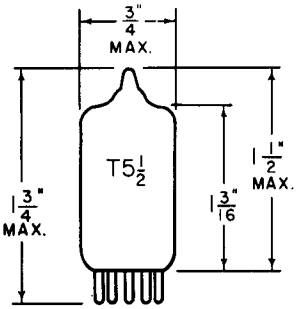
Plate Voltage	200 Volts
Grid Voltage	0 Volts
Cathode Bias Resistor	100 Ohms
Plate Current	12 Ma
Transconductance	9500 μmhos
Amplification Factor	80
Ec for Ib = 20 μAdc (Approx.)	−6.5 Volts

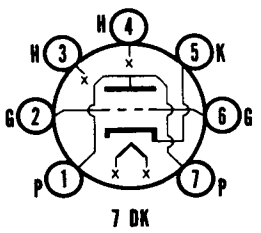
NOTES:

1. *For parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater voltage.*
2. *The bogey value of current is obtained when operating the heater at the specified 6.3 volts.*
3. *Heater voltage supply variations shall be restricted to maintain heater voltage within the specified tolerance.*
4. *Shield No. 316.*
5. *In Sonobouy or other battery applications where considerations of long life are secondary to those of power output, the maximum ratings for cathode current and grid current may be taken as 50 mAdc and 15 mAdc respectively.*

QUICK REFERENCE DATA

The Sylvania Type 7738 is a miniature high mu triode designed for Continuous Class C Amplifier Service in the 200 megacycle range.





7 DK

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AUGUST, 1960

File Under
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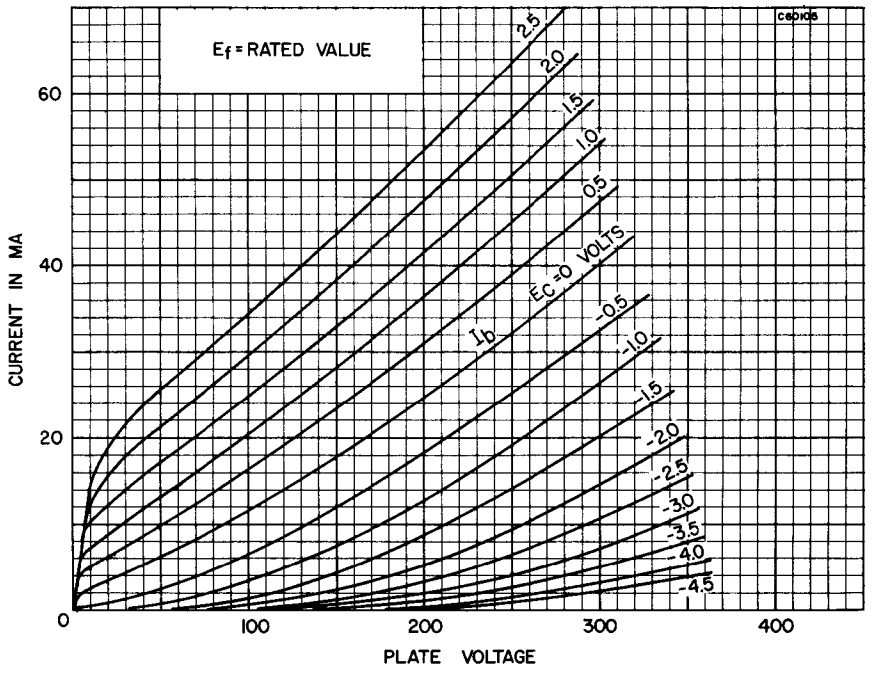
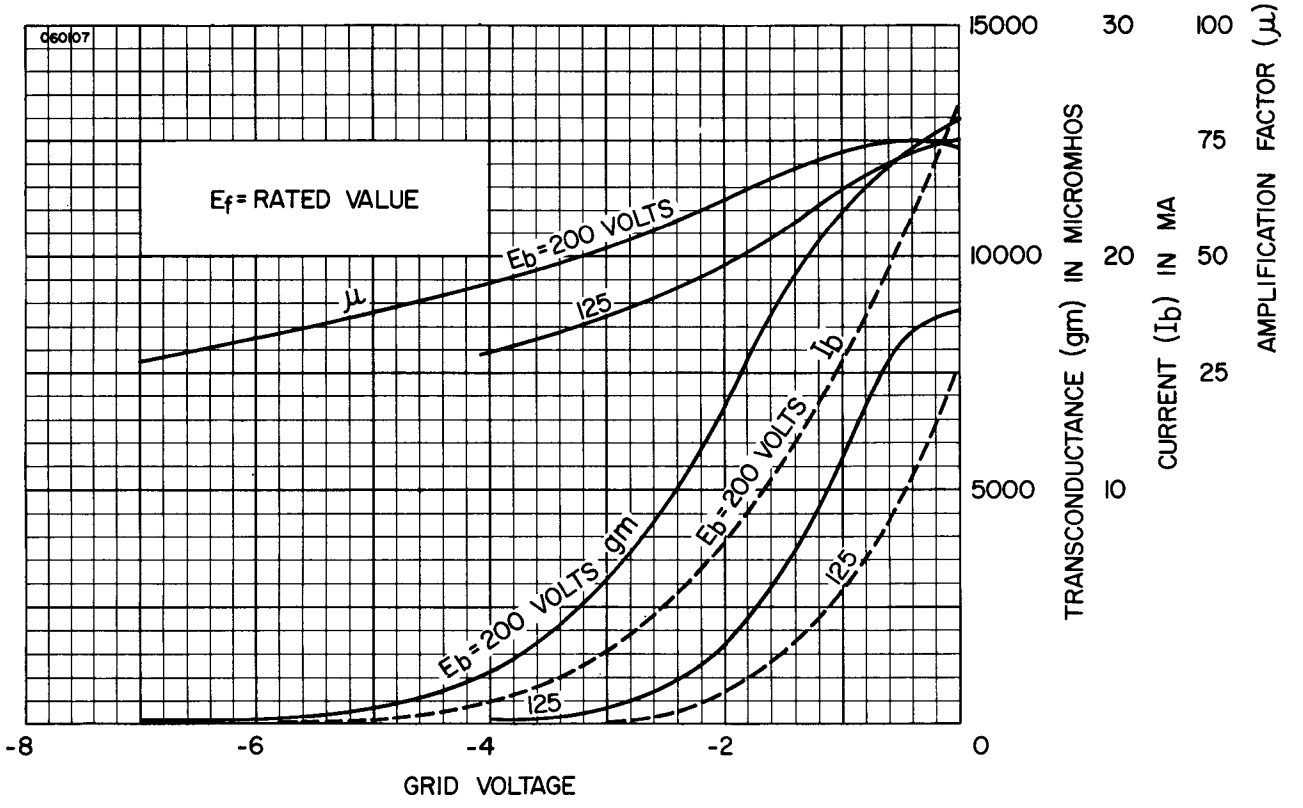
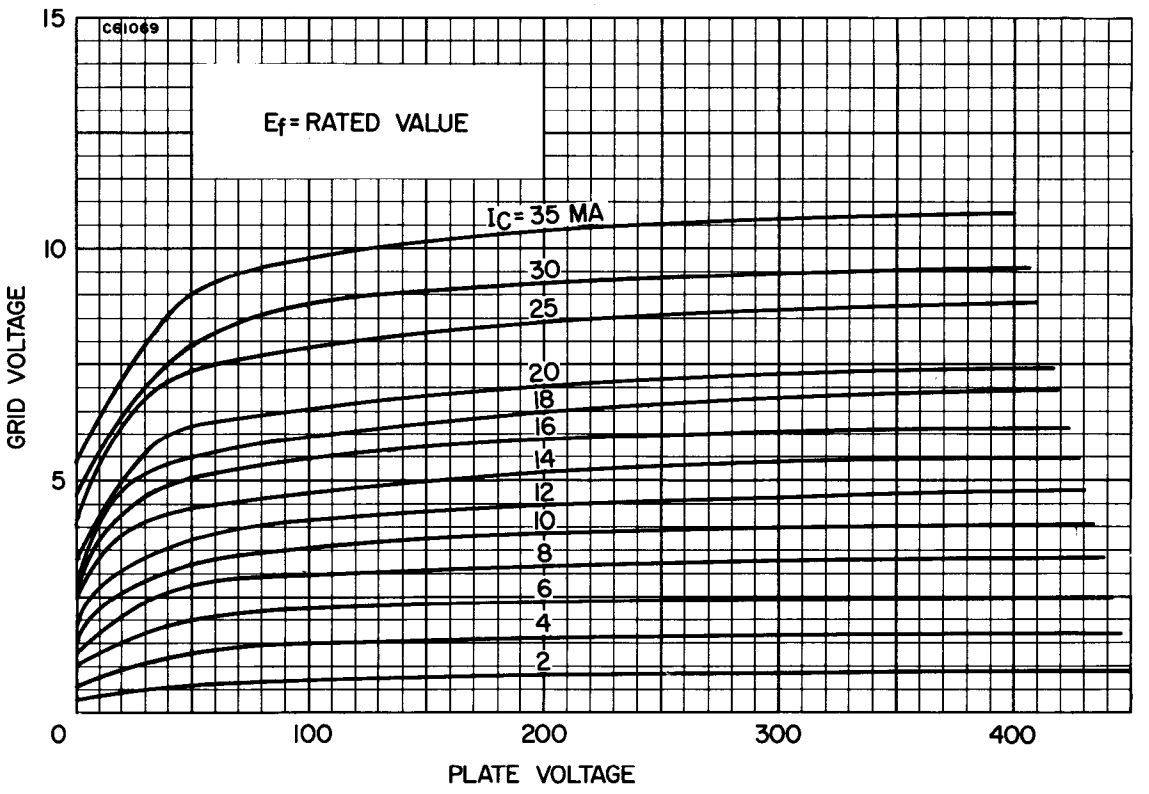
AVERAGE PLATE CHARACTERISTICS



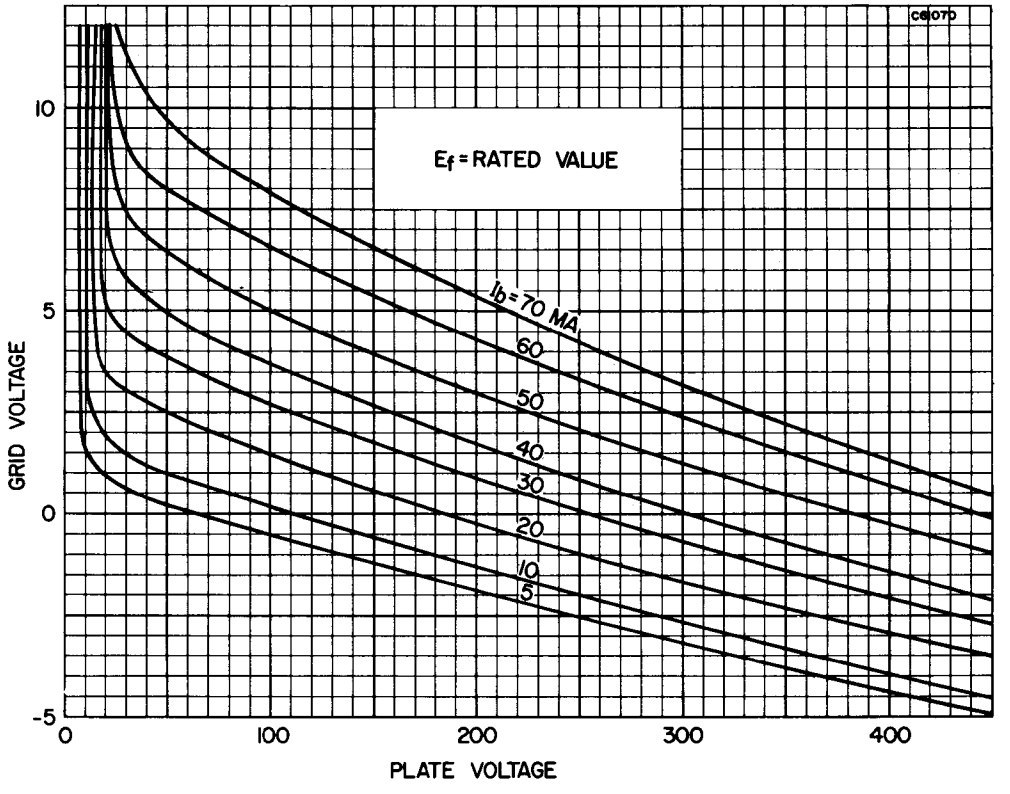
AVERAGE TRANSFER CHARACTERISTICS

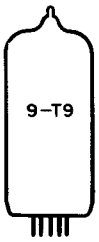


AVERAGE GRID CHARACTERISTICS



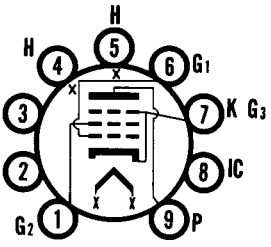
CONSTANT CURRENT CHARACTERISTICS





SYLVANIA TYPES 7754 7695

BEAM POWER AMPLIFIER



9MQ

The 9-T9 design utilizes a T-9 (1⅛" Dia.) bulb based to fit a standard 9-pin miniature socket. Advantages of the 9-T9 include an increase in the heat dissipation safety margin, as compared to 9-pin miniature tubes employing T-6½ (15/16" Dia.) bulbs.

MECHANICAL DATA

Bulb	Special, T-9
Base	9-Pin, Same as E9-1, except Bulb Diameter
Outline	See Drawing
Basing	9MQ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS	**7754**	**7695**
Heater Voltage	6.3	50 Volts
Heater Current[1]	1200	150 Ma
Maximum Heater Current Range[2]		140-160 Ma
Heater-Cathode Voltage (Design Maximum Values)		
Heater Negative with Respect to Cathode		
Total D C and Peak		200 Volts Max.
Heater Positive with Respect to Cathode		
D C		100 Volts Max.
Total D C and Peak		200 Volts Max.

DIRECT INTERELECTRODE CAPACITANCES (approx.)	
Grid No. 1 to Plate	0.75 μμf
Input: g1 to (h+k, g3+g2)	14 μμf
Output: p to (h+k, g3+g2)	9 μμf

RATINGS (Design Maximum Values)	
Plate Voltage	150 Volts Max.
Grid No. 2 Voltage	150 Volts Max.
Plate Dissipation	16 Watts Max.
Grid No. 2 Dissipation	2.5 Watts Max.
Grid No. 1 Circuit Resistance	
Fixed Bias	0.1 Megohm Max.
Cathode Bias	0.5 Megohm Max.

CHARACTERISTICS AND TYPICAL OPERATION

	Class AB1 Push-Pull		**Class A1 Single Tube**	
Plate Voltage	130	140	130	140 Volts
Grid No. 2 Voltage	130	140	130	140 Volts
Grid No. 1 Voltage	−12	—	−11	— Volts
Cathode Resistor	—	50	—	100 Ohms
Peak AF Grid No. 1 Voltage	11.3	11.3	11	11.3 Volts
Zero Sig. Plate Current	195	210	100	100 Ma
Max. Sig. Plate Current	220	210	108	100 Ma
Zero Sig. Grid No. 2 Current	9	9	5	5 Ma
Max. Sig. Grid No. 2 Current	24	20	15	14 Ma
Transconductance	—	—	11,000	— μmhos
Plate Resistance (approx.)	—	—	7000	— Ohms
Load Resistance	—	—	1100	1100 Ohms
Load Resistance (P1 to P1)	1800	1500	—	—
Max. Signal Power Output	10	10	4.5	4.5 Watts
Total Harmonic Distortion	6	4	11	11 Percent

SINGLE ENDED PUSH-PULL, CLASS A
TRANSFORMERLESS OPERATION (See Circuit and Curve)

Supply Voltage	280 Volts
Plate Load Resistance	500 Ohms
Grid No. 2 Resistors (Rc2)	4000 Ohms
Peak AF Grid No. 1 Voltage	10.5 Volts
Power Output	5 Watts
Distortion	10 Percent

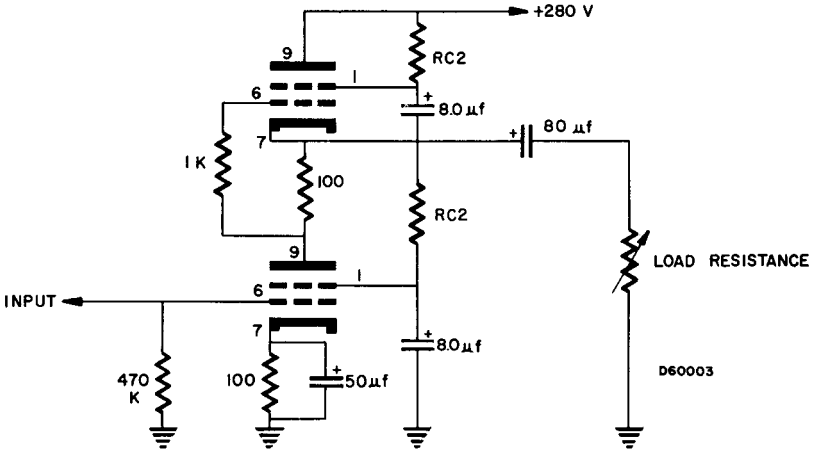
NOTES:

1. For series heater operation, equipment should be so designed so that at normal supply voltage bogey tubes will operate at this value of heater current.
2. Design Maximum Values.

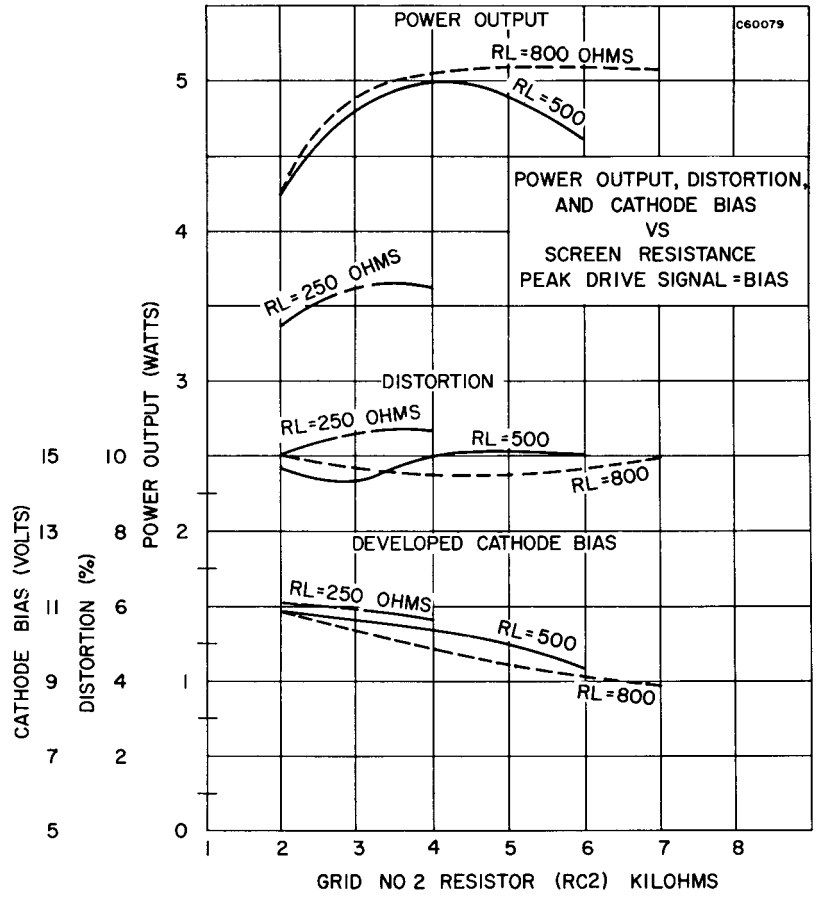
APPLICATION

The Sylvania Type 7695, beam power pentode, features remarkably high power sensitivity as an audio power amplifier. In Class A1 operation, it can deliver 4.5 watts of power with a B+ voltage of only 130 volts. As a result, the 7695 -7754 makes possible economies in power supply requirements.

Single Ended Push Pull Circuit



Single-Ended, Push-Pull, TRANSFORMERLESS OPERATION (See Circuit)



ADVANCE DATA

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-1
Basing	8DG
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature (per JEDEC JO-H1)	220°	C	
Altitude[2]	80000	Ft.	
Radiation			
Total Dosage ($\int$ neutrons/sq. cm/sec.)	10^{16}	nvt	
Dose Rate (neutrons/sq. cm/sec.)	10^{12}	nv	
DURABILITY CHARACTERISTICS[4]			
Impact Acceleration (3/4 msec Duration)[5]	750	G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[6]	2.5	G	Max.
On-Off Heater Cycles[7]	2000		Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	26.5	V	
Heater Current	90	mA	

DIRECT INTERELECTRODE CAPACITANCES

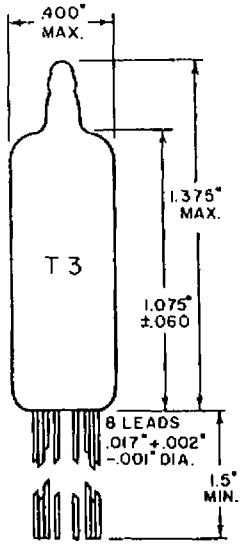
	Shielded[8]	Unshielded		
Grid to Plate (Each Section)	1.4	1.5	µµf	
Input (Each Section)	2.2	2.0	µµf	
Output				
Section No. 1	1.3	0.28	µµf	
Section No. 2	1.3	0.33	µµf	
Grid to Grid	0.013	0.015	µµf	Max.
Plate to Plate	0.30	0.45	µµf	Max.

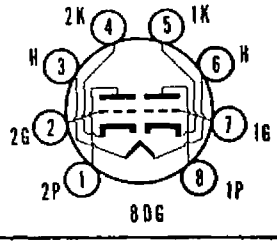
CONTROLLED DETRIMENTS

Interelectrode Insulation[9]	100	Meg.	Min.
Total Grid Current[10]	-0.3	µAdc	Max.
Grid Emission[11]	-0.5	µAdc	Max.
Vibration Output[12] as equivalent Ec1	2.5	mVac	Max.
Heater-Cathode Leakage[13]	5.0	µAdc	Max.

QUICK REFERENCE DATA

The Premium Subminiature Type 7759 is a general purpose, medium mu, double triode having separate cathode connections for each section. It is particularly useful in oscillator and amplifier applications where power requirements permit the use of two tubes in one envelope. The 7759 is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability.





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EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

July 6, 1960

146 (10-58)

from JEDEC release #2908, Aug. 1, 1960

RATINGS[1] (Absolute Maximum)

Heater Voltage[3]	26.5 (±10%)	V
Plate Voltage	165	Vdc
Peak Plate Forward Voltage[4]	330	v
Plate Dissipation (Each Section)	1.1	W
Plate Current (Each Section)	22	mAdc
DC Grid Voltage		
Positive Value	0	Vdc
Negative Value	55	Vdc
Grid Current	5.5	mAdc
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	200	v
Heater Negative with Respect to Cathode	200	v
Grid Circuit Resistance	1.1	Meg

CHARACTERISTICS (Each Section)

Plate Voltage	100	Vdc
Cathode Resistor	150	Ohms
Plate Current	6.5	mAdc
Transconductance	5400	μmhos
Amplification Factor	35	
Grid Voltage for Ib = 100 μAdc	-6.5	Vdc

NOTES:

1. Limitations beyond which normal tube performance and tube life may be impaired.
2. If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.
3. Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 26.5 volts.
4. Tests performed as a measure of the mechanical durability of the tube structure.
5. Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = 3/4 milliseconds.
6. Vibrational forces applied in any direction for a period of 96 hours.
7. One cycle consists of the application of Ef = 29.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.
8. External shield No. 318 connected to cathode.
9. Measure each section separately with Ef = 26.5 V; Eg-all = -100 Vdc; Ep-all = -300 Vdc; Cathode is positive so that no cathode emission occurs.

NOTES: (Cont'd)

10. Measure each section separately with Ef = 26.5 V; Eb = 150 Vdc; Rk = 300 ohms.

11. Each section preheated for five minutes with Ef = 31.5 V; Eb = 150 Vdc; Rk = 500 ohms; Rg = 1.0 Meg; then each section tested separately with Ef = 31.5 V; Eb = 150 Vdc; Ec1 = -7.5 Vdc; Rg = 1.0 Meg.

12. Test each section separately with Ef = 26.5 V; Eb = 100 Vdc; Rk = 150 ohms; CK = 1000 μf; Rp = 10,000 ohms; F = 40 cps; Acc = 15 g.

13. Measure each section separately with Ef = 26.5 V; Ehk = ± 100 Vdc.

14. Per MIL-E-1 Par. 6.5 and General Section of this Manual titled Specifications and Ratings.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-1
Basing	8DG
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature (per JEDEC JO-H1)	220°	C	
Altitude[2]	80,000	Ft.	
Radiation			
Total Dosage ($\int$ neutrons/sq. cm/sec.)	10^{16}	nvt	
Dose Rate (neutrons/sq. cm/sec.)	10^{12}	nv	

DURABILITY CHARACTERISTICS[4]

Impact Acceleration (3/4 msec Duration)[5]	750	G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[6]	2.5	G	Max.
On-Off Heater Cycles[7]	2,000		Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	26.5	V
Heater Current	90	mA

DIRECT INTERELECTRODE CAPACITANCES

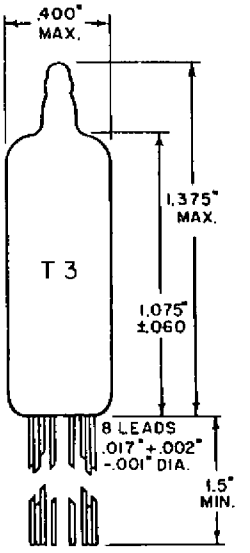
	Shielded[8]	Unshielded		
Grid to Plate (Each Section)	1.8	1.8	µµf	
Input (Each Section)	2.5	2.2	µµf	
Output				
Section No. 1	1.3	0.34	µµf	
Section No. 2	1.3	0.36	µµf	
Grid to Grid	0.013	0.015	µµf	Max.
Plate to Plate	0.30	0.45	µµf	Max.

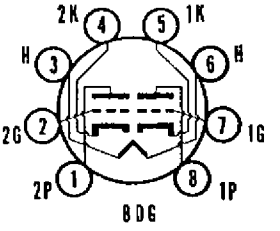
CONTROLLED DETRIMENTS

Interelectrode Insulation[9]	100	Meg	Min.
Total Grid Current[10]	-0.4	µAdc	Max.
Grid Emission[11]	-0.5	µAdc	Max.
Vibration Output[12] as equivalent Ecl	5.0	mVac	Max.
Heater-Cathode Leakage[13]	5	µAdc	Max.

QUICK REFERENCE DATA

The Premium Subminiature Type 7760 is a general purpose, medium mu, double triode having separate cathode connections for each section. It is particularly useful in oscillator and amplifier applications where power requirements permit the use of two tubes in one envelope.
The 7760 is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability.





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Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
July 6, 1960

146 (10-58)

from JEDEC release #2908, Aug. 1, 1960

RATINGS[1] (Absolute Maximum)

Heater Voltage[3]	26.5 (±10%)	V
Plate Voltage	55	Vdc
Plate Current (Each Section)	22	mAdc
Grid Current (Each Section)	8.5	mAdc
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	100	v
Heater Negative with Respect to Cathode	100	v

CHARACTERISTICS (Each Section)

Plate Voltage	26.5	Vdc
Grid Resistor	2.2	Megohms
Plate Current	3.0	mAdc
Transconductance	5000	μmhos
Amplification Factor	20	
Grid Voltage for Ib = 50 μAdc	-3.5	Vdc

NOTES:

1. Limitations beyond which normal tube performance and tube life may be impaired.

2. If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.

3. Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 26.5 volts.

4. Tests performed as a measure of the mechanical durability of the tube structure.

5. Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock Duration = 3/4 milliseconds.

6. Vibrational forces applied in any direction for a period of 96 hours.

7. One cycle consists of the application of Ef = 29.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.

8. External shield No. 318 connected to cathode.

9. Measure each section separately with Ef = 26.5 V; Eg-all = -100 Vdc; Ep-all = -100 Vdc; Cathode is positive so that no cathode emission occurs.

10. Measure each section separately with Ef = 26.5 V; Eb = 50 Vdc; Ec = -1.5 Vdc.

11. Preheat each section separately for five minutes with Ef = 31.5 V; Eb = 26.5 Vdc; Rg = 2.2 Meg; then test each section separately with Ef = 31.5 V; Eb = 26.5 Vdc; Ec = 3.5 Vdc; Rg = 0.1 Meg.

12. Test each section separately with Ef = 26.5 V; Eb = 26.5 Vdc; Rg = 2.2 Megs; Cgl = 1 μf; Rp = 10,000 ohms; F = 40 cps; Acc = 15 g.

13. Measured with Ef = 26.5 V; Ehk = ± 100 Vdc; each section separately.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-3
Basing	8DL
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature (per JEDEC JO-H1)	220°	C	
Altitude[2]	80,000	Ft.	
Radiation			
Total Dosage ($\int$ neutrons/sq. cm/sec.)	10^{16}	nvt	
Dose Rate (neutrons/sq. cm/sec.)	10^{12}	nv	
DURABILITY CHARACTERISTICS[4]			
Impact Acceleration (3/4 msec Duration)[5]	450	G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[6]	2.5	G	Max.
On-Off Heater Cycles[7]	2000		Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	26.5	V	
Heater Current	110	mA	

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[8]	Unshielded		
Grid No. 1 to Plate	0.18	0.20	μμf	Max.
Input	8.50	8.00	μμf	
Output	8.00	4.60	μμf	

CONTROLLED DETRIMENTS

Interelectrode Insulation[9]	100	Meg	Min.
Total Grid Current[10]	-1.0	μAdc	Max.
Grid Emission[11]	-2.0	μAdc	Max.
Vibration Output[12] as equivalent Ec1)	2.4	mVac	Max.
Heater-Cathode Leakage[13]	25	μAdc	Max.

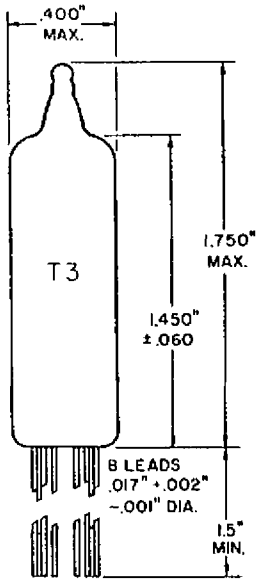
RATINGS[1] (Absolute Maximum)

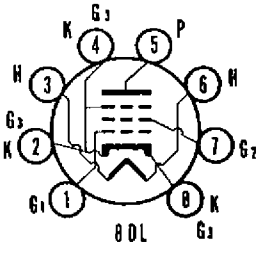
Heater Voltage[3]	26.5 (±10%)	V	
Plate Voltage	165	Vdc	
Peak Plate Forward Voltage[14]	330	v	
Grid No. 2 Voltage	155	Vdc	

from JEDEC release #2908, Aug. 1, 1960

QUICK REFERENCE DATA

The Premium Subminiature Type 7761 is a high gm video pentode intended for operation under conditions of severe shock, vibration, high temperature and high altitude.
The Sylvania Type 7761 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





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July 6, 1960

RATINGS[1] (Absolute Maximum) (Cont'd)

Plate Dissipation	4.0	W
Grid No. 2 Dissipation	1.0	W
Cathode Current	40	mAdc
Grid No. 1 Voltage		
Positive Value	0	Vdc
Negative Value	55	Vdc
Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200	v
Heater Positive with Respect to Cathode	200	v
Grid No. 1 Circuit Resistance		
Self Bias	500,000	Ohms
Fixed Bias	100,000	Ohms

CHARACTERISTICS

Plate Voltage	150	Vdc
Grid No. 2 Voltage	100	Vdc
Cathode Resistor	100	Ohms
Plate Current	21	mAdc
Grid No. 2 Current	4.0	mAdc
Transconductance	9000	μmhos
Plate Resistance	50,000	Ohms
Grid No. 1 Voltage for Ib = 75 μAdc	-14	Vdc

NOTES:

1. Limitations beyond which normal tube performance and tube life may be impaired.

2. If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.

3. Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 26.5 volts.

4. Tests performed as a measure of the mechanical durability of the tube structure.

5. Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock Duration = 3/4 milliseconds.

6. Vibrational forces applied in any direction for a period of 96 hours.

7. One cycle consists of the application of Ef = 29.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.

8. External shield No. 318 connected to cathode.

9. Measured with Ef = 26.5 V; Egl-all = -100 Vdc; Ep-all = -300 Vdc; Cathode is positive so no cathode emission occurs.

NOTES: (Cont'd)

10. Measured with Ef = 26.5 V; Eb = 150 Vdc; Ec2 = 100 Vdc; Rk = 100 ohms.

11. Preheated for five minutes with Ef = 31.5 V; Eb = 150 Vdc; Ec2 = 100 Vdc; Rk = 100 ohms; Rg1 = 1.0 Meg then tested with Ef = 31.5 V; Eb = 150; Ec2 = 100 Vdc; Ec1 = -14 Vdc; Rg1 = 1.0 Meg.

12. Test with Ef = 26.5 V; Eb = 150 Vdc; Ec2 = 100 Vdc; Rk = 100 ohms; CK = 1000 μf; Rp = 2000 ohms; F = 40 cps; Acc = 15 g.

13. Measured with Ef = 26.5 V; Ehk = ± 100 Vdc.

14. Per MIL-E-1 Par. 6.5 and General Section of this Manual titled Specifications and Ratings.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-3
Basing	8DL
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature (per JEDEC JO-H1)	220°	C	
Altitude[2]	80000	Ft.	
Radiation			
Total Dosage (∫ neutrons/sq. cm/sec.)	10^{16}	nvt	
Dose Rate (neutrons/sq. cm/sec.)	10^{12}	nv	

DURABILITY CHARACTERISTICS[4]

Impact Acceleration (3/4 msec Duration)[5]	450	G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)	2.5	G	Max.
On-Off Heater Cycles[7]	2000		Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	26.5	V
Heater Current	110	mA

DIRECT INTERELECTRODE CAPACITANCES

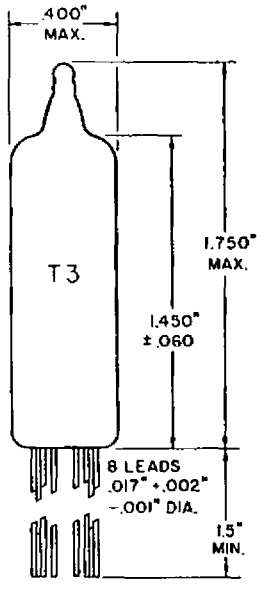
	Shielded[8]	Unshielded	
Grid No. 1 to Plate	0.11	0.15	μμf
Input	6.5	6.5	μμf
Output	7.5	4.5	μμf

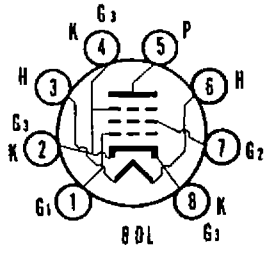
CONTROLLED DETRIMENTS

Interelectrode Insulation[9]	100	Meg	Min.
Total Grid Current[10]	-1.0	μAdc	Max.
Grid Emission[11]	-2.0	μAdc	Max.
Vibration Output[12] as equivalent Ec1	11.5	mVac	Max.
Heater-Cathode Leakage[13]	25	μAdc	Max.

QUICK REFERENCE DATA

The Premium Subminiature Type 7762 is a beam power pentode designed for use as an audio amplifier. It is intended for operation under conditions of severe shock, vibration, high temperature and high altitude. The Sylvania Type 7762 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





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July 6, 1960

146 (10-58)

from JEDEC release #2908, Aug. 1, 1960

RATINGS[1] (Absolute Maximum)

Heater Voltage[3]	26.5 (±10%)	V
Plate Voltage	165	Vdc
Peak Plate Forward Voltage[4]	330	v
Grid No. 2 Voltage	155	Vdc
Plate Dissipation	4.0	W
Grid No. 2 Dissipation	1.0	W
Cathode Current	50	mAdc
DC Grid No. 1 Voltage		
Positive Value	0	Vdc
Negative Value	55	Vdc
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	200	v
Heater Negative with Respect to Cathode	200	v
Grid No. 1 Circuit Resistance		
Self Bias	0.5	Meg
Fixed Bias	0.1	Meg

CHARACTERISTICS

Plate Voltage	110	Vdc
Grid No. 2 Voltage	110	Vdc
Cathode Resistor	270	Ohms
Plate Current	30	mAdc
Grid No. 2 Current	2.2	mAdc
Transconductance	4200	µmhos
Plate Resistance	15000	Ohms
Grid Voltage for Ib = 100 µAdc	-40	Vdc
Power Output at Rl = 3000 ohms; Esig. = 6.4 Vac;	1.0	Watt

NOTES:

1. Limitations beyond which normal tube performance and tube life may be impaired.

2. If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.

3. Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 26.5 volts.

4. Tests performed as a measure of the mechanical durability of the tube structure.

5. Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine or Electronic Devices. Shock duration = 3/4 milliseconds.

6. Vibrational forces applied in any direction for a period of 96 hours.

7. One cycle consists of the application of Ef = 29.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.

NOTES: (Cont'd)

8. External shield No. 318 connected to cathode.

9. Measure with Ef = 26.5 V; Eg-all = -100 Vdc; Ep-all = -300 Vdc; Cathode is positive so that no cathode emission occurs.

10. Measure with Ef = 26.5 V; Eb = Ec2 = 110 Vdc; Rk = 270 ohms.

11. Preheated for five minutes with Ef = 31.5 V; Eb = Ec2 = 100 Vdc; Rk = 220 ohms; Rg1 = 0.5 Meg; then tested with Ef = 31.5 V; Eb = Ec2 = 100 Vdc; Ec1 = -40 Vdc; Rg1 = 0.5 Meg.

12. Test with Ef = 26.5 V; Eb = Ec2 = 110 Vdc; Rk = 270 ohms; Ck = 100 μf; Rp = 2000 ohms; F = 40 cps; Acc = 15 g.

13. Measure with Ef = 26.5 V; Ehk = ± 100 Vdc.

14. Per MIL-E-1 Par. 6.5 and General Section of this Manual titled Specifications and Ratings.

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9AJ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

Heater Operation	Parallel
Heater Voltage[1]	6.3 Volts
Heater Current	365 Ma

Ratings (Design Maximum Values)

	Min-Max
Heater Voltage[2]	5.7 - 6.9 Volts
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Each Section)

	Shielded	Unshielded
Grid to Plate	1.4	1.4 pf
Input: g to (h + k)	3.3	3.3 pf
Output: p to (h + k)	2.5	1.8 pf
Grid to Grid (Max.)	.005	.005 pf
Plate to Plate (Max.)	.015	.045 pf

RATINGS (Design Maximum Values)

Continuous Class C Service at 175 mc[4]

Plate Voltage	200 Volts	Max.
Plate Dissipation (Each Plate)	3.5 Watts	Max.
Plate Dissipation (Both Plates)	7.0 Watts	Max.
Plate Input (Each Plate)	5.5 Watts	Max.
Cathode Current (Each Cathode)	30 mAdc	Max.
Grid Current (Each Grid)	2.5 mAdc	Max.
Negative Grid Voltage	75 Volts	Max.
Grid Circuit Resistance		
Fixed Bias	0.1 Megohm	Max.
Cathode Bias	0.5 Megohm	Max.

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

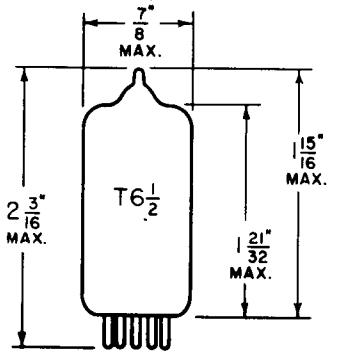
Plate Voltage	90 Volts
Grid Voltage	−1.3 Volts
Plate Current	15 Ma
Transconductance	12,500 μmhos
Amplification Factor	33

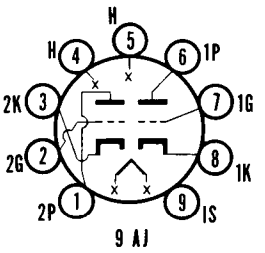
Class-C RF Frequency Multiplier	Doubler to 175 Mc
Plate Voltage	160 Volts
For Grid Voltage	−70 Volts
Use Grid Resistor	33,000 Ohms
Peak RF Grid Voltage	77 Volts
Grid Current	2.5 Ma
Plate Current	26 Ma
Power Output[5] (Approx.)	1.0 Watt

QUICK REFERENCE DATA

The Sylvania Type 7803 is a T-6½ medium mu double triode designed for Continuous Class C Amplifier Service in the 200 megacycle range.

The rating values apply specifically to Sonobouy and other battery applications where considerations of power output are paramount, and considerations of long life are of lesser importance.





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JUNE, 1963

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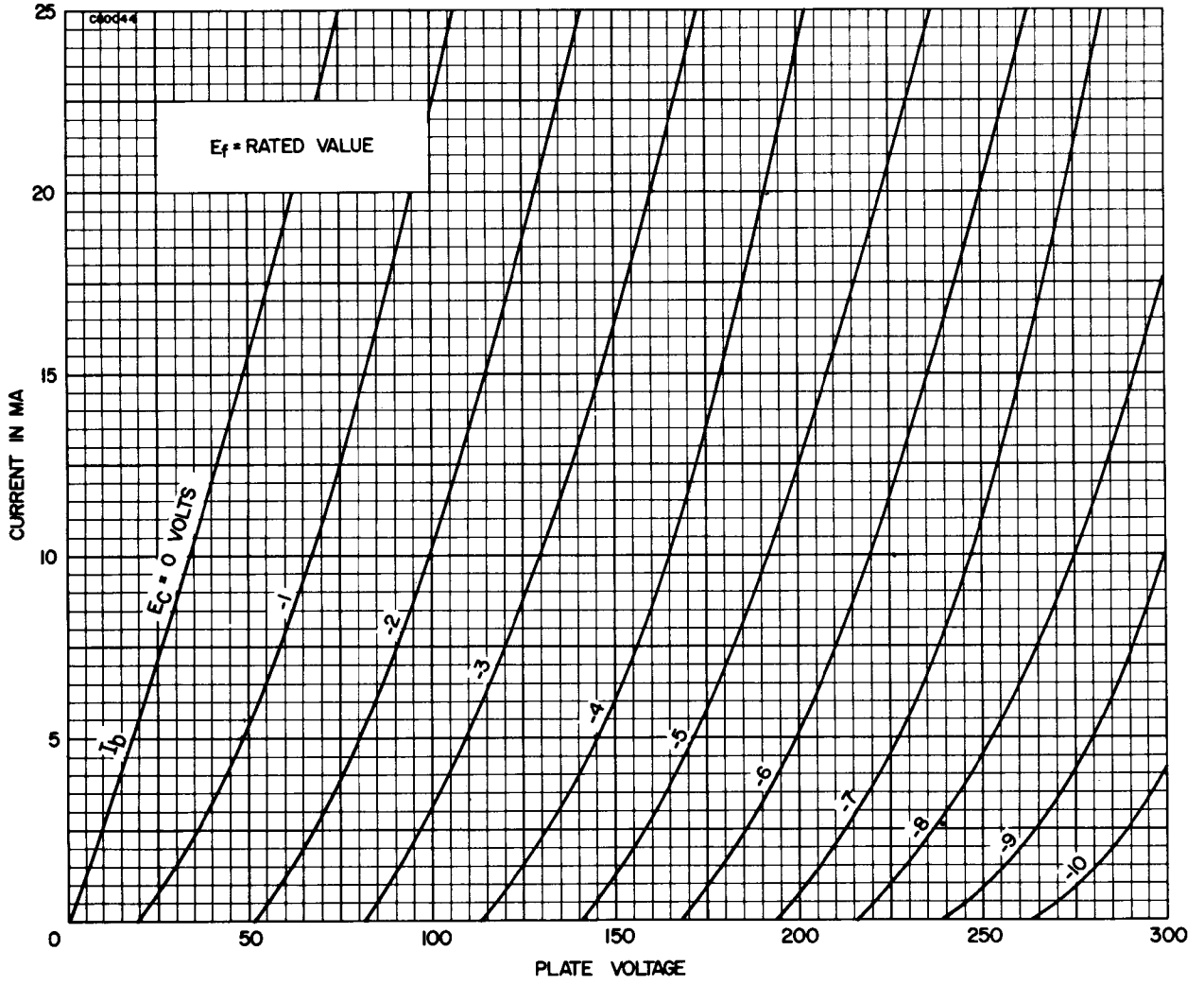
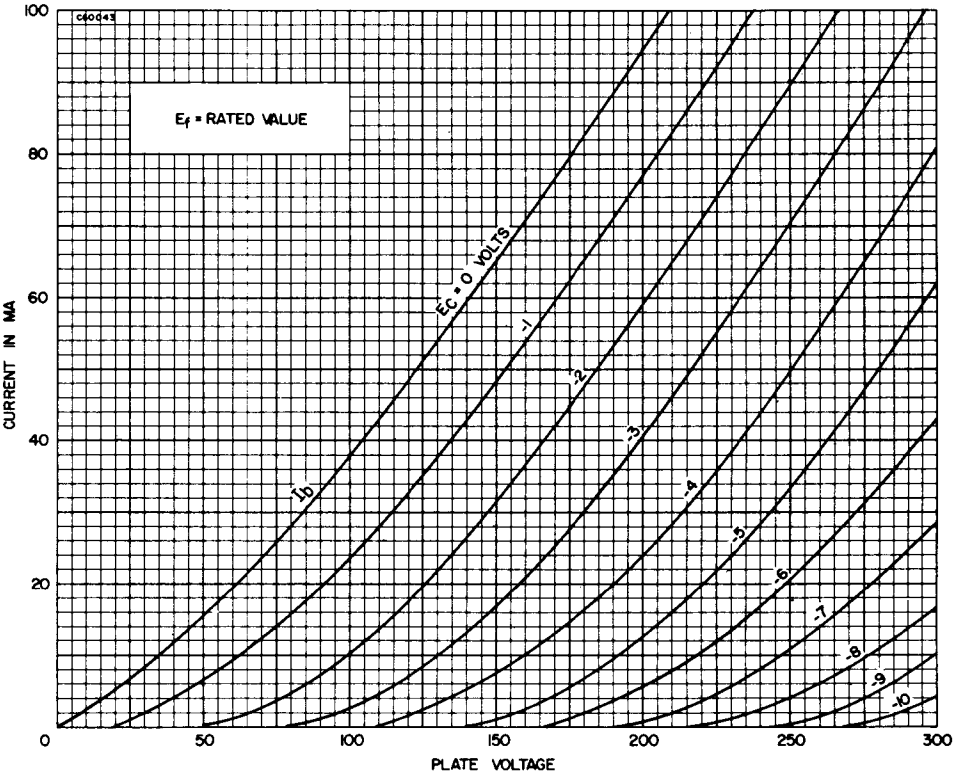
NOTES:

1. *For parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater voltage.*
2. *Heater voltage supply variations shall be restricted to maintain heater voltage within the specified values.*
3. *Shield No. 315.*
4. *The rating values apply specifically to Sonobouy and other battery applications where considerations of power output are paramount, and considerations of long life are of lesser importance.*
5. *These values are for useful power and are measured at the load of the output circuit.*
6. *To insure satisfactory operation in sonobouy applications Type 7803 is subjected to and must successfully pass an impact acceleration test at an acceleration level of 500 G.*

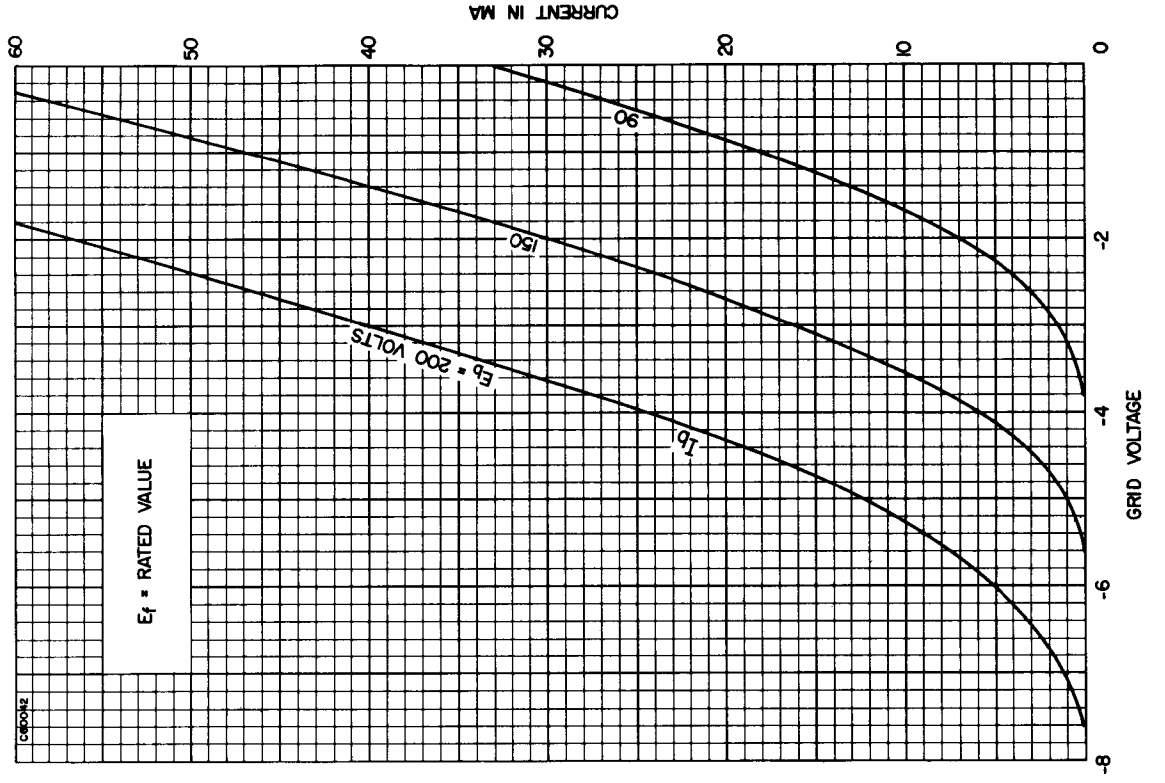
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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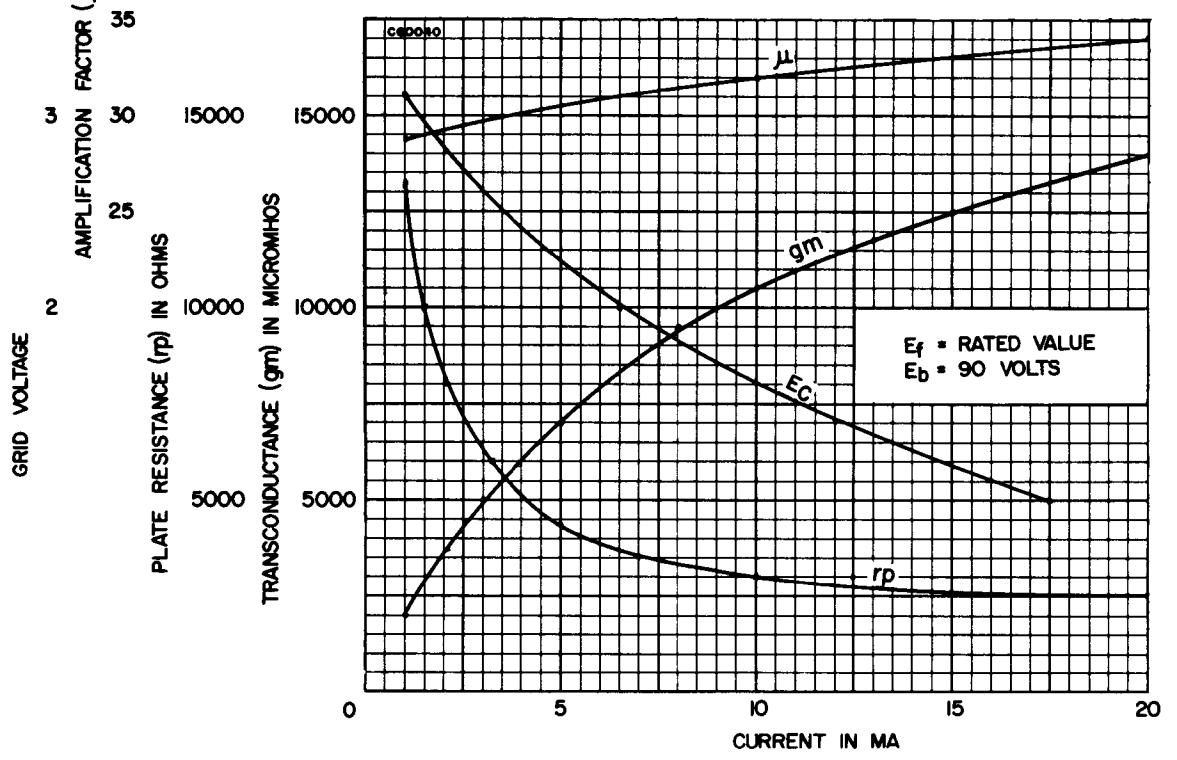
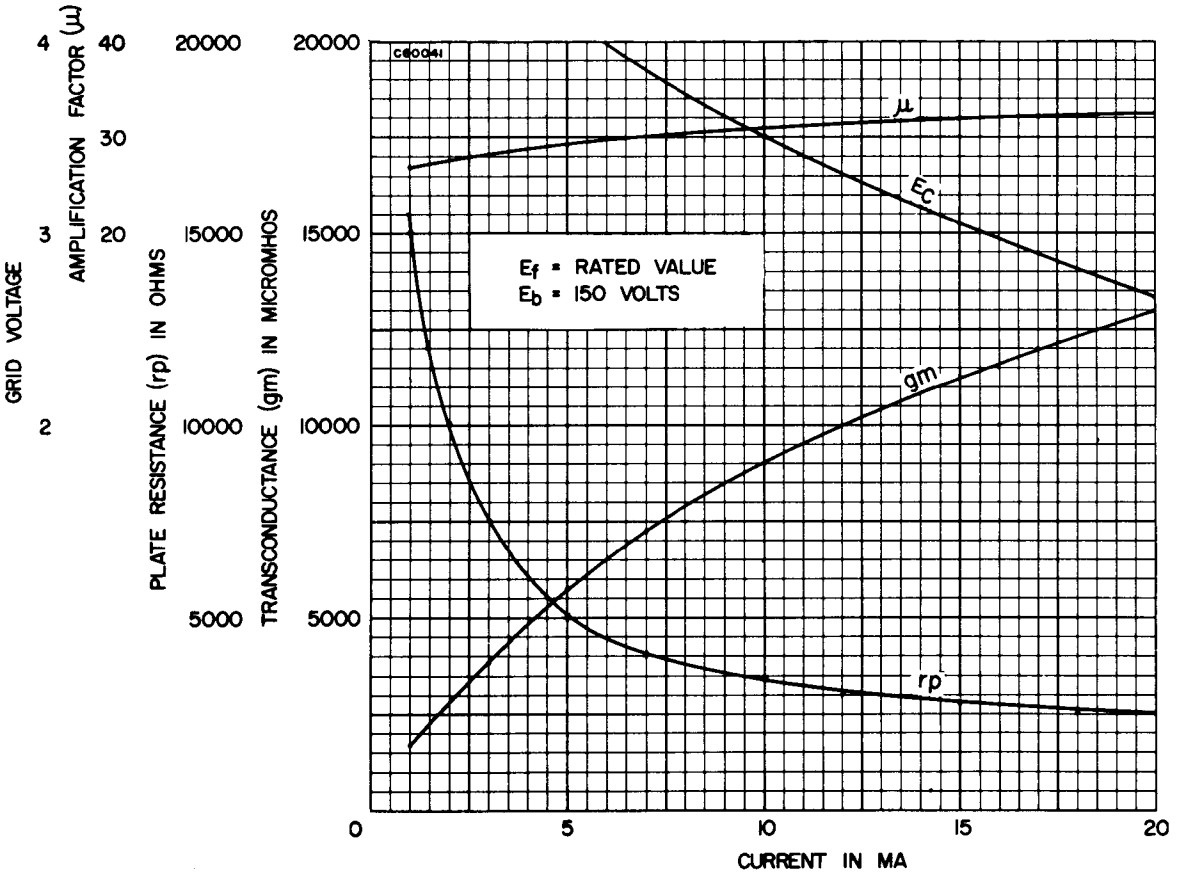
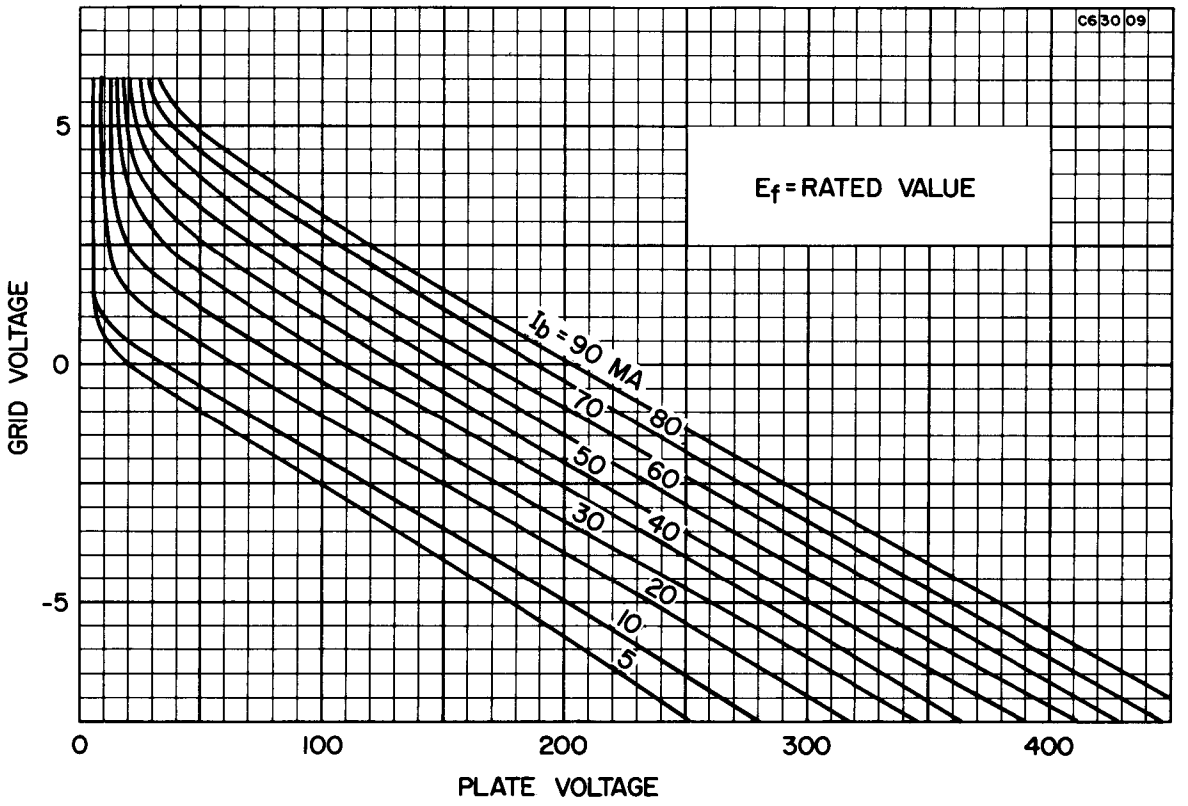


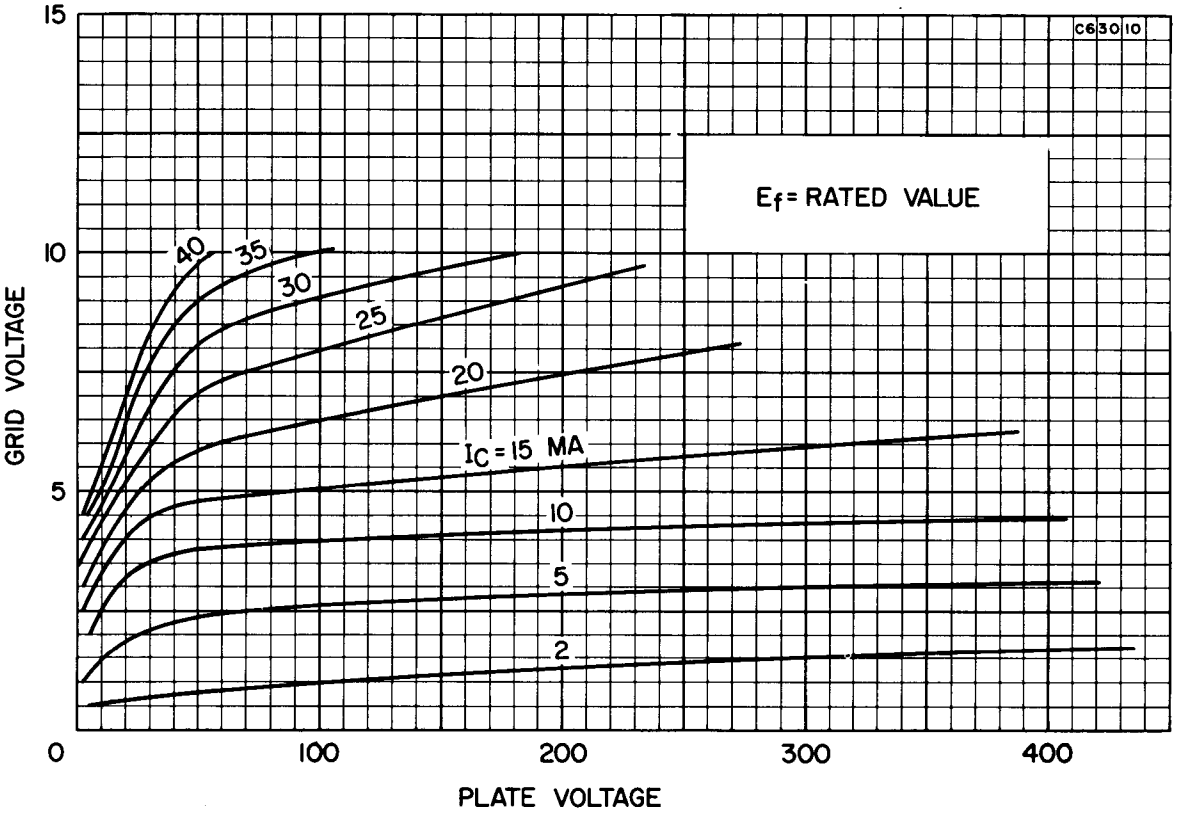
AVERAGE TRANSFER CHARACTERISTICS



CONSTANT PLATE CURRENT CHARACTERISTICS



CONSTANT GRID CURRENT CHARACTERISTICS



MECHANICAL DATA

Bulb	T-9
Base	Small Button Novar 9-Pin E9-75 (B7-233 or B8-142)
Outline	9-85
Basing	9NZ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

Heater Operation	Parallel
Heater Voltage[1]	6.3 Volts
Heater Current	800 Ma

Ratings (Design Maximum Values)[3]

	Min-Max
Heater Voltage[2]	5.7 - 6.9 Volts
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES (Unshielded)

Grid No. 1 to Plate	0.15 pf
Input	11 pf
Output	4.4 pf

RATINGS (Design Maximum Values)[3]

Plate Voltage	550 Volts
Grid No. 2 Voltage	440 Volts
Plate Dissipation	19 Watts
Grid No. 2 Dissipation[4]	3.3 Watts
Cathode Current	90 Ma
Grid No. 1 Circuit Resistance	
Fixed Bias	0.3 Megohms
Self Bias	1.0 Megohms

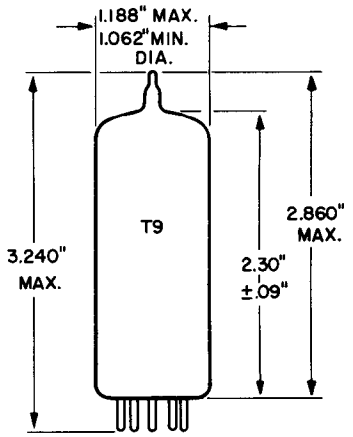
CHARACTERISTICS AND TYPICAL OPERATION

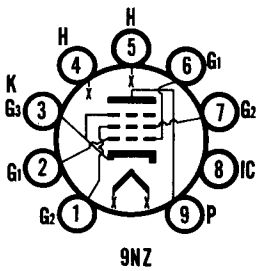
	Pentode Operation S.T.—Class A1 Amp	Ultra-Linear Operation Class AB1—Push-Pull	
Plate Voltage	300	400	425 Volts
Grid No. 2 Voltage	300	Note 5	Note 5
Grid No. 1 Voltage	−10	−20.5	— Volts
Cathode Resistor	—	—	185 Ohms
Peak AF Grid Voltage	10	41	42 Volts
Zero Signal Plate Current	60	60	88 Ma
Max. Signal Plate Current	75	115	100 Ma
Zero Signal Grid No. 2 Current	8	8	12 Ma
Max. Signal Grid No. 2 Current	15	18	16 Ma
Transconductance	10.2K	—	— μmhos
Plate Resistance (Approx.)	29K	—	— Ohms
Load Resistance	3K	—	— Ohms
Load Resistance (PL to PL)	—	6600	6600 Ohms
Power Output	11	23	21 Watts
Total Harmonic Distortion	13	2.5	3.5 Percent

QUICK REFERENCE DATA

The 7868 is a power pentode contained in a T-9 bulb with a 9-pin Novar base. It is designed for output stages in high fidelity audio amplifiers and can furnish relatively high power output, with low distortion.

In Push-Pull Class AB1 applications, two 7868's can deliver a maximum signal power of 44 watts, with 5 % total harmonic distortion.





9NZ

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JUNE, 1963

File Under
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CHARACTERISTICS AND TYPICAL OPERATION (Continued)

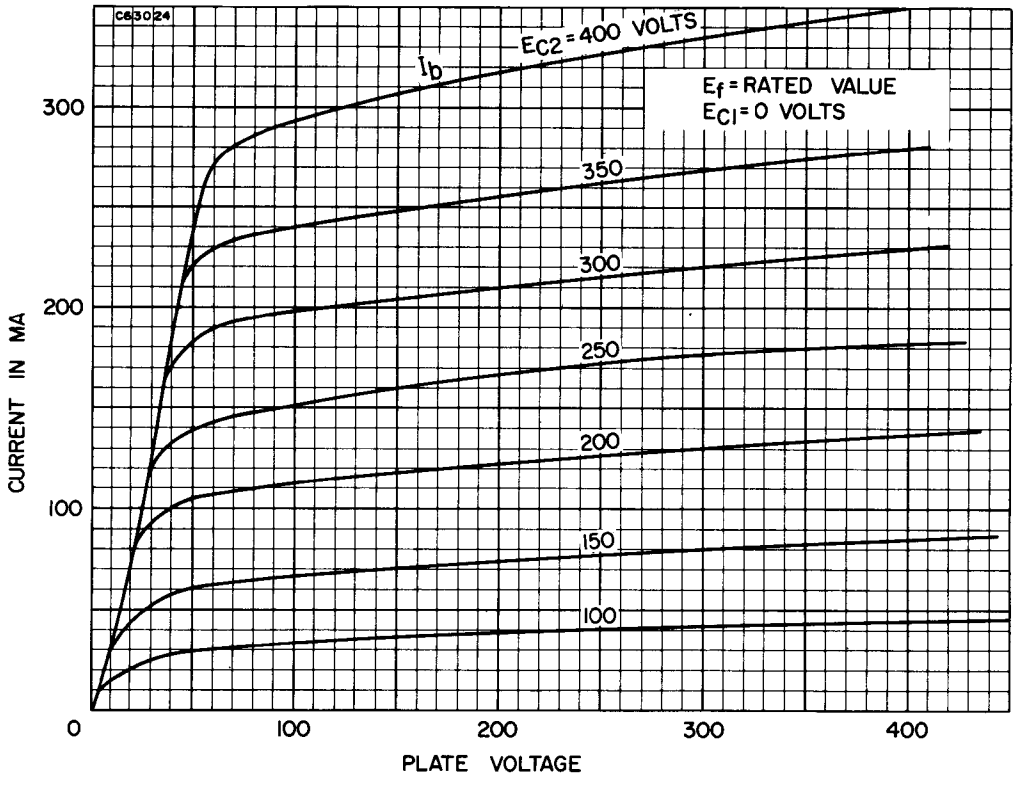
Pentode Operation (Class AB1 Push-Pull Amp.)

Plate Voltage	300	350	400	450	450	450 Volts
Grid No. 2 Voltage	300	350	350	350	400	400 Volts
Grid No. 1 Voltage	−12.5	−15.5	−16	−16.5	−21	— Volts
Cathode Resistor	—	—	—	—	—	170 Ohms
Peak AF Grid to Grid Voltage	25	31	32	33	42	31 Volts
Zero Signal Plate Current	74	72	64	60	40	86 Ma
Max. Signal Plate Current	116	130	135	142	145	94 Ma
Zero Signal Grid No. 2 Current	10	9.5	8	7.2	5	10 Ma
Max. Signal Grid No. 2 Current	28	32	28	26	30	20 Ma
Load Resistance (PL to PL)	6600	6600	6600	6600	6600	10,000 Ohms
Power Output	24	30	34	38	44	28 Watts
Total Harmonic Distortion	5	2.5	2	2.5	5	2 Percent

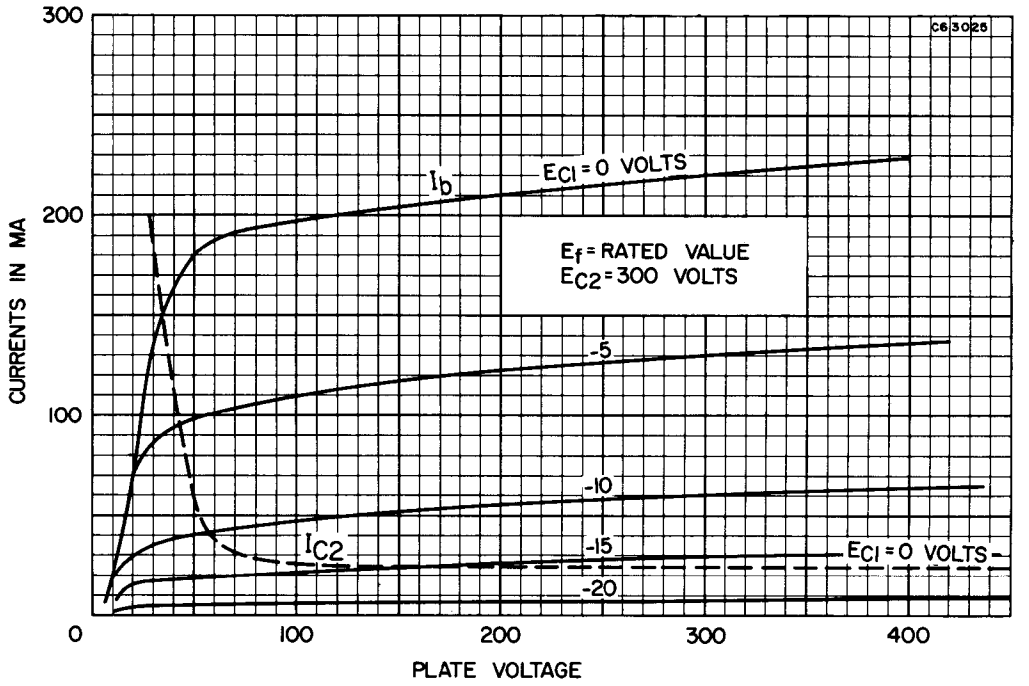
NOTES:

1. *For parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater voltage.*
2. *Heater voltage supply variations shall be restricted to maintain heater voltage within the specified values.*
3. *Design Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogey electron tube of a specified type as defined by its published data and should not be exceeded under the worst probable conditions.*
   The tube manufacturer chooses these values to provide acceptable serviceability of the tube, making allowance for the effects of changes in operating conditions due to variations in the characteristics of the tube under consideration.
   The equipment manufacturer should design so that initially and throughout life no design maximum value for the intended service is exceeded with a bogey tube under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all other electron devices in the equipment.
4. *Grid No. 2 Dissipation may be permitted to reach 6 watts during the periods of maximum input of speech and music signals. For efficient operation of Grid No. 2, the two Grid No. 2 connections, Pins 1 and 7, should be externally tied together.*
5. *Grid No. 2 tapped from the primary winding of output transformer, in a manner to apply 50 % of plate signal to G2 of each tube.*

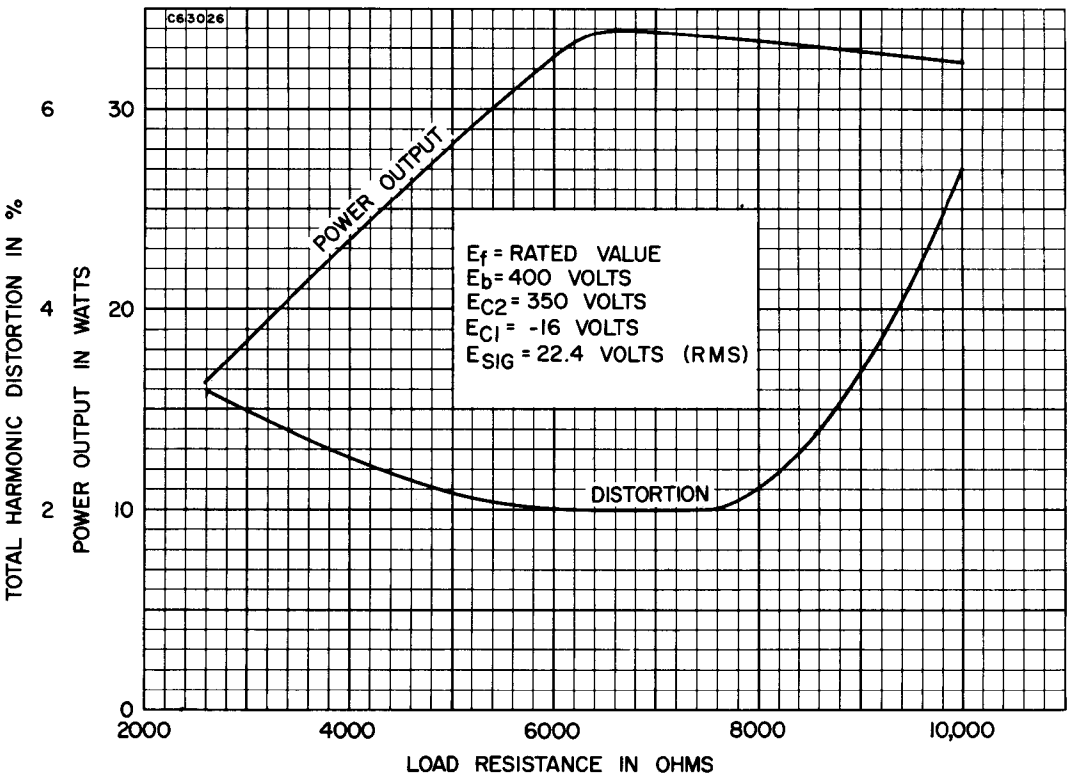
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



POWER OUTPUT AND DISTORTION



ADVANCE DATA

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-1
Basing	8DG
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature (Per JEDEC JO-H1)	220	°C
Altitude	80,000	Ft.
Radiation		
Total Dosage ($\int$ neutrons/sq. sm/sec.)	10^{16}	nvt
Dose Rate (neutrons/sq. cm/sec.)	10^{12}	nv

DURABILITY CHARACTERISTICS[2]

Impact Acceleration (3/4 msec Duration)[3]	750 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[4]	2.5 G	Max.
On-Off Heater Cycles[5]	2000	Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	26.5	V
Heater Current	90	mA

DIRECT INTERELECTRODE CAPACITANCES

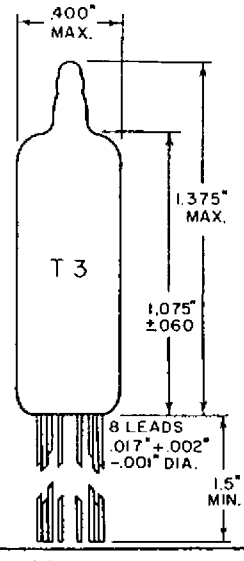
	Shielded[6]	Unshielded	
Grid to Plate (Each Section)	1.4	1.5	µµf
Input (Each Section): g to (h+k)	2.1	1.9	µµf
Output			
Section No. 1: p to (h+k)	1.3	0.28	µµf
Section No. 2: p to (h+k)	1.4	0.32	µµf
Grid to Grid	0.010	0.011	µµf Max.
Plate to Plate	0.30	0.50	µµf Max.

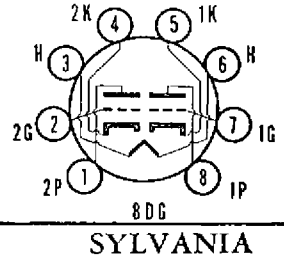
CONTROLLED DETRIMENTS

Interelectrode Insulation[7]	100	Meg. Min.
Total Grid Current[8]	-0.3	µAdc Max.
Grid Emission[9]	-0.5	µAdc Max.
Vibration Output as equivalent Ec1[10]	2.5	mVac Max.
Heater-Cathode Leakage[11]	5.0	µAdc Max.

QUICK REFERENCE DATA

The Premium Subminiature Type 7887 is a general purpose, medium mu, double triode having separate cathode connections for each section. It is particularly useful in oscillator, amplifier and low power servo circuit applications. The 7887 is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability.





SYLVANIA ELECTRONIC TUBES

A Division of Sylvania Electric Products Inc.

RECEIVING TUBE OPERATIONS EMPORIUM, PA.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

December 27, 1960

146 (10-58)

from JEDEC release #3120, Jan. 23, 1961

RATINGS[1] (Absolute Maximum)

Heater Voltage	26.5 (±10%) V
Plate Voltage	165 Vdc
Peak Plate Forward Voltage	330 v
Plate Dissipation	1.1 W
Plate Current (Each Section)	22 mAdc
DC Grid Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Grid Current	5.5 mAdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid Circuit Resistance	1.1 Meg

CHARACTERISTICS (Each Section)

Plate Voltage	100 Vdc
Cathode Resistor	220 Ohms
Plate Current	8.5 mAdc
Transconductance	5000 µmhos
Amplification Factor	20
Grid Voltage for Ib = 100 µAdc	-9 Vdc

NOTES:

1. Limiting values beyond which normal tube life and normal tube performance may be impaired.

2. Tests performed as a measure of the mechanical durability of the tube structure.

3. Force as applied in any direction by the Navy Type High Impace (Flyweight) Shock Machine for Electronic Devices. Shock duration = 3/4 milliseconds.

4. Vibrational forces applied in any direction for a period of 96 hours.

5. One cycle consists of the application of Ef = 29.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.

6. Capacitances are measured with an external shield No. 318.

7. Measure each section separately with Ef = 26.5 V Eg-All = -100 Vdc; Ep-all = -300 Vdc; cathode is positive so that no cathode emission occurs.

8. Measure each section separately with Ef = 26.5 V; Eb = 100 Vdc; Rk = 220 ohms.

NOTES: (Cont'd)

9. Each section preheated for five minutes with Ef = 31.5 V; Eb = 100 Vdc; Rk = 220 ohms; Rg = 1.0 Meg; then each section tested separately with Ef = 31.5 V; Eb = 100 Vdc; Ec1 = -9.0 Vdc; Rg = 1.0 Meg.

10. Test each section separately with Ef = 26.5 V; Eb = 100 Vdc; Rk = 220 ohms; Ck = 1000 µf; Rp = 10,000 ohms; F = 40 cps; Acc = 15 g.

11. Measure each section separately with Ef = 26.5 V; Ehk = ±100 Vdc.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-1
Basing	8DK
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature (Per JEDEC JO-H1)	220	°C
Altitude	80,000	Ft.
Radiation		
Total Dosage (∫neutrons/sq. cm/sec.)	10^{16}	nvt
Dose Rate (neutrons/sq. cm/sec.)	10^{12}	nv

DURABILITY CHARACTERISTICS[2]

Impact Acceleration (3/4 msec Duration)[3]	750 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[4]	2.5 G	Max.
On-Off Heater Cycles[5]	2000	Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	26.5 V
Heater Current	45 mA

DIRECT INTERELECTRODE CAPACITANCES

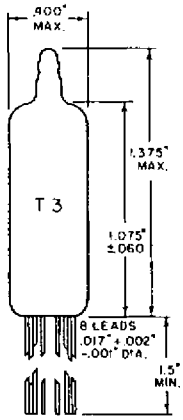
	Shielded[6]	Unshielded	
Grid to Plate (Each Section)	1.3	1.4	µµf
Input (Each Section)	2.4	2.2	µµf
Output	2.4	0.7	µµf

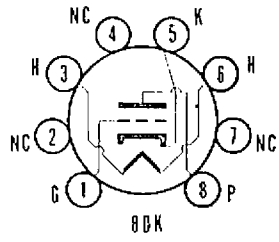
CONTROLLED DETRIMENTS

Interelectrode Insulation[7]	100 Meg.	Min.
Total Grid Current[8]	-0.4 µAdc	Max.
Grid Emission[9]	-0.5 µAdc	Max.
Vibration Output as Equivalent Ec1[10]	2.5 mVac	Max.
Heater-Cathode Leakage[11]	5.0 µAdc	Max.

QUICK REFERENCE DATA

The Premium Subminiature Type 7888 is a high gm, medium mu triode intended primarily for use as a UHF oscillator. It is also well suited to a variety of low frequency oscillator and amplifier applications. The 7888 is designed for operation under conditions of severe shock, vibration, high temperature and high altitude, and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





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EMPORIUM, PA.

Prepared and Released By The
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EMPORIUM, PENNSYLVANIA

December 28, 1960

146 (10-58)

from JEDEC release #3120, Jan. 23, 1961

RATINGS[1] (Absolute Maximum)

Heater Voltage[3]	26.5 (±10%)	V
Plate Voltage	165	Vdc
Peak Plate Forward Voltage	330	v
Plate Dissipation (Each Section)	3.3	W
Plate Current (Each Section)	22	mAdc
DC Grid Voltage		
Positive Value	0	Vdc
Negative Value	55	Vdc
Grid Current	5.5	mAdc
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	200	v
Heater Negative with Respect to Cathode	200	v
Grid Circuit Resistance	1.1	Meg

CHARACTERISTICS (Each Section)

Plate Voltage	100	150	Vdc
Cathode Resistor	150	180	Ohms
Plate Current	8.5	13	mAdc
Transconductance	5800	6500	µmhos
Amplification Factor	27	27	
Grid Voltage for Ib = 100 µAdc	-7	-11	Vdc

NOTES:

1. Limiting values beyond which normal tube life and normal tube performance may be impaired.

2. Tests performed as a measure of the mechanical durability of the tube structure.

3. Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = 3/4 milliseconds.

4. Vibrational forces applied in any direction for a period of 96 hours.

5. One cycle consists of the application of Ef = 29.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.

6. Capacitances are measured with an external shield No. 318.

7. Measure with Ef = 26.5 V eg-all = -100 Vdc; Ep-all = -300 Vdc; cathode is positive so that no cathode emission occurs.

8. Measure with Ef = 26.5 V; Eb = 150 Vdc; Rk = 380 ohms; Rg = 1.0 Meg.

9. Preheat for five minutes with Ef = 31.5 V; Eb = 100 Vdc; Rk = 150 ohms; Rg = 1.0 Meg; then test with Ef = 31.5 V; Eb = 100 Vdc; Ec1 = -7.0 Vdc; Rg = 1.0 Meg.

10. Test with Ef = 26.5 V; Eb = 100 Vdc; Rk = 150 ohms; CK = 1000 µf; Rp = 10,000 ohms; F = 40 cps; Acc = 15 g.

11. Measure with Ef = 26.5 V; Ehk = ±100 Vdc.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-1
Basing	8DG
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature (Per JEDEC JO-H1)	220	°C
Altitude	80,000	Ft.
Radiation		
Total Dosage (∫ neutrons/sq. cm/sec.)	10^{16}	nvt
Dose Rate (neutrons/sq. cm/sec.)	10^{12}	nv

DURABILITY CHARACTERISTICS[2]

Impact Acceleration (3/4 msec Duration)[3]	750 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[4]	2.5 G	Max.
On-Off Heater Cycles[5]	2000	Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	26.5	V
Heater Current	90	mA

DIRECT INTERELECTRODE CAPACITANCES

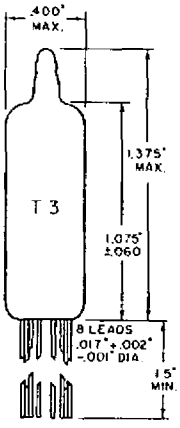
	Shielded[6]	Unshielded		
Grid to Plate (Each Section)	1.0	1.0	µµf	
Input (Each Section)	1.9	1.7	µµf	
Output				
Section No. 1	1.5	0.23	µµf	
Section No. 2	1.5	0.28	µµf	
Grid to Grid	0.011	0.014	µµf	Max.
Plate to Plate	0.60	0.80	µµf	Max.

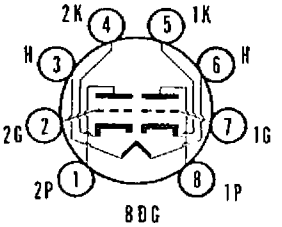
CONTROLLED DETRIMENTS

Interelectrode Insulation[7]	100	Meg.	Min.
Total Grid Current[8]	-0.3	µAdc	Max.
Grid Emission[9]	-0.5	µAdc	Max.
Vibration Output as Equivalent Ec1[10]	2.5	mVac	Max.
Heater-Cathode Leakage	5.0	µAdc	Max.

QUICK REFERENCE DATA

The Premium Subminiature Type 7889 is a general purpose, medium mu, double triode having separate cathode connections for each section. It is particularly useful in low level audio applications. The 7889 is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability.





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146 (10-58)

from JEDEC release #3120, Jan. 23, 1961

RATINGS[1] (Absolute Maximum)

Heater Voltage	26.5 (±10%) V
Plate Voltage	165 Vdc
Peak Plate Forward Voltage	330 v
Plate Dissipation (Each Section)	0.55 W
Plate Current (Each Section)	3.3 mAdc
DC Grid Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid Circuit Resistance	1.1 Meg

CHARACTERISTICS (Each Section)

Plate Voltage	100	150 Vdc
Cathode Resistor	1500	820 Ohms
Plate Current	0.8	1.75 mAdc
Transconductance	1800	2500 µmhos
Amplification Factor	70	70
Grid Voltage for Ib = 50 µAdc	-2.8	-3.7 Vdc

NOTES:

1. Limiting values beyond which normal tube life and normal tube performance may be impaired.

2. Tests performed as a measure of the mechanical durability of the tube structure.

3. Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = 3/4 milliseconds.

4. Vibrational forces applied in any direction for a period of 96 hours.

5. One cycle consists of the application of Ef = 29.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.

6. Capacitances are measured with an external shield No. 318.

7. Measure each section separately with Ef = 26.5 V Eg-all = -100 Vdc; Ep-all = -300 Vdc; cathode is positive so that no cathode emission occurs.

8. Measure each section separately with Ef = 26.5 V; Eb = 150 Vdc; Rk = 820 ohms; Rg = 1.0 Meg.

NOTES: (Cont'd)

9. Each section preheated for five minutes with Ef = 31.5 V; Eb = 150 Vdc; Rk = 820 ohms; Rg = 1.0 Meg; then each section tested separately with Ef = 31.5 V; Eb = 150 Vdc; Ec1 = -4.0 Vdc; Rg = 1.0 Meg.

10. Test each section separately with Ef = 26.5 V; Eb = 100 Vdc; Rk = 1500 ohms; CK = 1000 µf; Rp = 10,000 ohms; F = 40 cps; Acc = 15 g.

11. Measure each section separately with Ef = 26.5 V; Ehk = ±100 Vdc.

PENTODE DE PUISSANCE

Amplificateur vidéofréquence

EL 183

CARACTERISTIQUES GENERALES

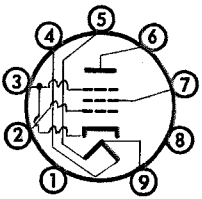
Cathode à chauffage indirect			
Alimentation du filament		en paralléle	en série
Tension filament	Vf	6,3 V	12,6 V
Courant filament	If	600 mA	300 mA
Ampoule		A22-3	
Embase		9C12 (noval)	
Position de montage		quelconque	

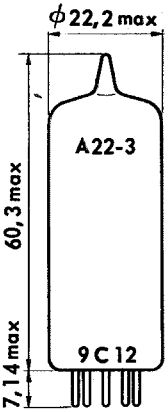
Capacités interélectrodes (sans blindage extérieur)

Capacité d'entrée	Ce	13	pF
Capacité de sortie	Cs	5,4	pF
Capacité anode/grille n° 1	Ca/g_1	80	mpF max.

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Connexion interne
Broche n° 2 ..... Grille n° 1
Broche n° 3 ..... Cathode, grille n° 3
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Anode
Broche n° 7 ..... Grille n° 2
Broche n° 8 ..... Connexion interne
Broche n° 9 ..... Point milieu filament





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LIMITES MAXIMALES D'UTILISATION

Systèmes des limites moyennes

Tension d'anode	Va	250 V max
Tension de grille 2	Vg_2	250 V max
Dissipation d'anode	Pa	6 W max
Dissipation de grille 2	Pg_2	2,2 W max
Courant de cathode	Ik	60 mA max
Résistance du circuit de grille 1	Rg_1	1 MΩ max
Tension entre filament et cathode (1)	Vfk	200 V max

CARACTERISTIQUES NOMINALES

Tension d'alimentation	VN	220 V
Résistance d'anode	Ra	1 800 Ω
Tension d'anode	Va	150 V
Courant d'anode	Ia	40 mA
Courant de grille n° 2	Ig_2	7 mA
Tension de grille n° 2	Vg_2	220 V
Tension de grille n° 1	Vg_1	-2,1 V
Pente	S	25 mA/V
Résistance interne	ρ	20 kΩ

CONDITIONS NORMALES D'UTILISATION

Amplificateur vidéofréquence

Tension d'alimentation	VN	220 V
Tension de grille n° 2	Vg_2	220 V
Résistance d'anode (2)	Ra	1 800 Ω
Résistance de cathode (3)	Rk	130 Ω
Courant d'anode au repos	Ia	21 mA

(1) 150 V ctu + 50V cr

(2) Pour une tension d'alimentation de 220V, la résistance du circuit d'anode ne doit pas être inférieure à 1 800 Ω.

(3) Il est recommandé d'utiliser une polarisation par résistance de cathode.

Reproduction Interdite

MAZDA BELVU

PENTODE DE PUISSANCE

Amplificateur de balayage lignes
Amplificateur A.F.

EL 36

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

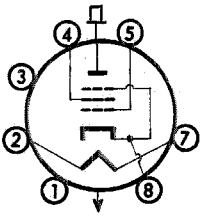
Tension filament	Vf	6,3 V
Courant filament	If	1,25 A
Ampoule		T9
Coiffe		C6-1
Embase		8C18 (octal)
Position de montage		quelconque

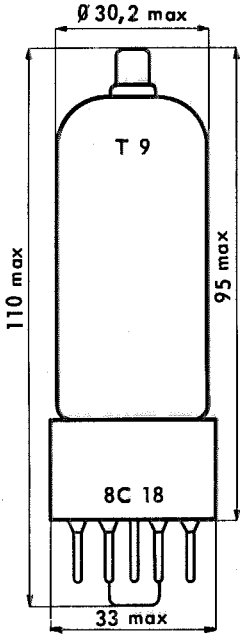
Capacités interélectrodes (sans blindage extérieur)

Capacité d'entrée	Ce	17,5 pF
Capacité de sortie	Cs	8 pF
Capacité anode/grille n° 1	Ca/g_1	1,1 pF max

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Connexion interne
Broche n° 2 ..... Filament
Broche n° 3 ..... Connexion interne
Broche n° 4 ..... Grille n° 2
Broche n° 5 ..... Grille n° 1
Broche n° 6 ..... Manque
Broche n° 7 ..... Filament
Broche n° 8 ..... Cathode, grille n° 3
Coiffe ..... Anode





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EL 36

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LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode à courant nul	Va bl	550 V max
Tension d'anode (1)	Va	250 V max
Tension de crête d'anode (2)	Va cr	7 000 V max
Tension inverse de crête d'anode (2)	Va icr	1 500 V max
Tension de grille n° 2 à courant nul	Vg_2 bl	550 V max
Tension de grille n° 2	Vg_2	250 V max
Tension négative de crête de grille n° 1 (2)	$-Vg_1$ cr	1 000 V max
Dissipation d'anode	Pa	voir diagrammes
Dissipation de grille n° 2	Pg_2	voir diagrammes
Courant de cathode	Ik	200 mA max
Résistance du circuit de grille n° 1	Rg_1	0,5 MΩ max
- pour amplification de déviation horizontale	Rg_1	2,2 MΩ max
Tension entre filament et cathode	Vfk	100 V max
Résistance du circuit entre filament et cathode	Rfk	20 kΩ max

CARACTERISTIQUES NOMINALES

Tension d'anode	Va	100 V
Tension de grille n° 2	Vg_2	100 V
Tension de grille n° 1	Vg_1	-8,2 V
Courant d'anode	Ia	100 mA
Courant de grille n° 2	Ig_2	7 mA
Pente	S	14 mA/V
Résistance interne	ρ	5 kΩ
Facteur d'amplification g_2 g_1	Kg_2 g_1	5,6 –

CONDITIONS NORMALES D'UTILISATION

Amplificateur classe B

Tension d'anode	Va	300 V	
Tension de grille n° 2	Vg_2	150 V	
Tension de grille n° 1	Vg_1	-29 V	
Résistance entre anode	Raa	3,5 kΩ	
Tension d'entrée	Ve	0	20 Veff
Courant d'anode	Ia	2×18	2×100 mA
Courant de grille n° 2	Ig_2	2×0,5	2×19 mA
Puissance de sortie	Ps	0	44,5 W
Distorsion totale	Dt	–	7,2 %

(1) Va = 300 V max en classe B
(2) Durée de l'impulsion limitée à 18% d'un cycle de balayage avec un maximum de 18 μs.

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PENTODE DE PUISSANCE

Amplificateur de sortie A.F.

EL 41

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

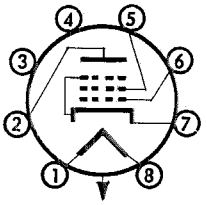
Tension filament	Vf	6,3 V
Courant filament	If	710 mA
Ampoule		A 22-12
Embase		8C 12 (médium)
Position de montage		quelconque

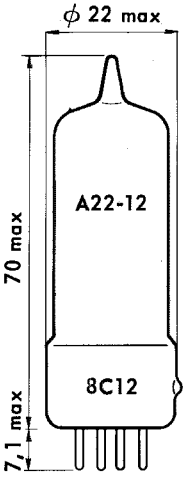
Capacités interélectrodes (sans blindage extérieur)

Capacité d'entrée	Ce	10,2 pF
Capacité de sortie	Cs	7,8 pF
Capacité anode/grille n° 1	Ca/g_1	1 pF max
Capacité grille n° 1/filament	Cg_1/f	0,15 pF max

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Filament
Broche n° 2 ..... Anode
Broche n° 3 ..... Connexion interne
Broche n° 4 ..... Connexion interne
Broche n° 5 ..... Grille n° 2
Broche n° 6 ..... Grille n° 1
Broche n° 7 ..... Cathode, grille n° 3
Broche n° 8 ..... Filament





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LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode à courant nul	Va bl	550 V max
Tension d'anode	Va	300 V max
Tension de grille n° 2 à courant nul	Vg_2 bl	550 V max
Tension de grille n° 2	Vg_2	300 V max
Dissipation d'anode	Pa	9 W max
Dissipation de grille n° 2		
à signal nul	Pg_2 sig o	1,4 W max
à signal max	Pg_2 sig max	3,3 W max
Courant de cathode	Ik	55 mA max
Résistance du circuit de grille n° 1	Rg_1	1 MΩ max
Résistance entre filament et cathode	Rfk	20 kΩ max
Tension entre filament et cathode	Vfk	100 V max

CONDITIONS NORMALES D'UTILISATION

Amplificateur de sortie A.F. - Classe A

Tension d'anode	Va	250 V
Tension de grille n° 2	Vg_2	250 V
Résistance de cathode	Rk	170 Ω
Courant d'anode	Ia	36 mA
Courant de grille n° 2	Ig_2	5,2 mA
Pente	S	10 mA/V
Résistance interne	ρ	40 kΩ
Résistance de charge d'anode	Ra	7 kΩ
Tension d'entrée	Ve	3,8 V eff
Puissance de sortie	Ps	3,9 W
pour une distorsion totale de	Dt	10 %
Facteur d'amplification g_2 g_1	Kg_2 g_1	22 -

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MAZDA BELVU

PENTODE DE PUISSANCE

Amplificateur de balayage lignes

EL 502

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect

Alimentation du filament en parallèle

Tension filament	Vf	6,3 V
Courant filament	If	1,7 A
Ampoule		T12-72 (Jedec)
Embase		9C18 (magnoval)
Coiffe		C6-1
Position de montage		quelconque

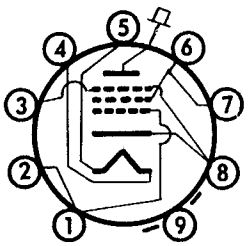
Capacités interélectrodes (sans blindage extérieur)

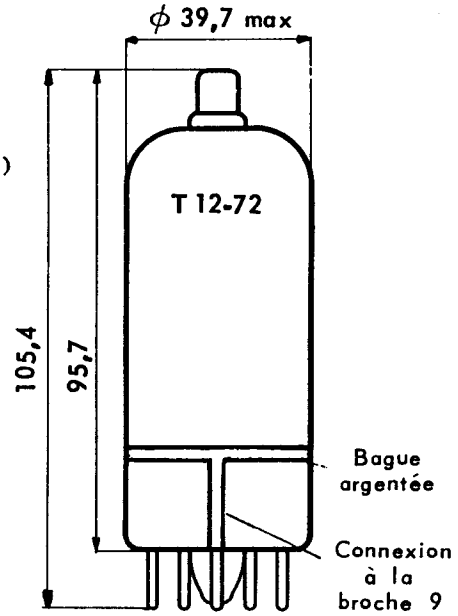
Capacité d'entrée	Ce	29 pF
Capacité de sortie	Cs	11 pF
Capacité grille n° 1/anode	Cg_1/a	0,7 pF max

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Grille n° 1 (1)
Broche n° 2 ..... Grille n° 1 (1)
Broche n° 3 ..... Cathode et grille n° 3 (2)
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Grille n° 2 (3)
Broche n° 7 ..... Grille n° 2 (3)
Broche n° 8 ..... Cathode et grille n° 3 (2)
Broche n° 9 ..... Connexion à la bague argentée (4)
Coiffe ..... Anode

Notes : voir page 1.3





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EL 502

MAZDA BELVU

LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode à courant nul	$Va\ bl$	550 V max
Tension continue d'anode	Va	250 V max
Tension de crête positive d'anode (1)	$Va\ cr$	7 500 V max
Tension de crête négative d'anode (1)	$-Va\ cr$	1 500 V max
Tension de grille n° 2 à courant nul	$Vg_2\ bl$	550 V max
Tension continue de grille n° 2	Vg_2	250 V max
Tension de crête négative de grille n° 1 (1)	$-Vg_1\ cr$	300 V max
Courant moyen de cathode	Ik	250 mA max
Courant de crête de cathode	$Ik\ cr$	700 mA max
Dissipation d'anode	Pa	20 W max
Dissipation de grille n° 2	Pg_2	4,5 W max
Tension de crête entre filament et cathode :		
- filament négatif par rapport à la cathode	$-Vfk$	250 V max
- filament positif par rapport à la cathode	Vfk	220 V max
Résistance du circuit de grille n° 1	Rg_1	2,2 MΩ max
Température de l'ampoule au point le plus chaud (2)		225 °C max

CARACTERISTIQUES NOMINALES

Tension d'anode	Va	70	100	7 500 (3) V
Tension de grille n° 2	Vg_2	170	100	170 V
Tension de grille n° 1	Vg_1	-6,5	Rk=50Ω	-150 V
Courant d'anode	Ia	465	-	0,04 mA
Courant de grille n° 2	Ig_2	40	-	- mA
Pente	S	-	17	- mA
Résistance interne	ρ	-	5	- kΩ
Facteur d'amplification en triode	K	-	5	-
Tension de grille n° 1 pour un courant d'anode de 50 μA	$Vg_1\ bl$	-	-40	- V

(1) Limite absolue, pendant 22% de durée d'impulsion d'un cycle de balayage avec un maximum de 18 μs.

(2) Limite absolue. Voir "Recommandations relatives à l'utilisation des Tubes Electriques" FNIE 011-p. 8.

(3) Mesuré en impulsions.

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Courant d'anode de crête

Pour un tube neuf moyen, le courant d'anode de crête est de 835 mA pour des tensions d'anode de 100 volts, de grille n° 2 de 190 volts et de grille n° 1 de 0 volt.

Afin de tenir compte des tolérances de fabrication, du vieillissement du tube, des variations de la tension du réseau et de la dispersion des caractéristiques des éléments du circuit, ce dernier devra être conçu pour un courant d'anode de crête ne dépassant pas 600 mA pour des tensions d'anode de 100 volts, de grille n° 2 de 190 volts et de grille n° 1 de 0 volt.

Notes de la page 1.1

(1) Pour favoriser la dispersion calorifique, brancher la connexion de grille n° 1 à la fois sur les broches n° 1 et 2.
(2) Le circuit de cathode doit être connecté à la broche n° 8.
(3) Pour favoriser la dispersion calorifique, brancher la connexion de grille n° 2 à la fois sur les broches n° 6 et 7.
(4) Afin d'éviter des instabilités du balayage dûes à des charges statiques sur le verre, brancher la broche n° 9 (bague argentée extérieure) à la masse du châssis.

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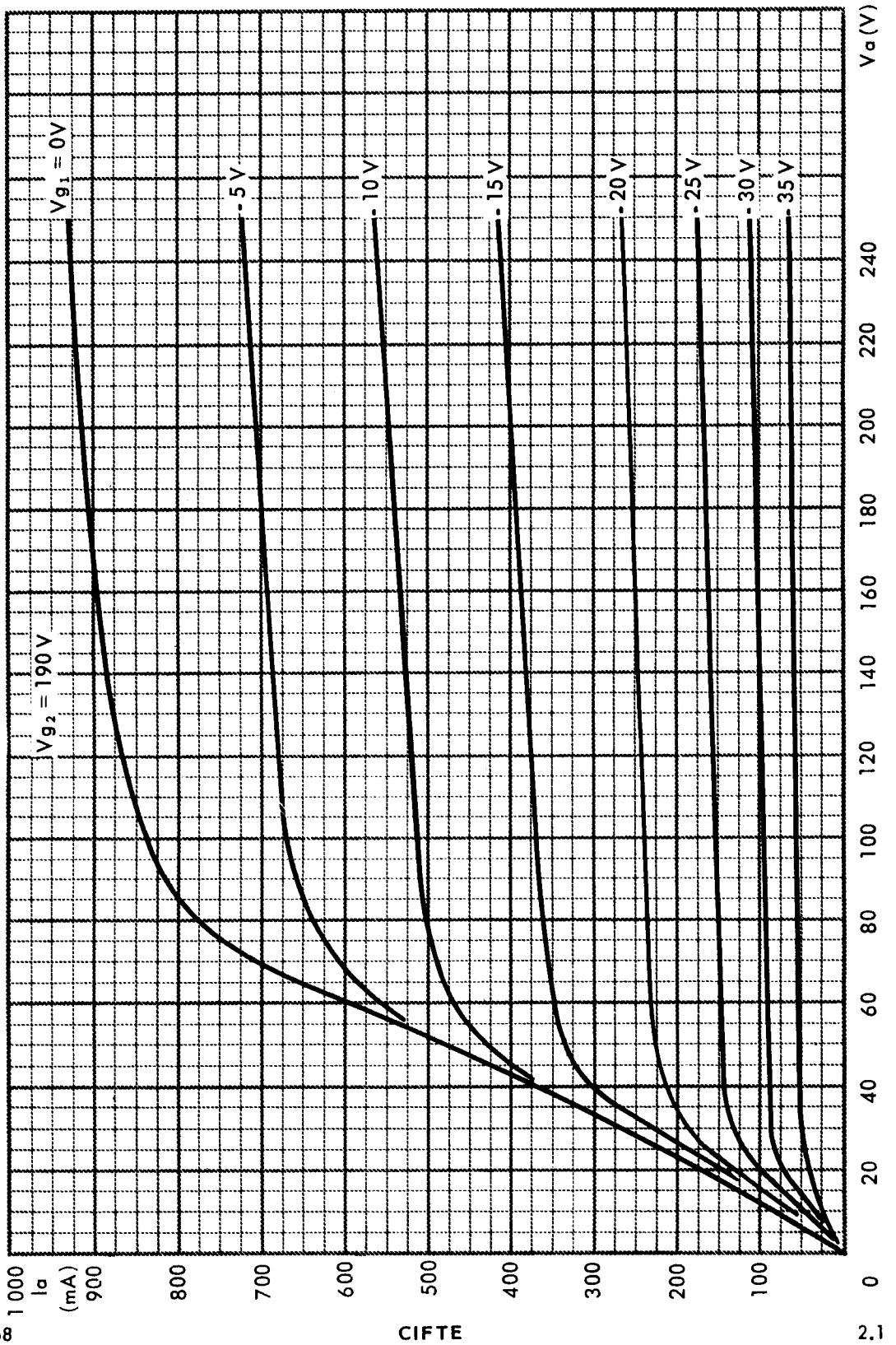
EL 502



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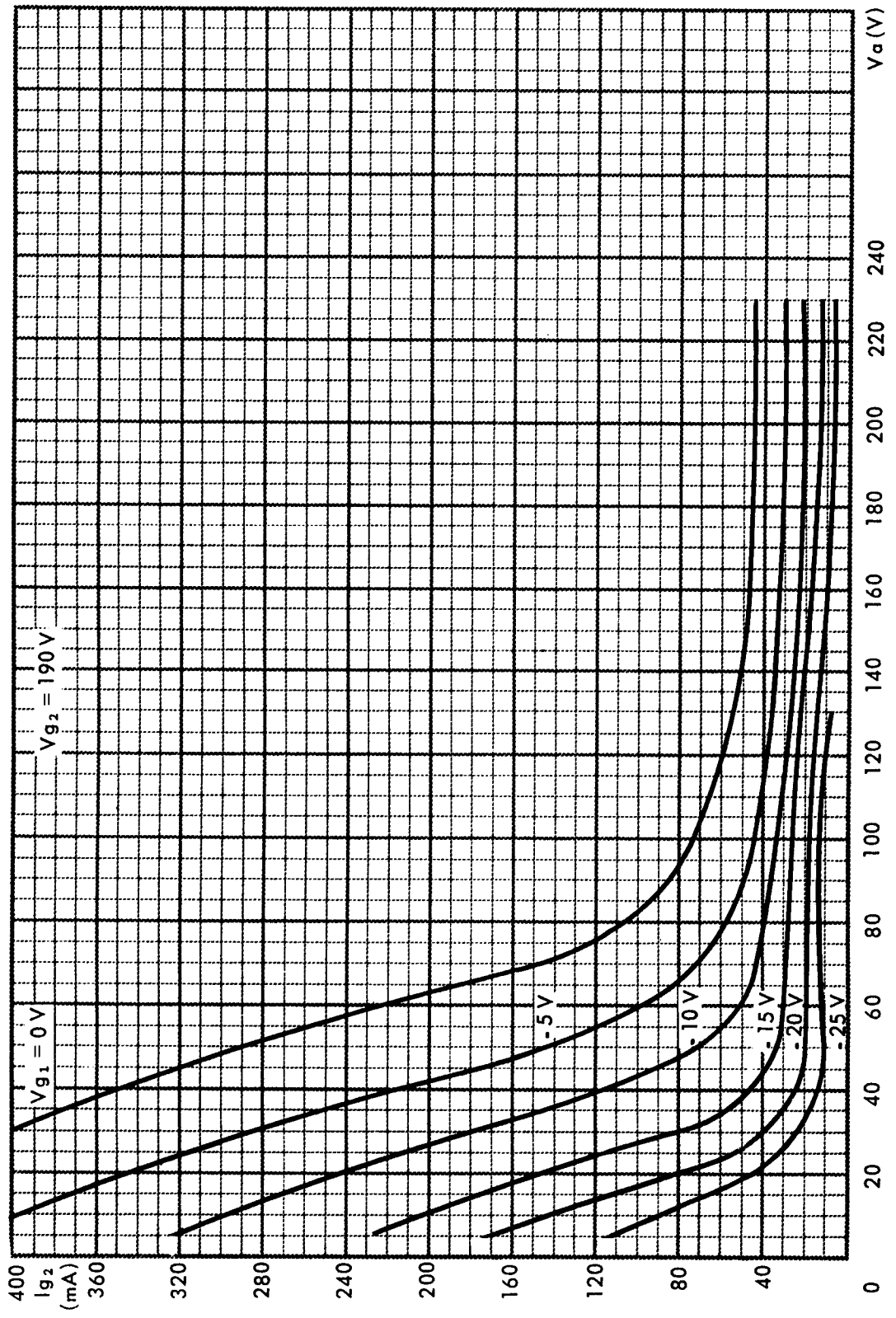

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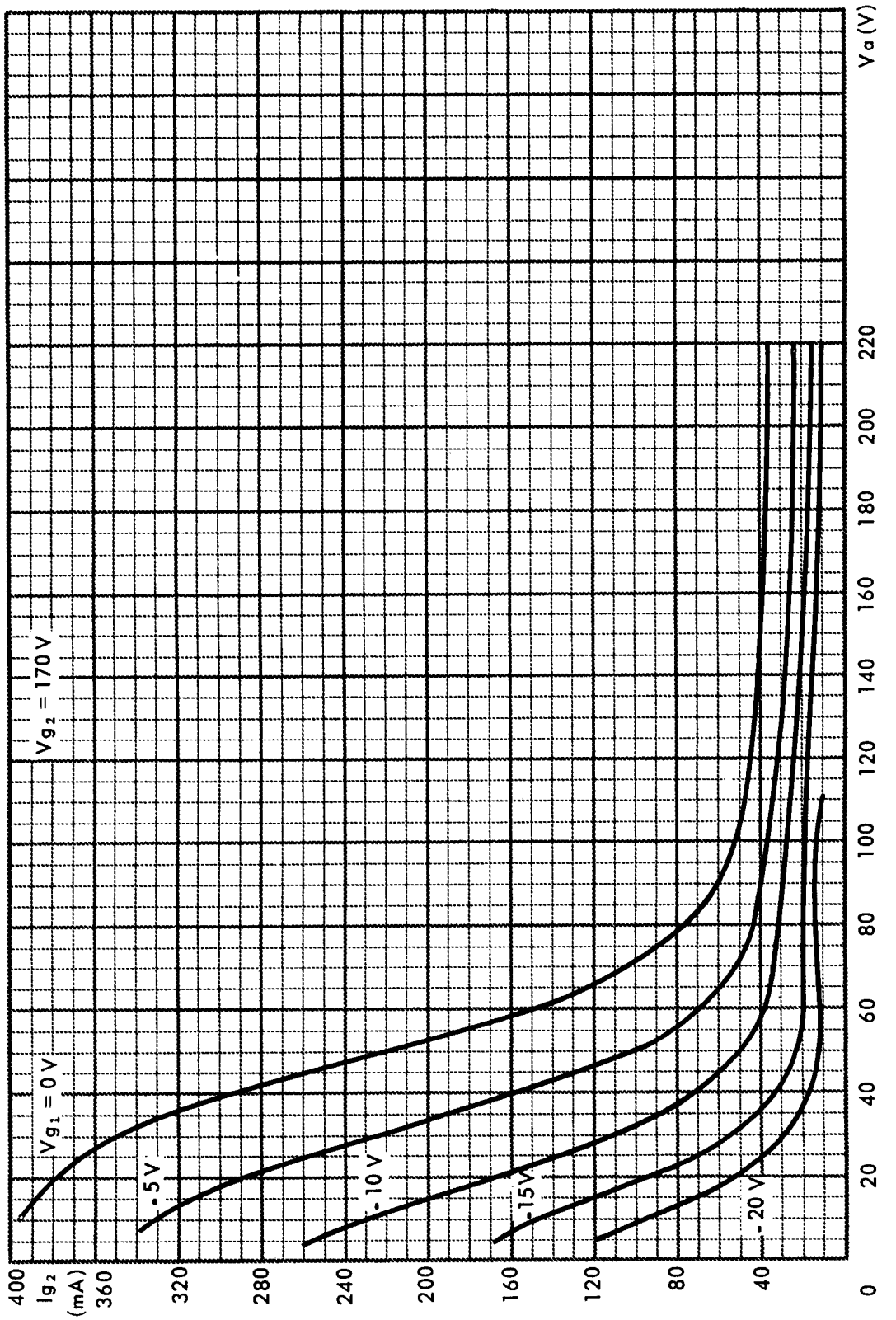

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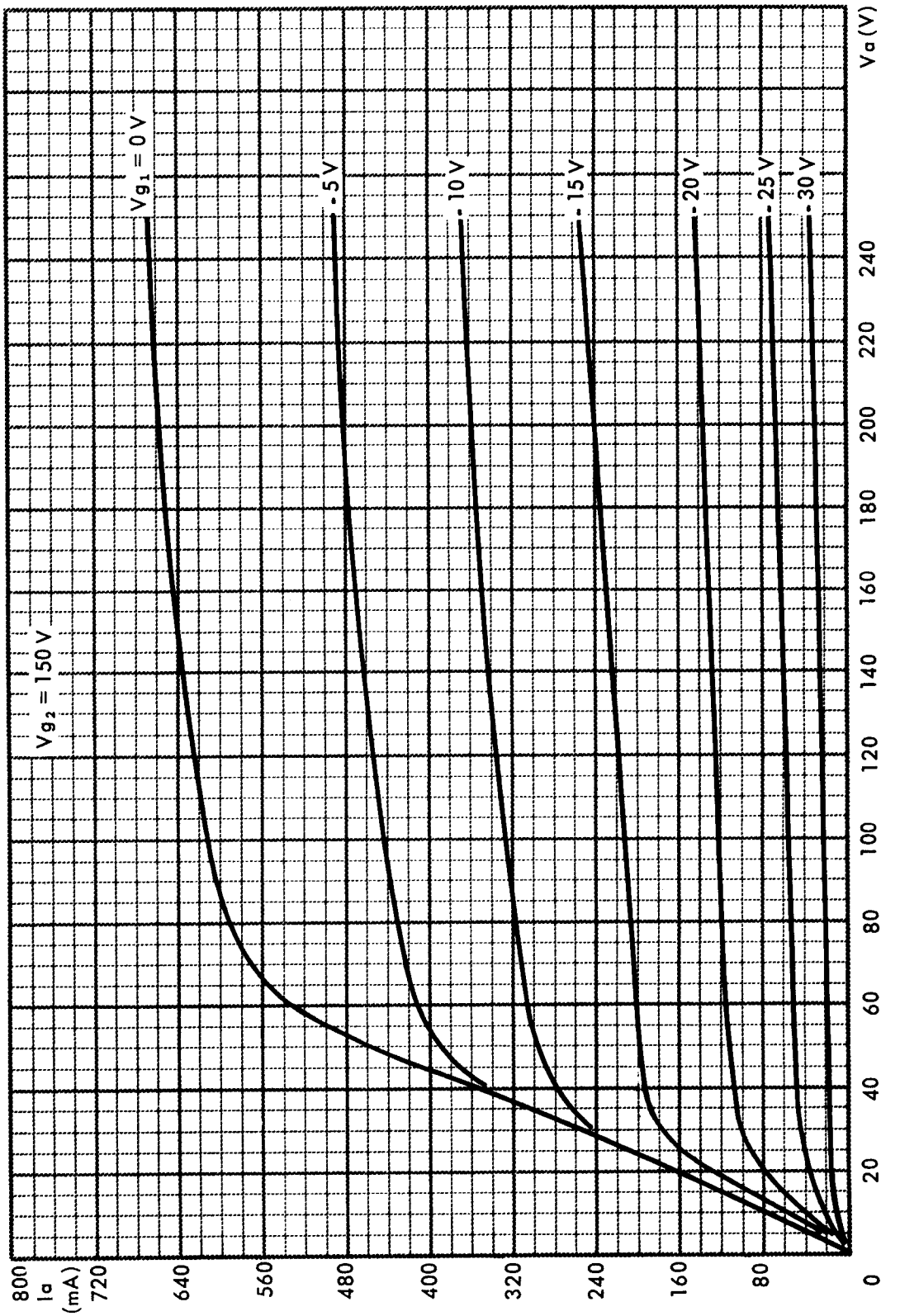

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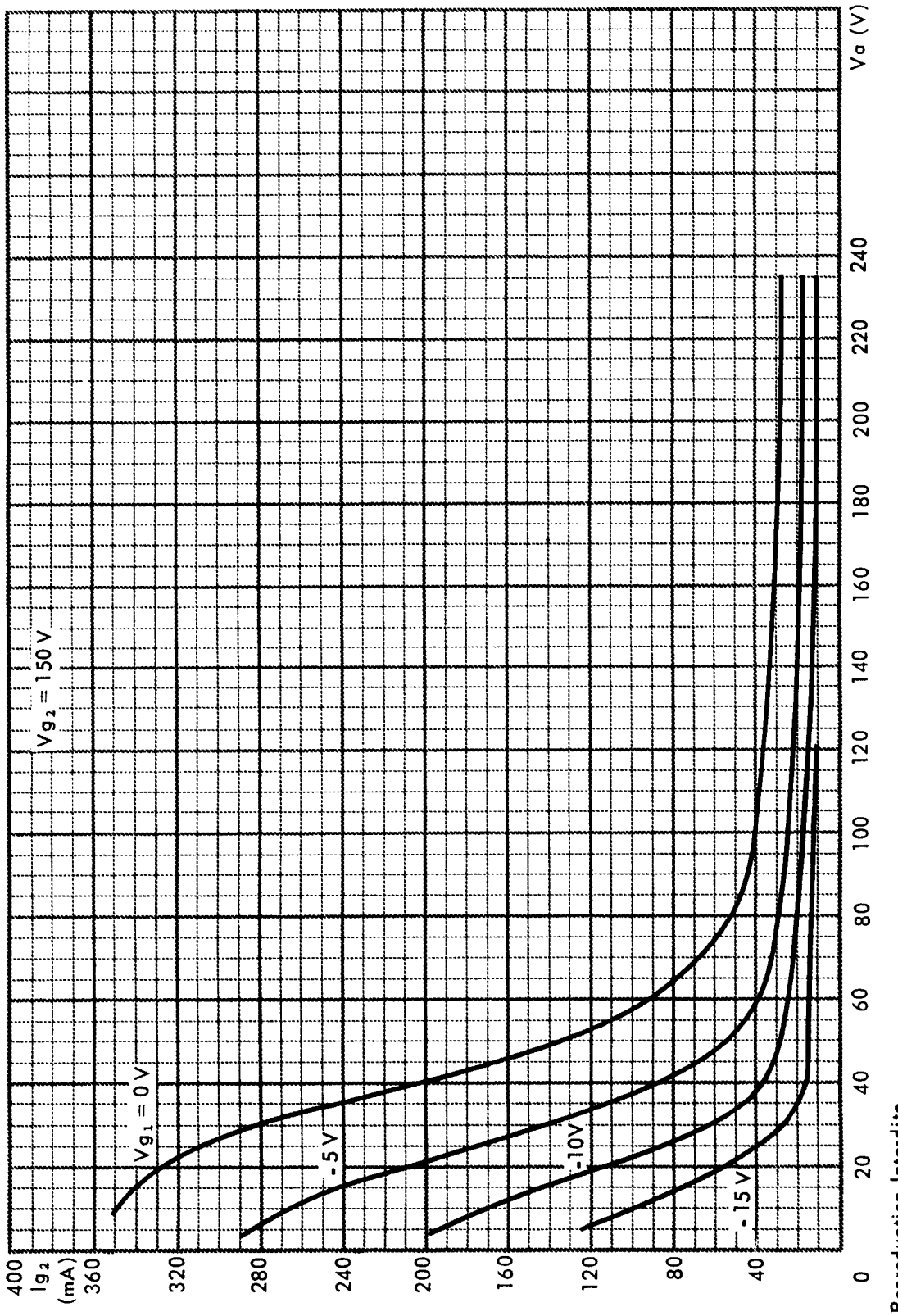

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PENTODE DE PUISSANCE

Amplificateur de sortie A.F.

EL 503

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

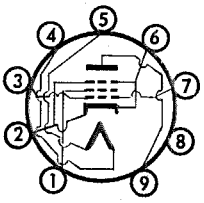
Tension filament	Vf	6,3 V
Courant filament	If	1,2 A
Ampoule		T12
Embase		9C18 (magnoval)
Position de montage		quelconque

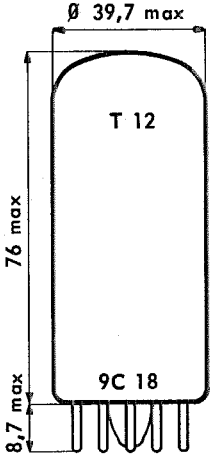
Capacités interélectrodes (sans blindage extérieur)

Capacité d'entrée	Ce	22,5 pF
Capacité grille n° 1/anode	Cg_1/a	2,2 pF
Capacité grille n° 1/filament	Cg_1/f	325 mpF
Capacité de sortie	Cs	12,6 pF

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Grille n° 2
Broche n° 2 ..... Cathode, grille n° 3
Broche n° 3 ..... Grille n° 1
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Cathode, grille n° 3
Broche n° 7 ..... Grille n° 1
Broche n° 8 ..... Connexion interne
Broche n° 9 ..... Anode





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EL 503

MAZDA BELVU

LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode, à courant nul	V_a bl	550 V max
Tension d'anode	V_a	300 V max
Tension de grille n° 2, à courant nul	V_{g_2} bl	550 V max
Tension de grille n° 2	V_{g_2}	300 V max
Dissipation d'anode	Pa	27 W max
Dissipation de grille n° 2	P_{g_2}	6 W max
Dissipation de crête de grille n° 2	P_{g_2} cr	9 W max
Courant de cathode	Ik	200 mA max
Résistance du circuit de grille n° 1, avec polarisation automatique	R_{g_1}	0,5 MΩ max
Tension entre le filament et la cathode	Vfk	100 V max

CARACTERISTIQUES NOMINALES

Tension d'anode	V_a	250 V
Tension de grille n° 2	V_{g_2}	250 V
Tension de grille n° 1	V_{g_1}	-13,2 V
Courant d'anode	Ia	100 mA
Courant de grille n° 2	I_{g_2}	8,5 mA
Pente	S	23 mA/V
Facteur d'amplification g_2 g_1	$K_{g_2 g_1}$	13
Résistance interne	$\bar{\rho}$	7,3 kΩ

CONDITIONS D'UTILISATION

Amplificateur A.F. - montage push-pull - Classe AB

Tension d'alimentation d'anode	V_aN		265 V
Tension d'alimentation de grille n° 2	$V_{g_2}N$		265 V
Résistance commune de cathode	Rk		56 Ω
Résistance de charge d'anode à anode	Raa		2400 Ω
Courant d'anode	Ia	2×100	2×118 mA
Courant de grille n° 2	I_{g_2}	2×8,5	2×32,5 mA
Tension d'entrée	Ve	0	11,5 Veff
Puissance de sortie	Ps	0	40 W
Distorsion harmonique totale	Dt	-	5 %

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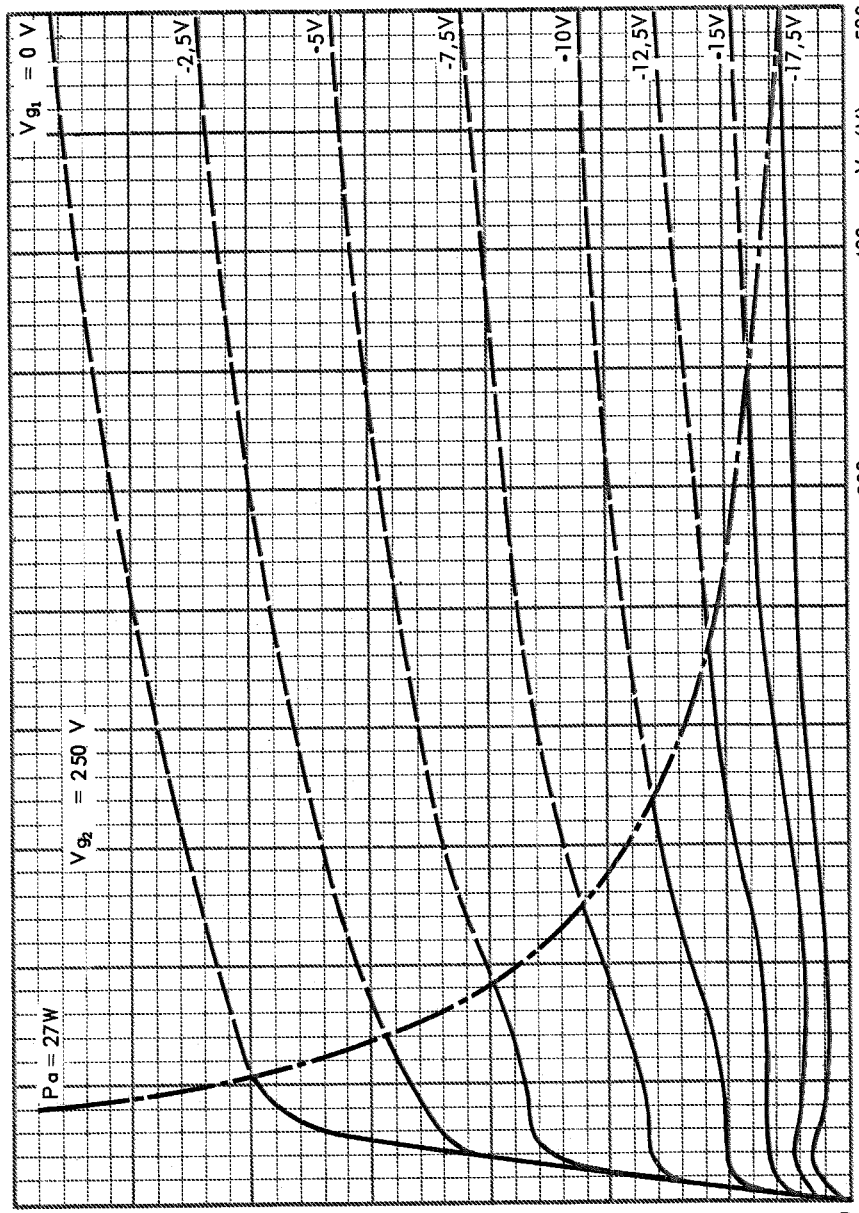
EL 503



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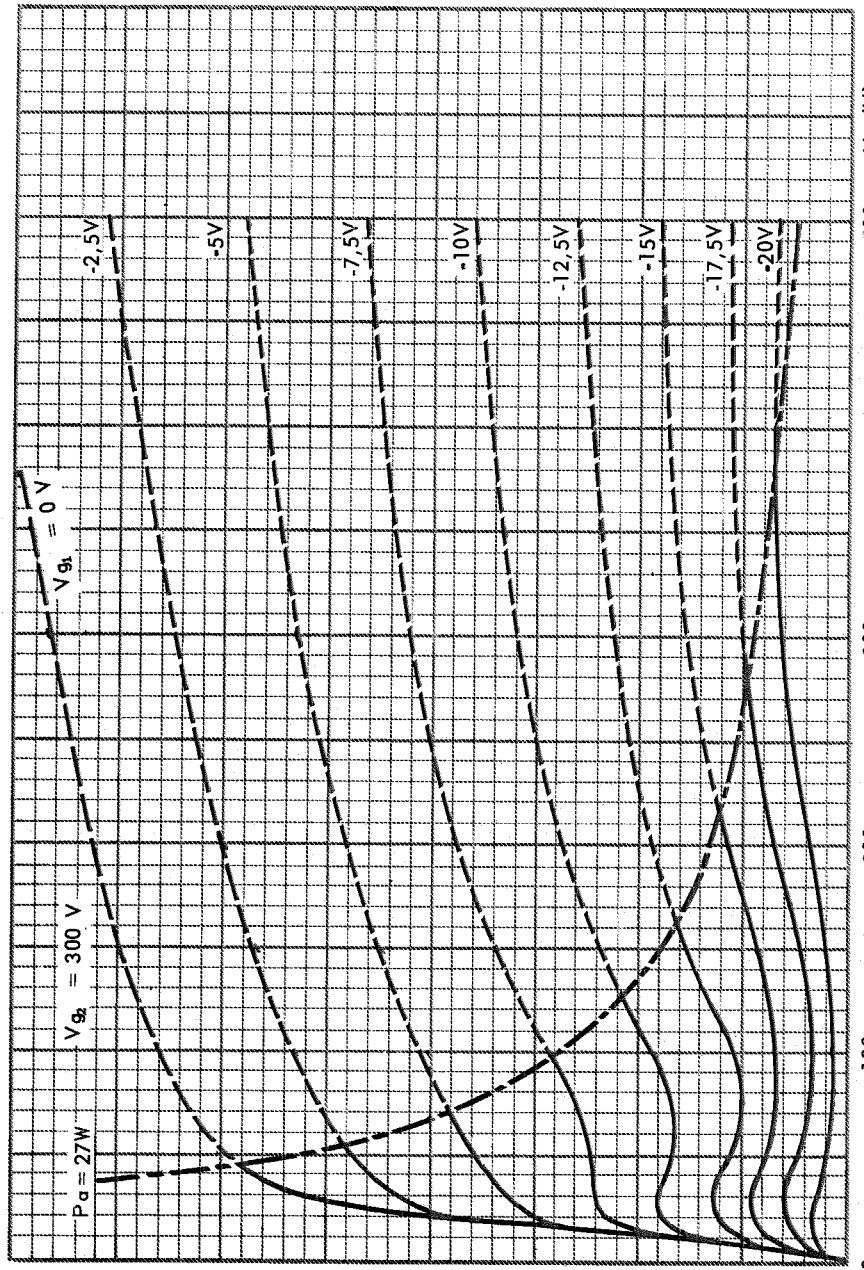

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MAZDA BELVU

PENTODE DE PUISSANCE

Amplificateur de balayage lignes

EL 504

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

Tension filament	Vf	6,3 V
Courant filament	If	1,38 A
Ampoule		T9 (Jedec)
Coiffe		C6-1
Embase		9C18 (magnoval)
Position de montage		quelconque

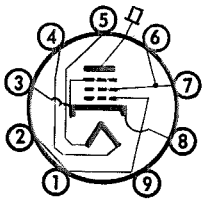
Capacités interélectrodes (sans blindage extérieur)

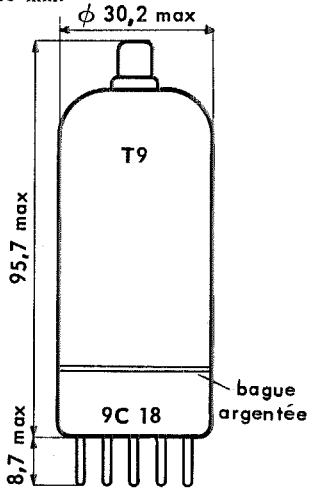
Capacité grille n°1/filament	Cg_1/F	0,2 pf max

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Grille n° 1
Broche n° 2 ..... Grille n° 1
Broche n° 3 ..... Cathode, grille n°3
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Grille n° 2
Broche n° 7 ..... Grille n° 2
Broche n° 8 ..... Cathode, grille n°3
Broche n° 9 ..... Connexion interne
Coiffe ..... Anode

Si on utilise un blindage métallique en combinaison avec le support du tube, ce blindage doit être connecté à la masse, d'une part, et à la bague argentée de l'ampoule, d'autre part. La distance entre le bord supérieur du blindage et le support ne doit pas dépasser 18 mm.





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LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode à courant nul	Vabl	550 V max
Tension d'anode	Va	250 V max
Tension de crête d'anode	Vacr	7.000 V max
Tension de grille n° 2 à courant nul	Vg_2bl	550 V max
Tension de grille n° 2	Vg_2	250 V max
Dissipation d'anode	Pa	voir diagramme
Dissipation de grille n° 2	Pg_2	voir diagramme
Courant de cathode	Ik	250 mA max
Résistance du circuit de grille n° 1	Rg_1	0,5 MΩ max
		2,2 MΩ max (1)
Tension entre filament et cathode	Vfk	220 V max

CARACTERISTIQUES NOMINALES

Tension d'anode	Va	75 V
Tension de grille n° 2	Vg_2	200 V
Tension de grille n° 1	Vg_1	-10 V
Courant de crête d'anode	Iacr	440 mA
Courant de crête de grille n° 2	Ig_2cr	30 mA

(1) Cette limite n'est valable que pour l' amplification de balayage lignes.

Reproduction Interdite

CONDITIONS NORMALES D'UTILISATION

Amplificateur de balayage lignes

Avec stabilisation. Fonctionnement au-dessus du genou

VN	170		200			230			V
Rg_2 (1)	1,2		1,5			2,2			kΩ
Vg_2	130	150	130	150	170	150	170	190	V
Va (2)	62	66	65	69	73	72	76	80	V
Vg_1 (3)	-6	-7	-6	-7	-8	-7	-8	-9	V
Iacr (4)	250	310	250	310	360	310	360	420	mA

Sans stabilisation

Tension d'alimentation	VN	190	230 V
Résistance de grille n° 2	Rg_2	2,2	2,2 kΩ
Tension continue de grille n° 1	Vg_1 (3)	+ 1	+ 1 V
Courant de crête d'anode	Iacr (4)	230	320 mA

(1) Valeur minimale de la résistance du circuit de grille n° 2 à utiliser afin d'éviter une dissipation excessive de cette électrode lors de la mise sous tension de l'appareil.

(2) Les valeurs indiquées concernent la fin d'un cycle de balayage, dans les conditions nominales d'utilisation. Le tube fonctionnera encore au-dessus du genou si la tension du secteur est inférieure de 10% à la valeur nominale et si la tension d'anode diminue de 15 V par suite de la dispersion sur les caractéristiques du tube et des composants.

(3) Les valeurs indiquées concernent la fin d'un cycle de balayage. Pendant le retour, la tension de grille n° 1 nécessaire pour assurer le blocage du tube est de - 120 V. (Va = 7 kV; Vg_2 = 200 V; Rg_1 = 1 kΩ).

(4) Afin de tenir compte des tolérances de fabrication, du vieillissement du tube et d'une diminution de la tension du réseau pouvant atteindre 10% de la tension nominale, les valeurs indiquées du courant de crête d'anode ne doivent pas être dépassées, dans chaque cas d'utilisation, pour la tension nominale du réseau.

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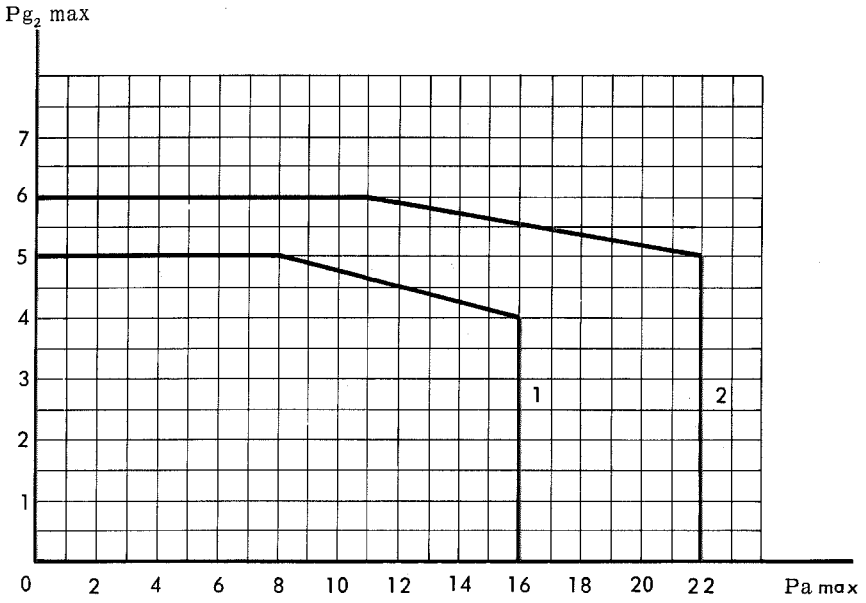

La figure ci-dessus indique les valeurs maximales admissibles de la dissipation d'anode Pa et de la dissipation de grille n° 2, Pg_2 :

- Dans le **système des limites moyennes,** pour le contour 1
  le point d'abscisse Pa et d'ordonnée Pg_2 doit se trouver à l'intérieur de la zone délimitée par les axes et le contour 1.

- Dans le **système des limites hybrides,** pour le contour 2
  elles ne doivent pas être dépassées, avec un tube moyen, dans les pires conditions probables d'utilisation, pour un balayage lignes normal.

(cf. Recommandations relatives à l' utilisation des tubes électroniques - FNIE - 011 p. 9 et annexe 1 p. 47).

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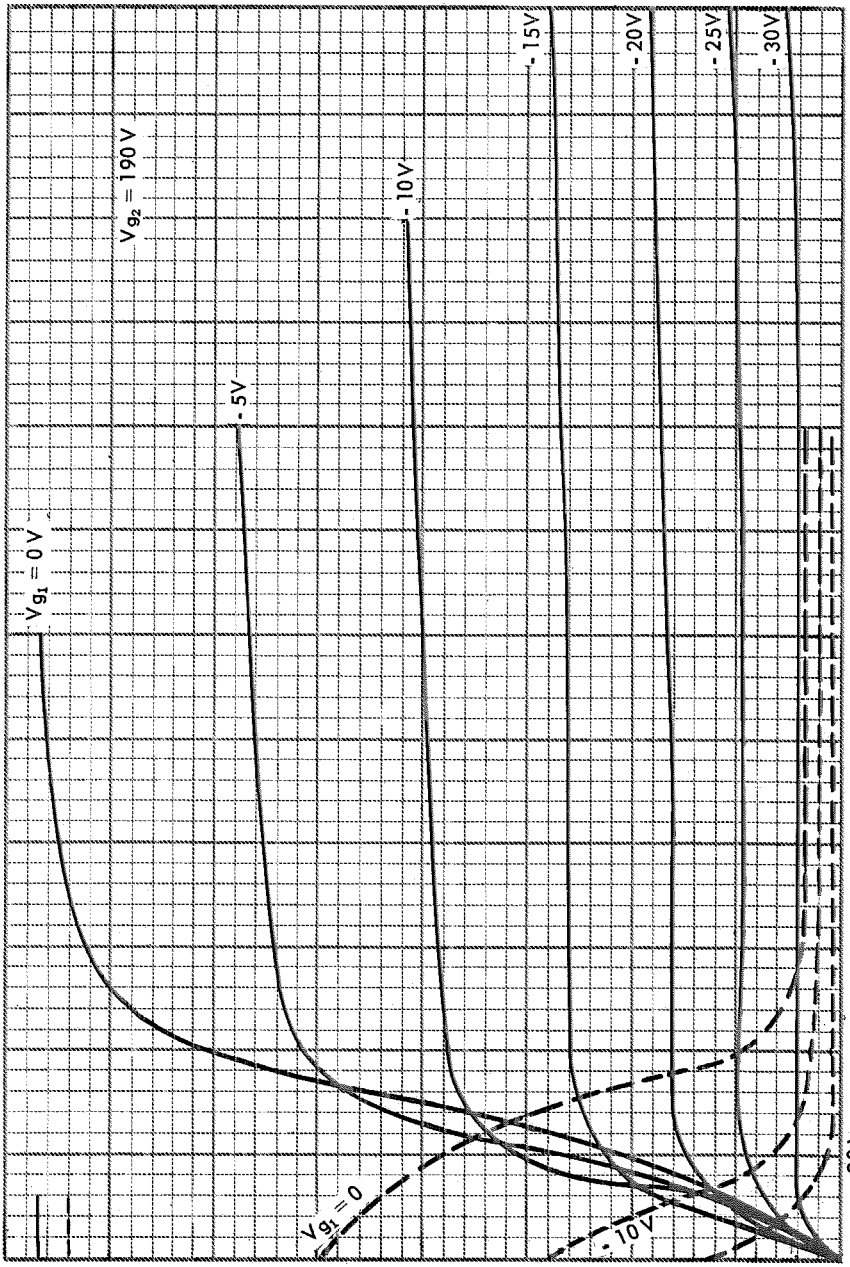
EL 504



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EL 504

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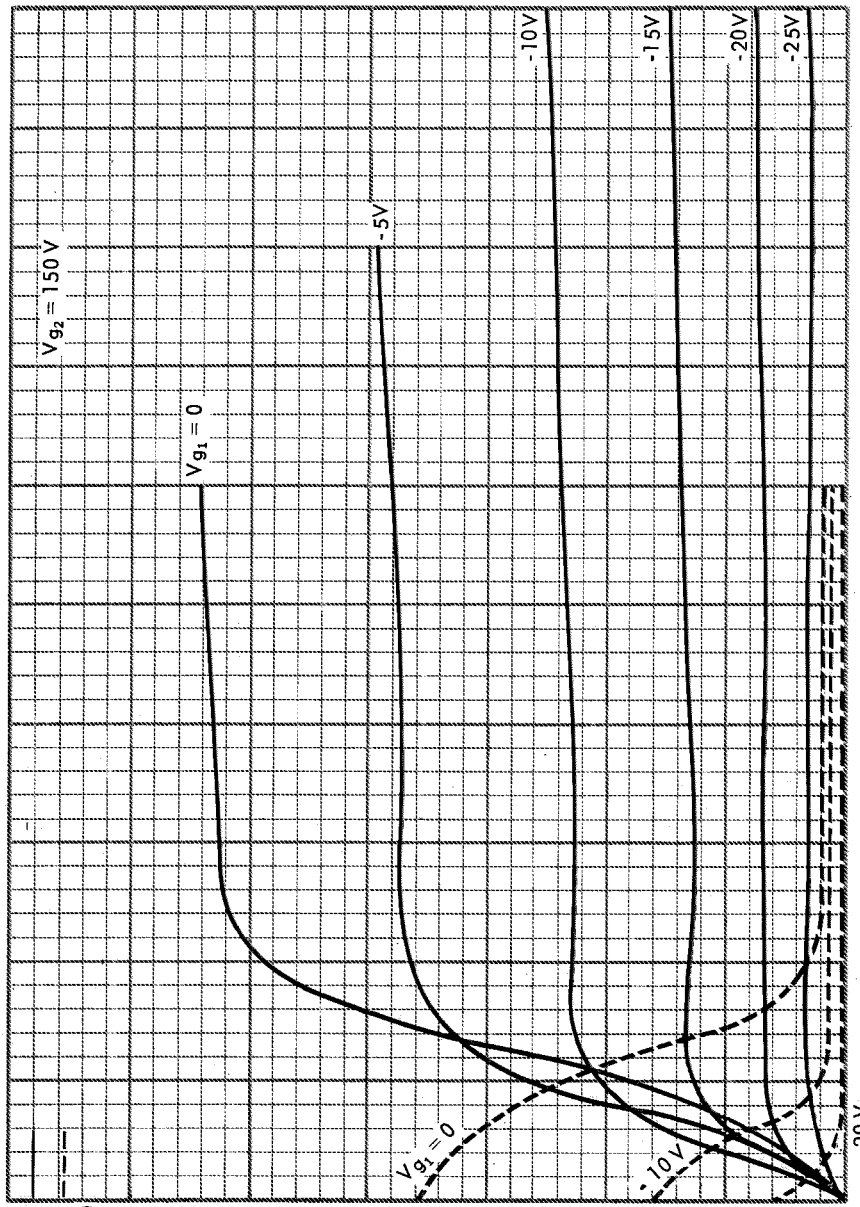

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MAZDA BELVU

PENTODE DE PUISSANCE

Amplificateur de balayage
lignes TVC

EL 509

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

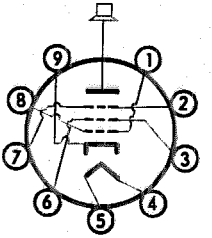
Tension filament	Vf	6,3 V
Courant filament	If	2 A
Ampoule		T 12
Embase		9C18 (magnoval)
Coiffe		C6-1

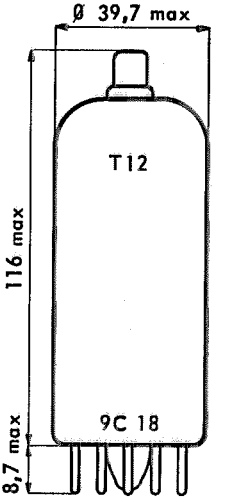
Capacités interélectrodes

Capacité grille n° 1/filament	Cg_1/f	200 mpF max
Capacité grille n° 1/anode	Cg_1/a	2,5 pF

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Grille n° 1
Broche n° 2 ..... Grille n° 3
Broche n° 3 ..... Grille n° 2
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Grille n° 2
Broche n° 7 ..... Grille n° 3
Broche n° 8 ..... Grille n° 1
Broche n° 9 ..... Cathode
Coiffe ..... Anode





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LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode à courant nul	Va bl	700 V max
Tension d'anode de crête	Va cr	7 000 V max (1) (2)
Tension de grille n° 3	Vg_3	50 V max
Tension de grille n° 2 à courant nul	Vg_2 bl	700 V max
Tension de grille n° 2	Vg_2	250 V max
Dissipation d'anode	Pa	30 W max
- dans le système des limites hybrides	Pa	40 W max
Dissipation de grille n° 2	Pg_2	7 W max (3)
- dans le système des limites hybrides	Pg_2	9 W max
Courant de cathode	Ik	500 mA max
Tension entre le filament et la cathode	Vfk	250 V max
Tension négative de crête de grille n° 1	$-Vg_1$ cr	550 V max (1)
Résistance du circuit de grille n° 1		
- avec une polarisation fixe	Rg_1	0,5 MΩ max
- avec stabilisation	Rg_1	2,2 MΩ max
Résistance du circuit de grille n° 3	Rg_3	10 kΩ max (4)

CARACTERISTIQUES NOMINALES

(mesurables seulement en impulsions)

Tension d'anode	Va	160	45 V
Tension de grille n° 3	Vg_3	0	0 V
Tension de grille n° 2	Vg_2	160	160 V
Tension de grille n° 1	Vg_1	0	0 V
Courant d'anode	Ia	1 400	1 000 mA
Courant de grille n° 2	Ig_2	45	- mA

CONDITIONS D'UTILISATION

Tension d'anode en fin de balayage	Va	55 V + 10 % VaN (5)
Tension de grille n° 3	Vg_3	0 V (6)
Tension de grille n° 2	Vg_2	175 V
Courant de crête d'anode	Ia cr	800 mA
Courant de crête de grille n° 2	Ig_2 cr	70 mA

Pendant le retour, la tension négative de grille n° 1 nécessaire pour assurer le blocage du tube est de 170 V min. pour Va = 7 000 V, Vg_2 = 175 V et Zg_1 = 1 kΩ à la fréquence de balayage ligne.

(1) Durée de l'impulsion limitée à 22 % d'un cycle, avec un maximum de 18 µs.
(2) Dans le système des limites absolues : 8 kV max.
(3) Pendant la période de chauffage de la cathode : 14 W max.
(4) Si on utilise une résistance inférieure ou égale à 10 kΩ, un découplage par capacité n'est pas nécessaire.
(5) Il faut inclure 10 % de la tension d'alimentation d'anode dans la tension en fin de balayage pour assurer le fonctionnement normal quand le secteur varie de -10%. La valeur de la tension d'alimentation peut être choisie arbitrairement, mais la valeur de la tension d'anode à courant nul ne doit pas être dépassée.
(6) La grille n° 3 peut être portée à une tension positive de 20 V environ afin d'éliminer éventuellement les oscillations de Barkhausen et l'effet de "Snivet".

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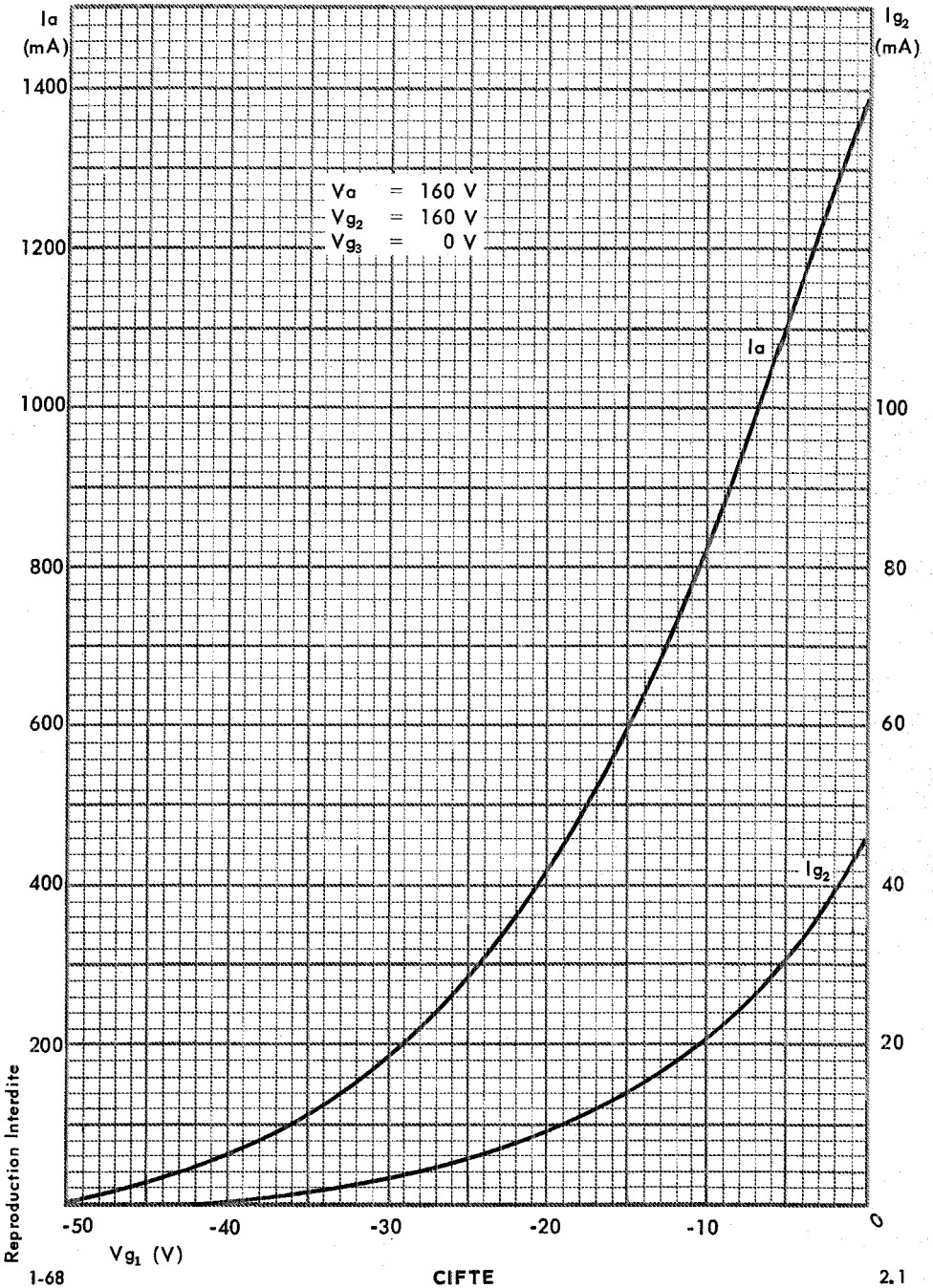

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PENTODE DE PUISSANCE

Amplificateur de balayage lignes

EL 511

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

Tension filament	Vf	6,3 V
Courant filament	If	1,3 A
Ampoule		T 12-72
Embase		9 C 18 (Magnoval)
Coiffe		C 6.1

Position de montage
Verticale : embase en bas
Horizontale : broches nº 4 et 9 situées dans un plan vertical.

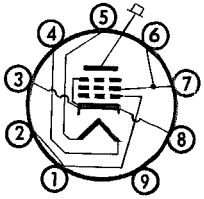
Capacités interélectrodes

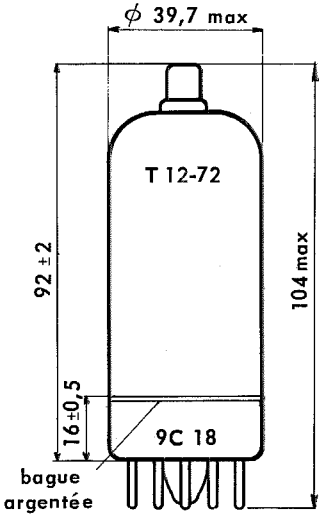
Capacité anode/ grille nº 1	Ca/g_1	1,6 pF max
Capacité d'entrée	Ce	29 pF max
Capacité de sortie	Cs	11 pF max

BROCHAGE ET ENCOMBREMENT

Broche nº 1 ..... Grille nº 1
Broche nº 2 ..... Grille nº 1
Broche nº 3 ..... Cathode
grille nº 3 (1)
Broche nº 4 ..... Filament
Broche nº 5 ..... Filament
Broche nº 6 ..... Grille nº 2
Broche nº 7 ..... Grille nº 2
Broche nº 8 ..... Cathode
grille nº 3 (1)
Broche nº 9 ..... Connexion interne
Coiffe ..... Anode

(1) Le circuit de cathode doit être connecté à la broche nº 8.





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LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode à courant nul	Vabl	550 V max
Tension continue d'anode	Va	250 V max
Tension de crête positive d'anode (1)	Vacr	7 500 V max
Tension de crête négative d'anode (1)	-Vacr	1 500 V max
Tension de grille n° 2 à courant nul	Vg_2 bl	550 V max
Tension continue de grille n° 2	Vg_2	250 V max
Tension de crête négative de grille n° 1 (1)	$-Vg_1$ cr	300 V max
Courant moyen de cathode	Ik	250 mA max
Dissipation d'anode Dissipation de grille n° 2 } voir courbes p. 1.5		
Tension de crête entre filament et cathode		
- filament négatif par rapport à la cathode	-Vfk cr	250 V max
- filament positif par rapport à la cathode	Vfk cr	200 V max
Résistance du circuit de grille n° 1		
- avec stabilisation	Rg_1	2,2 MΩ max
- avec polarisation par la cathode	Rg_1	0,5 MΩ max
Température de l'ampoule au point le plus chaud (2).		225° C max

(1) Limite absolue, pendant 22% de durée d'impulsion d'un cycle de balayage avec un maximum de 18 μs.

(2) Limite absolue.

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CONDITIONS NORMALES D'UTILISATION

Amplificateur de balayage lignes

Avec stabilisation - Fonctionnement au-dessus du genou

Tension d'alimentation	VN		170		V
Résistance du circuit de grille n° 2 (1)	Rg_2		1,2		kΩ min
Tension de grille n° 2	Vg_2	130		150	V
Tension d'anode en fin de cycle de balayage (2)	Va	62		66	V
Tension de grille n° 1 en fin de cycle de balayage (3)	Vg_1	-6		-7	V
Courant de crête d'anode (4)	Iacr	250		310	mA
Tension d'alimentation	VN		200		V
Résistance du circuit de grille n° 2 (1)	Rg_2		1,5		kΩ min
Tension de grille n° 2	Vg_2	130	150	170	V
Tension d'anode en fin de cycle de balayage (2)	Va	65	69	73	V
Tension de grille n°1 en fin de cycle de balayage (3)	Vg_1	-6	-7	-8	V
Courant de crête d'anode (4)	Iacr	250	310	360	mA
Tension d'alimentation	VN		230		V
Résistance du circuit de grille n° 2 (1)	Rg_2		2,2		kΩ min
Tension de grille n° 2	Vg_2	150	170	190	V
Tension d'anode en fin de cycle de balayage (2)	Va	72	76	80	V
Tension de grille n° 1 en fin de cycle de balayage (3)	Vg_1	-7	-8	-9	V
Courant de crête d'anode (4)	Iacr	310	360	420	mA

Sans stabilisation

Tension d'alimentation	VN	190	230	V
Résistance du circuit de grille n° 2	Rg_2	2,2	2,2	kΩ min
Tension de grille n° 1 en fin de cycle de balayage (3)	Vg_1	+1	+1	V
Courant de crête d'anode (4)	Iacr	230	320	mA

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Notes

1 - Valeur minimale de la résistance du circuit de grille n° 2 à utiliser afin d'éviter une dissipation excessive de cette électrode lors de la mise sous tension de l'appareil.

2 - Les valeurs indiquées de la tension d'anode correspondent à la tension nominale du secteur. Pour une tension du secteur inférieure de 10% à la valeur nominale, le tube fonctionnera encore au-dessus du genou de la caractéristique Ia = f (Va).

3 - Pendant le retour, la tension négative de grille n° 1 nécessaire pour assurer le blocage du tube est de - 150 V min. (Va = 7,5 kV, Vg_2 = 170 V).

4 - Afin de tenir compte des tolérances de fabrication, du vieillissement du tube et d'une diminution de la tension du réseau pouvant atteindre 10% de la tension, les valeurs indiquées du courant de crête de l'anode ne doivent pas être dépassées, dans chaque cas d'utilisation, pour la tension nominale du réseau.

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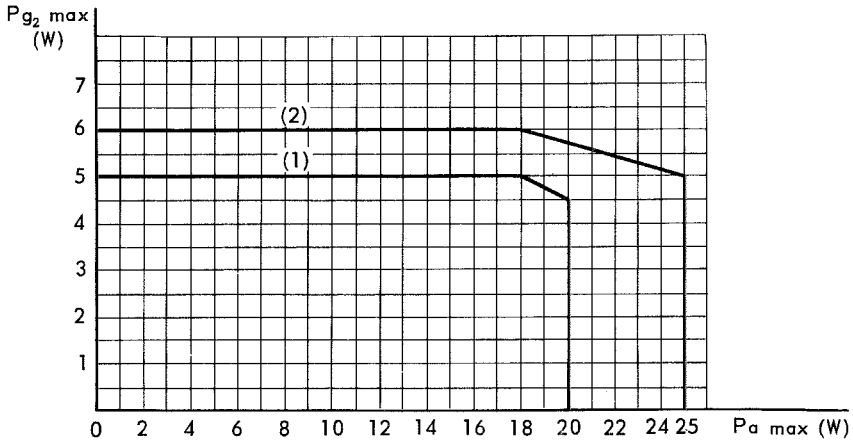

La figure ci-dessus indique les valeurs maximales admissibles de la dissipation d'anode Pa et de la dissipation de grille n° 2, Pg_2 :

- Dans le **système des limites moyennes,** pour le contour 1, le point d'abscisse Pa et d'ordonnée Pg_2 doit se trouver à l'intérieur de la zone délimitée par les axes et le contour 1.

- Dans le **système des limites hybrides,** pour le contour 2, elles ne doivent pas être dépassées, avec un tube moyen, dans les pires conditions probables d'utilisation, pour un balayage lignes normal.

(cf. Recommandations relatives à l'utilisation des tubes électroniques - FNIE - 011 p. 9 et annexe 1 p. 47).

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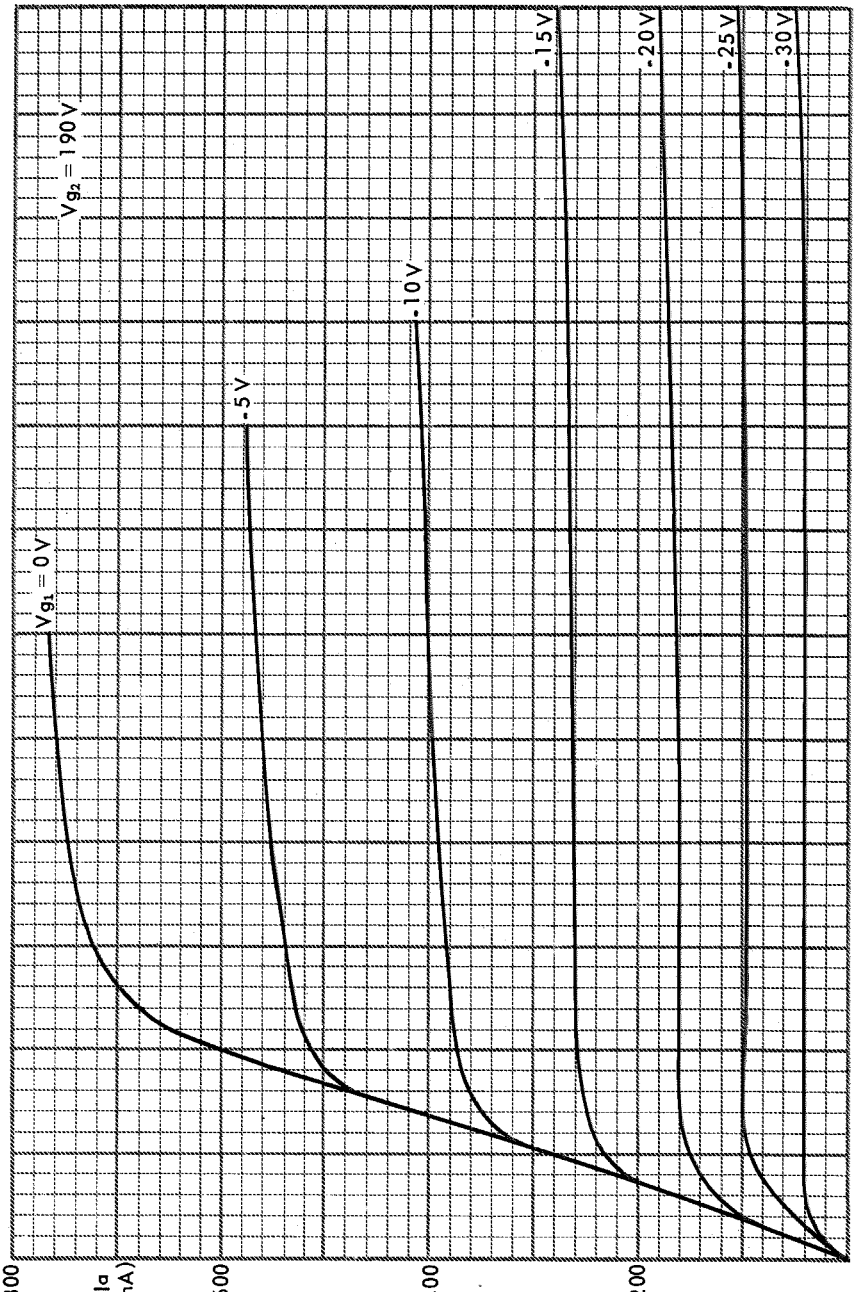

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EL 511

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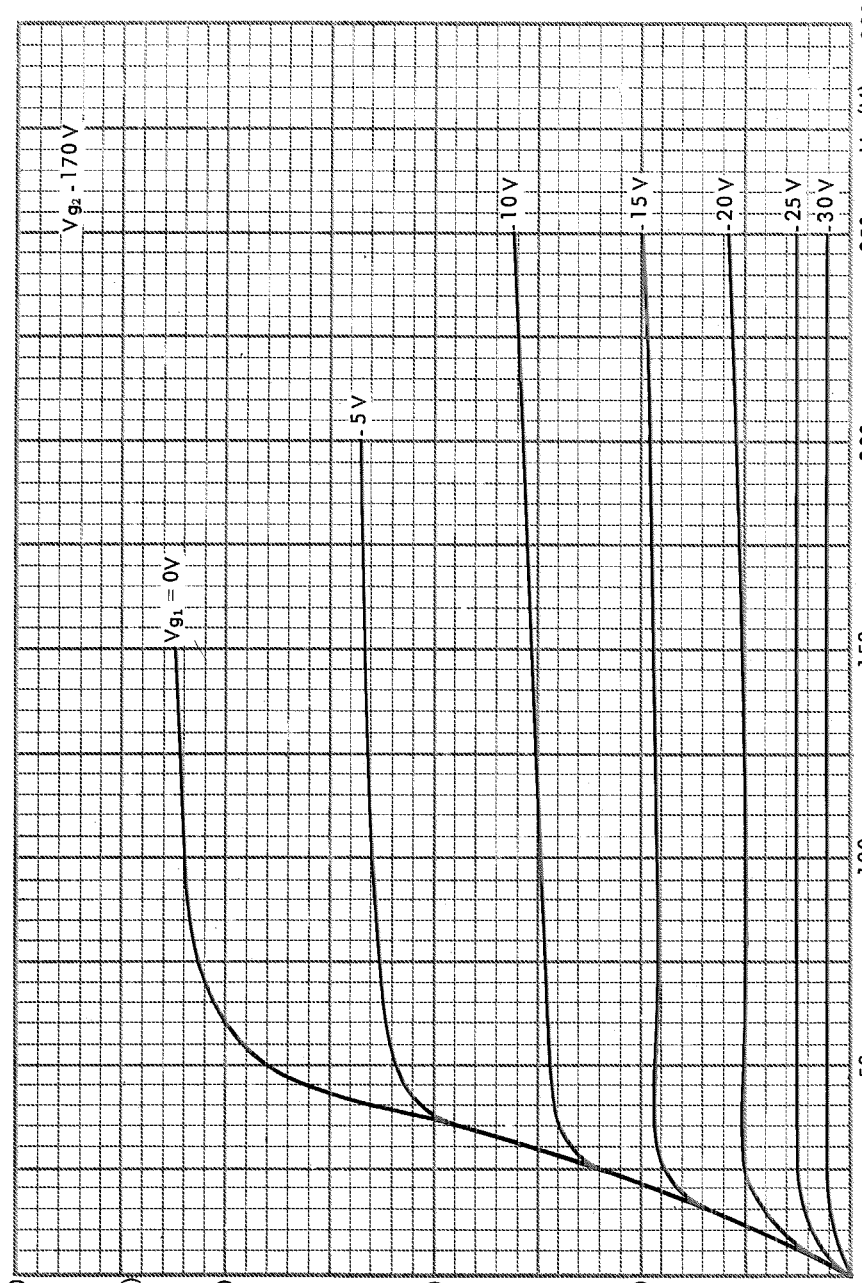

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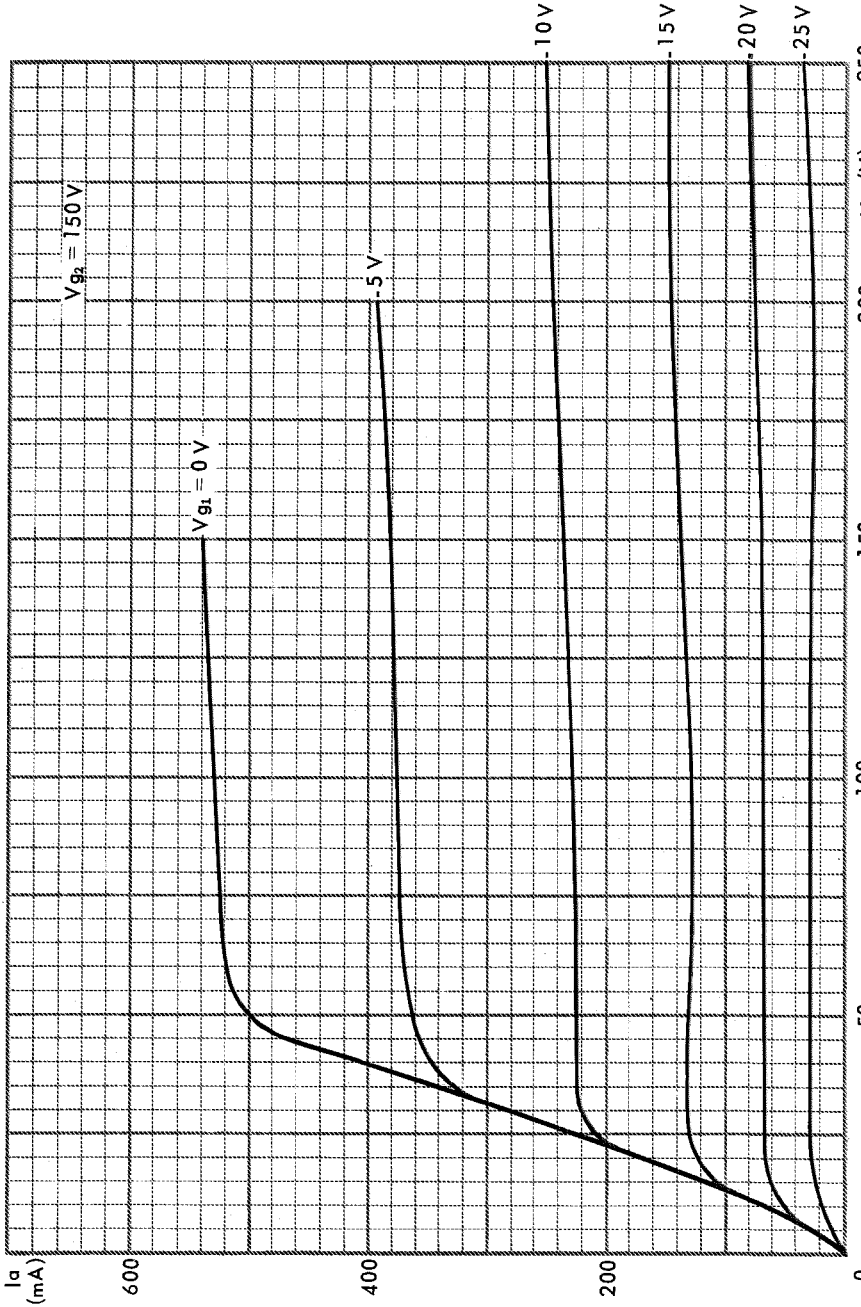

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EL 511

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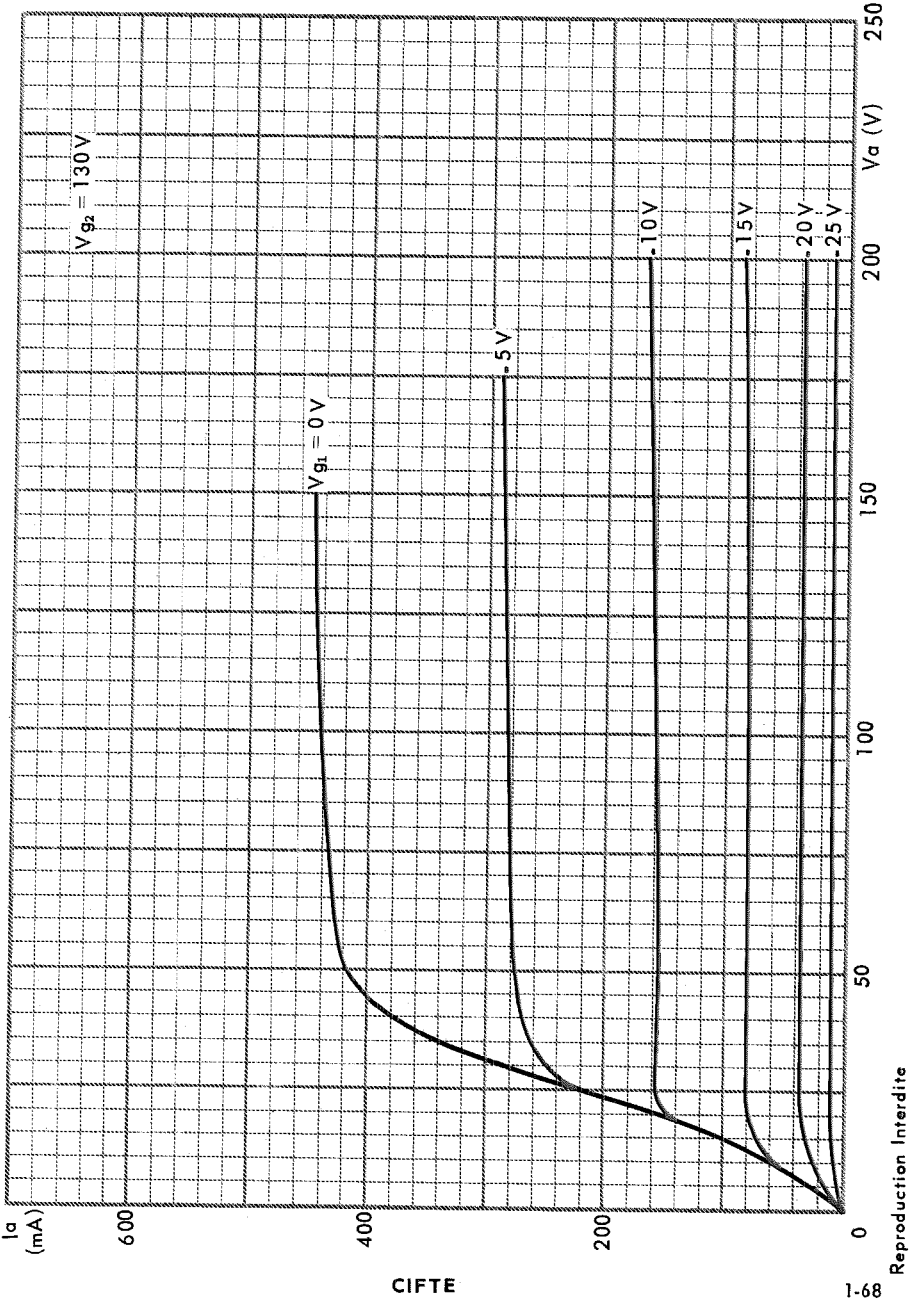

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PENTODE DE PUISSANCE

Amplificateur vidéofréquence TVC

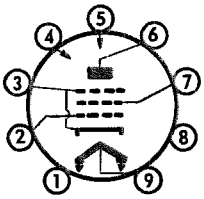
EL 806

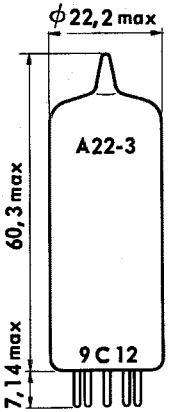
CARACTERISTIQUES GENERALES

Cathode à chauffage indirect			
Branchement du filament		en série	en parallèle
Tension filament	Vf	12,6	6,3 V
Courant filament	If	300	600 mA
Ampoule		A22-3	
Embase		9C12 (Noval)	
Position de montage		quelconque	
Capacités interélectrodes			
Capacité d'entrée	Ce		13,5 pF
Capacité de sortie	Cs		5 pF
Capacité anode/ grille n° 1	Ca/ g_1		80 mpF max

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Connexion interne
Broche n° 2 ..... Grille n° 1
Broche n° 3 ..... Cathode-grille n° 3
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Anode
Broche n° 7 ..... Grille n° 2
Broche n° 8 ..... Connexion interne
Broche n° 9 ..... Point-milieu du filament





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LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode	Va	250 V max
Tension de grille n° 2	Vg_2	250 V max
Dissipation d'anode	Pa	10 W max
Dissipation de grille n° 2	Pg_2	3 W
Courant de cathode	Ik	60 mA max
Résistance du circuit de grille n° 1	Rg_1	1 MΩ max
Tension entre le filament et la cathode	Vfk	200 V max (50 Veff + 150 Vctu)

CARACTERISTIQUE NOMINALES

Tension d'anode	Va	150 V
Tension de grille n° 2	Vg_2	240 V
Résistance de cathode	Rk	56 Ω
Courant de grille n° 2	Ig_2	8 mA
Pente	S	25 mA/V
Courant d'anode, pour Vg_1 = - 2,5 V	Ia	40 mA

Reproduction Interdite

MAZDA BELVU

PENTODE DE PUISSANCE

Amplificateur vidéofréquence

EL 83

6 CK 6

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

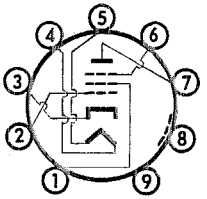
Tension filament	Vf	6,3 V
Courant filament	If	710 mA
Ampoule		A22-4
Embase		9C12 (noval)
Position de montage		quelconque

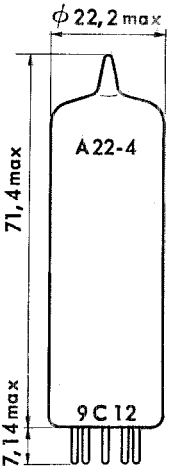
Capacités interélectrodes (sans blindage extérieur)

Capacité d'entrée	Ce	10,8 pF
Capacité de sortie	Cs	6,6 pF
Capacité grille n°1/anode	Cg_1/a	0,1 pF max
Capacité grille n°1/filament	Cg_1/f	0,15 pF max
Capacité grille n°1/grille n°2	Cg_1/g_2	3,2 pF

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Grille n° 2
Broche n° 2 ..... Grille n° 1
Broche n° 3 ..... Cathode
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Grille n° 3
Broche n° 7 ..... Anode
Broche n° 8 ..... Blindage interne
Broche n° 9 ..... Non connectée





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EL 83
6 CK 6

MAZDA
BELVU

LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode à courant nul	Vabl	550 V max
Tension d'anode	Va	300 V max
Tension de grille n° 2 à courant nul	Vg_2bl	550 V max
Tension de grille n° 2	Vg_2	300 V max
Tension négative de grille n° 1 pour un courant de grille n° 1 égale à + 0,3 μA	$-Vg_1$	1,3 V max
Courant de cathode	Ik	70 mA max
Dissipation d'anode	Pa	9 W max
Dissipation de grille n° 2	Pg_2	2 W max
Résistance du circuit de grille n° 1 :		
- avec polarisation automatique	Rg_1	1 MΩ max
- avec polarisation fixe	Rg_1	0,5 MΩ max
Résistance du circuit entre filament et cathode	Rfk	20 kΩ max
Tension entre filament et cathode	Vfk	100 V max

CARACTERISTIQUES NOMINALES

Tension d'anode	Va	250 V
Tension de grille n° 3	Vg_3	0 V
Tension de grille n° 2	Vg_2	250 V
Tension de grille n° 1	Vg_1	- 5,5 V
Courant d'anode	Ia	36 mA
Courant de grille n° 2	Ig_2	5 mA
Pente	S	10 mA/V
Résistance interne	ρ	0,13 MΩ
Facteur d'amplification g_2 g_1	Kg_2g_1	24 -

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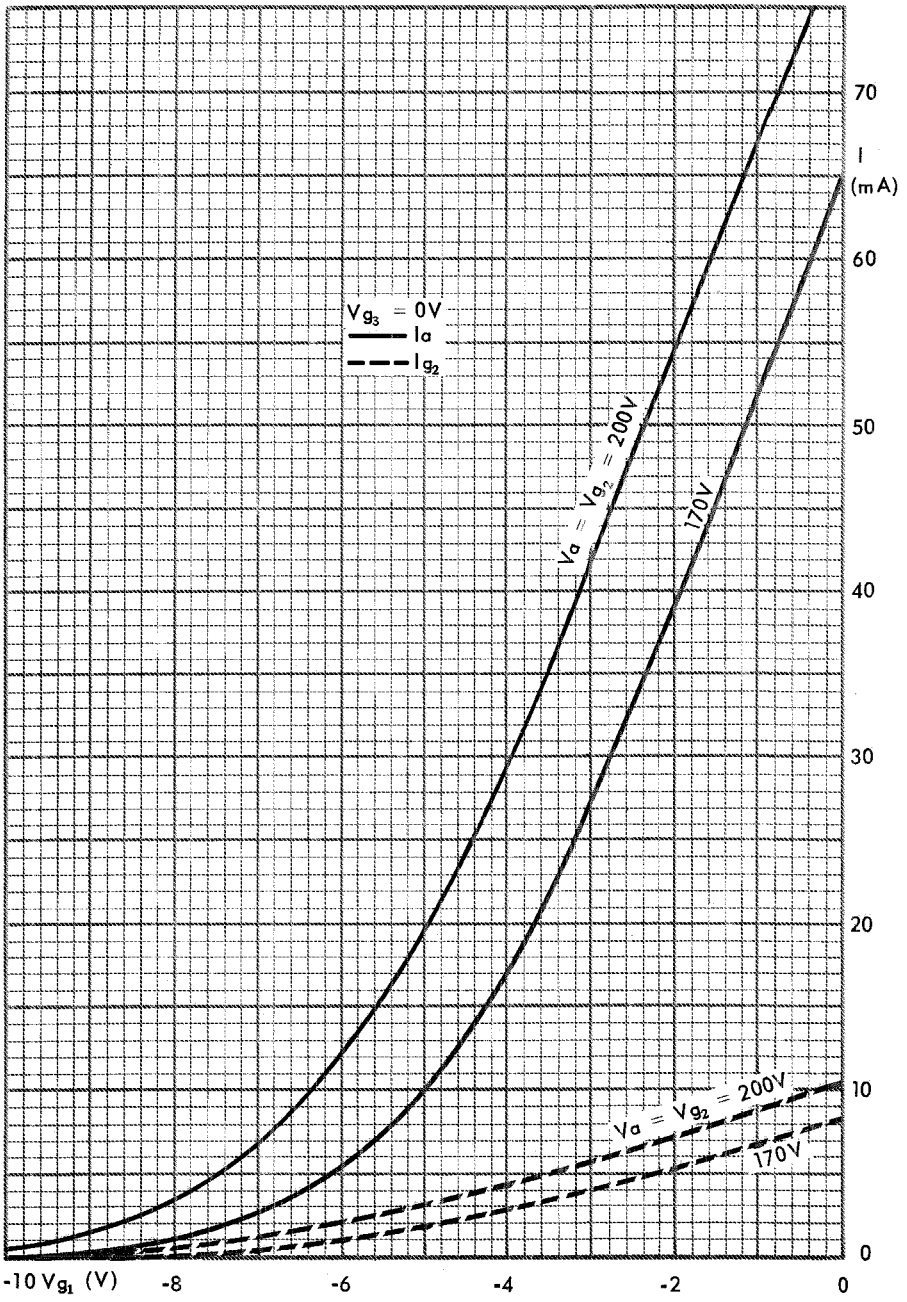
EL 83
6 CK 6



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EL 83
6 CK 6

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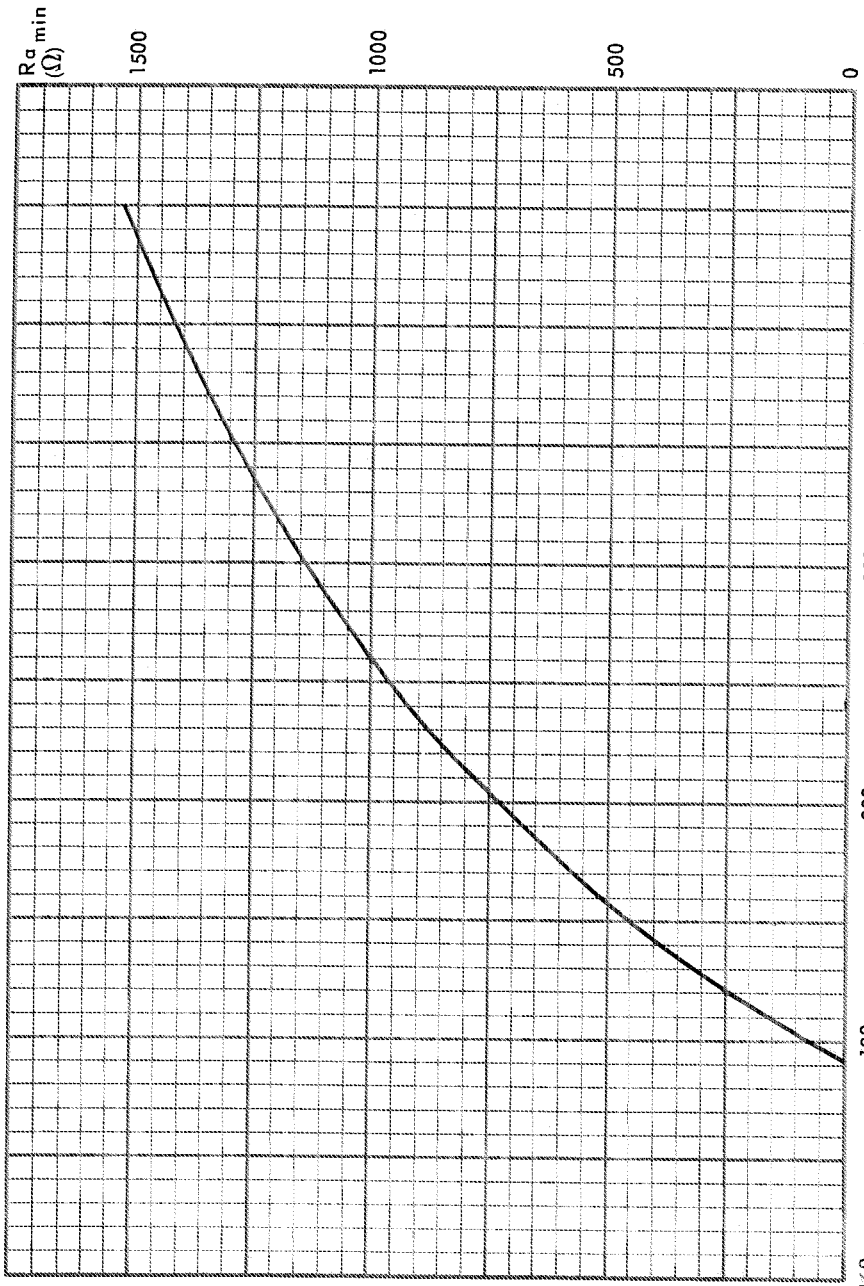


Reproduction Interdite

PENTODE DE PUISSANCE

Amplificateur de sortie A.F.

EL 84
6BQ5

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

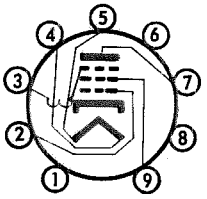
Tension filament	Vf	6,3 V
Courant filament	If	760 mA
Ampoule		A22-4
Embase		9C12 (noval)
Position de montage		quelconque

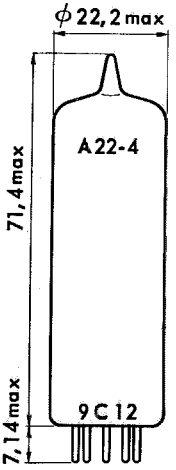
Capacités interélectrodes (sans blindage extérieur)

Capacité d'entrée	Ce	10,8 pF
Capacité de sortie	Cs	6,5 pF
Capacité grille n° 1/anode	Cg_1/a	0,5 pF max
Capacité grille n° 1/ filament	Cg_1/f	0,25 pF max

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Connexion interne
Broche n° 2 ..... Grille n° 1
Broche n° 3 ..... Cathode et grille n° 3
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Connexion interne
Broche n° 7 ..... Anode
Broche n° 8 ..... Connexion interne
Broche n° 9 ..... Grille n° 2





Reproduction interdite

EL 84
6BQ5

MAZDA
BELVU

LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode à courant nul	Va_{bl}	550 V max
Tension d'anode	Va	300 V max 1)
Dissipation d'anode	Pa	12 W max 1)
Tension de grille n° 2 à courant nul	$Vg_{2\,bl}$	550 V max
Tension de grille n° 2	Vg_2	300 V max 1)
Dissipation de grille n° 2	Pg_2	2 W max
Tension négative de grille n° 1	$-Vg_1$	100 V max
Tension négative de grille n° 1 pour un courant de grille n° 1 de + 0,3 μA	$-Vg_1$	1,3 V max
Courant de cathode	Ik	65 mA max
Résistance du circuit de grille n° 1	Rg_1	1 MΩ max 2)
Résistance du circuit de grille n° 1	Rg_1	0,3 MΩ max 3)
Tension entre filament et cathode	Vfk	100 V max
Résistance du circuit entre filament et cathode	Rfk	20 kΩ max

CARACTERISTIQUES NOMINALES

Tension d'anode	Va	250	250 V
Tension de grille n° 2	Vg_2	250	250 V
Résistance de cathode	Rk	135	210 Ω
Tension de la grille n° 1	Vg_1	-7,3	-8,4 V
Courant d'anode	Ia	48	36 mA
Courant de grille n° 2	Ig_2	5,5	4,1 mA
Résistance interne	ρ	38	40 kΩ
Pente	S	11,3	10 mA/V
Résistance de charge d'anode	Ra	5,2	7 kΩ
Tension d'entrée	Ve	4,3	3,5 Veff
Puissance de sortie	Ps	5,7	4,2 W
Distorsion	D	10	10 %

(1) Si la tension de chauffage et les tensions positives sont obtenues à partir d'un accumulateur, les valeurs maximales de Va et de Vg2 sont ramenées à 250 V et celle de la dissipation d'anode à 9 W.
(2) Cas d'une polarisation automatique.
(3) Cas d'une polarisation fixe.

Reproduction Interdite

CONDITIONS NORMALES D'UTILISATION

Amplificateur push-pull, classe B

Tension d'anode	Va	250		300		V
Tension de grille n° 2	Vg_2	250		300		V
Tension de grille n° 1	Vg_1	-11,6		-14,7		V
Résistance de charge entre anodes	Raa	8		8		kΩ
Tension d'entrée	Ve	0	8	0	10	Veff
Courant d'anode	Ia	2×10	2×37,5	2×7,5	2×46	mA
Courant de grille n° 2	Ig_2	2×1,1	2×7,5	2×0,8	2×11	mA
Puissance de sortie	Ps	0	11	0	17	W
Distorsion totale	Dt	- -	3	-	4	%

Amplificateur push-pull, classe AB.

Tension d'anode	Va	250		300		V
Tension de grille n° 2	Vg_2	250		300		V
Résistance de cathode	Rk	130		130		Ω
Résistance de charge entre anodes	Raa	8		8		kΩ
Tension d'entrée	Ve	0	8	0	10	Veff
Courant d'anode	Ia	2×31	2×37,5	2×36	2×46	mA
Courant de grille n° 2	Ig_2	2×3,5	2×7,5	2×4	2×11	mA
Puissance de sortie	Ps	0	11	0	17	W
Distorsion totale	Dt	-	3	-	4	%

Amplificateur classe A, montage triode (G2 reliée à l'anode)

Tension d'anode	Va	250			V
Résistance de cathode	Rk	270			Ω
Résistance d'anode	Ra	3,5			kΩ
Tension d'entrée	Ve	0	1,0	6,7	Veff
Courant d'anode	Ia	34	-	36	mA
Puissance de sortie	Ps	-	0,05	1,95	Watt
Distorsion totale	Dt	-	-	9	%

Amplificateur push-pull, classe AB, montage triode (G2 reliée à l'anode)

Tension d'anode	Va	250		300		V
Résistance de cathode	Rk	270		270		Ω
Résistance de charge entre anodes	Raa	10		10		kΩ
Tension d'entrée	Ve	0	8,3	0	10	Veff
Courant d'anode	Ia	2×20	2×21,7	2×24	2×26	mA
Puissance de sortie	Ps	0	3,4	0	5,2	W
Distorsion totale	Dt	-	2,5	-	2,5	%

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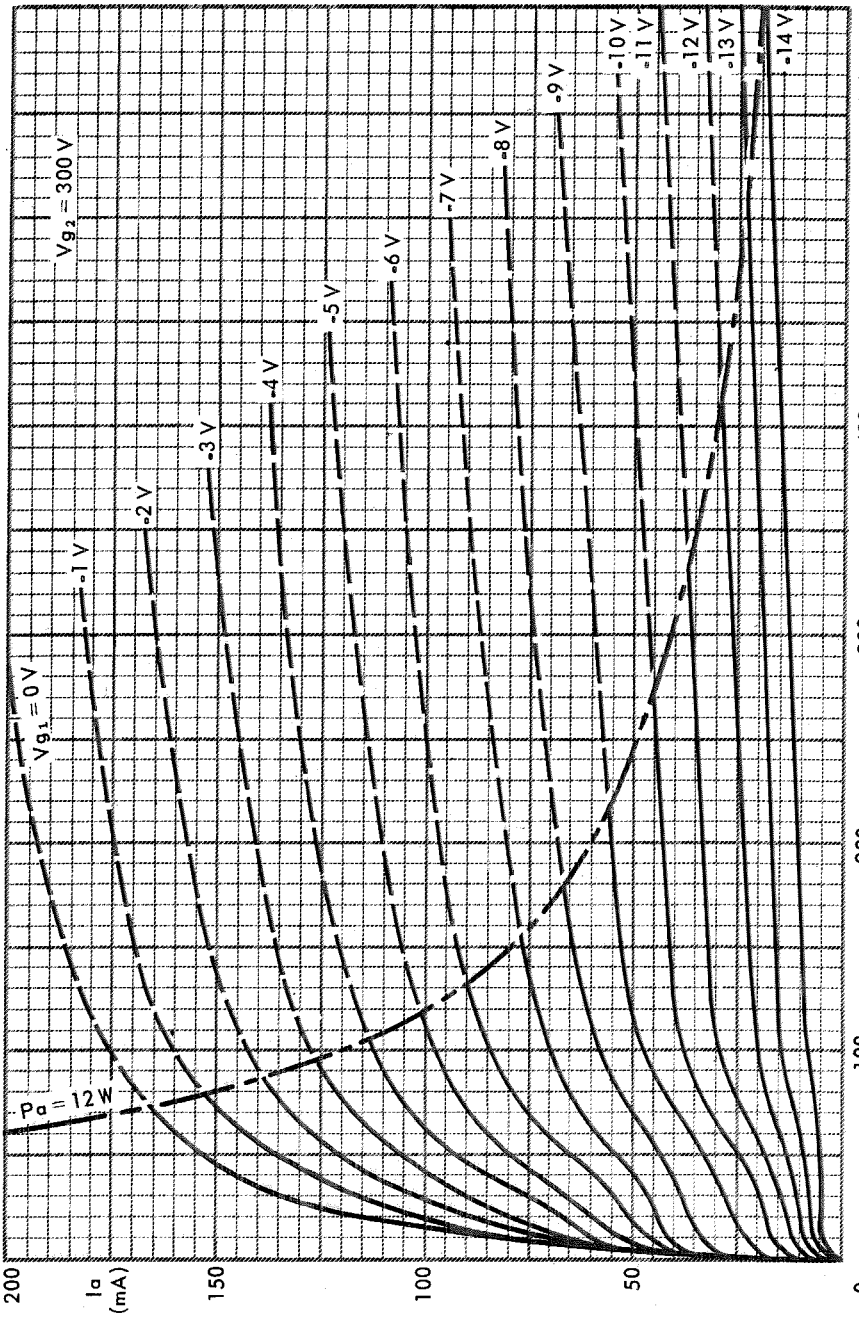
EL 84
6BQ5



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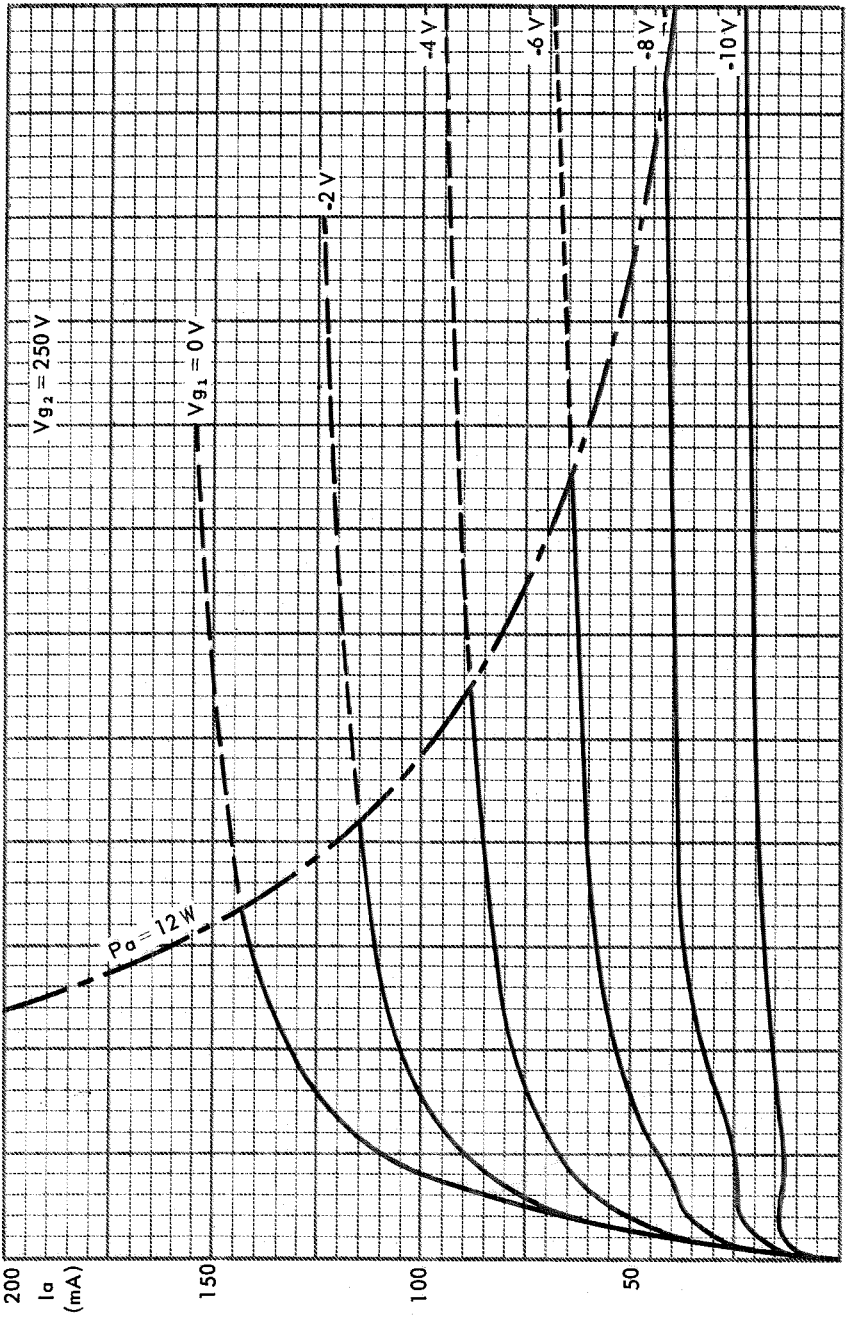
EL 84
6BQ5

MAZDA
BELVU



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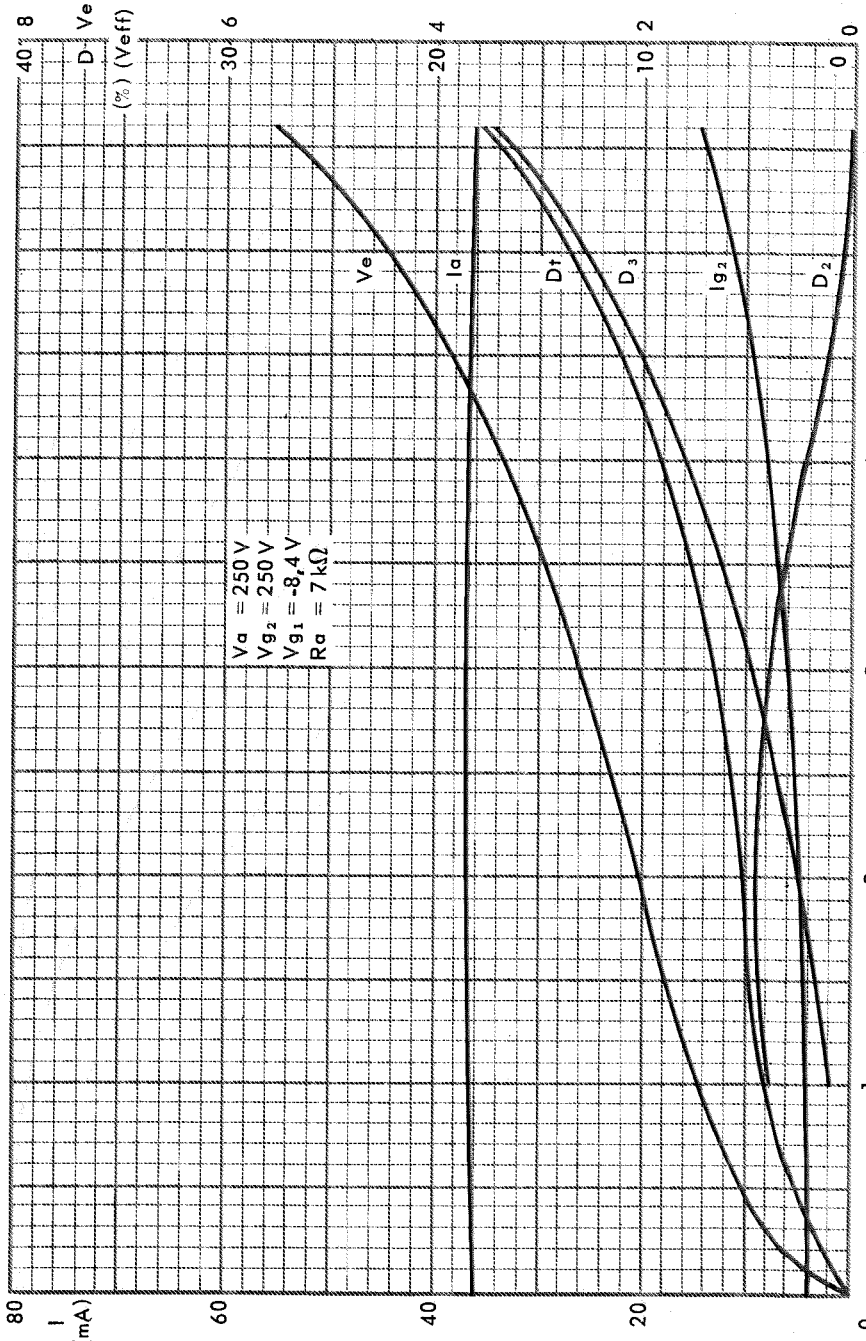
EL 84
6BQ5



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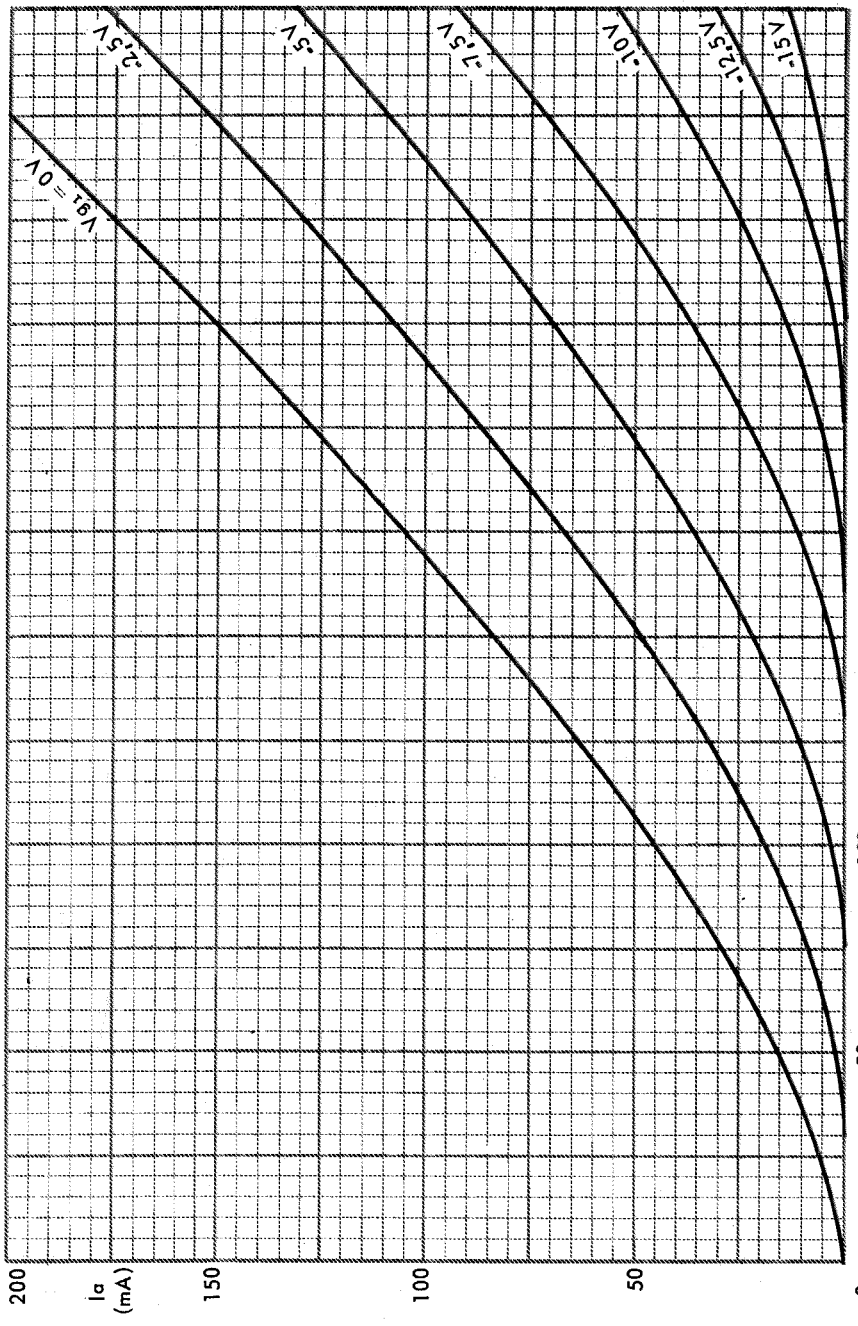
EL 84
6 BQ 5

MAZDA
BELVU

MONTAGE TRIODE



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LIMITES MAXIMALES D'UTILISATION

Utilisation en amplificateur de balayage images

Courant d'anode de crête

Pour un tube neuf moyen, le courant d'anode de crête est de 125 mA pour Va = 70 V , Vg_2 = 230 V et Vg_1 = 0 V.

Afin de tenir compte des tolérances de fabrication, du vieillissement du tube, des variations de tension du réseau et de la dispersion des caractéristiques des éléments du circuit, ce dernier devra être conçu pour un courant de crête d'anode ne dépassant pas 100 mA pour Va = 70 V , Vg_2 = 230 V et Vg_1 = 0 V.

Par ailleurs, les caractéristiques telles que : microphonie, linéarité, effet S ont été particulièrement étudiées pour l'utilisation en balayage images.

Pour toutes les autres caractéristiques, consulter la documentation relative au tube EL 84/6 BQ 5.

Reproduction Interdite

MAZDA BELVU

PENTODE DE PUISSANCE

Amplificateur A.F.
Amplificateur de balayage images

EL 86 F

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

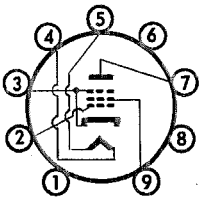
Tension filament	Vf	6,3 V
Courant filament	If	760 mA
Ampoule		A22-4
Embase		9C12 (noval)
Position de montage		quelconque

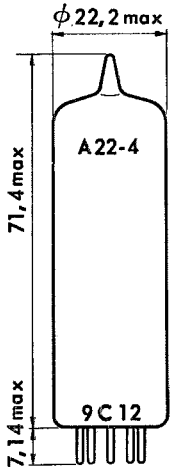
Capacités interélectrodes (sans blindage extérieur)

Capacité anode/grille n° 1	Ca/g_1	0,6 pF max
Capacité d'entrée	Ce	13 pF
Capacité de sortie	Cs	6,8 pF
Capacité grille n° 1/filament	Cg_1/f	0,25 pF max

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Connexion interne
Broche n° 2 ..... Grille n° 1
Broche n° 3 ..... Cathode, grille n° 3
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Connexion interne
Broche n° 7 ..... Anode
Broche n° 8 ..... Connexion interne
Broche n° 9 ..... Grille n° 2





Reproduction interdite

LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode à courant nul	Va bl	550 V max
Tension d'anode	Va	250 V max
Tension de crête d'anode (1)	Va cr	2000 V max
Tension de grille n° 2 à courant nul	Vg_2 bl	550 V max
Tension de grille n° 2	Vg_2	250 V max
Dissipation d'anode		
- pour l'amplification A.F.	Pa	12 W max
- pour le balayage images	Pa	10 W max
Dissipation de grille n° 2	Pg_2	1,75 W max
Dissipation de crête de grille n° 2	Pg_2 cr	6 W max
Courant de cathode	Ik	100 mA max
Résistance du circuit de grille n° 1 avec polarisation automatique (2)	Rg_1	1 MΩ max
Résistance du circuit entre filament et cathode	Rfk	20 kΩ max
Tension entre filament et cathode	Vfk	200 V max

CARACTERISTIQUES NOMINALES

Tension d'anode	Va	170 V
Tension de grille n° 2	Vg_2	170 V
Tension de grille n° 1	Vg_1	-12,5 V
Courant d'anode	Ia	70 mA
Courant de grille n° 2	Ig_2	3,5 mA
Pente	S	11 mA/V
Résistance interne	ρ	26 kΩ
Facteur d'amplification $g_2\,g_1$	$Kg_2\,g_1$	8 -

(1) durée de l'impulsion limitée à 4% d'une période de balayage avec un maximum de 0,8 ms.

(2) pour l'utilisation en amplificateur de balayage images, la limite maximale est de 2 MΩ

Reproduction interdite

CONDITIONS NORMALES D'UTILISATION

Amplificateur A.F. - classe A.

Tension d'alimentation	VN		200	V
Résistance de charge d'anode	Ra		2,5	kΩ
Résistance de grille n° 2	Rg_2		470	Ω
Résistance de cathode	Rk		215	Ω
Tension d'entrée	Ve	0	0,52	7 Veff
Courant d'anode	Ia	65	-	64 mA
Courant de grille n° 2	Ig_2	3,2	-	11,4 mA
Puissance de sortie	Ps	0	0,05	5,3 W
Distorsion totale	Dt	-	-	10 %

Amplificateur push-pull A.F. - classe A.B.

Tension d'alimentation d'anode	Va N		250	V
Tension d'alimentation de grille n° 2	Vg_2 N		200	V
Résistance de charge, d'anode à anode	Raa		5,5	kΩ
Résistance de cathode	Rk		150	Ω
Tension d'entrée	Ve	0	0,37	13 Veff
Courant d'anode	Ia	2×50	-	2×55 mA
Courant de grille n° 2	Ig_2	2×2	-	2×13 mA
Puissance de sortie	Ps	0	0,05	18,5 W
Distorsion totale	Dt	-	-	4,5 %

Amplificateur de balayage images

Courant d'anode de crête . Afin de tenir compte des tolérances de fabrication, du vieillissement du tube, des variations de la tension du réseau et de la dispersion des caractéristiques du circuit, ce dernier devra être conçu pour des courants de crête d'anode ne dépassant pas les valeurs indiquées ci-après :

Tension d'anode en fin de cycle de balayage	60	70	80 V
Tension de grille n° 2	170	200	220 V
Courant de crête d'anode	145	190	220 mA

En aucun cas, la tension de polarisation de la grille n° 1 ne doit être supérieure à - 1 volt.

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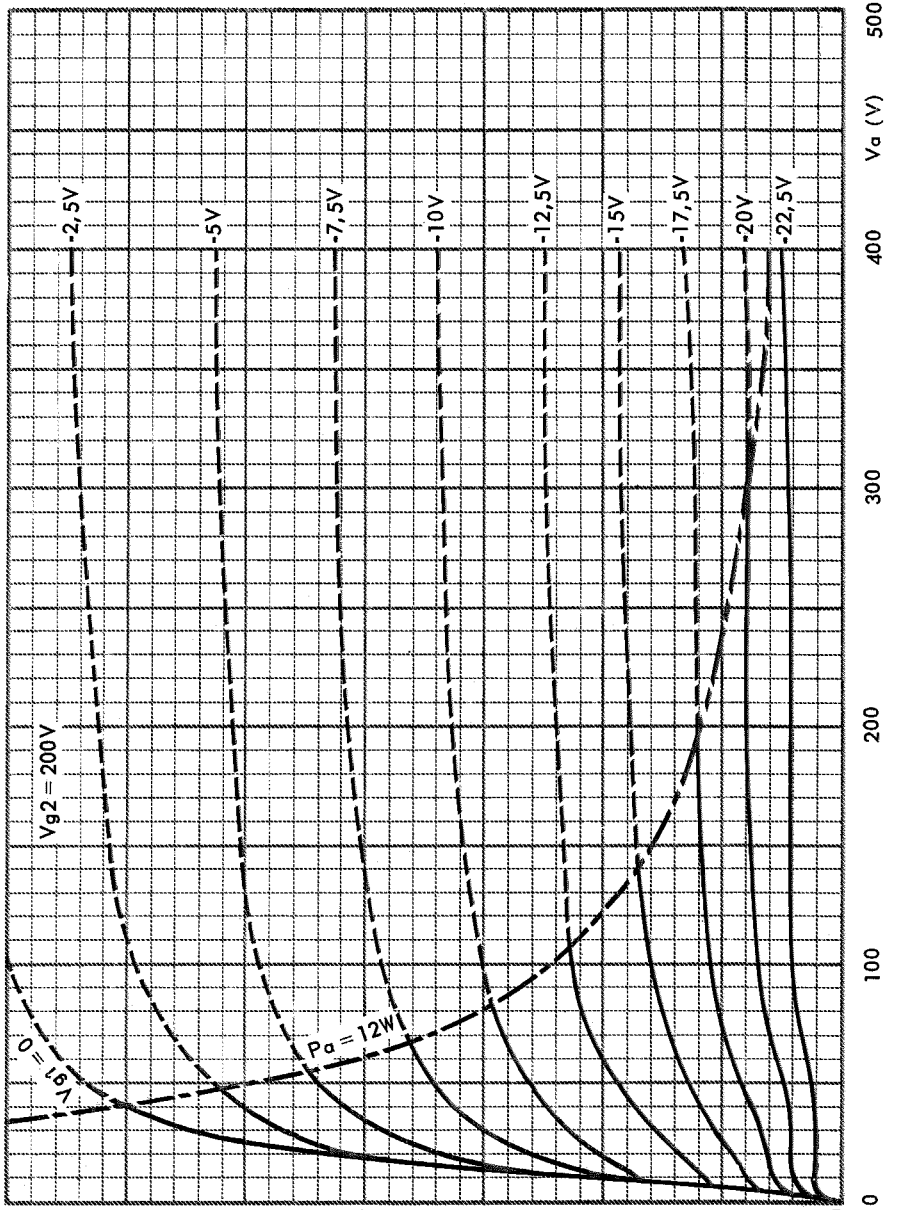

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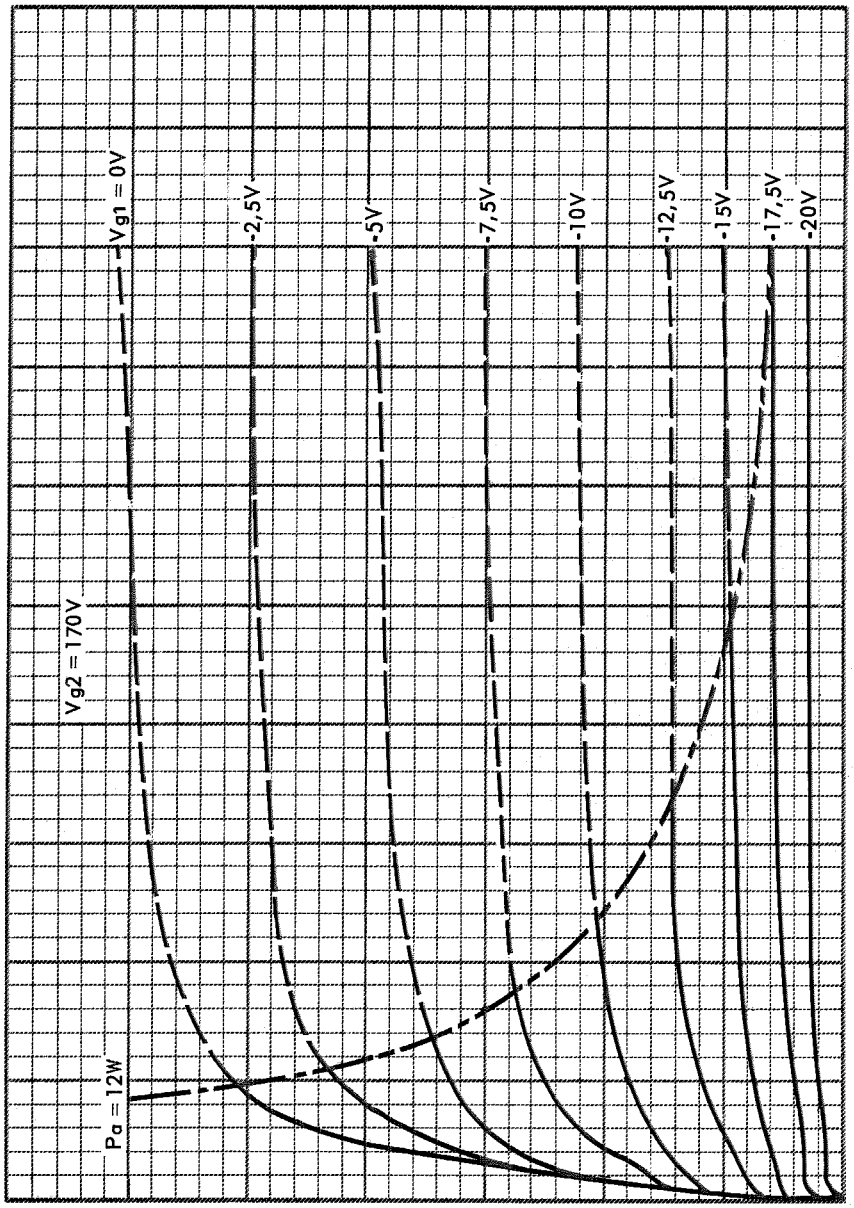
EL 86 F

MAZDA
BELVU



Reproduction Interdite

INDICATEUR D'ACCORD

EM 34

CARACTERISTIQUES GENERALES

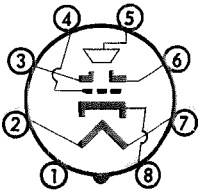
Cathode à chauffage indirect

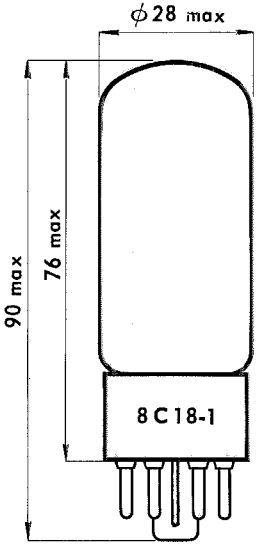
Alimentation du filament en série ou en parallèle

Tension filament	Vf	6,3 V
Courant filament	If	200 mA
Ampoule		voir dessin
Embase		8 C 18-1 (octal)
Position de montage		quelconque

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Non connectée
Broche n° 2 ..... Filament
Broche n° 3 ..... Anode n° 1
Broche n° 4 ..... Grille
Broche n° 5 ..... Ecran fluorescent (cible)
Broche n° 6 ..... Anode n° 2
Broche n° 7 ..... Filament
Broche n° 8 ..... Cathode





Reproduction Interdite

LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode n° 1 à courant nul	Va_1 bl	550 V max.
Tension d'anode n° 1	Va_1	275 V max.
Tension d'anode n° 2 à courant nul	Va_2 bl	550 V max.
Tension d'anode n° 2	Va_2	275 V max.
Tension de cible à courant nul	Vc bl	550 V max.
Tension de cible	Vc	275 V max.
Tension de grille pour un courant de grille de + 0,3 μA	-Vg	1,3 V max.
Résistance de grille	Rg	3 MΩ max.
Résistance entre filament et cathode	Rfk	20 kΩ max.
Tension entre filament et cathode	Vfk	100 V max.

CONDITIONS NORMALES D'UTILISATION

Tension d'alimentation d'anode	VaN	100	200	250 V
Résistance d'anode n° 1	Ra_1	1	1	1 MΩ
Résistance d'anode n° 2	Ra_2	1	1	1 MΩ
Courant de cible pour Vg = 0	Ic	0,2	0,55	0,75 mA
Tension de grille				
pour un angle d'ombre de 90° (1)	Vg	0	0	0 V
pour un angle d'ombre de 5° (1)	Vg	-	-4,2	-5 V
pour un angle d'ombre de 0° (1)	Vg	-2,5	-	- V
Tension de grille				
pour un angle d'ombre de 90° (2)	Vg	0	0	0 V
pour un angle d'ombre de 5° (2)	Vg	-	-12,5	-16 V
pour un angle d'ombre de 0° (2)	Vg	-8	-	- V

1) Angle de l'ombre produite par la tige de déviation de l'anode n° 1 mesuré au bord de l'écran.

2) Angle de l'ombre produite par la tige de déviation de l'anode n° 2 mesuré au bord de l'écran.

Reproduction Interdite

INDICATEUR D'ACCORD

avec triode amplificatrice

EM 84

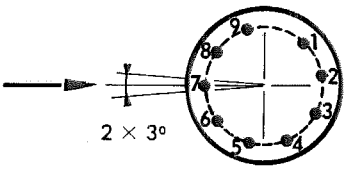
CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

Tension filament	Vf	6,3 V
Courant filament	If	210 mA
Ampoule		A22-7
Embase		9C12 (noval)

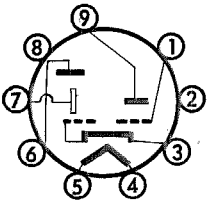
Position de montage

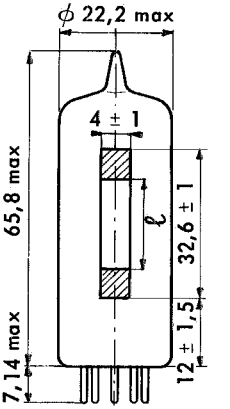
La flèche du dessin ci-dessous (tube vu de l'embase) indique la direction d'observation de la cible.



BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Grille Triode
Broche n° 2 ..... Connexion interne
Broche n° 3 ..... Cathode et grille de commande de l'indicateur
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Cible (Ecran fluorescent)
Broche n° 7 ..... Electrode de commande (couteau)
Broche n° 8 ..... Connexion interne
Broche n° 9 ..... Anode Triode





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LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode à courant nul	Va bl	550 V max
Tension d'anode	Va	300 V max
Tension de l'électrode de commande à courant nul	Vj bl	550 V max
Tension de l'électrode de commande	Vj	300 V max
Tension de cible pour un courant d'anode nul	Vc bl	550 V max
Tension de cible	Vc	300 V max
	Vc	170 V min
Dissipation d'anode	Pa	0,5 W max
Courant de cathode	Ik	3 mA max
Résistance du circuit de grille triode	RgT	3 MΩ max
Résistance entre filament et cathode	Rfk	20 kΩ max
Tension entre filament et cathode	Vfk	100 V max
Tension de grille pour un courant de + 0,3 μA	-Vg	1,3 V max
Température de l'ampoule au point le plus chaud		120 °C max

CONDITIONS NORMALES D'UTILISATION

(électrode de commande réunie à l'anode)

Tension d'alimentation	VN	250	V
Tension de cible	Vc	250	V
Résistance d'anode	Ra	470	kΩ
Résistance du circuit de grille triode	Rg T	3	MΩ
Tension de grille triode	Vg T	0	-22 V
Courant d'anode + électrode de commande	Ia j	0,45	0,06 mA
Courant de cible	Ic	1,0	1,8 mA
Longueur d'ombre	l	21 ±5	0 mm

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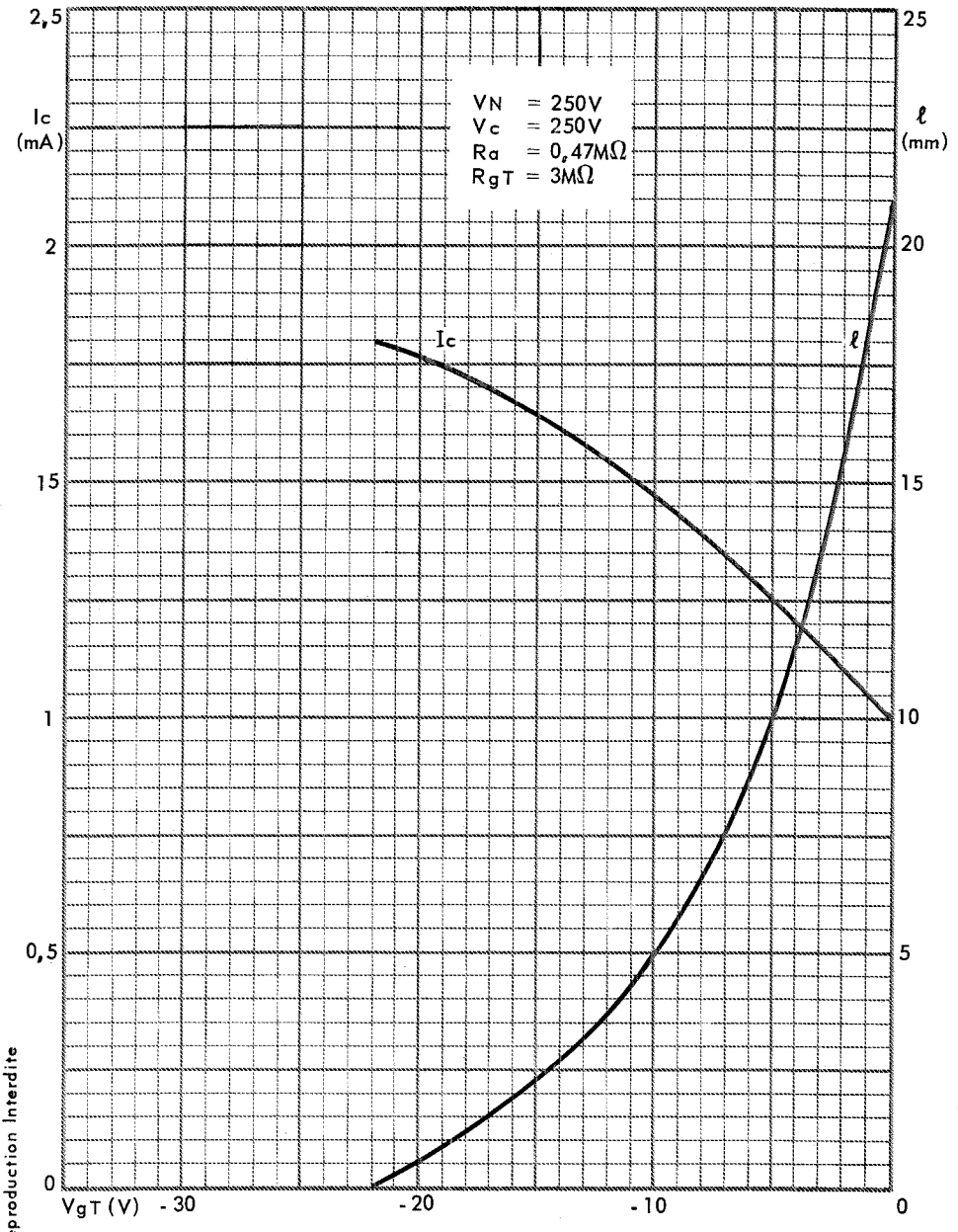


Reproduction interdite

INDICATEUR D'ACCORD

avec triode amplificatrice

EM 87

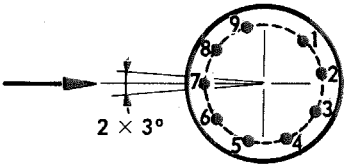
CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en série ou en parallèle

Tension filament	Vf	6,3 V
Courant filament	If	300 mA
Ampoule		A22-7
Embase		9C12 (noval)

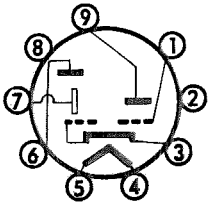
Position de montage

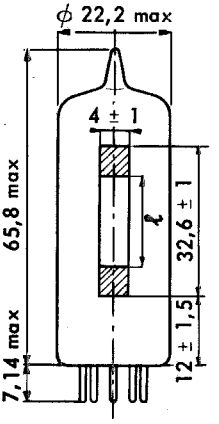
La flèche du dessin ci-dessous (tube vu de l'embase) indique la direction d'observation de la cible.



BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Grille triode
Broche n° 2 ..... Connexion interne
Broche n° 3 ..... Cathode et grille de commande de l'indicateur
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Cible (Ecran fluorescent)
Broche n° 7 ..... Electrode de commande (couteau)
Broche n° 8 ..... Connexion interne
Broche n° 9 ..... Anode Triode





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LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode à courant nul	Va bl	550 V max
Tension d'anode	Va	300 V max
Tension de l'électrode de commande à courant nul	Vj bl	550 V max
Tension de l'électrode de commande	Vj	300 V max
Tension de cible pour un courant d'anode nul	Vc bl	550 V max
Tension de cible	Vc	300 V max
	Vc	170 V min
Dissipation d'anode	Pa	0,6 W max
Courant de cathode	Ik	5 mA max
Résistance du circuit de grille Triode	RgT	3 MΩ max
Résistance entre filament et cathode	Rfk	100 kΩ max
Tension entre filament et cathode	Vfk	250 V max
Température de l'ampoule au point le plus chaud		120 ° C max

CONDITIONS NORMALES D'UTILISATION

Electrode de commande réunie à l'anode triode

Tension d'alimentation	V_N		250		V
Tension de cible	Vc		250		V
Résistance d'anode	Ra		100		kΩ
Résistance du circuit de grille Triode	RgT		3		MΩ
Tension de grille Triode	V_{gT}	0	-10	-15	V
Courant d'anode + électrode de commande	Iaj	2	0,5	0,2	mA
Courant de cible	Ic	1,0	1,8	2,0	mA
Longueur d'ombre	l	21	0	-1,5	mm (1)

(1) Cette valeur négative signifie que les deux parties lumineuses de la cible se recouvrent sur 1,5 mm.

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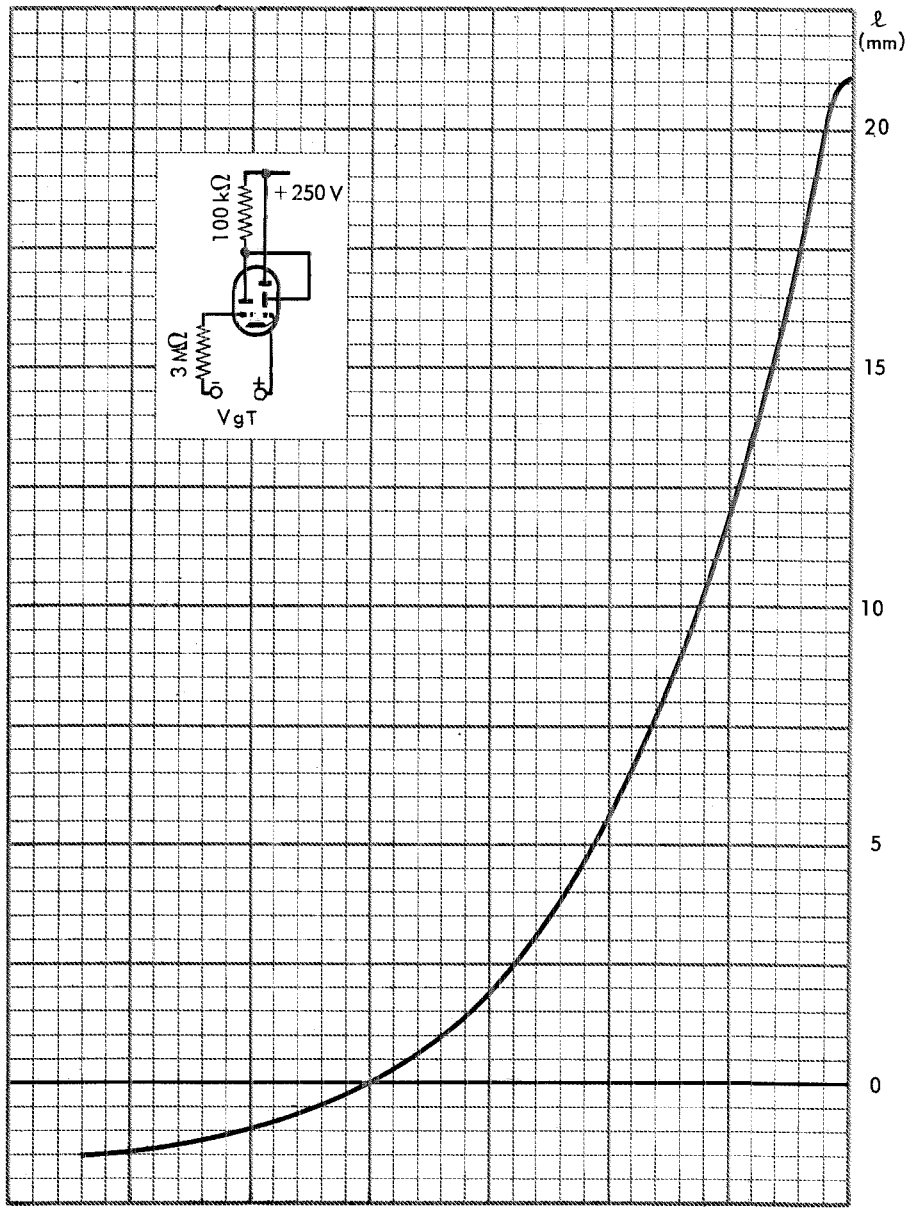

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EM 87

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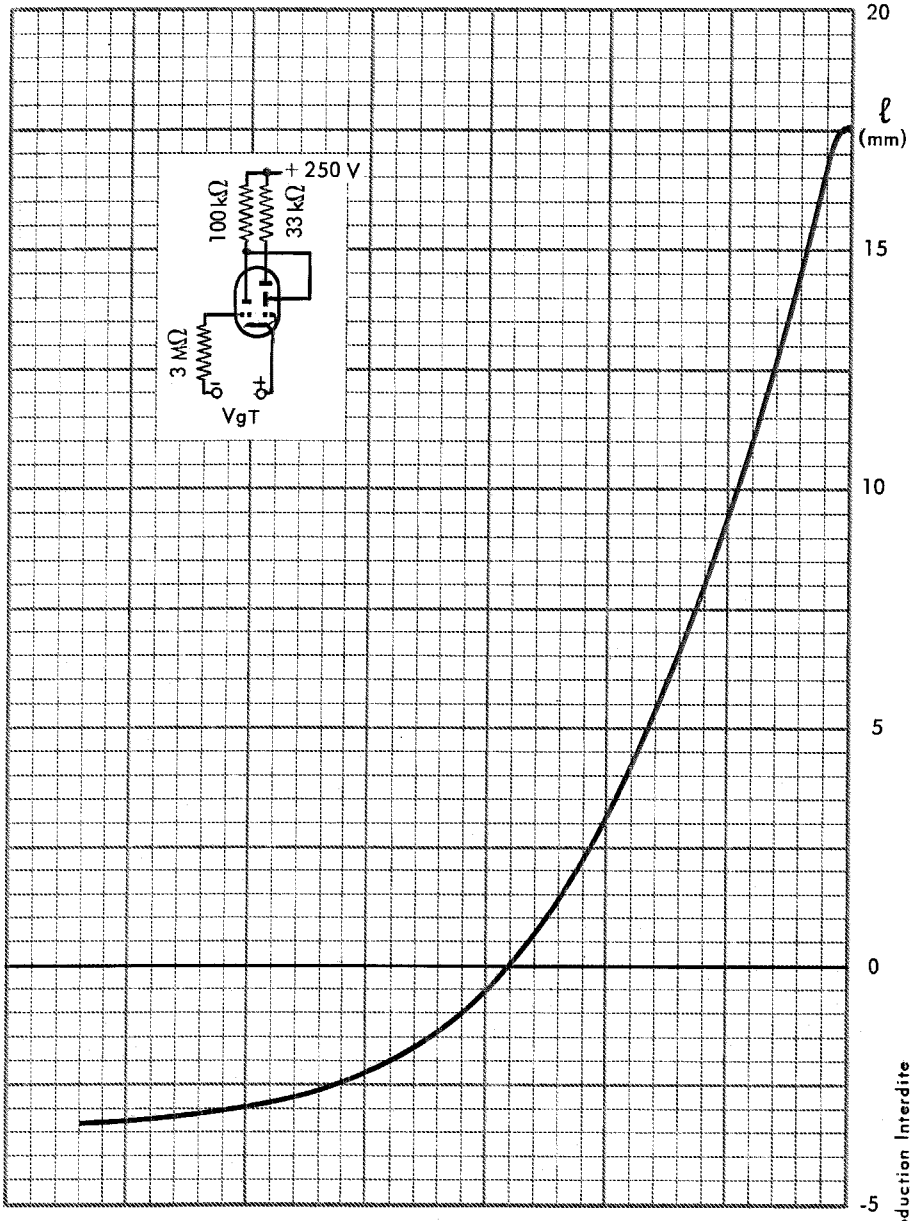

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MAZDA BELVU

DIODE DE RECUPERATION

pour les circuits de balayage lignes TVC

EY 500 A

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

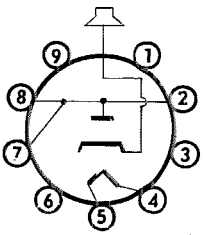
Tension filament	Vf	6,3 V
Courant filament	If	2,1 A
Ampoule		T 9
Embase		9C18 magnoval
Coiffe		C 6-1

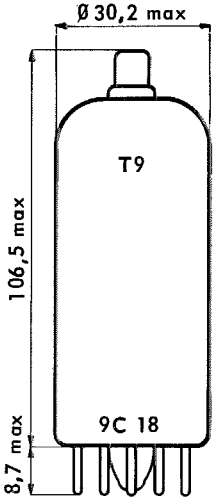
Capacités interélectrodes

Capacité anode/cathode	Ca/k	13,5 pF
Capacité cathode/filament	Ck/f	3,7 pF

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Connexion interne
Broche n° 2 ..... Anode
Broche n° 3 ..... Connexion interne
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Connexion interne
Broche n° 7 ..... Anode
Broche n° 8 ..... Anode
Broche n° 9 ..... Connexion interne
Coiffe ..... Cathode





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EY 500 A

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LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension de crête inverse d'anode	Vai cr	5,6 kV max (1)
Courant d'anode	Ia	440 mA max
Courant de crête d'anode	Ia cr	1 000 mA max
Dissipation d'anode	Pa	11 W max
Tension de crête filament - cathode	Vfk cr	6,3 kV max (1)

CARACTERISTIQUES

Résistance interne, pour un courant d'anode de 440 mA	ρ	42 Ω

(1) Pendant 22 % au plus d'une période, avec un maximum de 18 μs.

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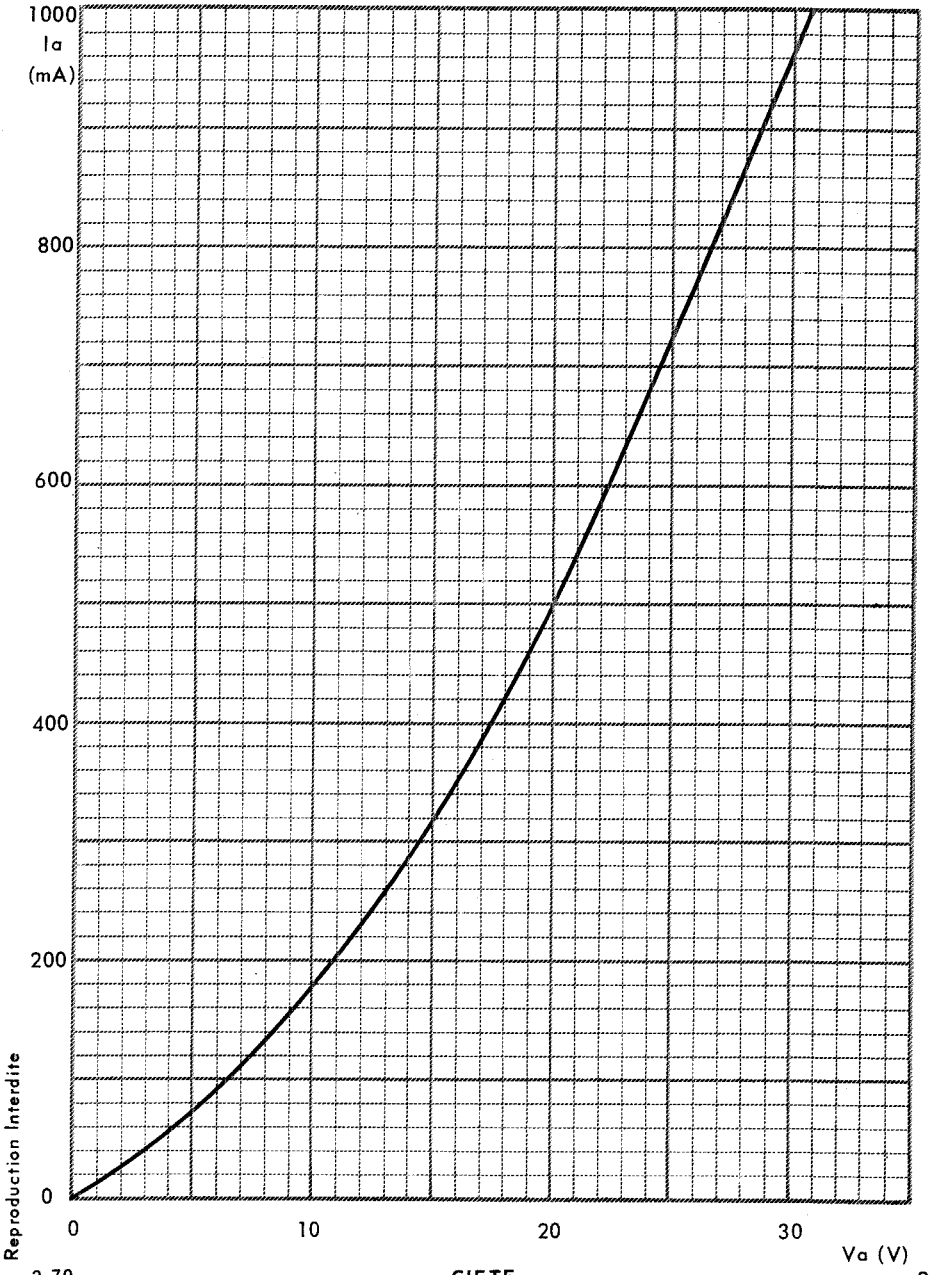

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MAZDA BELVU

DIODE T.H.T.

pour l'étage redresseur T.H.T.
des récepteurs de télévision portables

EY 51

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

Tension filament	Vf	6,3 V
Courant filament	If	90 mA
Ampoule		subminiature
Embase		sorties par fils
Position de montage		quelconque

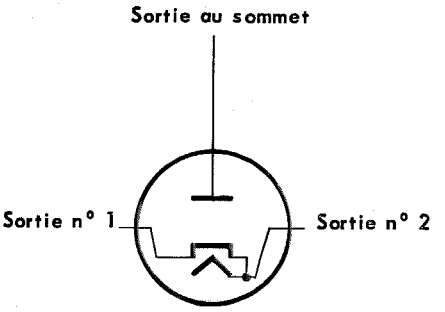
Capacités interélectrodes (sans blindage extérieur)

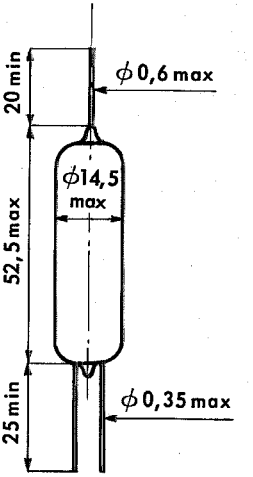
Capacité de sortie	Cs	0,8 pF

BROCHAGE ET ENCOMBREMENT

Sortie n° 1 ..... Filament
Sortie n° 2 ..... Filament - cathode
Au sommet ..... Anode

Si le tube est monté sur le circuit par soudure des fils, un grand soin doit être apporté à ces soudures pour éviter de surchauffer la traversée verre-métal.
Les fils ne doivent pas être soudés à moins de 10 mm de la sortie de l'ampoule.
On évitera également de plier les fils trop près de la traversée (observer une distance de 2 mm min).





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LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension inverse de crête d'anode	Vai cr	15 kV max
dans le système des limites absolues	Vai cr	18 kV max
Courant moyen d'anode	Ia	350 μA max
Courant de crête d'anode (1)	Ia cr	40 mA max
Tension filament (limites absolues)		
- pour la < 200 μA	Vf	1,6 V max
- pour la > 200 μA	Vf	1,3 V min

La capacité d'entrée du dispositif de filtrage ne doit pas avoir une valeur supérieure à 2000 pF.

CARACTERISTIQUES NOMINALES

Tension d'anode	Va	100 V
Courant d'anode	Ia	13 mA

(1) limité à 10 % d'un cycle de balayage lignes, avec un maximum de 10 μs.

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MAZDA BELVU

DIODE T.H.T.

Redresseur pour l'alimentation T.H.T. (20kV) des Cathoscopes monochromes 110°

EY 802

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

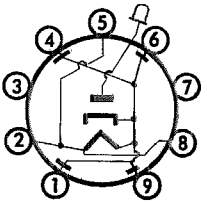
Tension filament	Vf	6,3 V
Courant filament	If	120 mA
Ampoule (siliconée)		A22-27
Coiffe		C6-1
Embase		9C12 (noval)
Position de montage		quelconque

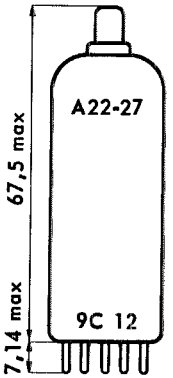
Capacités interélectrodes (sans blindage extérieur)

Capacité de sortie	Cs	1,2 pF

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Filament, cathode et bague intérieure anti-corona
Broche n° 2 ..... Filament
Broche n° 3 ..... Connexion interne
Broche n° 4 ..... Identique à broche n° 1
Broche n° 5 ..... Filament
Broche n° 6 ..... Identique à broche n° 1
Broche n° 7 ..... Connexion interne
Broche n° 8 ..... Filament
Broche n° 9 ..... Identique à broche n° 1
Coiffe ..... Anode





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LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes, sauf indication contraire

Tension inverse de crête d'anode	Va icr	25 kV max
dans le système des limites absolues	Va icr	30 kV max
Courant redressé	Ired	500 μA max
Courant de crête d'anode	Ia cr	50 mA max

La capacité d'entrée du dispositif de filtrage ne doit pas avoir une valeur supérieure à 2 000 pF.

Tension filament

La variation de la tension appliquée au filament ne doit pas être supérieure à ± 15 % par rapport à la valeur de centrage qui est de 1,4 volts.

Cette dispersion tient compte des variations possibles de réglage du téléviseur, c'est-à-dire du courant redressé, de la largeur de l'image, du standard utilisé, etc. En aucun cas, la tension de filament ne devra être en dehors des limites spécifiées.

Pour vérifier qu'il en est bien ainsi, il est recommandé de procéder aux mesures comme indiqué dans la brochure "Recommandations relatives à l'utilisation des tubes électroniques".
- Spécification Syndicale FNIE 011 de Mai 1959, pages 54 et 55.

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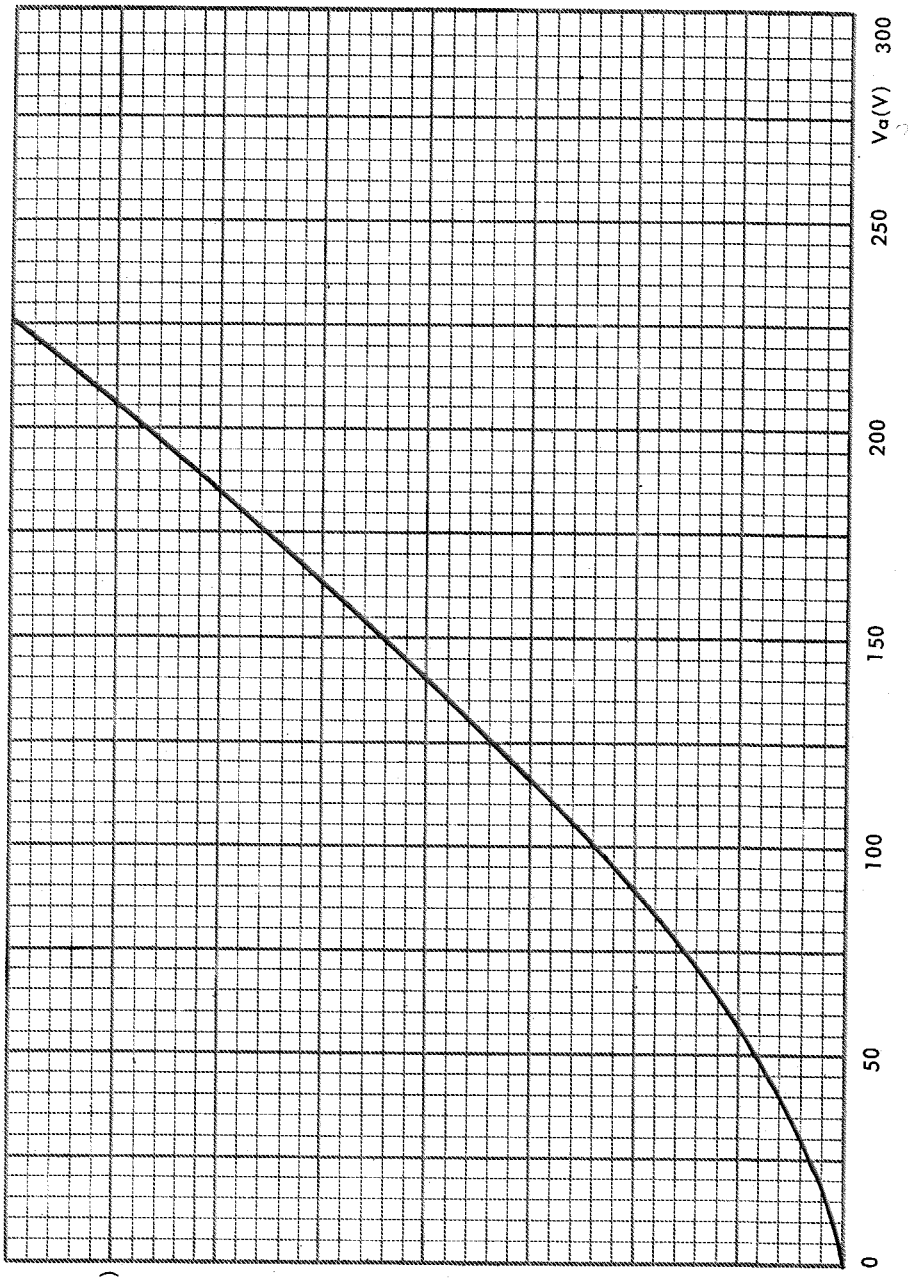
EY 802



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MAZDA
BELVU

DIODE DE RECUPERATION

pour les circuits de balayage lignes

EY 81 F

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

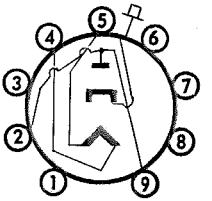
Tension filament	Vf	6,3 V
Courant filament	If	900 mA
Ampoule		A22-25
Coiffe		C6-1
Embase		9C12 (noval)
Position de montage		quelconque

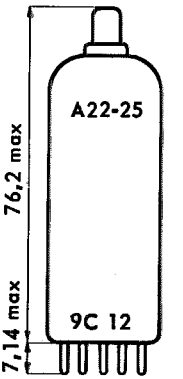
Capacités interélectrodes (sans blindage extérieur)

Capacité de sortie	Cs	6,4 pF
Capacité filament/cathode	Cf/k	2,5 pF

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Connexion interne
Broche n° 2 ..... Anode
Broche n° 3 ..... Connexion interne
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Connexion interne
Broche n° 7 ..... Connexion interne
Broche n° 8 ..... Connexion interne
Broche n° 9 ..... Anode
Coiffe ..... Cathode





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EY 81 F

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LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode à courant nul	Va bl	550 V max
Tension d'alimentation d'anode	VaN	250 V max
Dissipation d'anode	Pa	3,5 W max
Courant d'anode	Ia	150 mA max
Courant d'anode de crête	Ia cr	450 mA max
Tension inverse de crête d'anode (1)	Va icr	5000 V max
dans le système des limites absolues	Va icr	5600 V max
Tension de crête entre filament et cathode	Vfk cr	5000 V max
Tension entre filament et masse	Vfm	220 Veff max

(1) Durée maximale de l'impulsion : 22% d'un cycle, avec un maximum de 18 μs.

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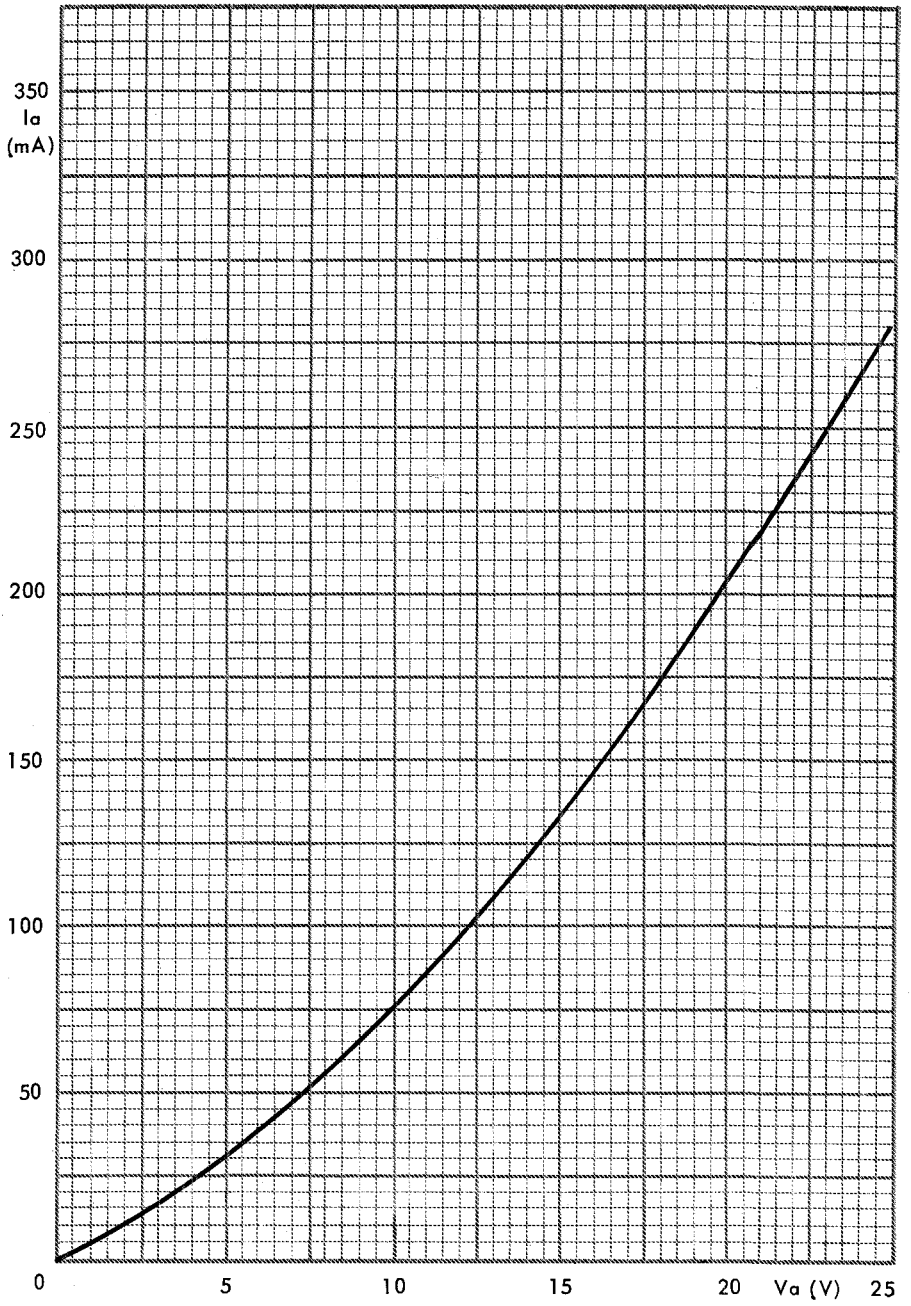
EY 81 F



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MAZDA BELVU

DIODE MONOPLAQUE

Redresseur pour alimentation de puissance

EY 82

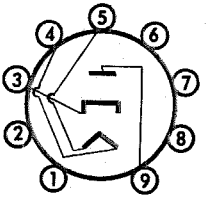
CARACTERISTIQUES GENERALES

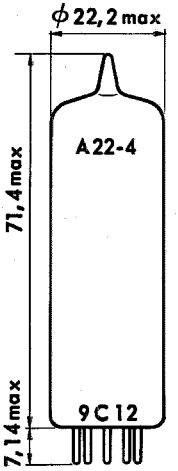
Cathode à chauffage indirect
Alimentation du filament en parallèle

Tension filament	Vf	6,3 V
Courant filament	If	900 mA
Ampoule		A 22-4
Embase		9C12 (noval)
Position de montage		quelconque

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Connexion interne
Broche n° 2 ..... Connexion interne
Broche n° 3 ..... Cathode
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Connexion interne
Broche n° 7 ..... Connexion interne
Broche n° 8 ..... Connexion interne
Broche n° 9 ..... Anode





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LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

2 tubes en redressement double alternance

Tension inverse de crête d'anode	Vai cr	850 V max
Courant redressé	Ired	360 mA max
Courant de crête d'anode (1)	Ia cr	1,1 A max
Tension de crête entre filament et cathode	Vfk cr	450 V max

La capacité d'entrée du dispositif de filtrage ne doit pas avoir une valeur supérieure à 60 μF pour les valeurs de résistance de protection dans chaque circuit d'anode indiquées ci-dessous. Si ces valeurs de résistance sont augmentées de 10 Ω, la valeur maximale de la capacité de filtrage est de 100 μF.

CONDITIONS NORMALES D'UTILISATION

2 tubes en redressement double alternance

Tension d'alimentation d'anode	VaN	2×250	2×280	2×300 Veff
Tension redressée	Vred	225	250	268 V
Courant redressé	Ired	360	360	360 mA
Résistance d'anode	Ra	2×75	2×95	2×110 Ω
Capacité de filtrage		60	60	60 μ F

(1) pour chaque tube.

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DIODE DE RECUPERATION

pour les circuits de balayage lignes

EY 88

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

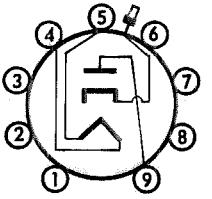
Tension filament	Vf	6,3 V
Courant filament	If	1,55 A
Ampoule		A22-28
Coiffe		C6-1
Embase		9C12 (noval)
Position de montage		quelconque

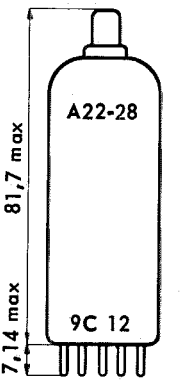
Capacités interélectrodes (sans blindage extérieur)

Capacité de sortie	Cs	8,6 pF
Capacité filament/cathode	Cf/k	2 pF

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Connexion interne
Broche n° 2 ..... Connexion interne
Broche n° 3 ..... Connexion interne
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Connexion interne
Broche n° 7 ..... Connexion interne
Broche n° 8 ..... Connexion interne
Broche n° 9 ..... Anode
Coiffe ..... Cathode





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LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension d'anode à courant nul	Va bl	550 V max
Tension continue d'anode	Va	250 V max
Courant d'anode	Ia	220 mA max
Courant d'anode de crête	Ia cr	550 mA max
Puissance dissipée sur l'anode	Pa	5 W max
Tension inverse de crête d'anode (1)	Va icr	6 kV max
dans le système des limites absolues (1)	Va icr	7,5 kV max
Tension de crête entre filament et cathode (1)	Vfk cr	6,6 kV max

(1) Durée d'impulsion limitée à 22 % d'un cycle de balayage horizontal avec un maximum de 18 μs.

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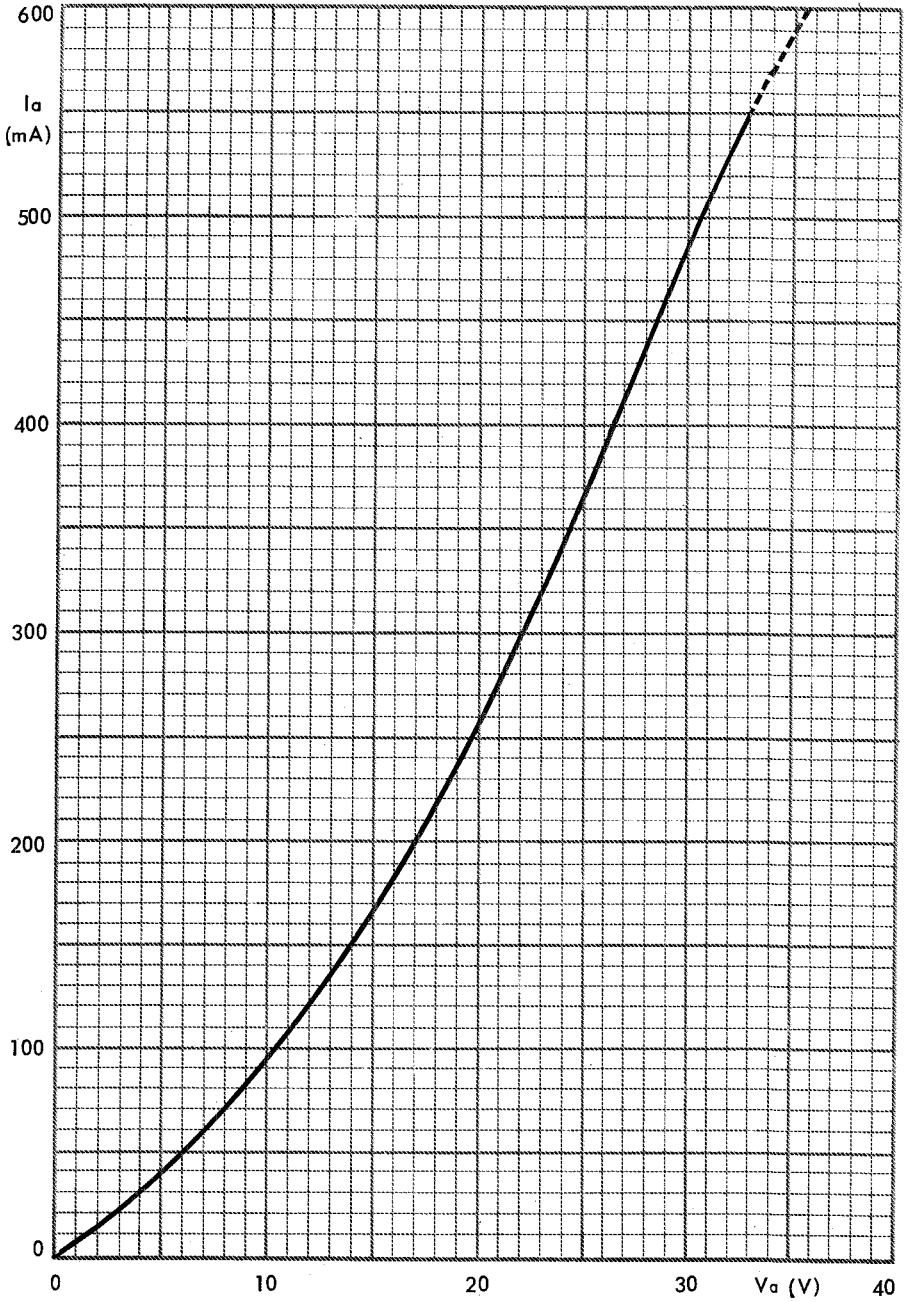

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MAZDA BELVU

DIODE BIPLAQUE

Redresseur double alternance

EZ 80
6V4

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

Tension filament	Vf	6,3 V
Courant filament	If	600 mA
Ampoule		A 22-3
Embase		9 C 12 (noval)
Position de montage		quelconque

LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

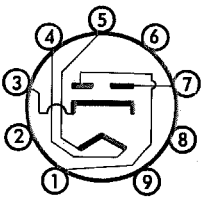
Tension inverse d'anode	Vai	1 000 V max
Courant redressé	Ired	90 mA max
Courant d'anode de crête	Iacr	270 mA max
Tension entre filament et cathode	Vfk	500 V max
Capacité à l'entrée du filtre	CL	50 μF max

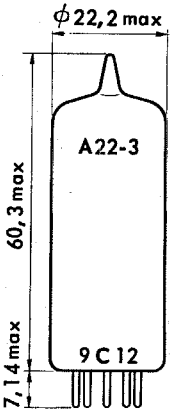
CONDITIONS NORMALES D'UTILISATION

Tension d'anode	Va	2 × 250	2 × 275	2 × 300	2 × 350	V eff
Courant redressé	Ired	90	90	90	90	mA max
Résistance d'anode	Ra	2 × 125	2 × 175	2 × 215	2 × 300	Ω min

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Anode n° 1
Broche n° 2 ..... Non connectée
Broche n° 3 ..... Cathode
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Connexion interne
Broche n° 7 ..... Anode n° 2
Broche n° 8 ..... Non connectée
Broche n° 9 ..... Non connectée





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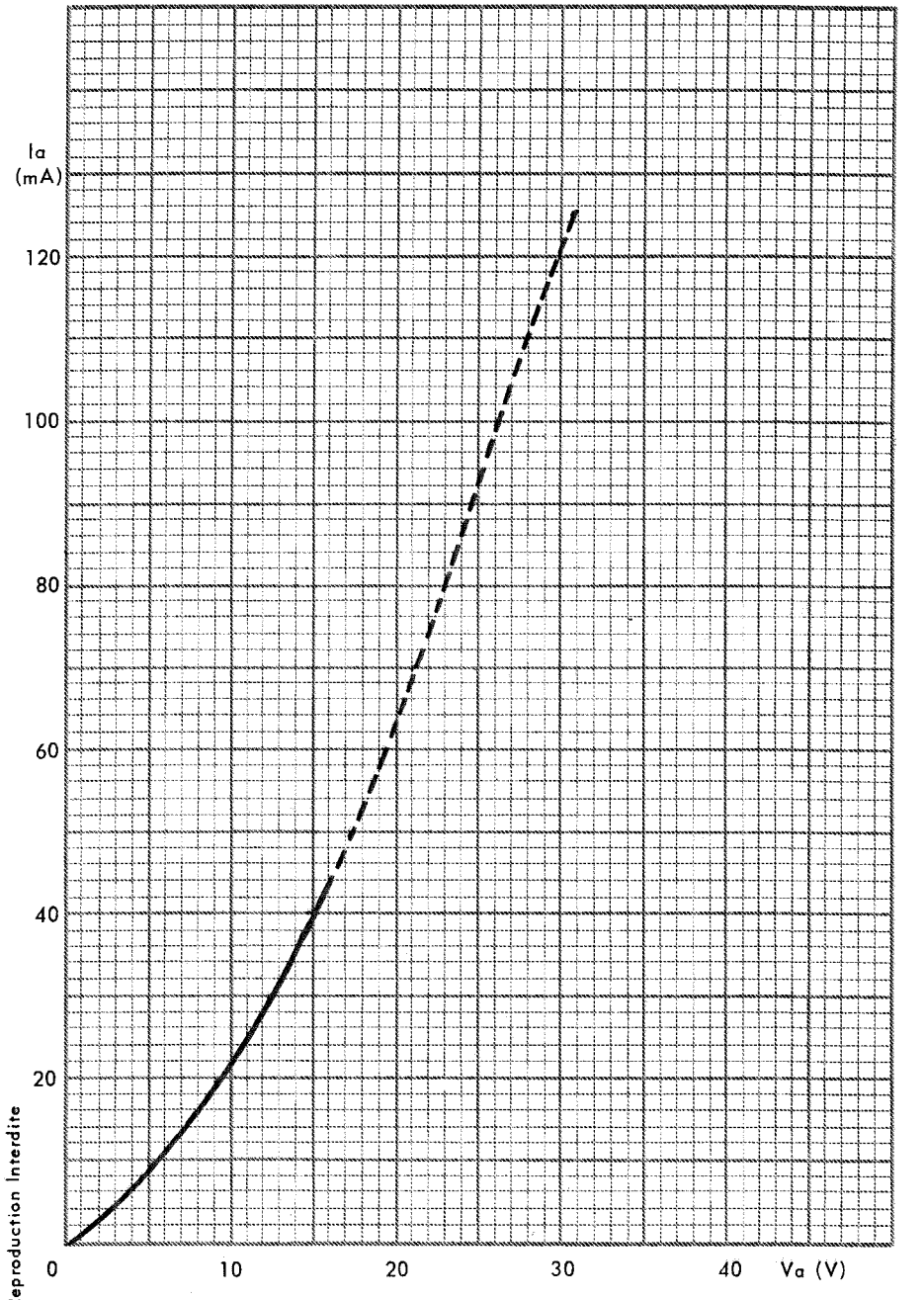
EZ 80
6 V 4



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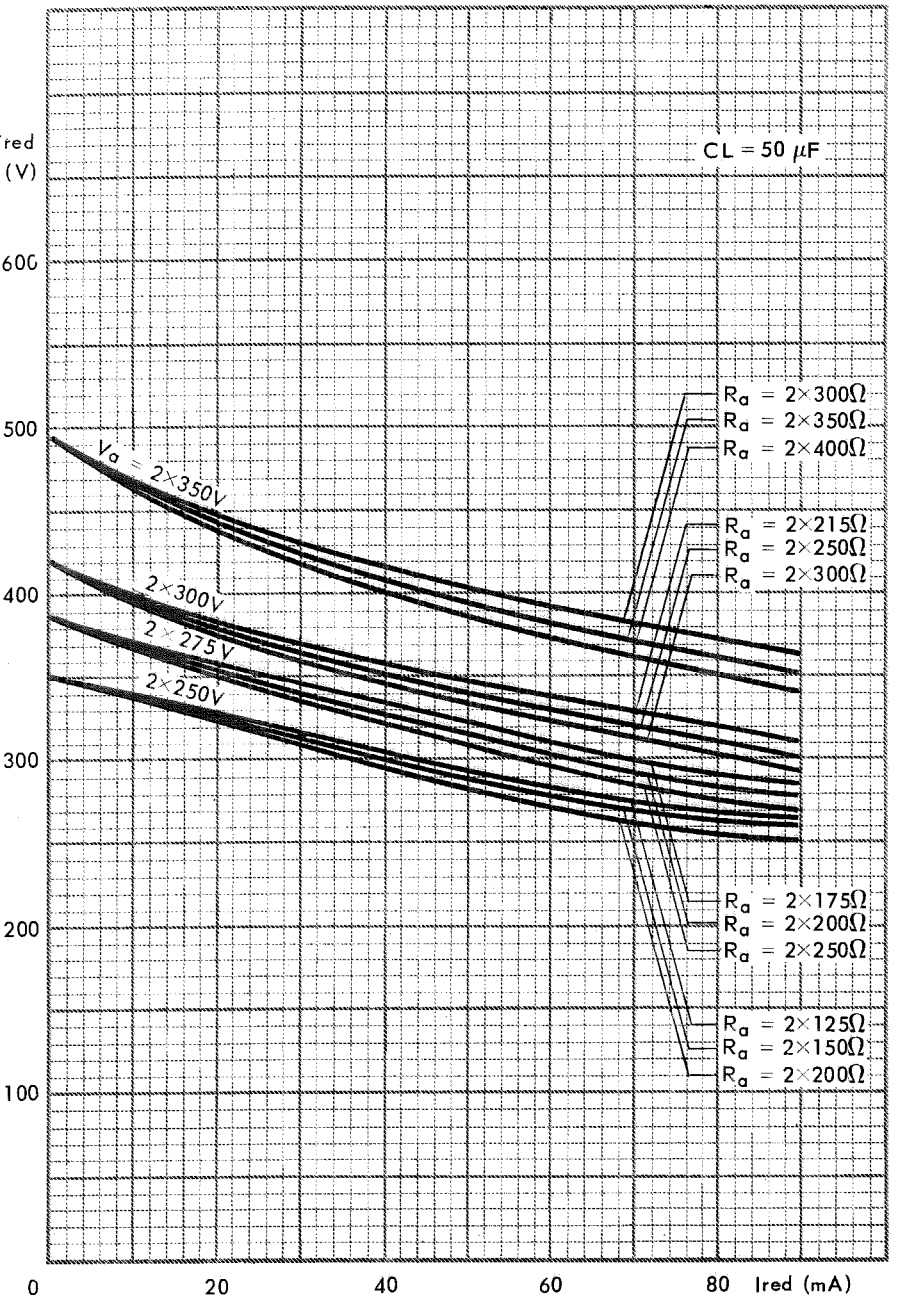
EZ 80
6 V 4

MAZDA
BELVU



Reproduction Interdite

MAZDA BELVU

DIODE BIPLAQUE

Redresseur double alternance

EZ 81

6 CA 4

CARACTERISTIQUES GENERALES

Cathode à chauffage indirect
Alimentation du filament en parallèle

Tension filament	Vf	6,3 V
Courant filament	If	1 A
Ampoule		A 22-4
Embase		9 C 12 (noval)
Position de montage		quelconque

LIMITES MAXIMALES D'UTILISATION

Système des limites moyennes

Tension inverse d'anode de crête	Vaicr	1 300 V max
Courant d'anode de crête	Iacr	500 mA max
Courant d'anode accidentel de pointe	Ia pa	1,8 A max
Tension entre filament et cathode	Vfk	500 V max
Capacité à l'entrée du filtre	CL	50 μF max

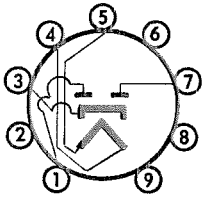
CONDITIONS NORMALES D'UTILISATION

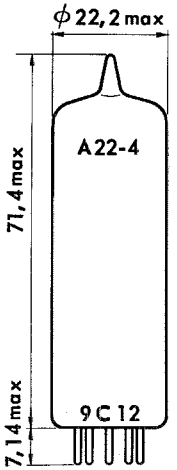
Redresseur double alternance (condensateur à l'entrée du filtre)

Tension d'anode	Va	2 × 250	2 × 350	2 × 450 Veff
Résistance d'anode	Ra	2 × 150	2 × 230	2 × 310 Ω
Courant redressé	Ired	160	150	100 mA
Tension redressée	Vred	245	350	500 V

BROCHAGE ET ENCOMBREMENT

Broche n° 1 ..... Anode n° 1
Broche n° 2 ..... Connexion interne
Broche n° 3 ..... Cathode
Broche n° 4 ..... Filament
Broche n° 5 ..... Filament
Broche n° 6 ..... Connexion interne
Broche n° 7 ..... Anode n° 2
Broche n° 8 ..... Connexion interne
Broche n° 9 ..... Connexion interne





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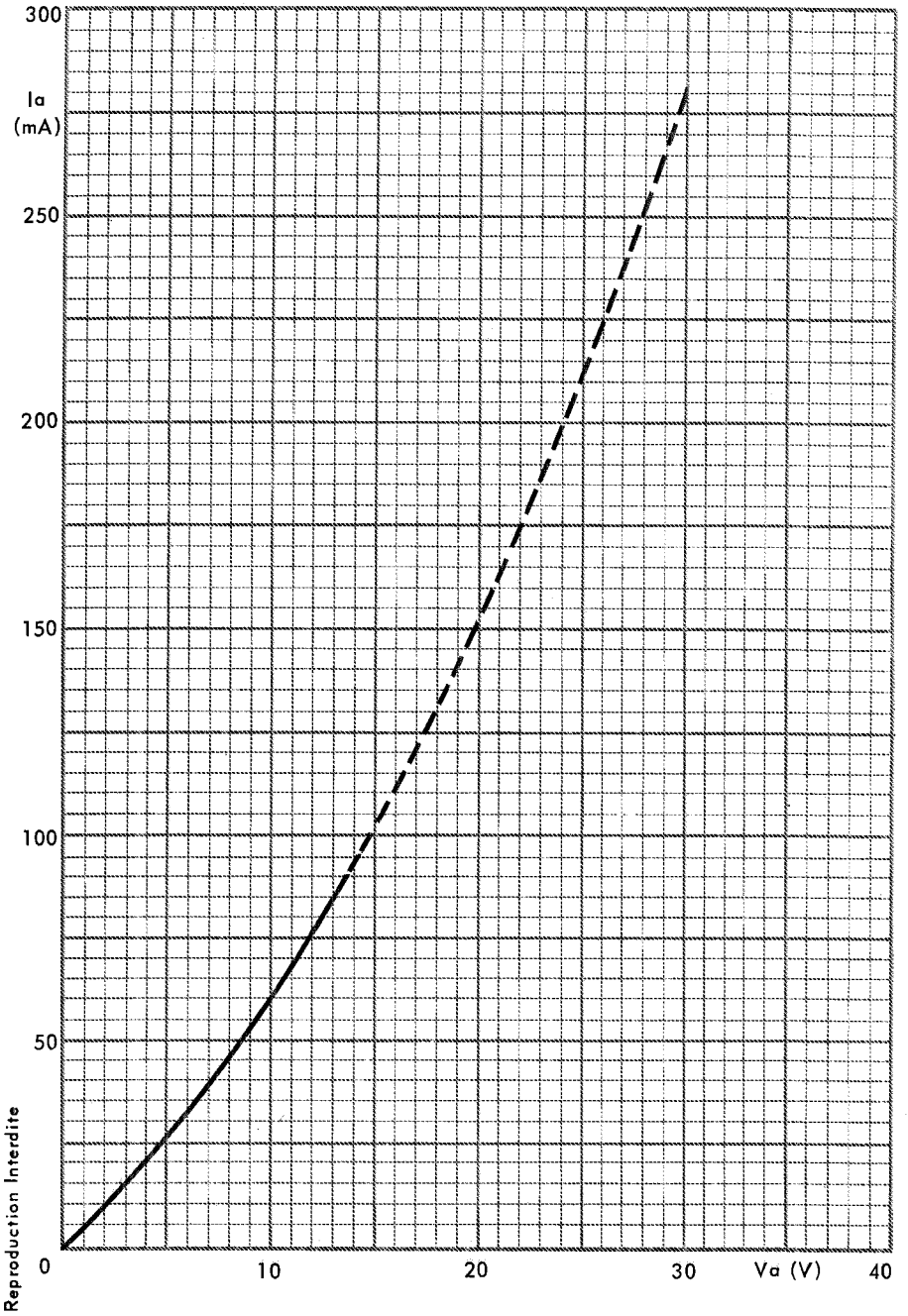
EZ 81
6CA4



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EZ 81
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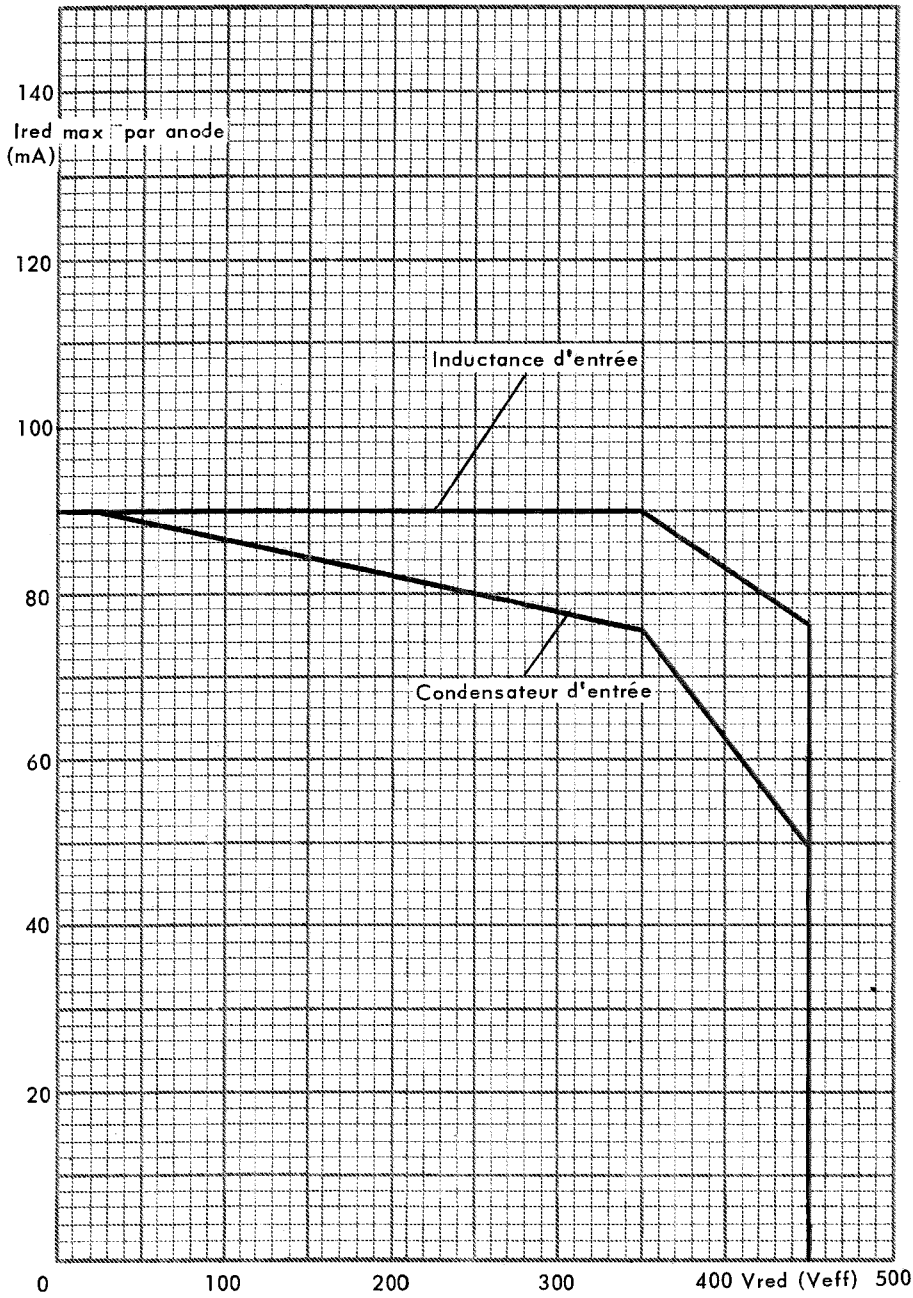
MAZDA
BELVU



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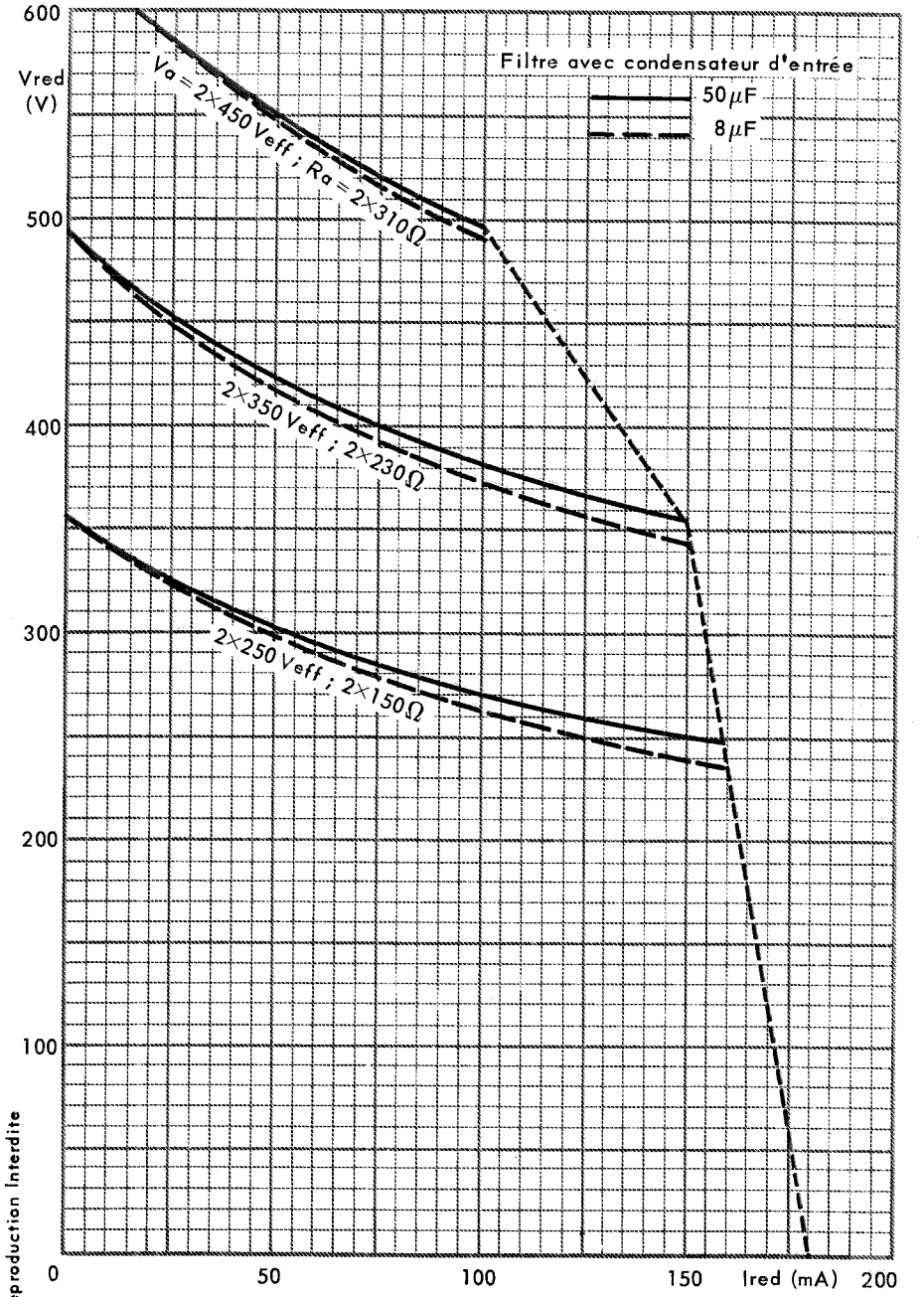
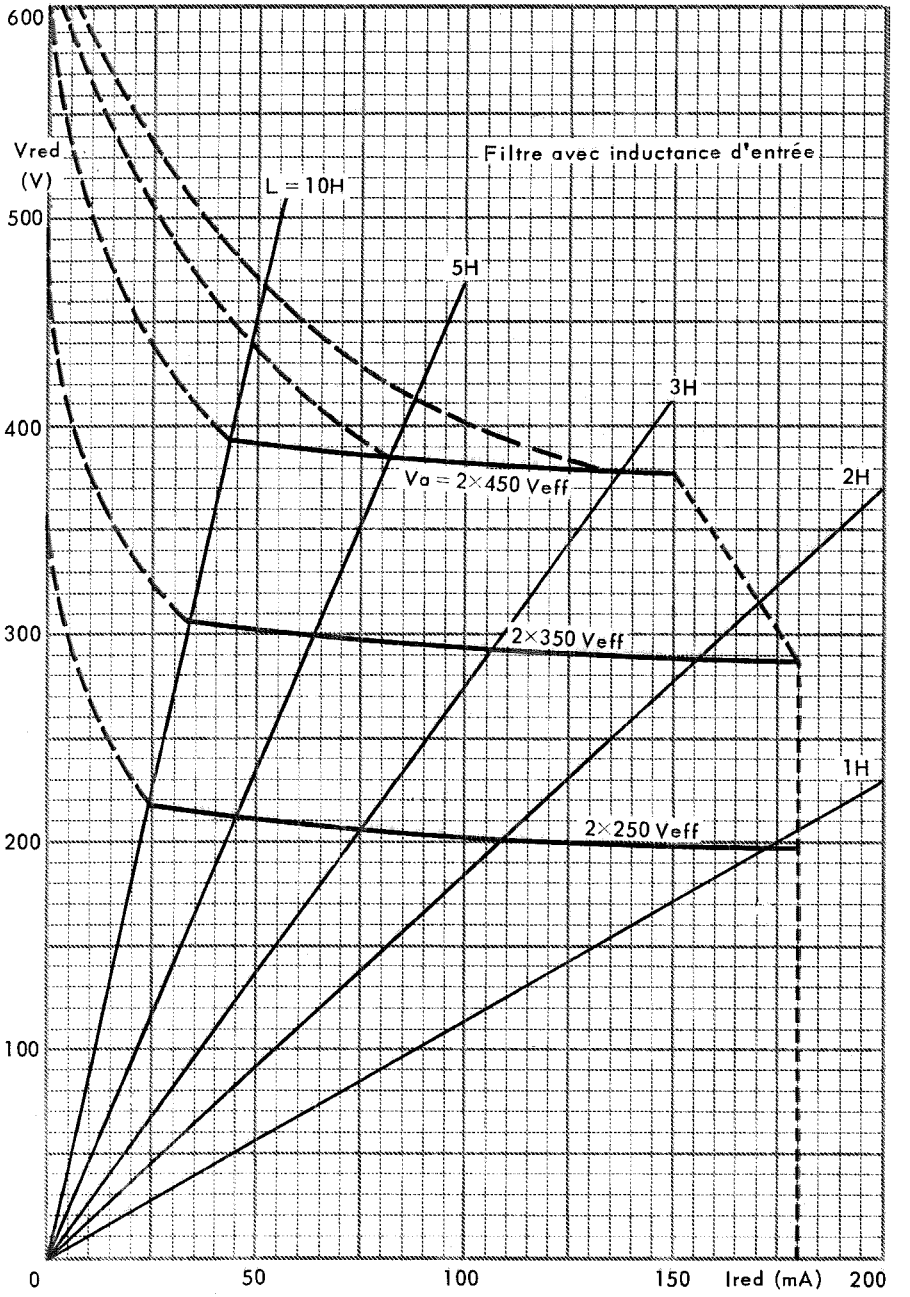


Reproduction interdite

EZ 81
6 CA 4

MAZDA
BELVU



Reproduction Interdite

MECHANICAL DATA

Bulb	T-9
Base[1]	13 Pin
Outline	See Drawing
Basing	See Drawing
Output Cathodes	No. 0 thru 9
Zero Position	No. 0 Cathode Centered Between Pins 12 and 13 ± 10°
Mounting Position	Any

ELECTRICAL DATA

INTERELECTRODE CAPACITANCES (Approx.)

Any Cathode to All Other Elements	4.2 pf
Guide No. 2 to All Other Elements	10 pf
Guide No. 1 to All Other Elements	11 pf

RATINGS (Absolute Values)

	Min.	Max.
Anode Supply Voltage[2]	400	800 Volts
Voltage Between Electrodes (Other than Anode)	—	140 Volts
Transfer Voltage	35	140 Volts
Anode Current	0.65	0.8 Ma
Input Frequency	0	50 Kpps
Ambient Temperature	−55	+60°C

TYPICAL OPERATING CHARACTERISTICS

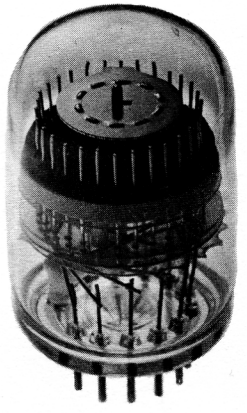
Anode Supply Voltage[2]	400 Volts	
Nominal Tube Drop	235 Volts	
Guide Bias	+35 Volts	Min.
Square Double Pulse Drive Amplitude (Each Pulse)[3]	−70 Volts	Min.
Square Double Pulse Width (Each Pulse)[3]	4 μSec.	Min.
Forced Reset Pulse Amplitude	−120 Volts	Min.
Forced Reset Pulse Width	4 μSec.	Min.
Cathode Load Resistor[4]	50 K-Ohms	Max.

NOTES:

1. *Sockets are available from Sylvania Electric Products Inc., 1035 Westminster, Williamsport, Pennsylvania. (Part No. 70-780-1)*
2. *A value for the anode resistor can be computed by subtracting the nominal tube drop from the supply voltage and dividing the remainder by the desired operating current.*
3. *Two separate pulses, back to back or with slight overlap, must be maintained.*
4. *The peak pulse output voltage can be determined by the IR drop across the chosen cathode resistor.*
5. *A counter tube brochure is available on request from Sylvania Electric Products Inc., 1100 Main Street, Buffalo 9, New York.*

QUICK REFERENCE DATA

The Type 8035 is a cold cathode, bidirectional decade counter tube with top viewed readout. It is designed to operate at inputs up to 50,000 pulses per second. All 10 cathodes are brought out to individual base pins. Applications include computing, scaling, counting, frequency dividing, coding, modulating, matrixing, indexing, multiplexing, addition and subtraction. (See Note 5.)



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EMPORIUM, PA.

Prepared and Released By The
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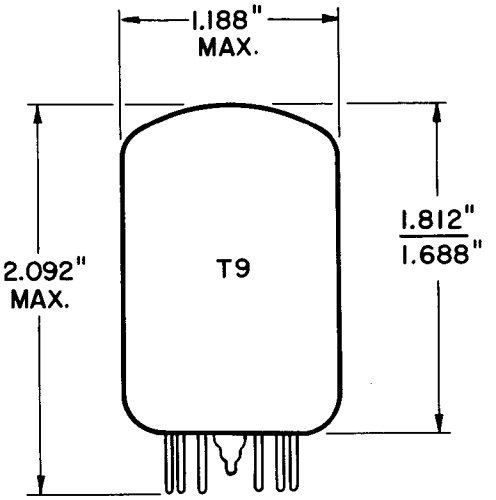
EMPORIUM, PENNSYLVANIA

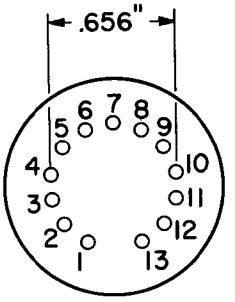
DECEMBER, 1963

File Under
SPECIAL PURPOSE
ELECTRONIC TUBES

OUTLINE



BASE CONNECTIONS



PIN NO.	1-K0	8-K3
	2-K9	9-K2
	3-K8	10-K1
	4-K7	11-G2
	5-K6	12-G1
	6-K5	13-Anode
	7-K4	

ADVANCE DATA

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-1
Basing	8DL
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature	220	°C
Altitude[2]	80,000	Ft.
Radiation		
Total Dosage (neutrons/sq. cm.)	10^{16}	nvt
Dose Rate (neutrons/sq. cm./sec.)	10^{12}	nv

DURABILITY CHARACTERISTICS[4]

Impact Acceleration (3/4 msec Duration)[5]	750	G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[6]	10	G	Max.
On-Off Heater Cycles[7]	2000		Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	26.5	V
Heater Current	45	mA

DIRECT INTERELECTRODE CAPACITANCES

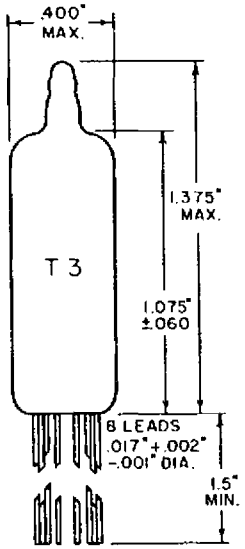
	Shielded[8]	Unshielded		
Grid No. 1 to Plate	0.015	0.03	µµf	Max.
Input	4.00	4.00	µµf	
Output	3.40	1.90	µµf	

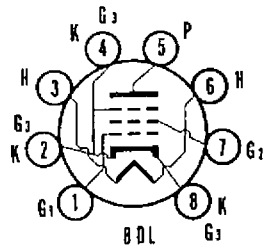
CONTROLLED DETRIMENTS

Interelectrode Insulation[9]	100	Meg	Min.
Total Grid Current[10]	-0.3	µAdc	Max.
Grid Emission[11]	-0.5	µAdc	Max.
Vibration Output[12] (As equivalent Ecl)	1.3	mVac	Max.
Heater-Cathode Leakage[13]	5	µAdc	Max.

QUICK REFERENCE DATA

The Premium Subminiature Type 8064 is a semi-remote cutoff pentode featuring a 26.5 volt, 45 ma heater. It is intended primarily for use as an agc controlled RF or IF amplifier at frequencies up to 400 mc. The 8064 is designed for dependable operation under conditions of severe shock, vibration, high temperature and high altitude, and is manufactured and inspected to meet the applicable specification for reliable operation.





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EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

June 1, 1961

146 (10-58)

from JEDEC release #3319, June 26, 1961

RATINGS[1] (Absolute Maximum)

Heater Voltage[3]	26.5 (±10%)	V
Plate Voltage	165	Vdc
Peak Plate Forward Voltage[14]	330	v
Grid No. 2 Voltage	155	Vdc
Plate Dissipation	1.1	W
Grid No. 2 Dissipation	0.55	W
Cathode Current	16.5	mAdc
Grid No. 1 Voltage		
Positive Value	0	Vdc
Negative Value	55	Vdc
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	200	v
Heater Negative with Respect to Cathode	200	v
Grid No. 1 Circuit Resistance	1.1	Meg

CHARACTERISTICS

Plate Voltage	100	Vdc
Grid No. 2 Voltage	100	Vdc
Cathode Resistor	120	Ohms
Plate Current	7.2	mAdc
Grid No. 2 Current	2.0	mAdc
Transconductance	4500	μmhos
Plate Resistance	0.275	Meg
Ec1 for Gm = 25 μmhos (75 μmhos Max.)	-14	Vdc

NOTES:

1. Limitations beyond which normal tube performance and tube life may be impaired.

2. If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.

3. Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 26.5 volts.

4. Tests performed as a measure of the mechanical durability of the tube structure.

5. Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine or Electronic Devices. Shock duration = 3/4 milliseconds.

6. Vibrational forces applied in any direction for a period of six hours, repeatedly sweeping the range from 30 cps to 3000 cps and back with the period of the sweep being three minutes. Heater voltage only shall be applied.

NOTES: Cont'd

7. One cycle consists of the application of Ef = 29.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.

8. External shield No. 318 connected to cathode.

9. Measure with Ef = 26.5 V; Eg-all = -100 Vdc; Ep-all = -300 Vdc; Cathode is positive so that no cathode emission occurs.

10. Measure with Ef = 26.5 V; Eb = Ec2 = 150 Vdc; Rk = 390 ohms.

11. Preheated for five minutes with Ef = 31.5 V; Eb = Ec2 = 100 Vdc; Rk = 120 ohms; Rg1 = 1.0 Meg; then tested with Ef = 31.5 V; Eb = Ec2 = 100 Vdc; Ec1 = -14 Vdc; Rg1 = 1.0 Meg.

12. Test with Ef = 26.5 V; Eb = Ec2 = 100 Vdc; Rk = 120 ohms; CK = 1000 μf; Rp = 10,000 ohms; F = 40 cps; Acc = 15 g.

13. Measure with Ef = 26.5 V; Ehk = ±100 Vdc.

14. Per MIL-E-1 Par. 6.5 and General Section of this Manual titled Specifications and Ratings.

GENERAL DATA

Spectral Response	See Curve
Wavelength of Max. Response	6100 ± 400 Angstroms
Sensitive Material	Cadmium-Sulfide
Shape of Sensitive Area	Circular
Construction	Hermetically Sealed in Glass Flexible Leads
Outline	See Drawing
Operating Position	Any

ELECTRICAL DATA

RATINGS (Absolute Maximum Values)

Breakdown Voltage[2]	400 VAC
Dissipation	
T-amb = 25°C	300 mW
T-amb = 70°C	25 mW
Ambient Temperature Range	-40 to +70 °C
Illumination	Note 3

CHARACTERISTICS

Cell Resistance[4]	
Illumination 2 FC	
Color Temperature 2870°K	5000 Ohms
Dark Resistance[5]	500,000 Ohms Min.

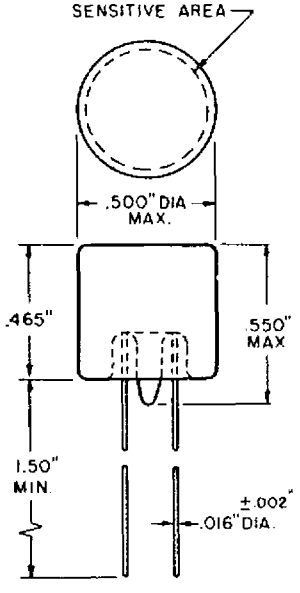
NOTES:

1. *Minute increases in relative humidity will produce change in color.*
2. *Measured with cell in complete darkness at a pulse rate of 120 pps, 50 μ sec. duration. Voltage in excess of the rated value may damage the cell. Maximum DC voltage is limited by maximum dissipation and minimum dark resistance rating.*
3. *Care should be exercised to prevent localized overheating of the sensitive surface when the cell is used with a lens system.*
4. *Measured after 60 minutes exposure to approximately 50 FC illumination (ambient room light).*
5. *Measured in complete darkness, 10 seconds after removal of 2 FC illumination.*

QUICK REFERENCE DATA

The Sylvania Type 8100 is a cadmium sulfide photo-conductive cell featuring high sensitivity and hermetically sealed-in-glass construction. The cell is back-filled with gas for a high dissipation safety factor and high voltage capability and includes a blue-dot compound which turns pink[1] if the cell envelope becomes damaged. It is designed for use in a variety of industrial applications as well as automatic contrast and brightness control in television receivers. The 8100 is particularly suited to direct operation of relays.

OUTLINE 8100



SYLVANIA ELECTRIC PRODUCTS INC.

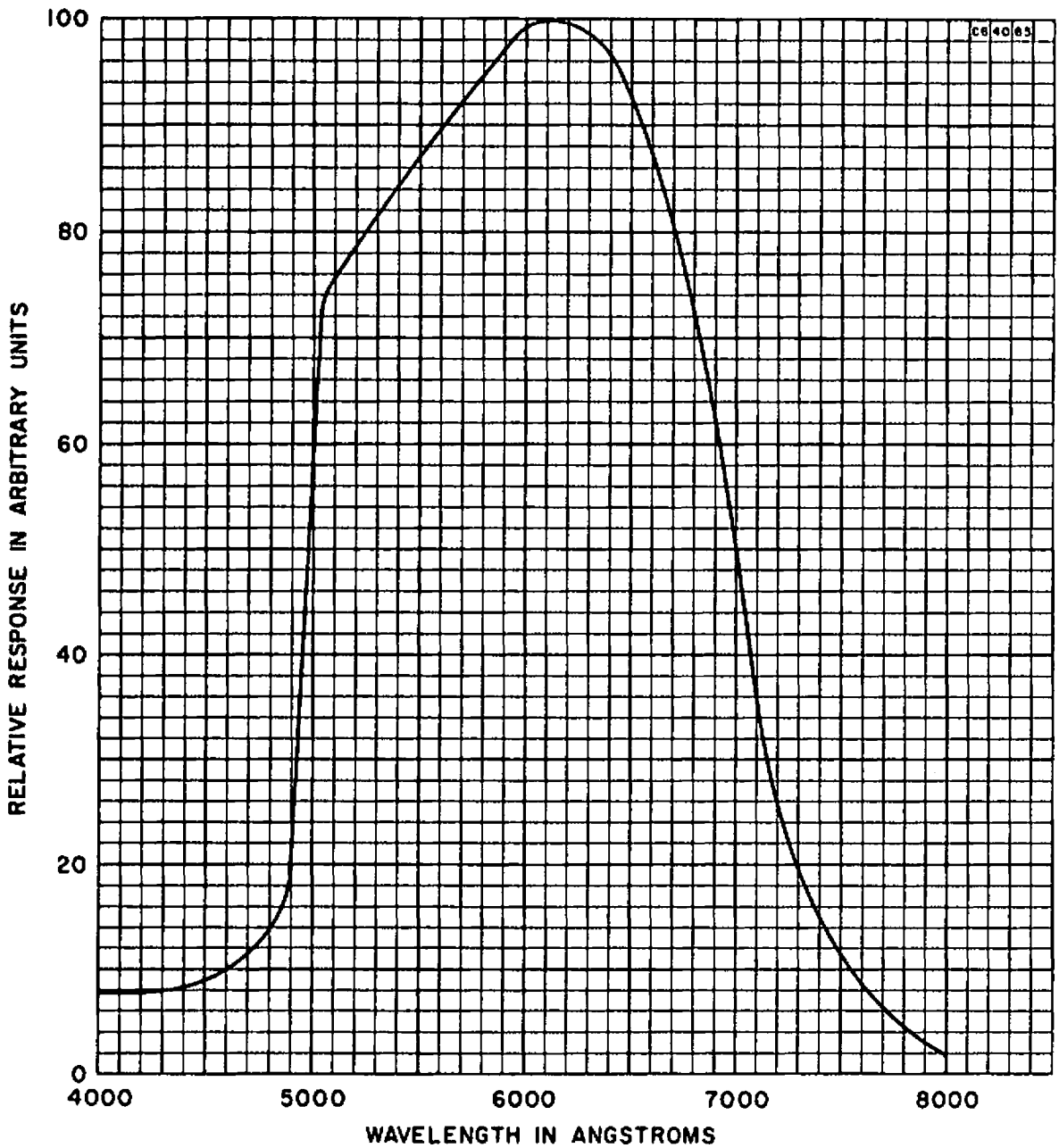
Electronic Components Group
ELECTRONIC TUBE DIVISION
EMPORIUM, PA.

A Technical Publication
MAY, 1965

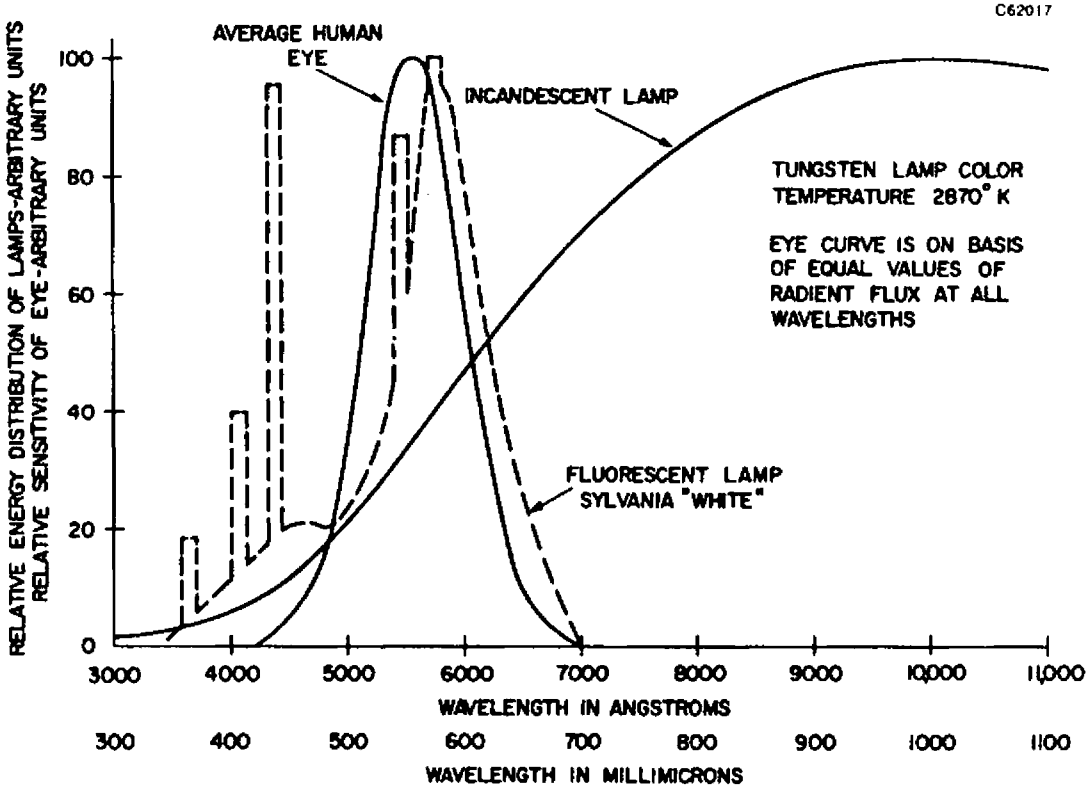
Title Under
PHOTOCONDUCTORS

from JEDEC release #3351C, Oct. 4, 1965

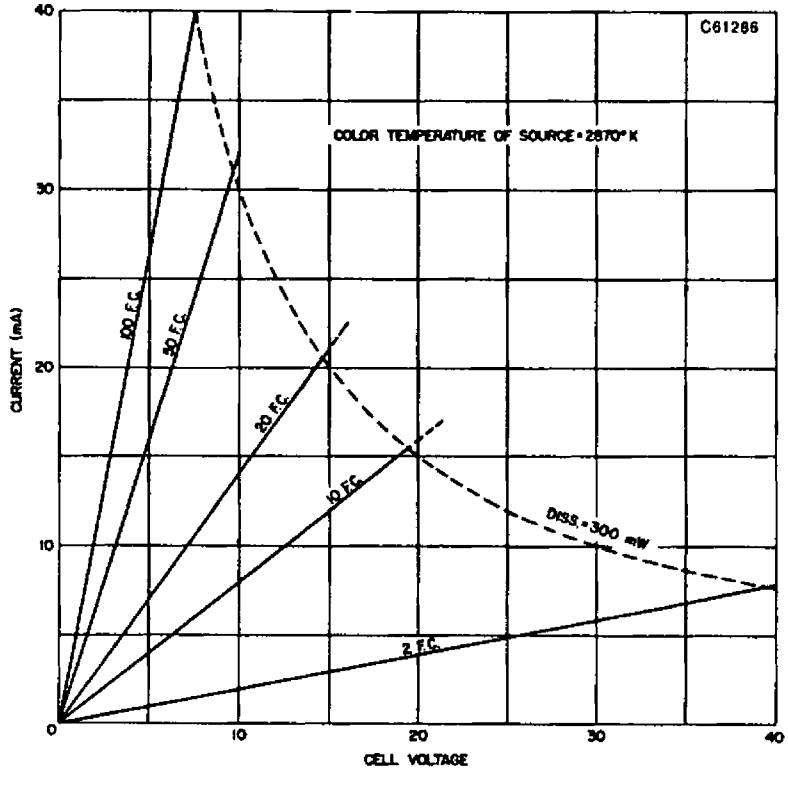
SPECTRAL RESPONSE



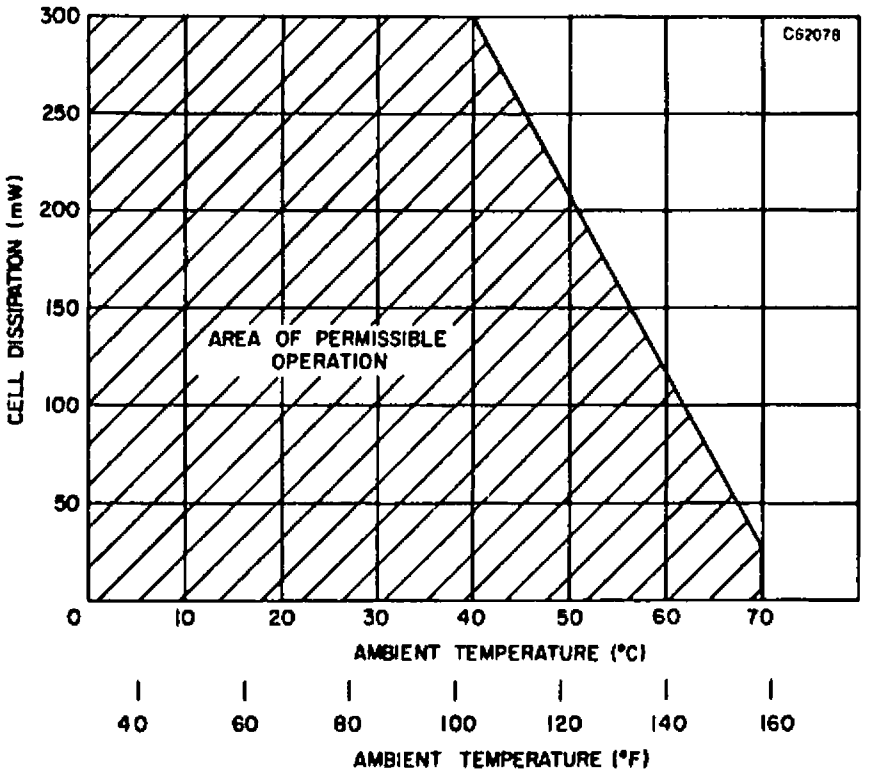
SPECTRAL CHARACTERISTIC OF HUMAN EYE, TUNGSTEN AND FLUORESCENT LAMPS



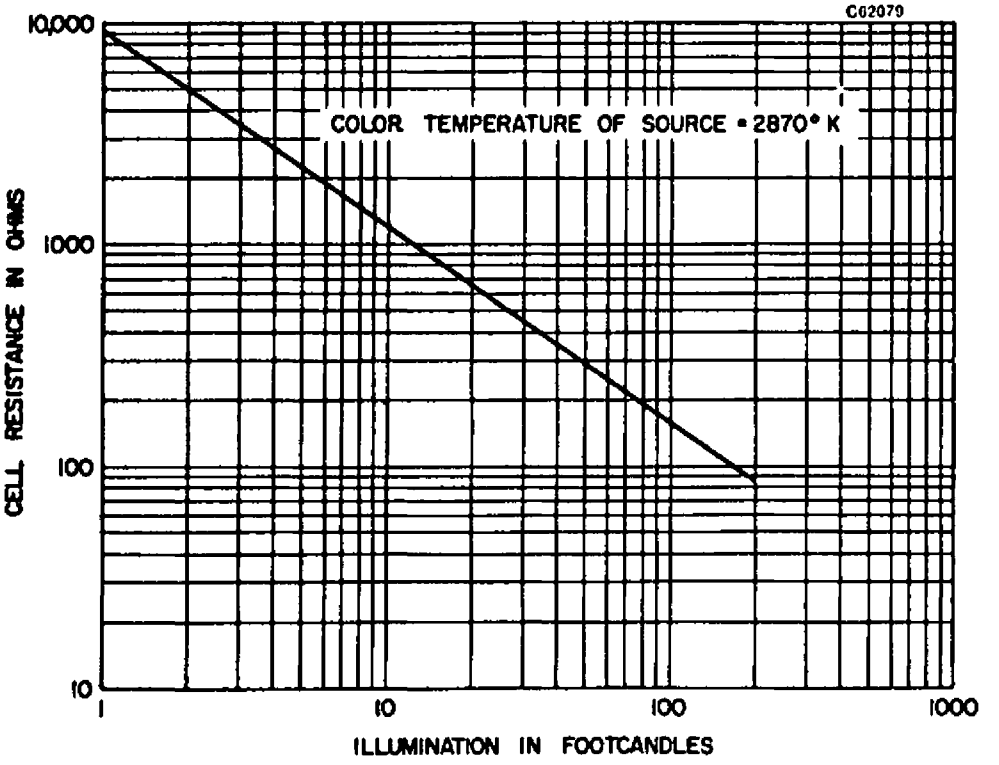
AVERAGE CHARACTERISTICS



PERMISSIBLE DISSIPATION AS A FUNCTION OF AMBIENT TEMPERATURE



AVERAGE CHARACTERISTICS



GENERAL DATA

Spectral Response	See Curve
Wavelength of Max. Response	6100 ± 400 Angstroms
Sensitive Material	Cadmium-Sulfide
Shape of Sensitive Area	Circular
Construction	Hermetically Sealed in Glass Flexible Leads
Outline	See Drawing
Operating Position	Any

ELECTRICAL DATA

RATINGS (Absolute Maximum Values)

Breakdown Voltage[2]	400 VAC
Dissipation	
T-amb = 25°C	300 mW
T-amb = 70°C	25 mW
Ambient Temperature Range	-40 to +70 °C
Illumination	Note 3

CHARACTERISTICS

Cell Resistance[1]	
Illumination 2 FC	
Color Temperature 2870°K	1500 Ohms
Dark Resistance[5]	200,000 Ohms Min.

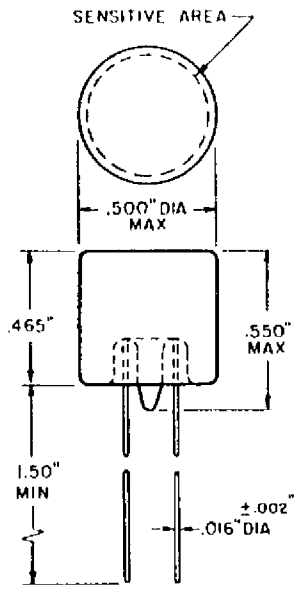
NOTES:

1. *Minute increases in relative humidity will produce change in color.*
2. *Measured with cell in complete darkness at a pulse rate of* 120 *pps,* 50 *μ sec. duration. Voltage in excess of the rated value may damage the cell. Maximum DC voltage is limited by maximum dissipation and minimum dark resistance rating.*
3. *Care should be exercised to prevent localized overheating of the sensitive surface when the cell is used with a lens system.*
4. *Measured after 60 minutes exposure to approximately 50 FC illumination (ambient room light).*
5. *Measured in complete darkness, 10 seconds after removal of 2 FC illumination.*

QUICK REFERENCE DATA

The Sylvania Type 8142 is a cadmium sulfide photo-conductive cell featuring high sensitivity and hermetically sealed-in-glass construction. The cell is back-filled with gas for a high dissipation safety factor and high voltage capability and includes a blue-dot compound which turns pink[1] if the cell envelope becomes damaged. The 8142 features relatively low resistance (1500 Ohms). It is designed for use in a wide variety of industrial applications, and is particularly suited to direct operation of relays.

OUTLINE 8142



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Electronic Components Group
ELECTRONIC TUBE DIVISION
EMPORIUM, PA.

A Technical Publication
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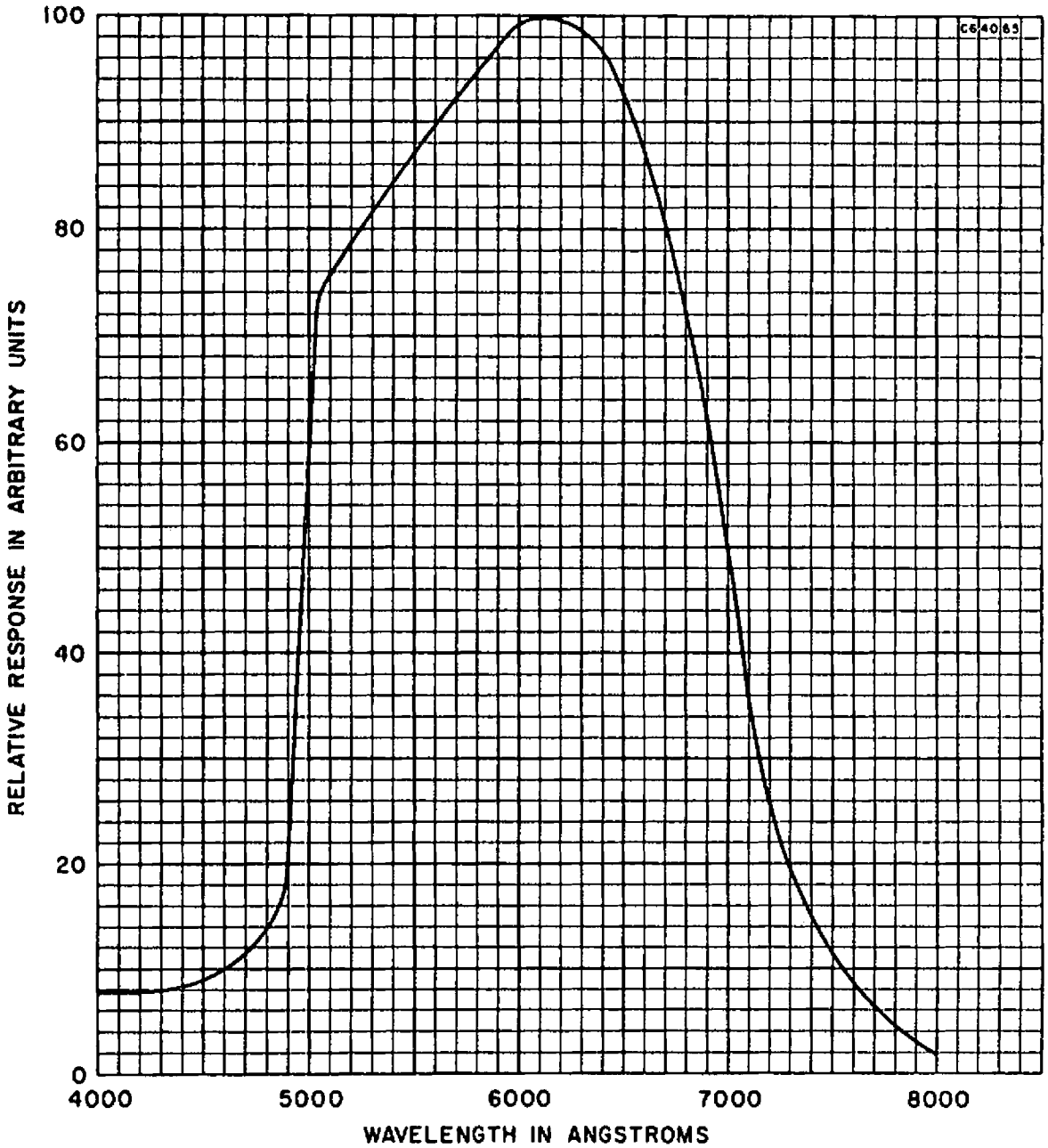
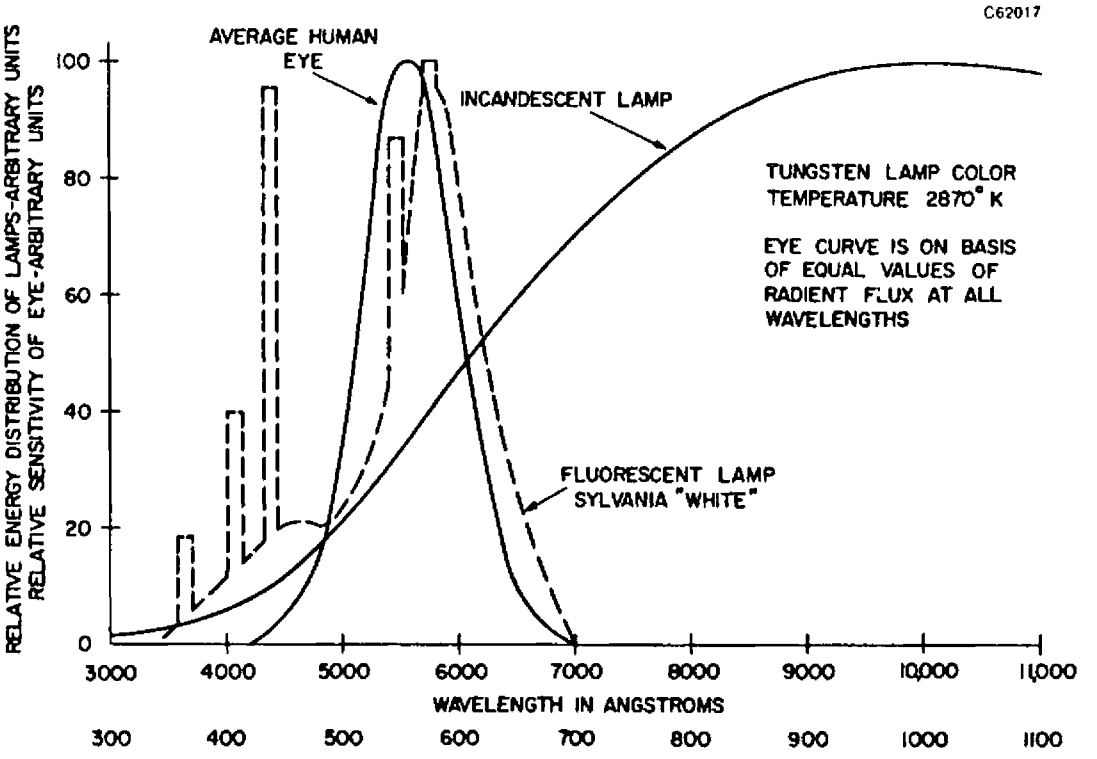
PAGE 1 OF 4
File Under
PHOTOCONDUCTORS

from JEDEC release #3477D, Oct. 4, 1965

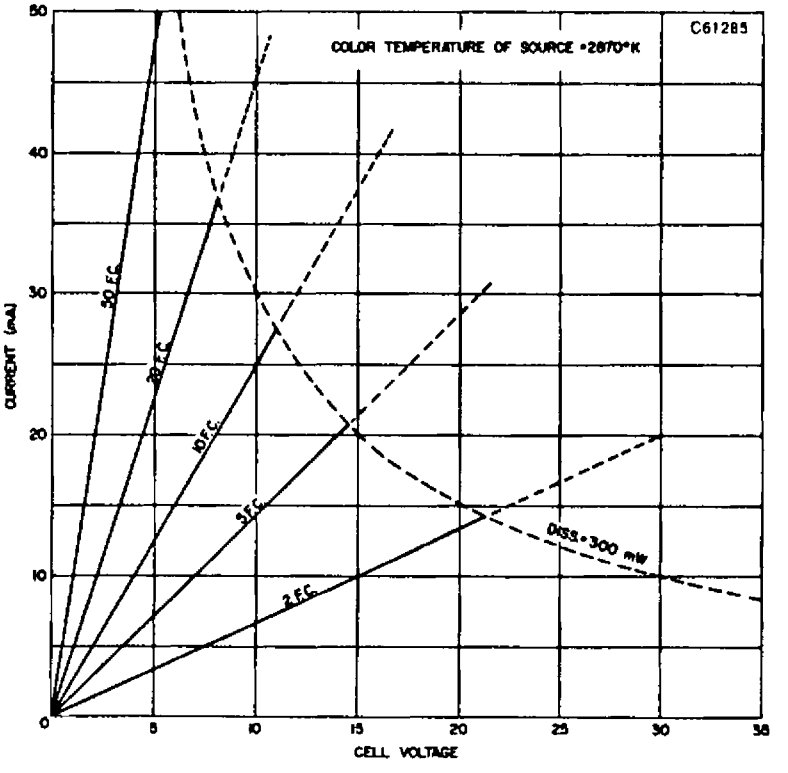
SPECTRAL RESPONSE



SPECTRAL CHARACTERISTIC OF HUMAN EYE, TUNGSTEN AND FLUORESCENT LAMPS



AVERAGE CHARACTERISTICS



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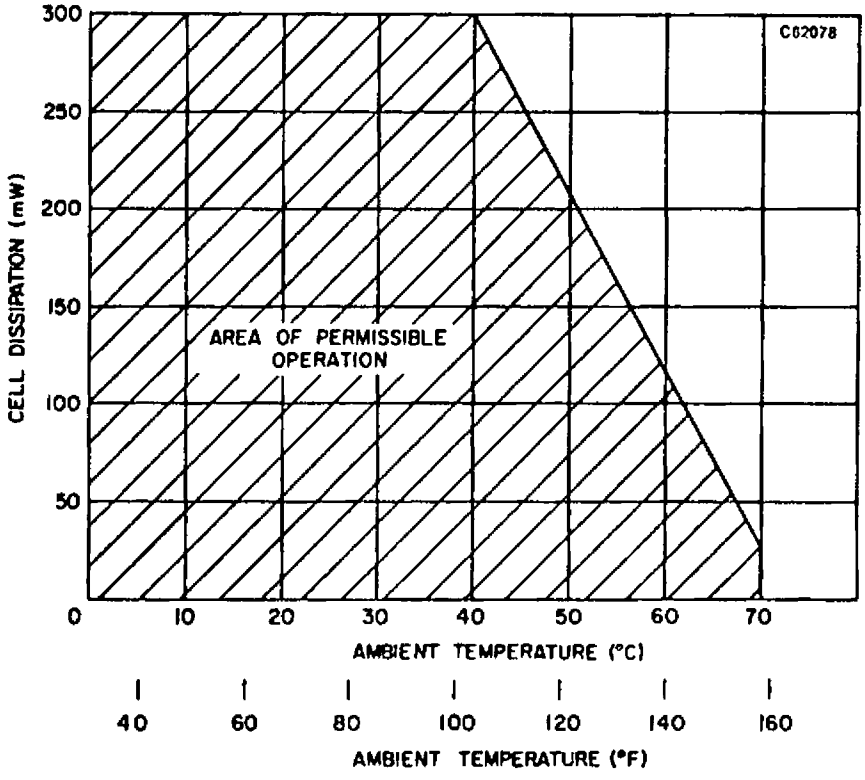
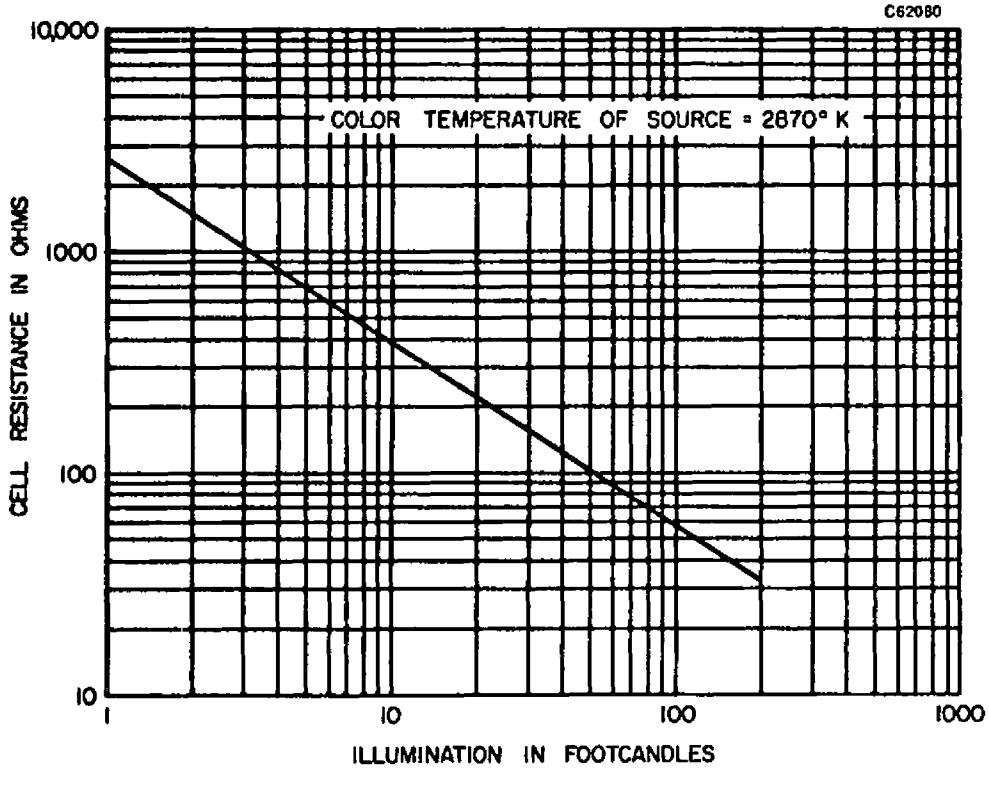


AVERAGE CHARACTERISTICS



GENERAL DATA

Spectral Response	See Curve
Wavelength of Max. Response	6100 ± 400 Angstroms
Sensitive Material	Cadmium-Sulfide
Shape of Sensitive Area	Circular
Construction	Hermetically Sealed in Glass Flexible Leads
Outline	See Drawing
Operating Position	Any

ELECTRICAL DATA

RATINGS (Absolute Maximum Values)

Breakdown Voltage[2]	400 VAC
Dissipation	
T-amb = 25°C	300 mW
T-amb = 70°C	25 mW
Ambient Temperature Range	-40 to +70 °C
Illumination	Note 3

CHARACTERISTICS

Cell Resistance[4]	
Illumination 2 FC	
Color Temperature 2870°K	9000 Ohms
Dark Resistance[5]	900,000 Ohms Min.

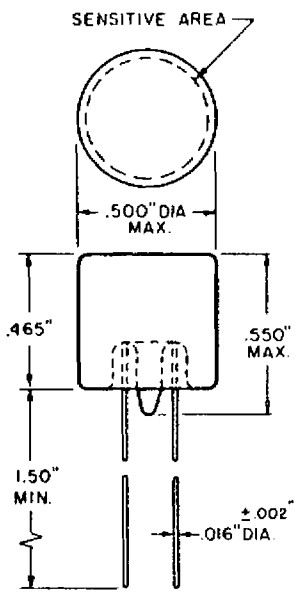
NOTES:

1. *Minute increases in relative humidity will produce change in color.*
2. *Measured with cell in complete darkness at a pulse rate of 120 pps, 50 μ sec. duration. Voltage in excess of the rated value may damage the cell. Maximum DC voltage is limited by maximum dissipation and minimum dark resistance rating.*
3. *Care should be exercised to prevent localized overheating of the sensitive surface when the cell is used with a lens system.*
4. *Measured after 60 minutes exposure to approximately 50 FC illumination (ambient room light).*
5. *Measured in complete darkness, 10 seconds after removal of 2 FC illumination.*

QUICK REFERENCE DATA

The Sylvania Type 8143 is a cadmium sulfide photo-conductive cell featuring high sensitivity and hermetically sealed-in-glass construction. The cell is back-filled with gas for a high dissipation safety factor and high voltage capability and includes a blue-dot compound which turns pink[1] if the cell envelope becomes damaged. The 8143 features relatively high resistance (9000 Ohms). It is designed for use in a wide variety of industrial applications, and is particularly suited to direct operation of relays.

OUTLINE 8143



SYLVANIA ELECTRIC PRODUCTS INC.

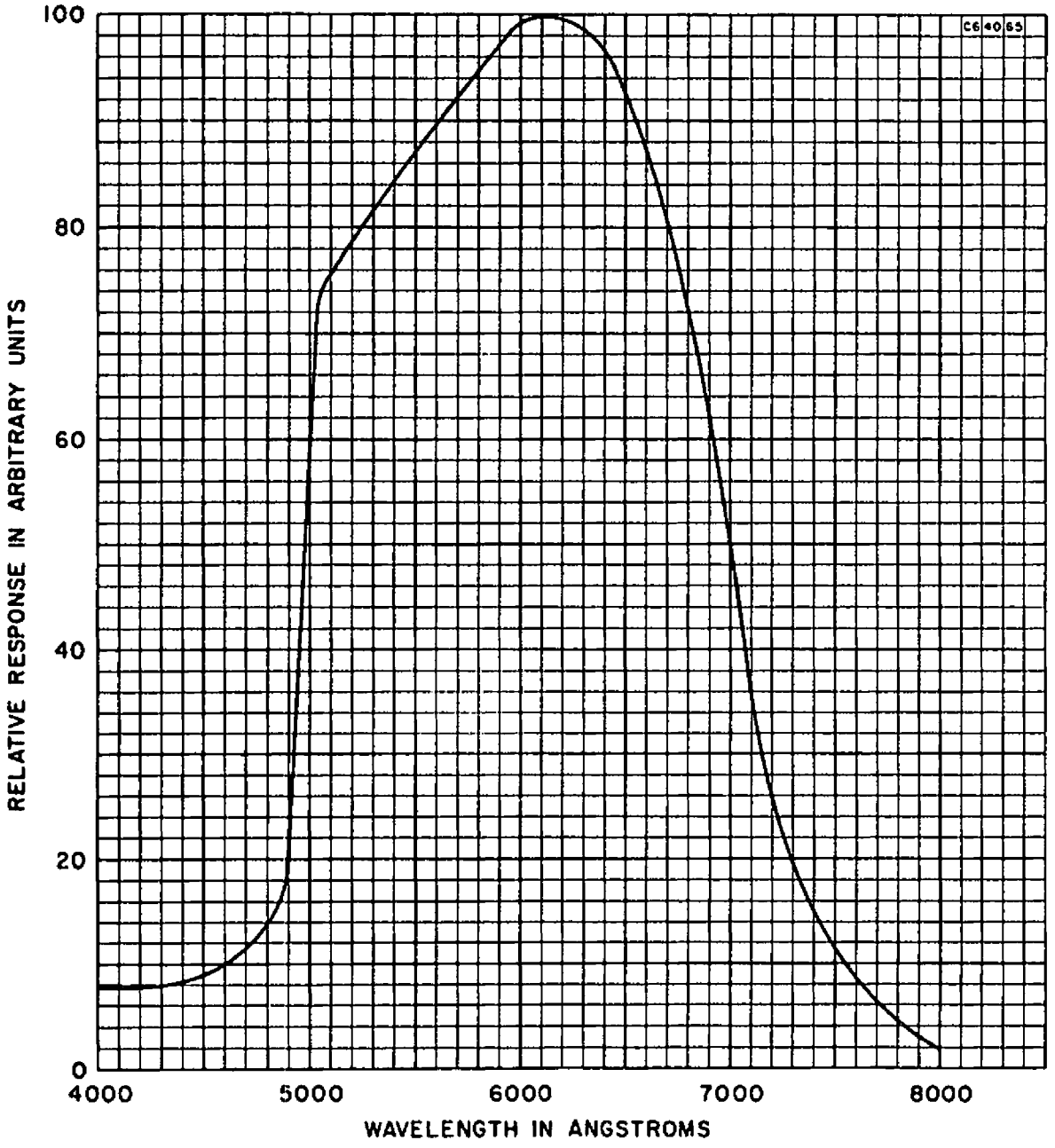
Electronic Components Group
ELECTRONIC TUBE DIVISION
EMPORIUM, PA.

A Technical Publication
MAY, 1965

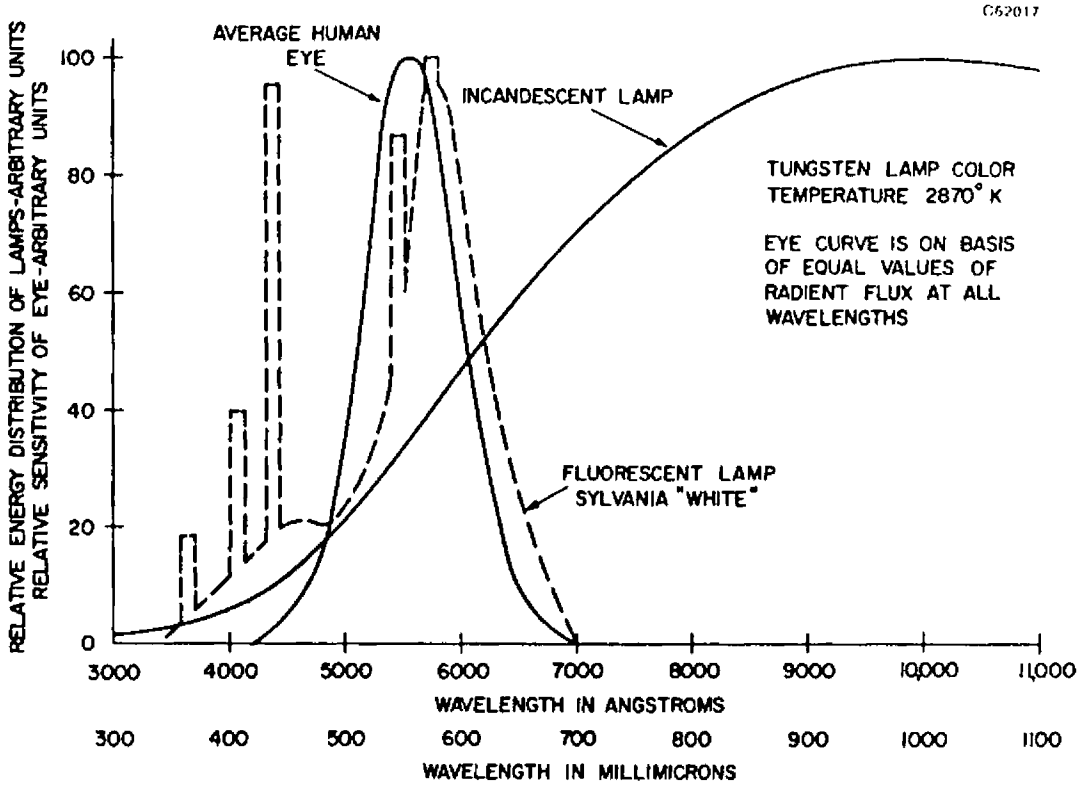
File Under
PHOTOCONDUCTORS

from JEDEC release #3477D, Oct. 4, 1965

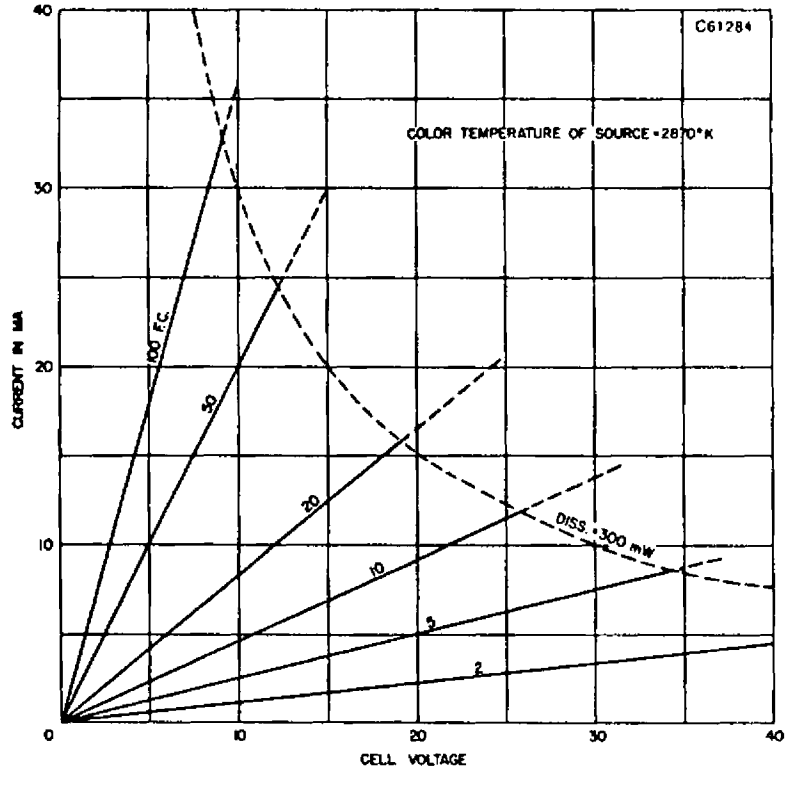
SPECTRAL RESPONSE



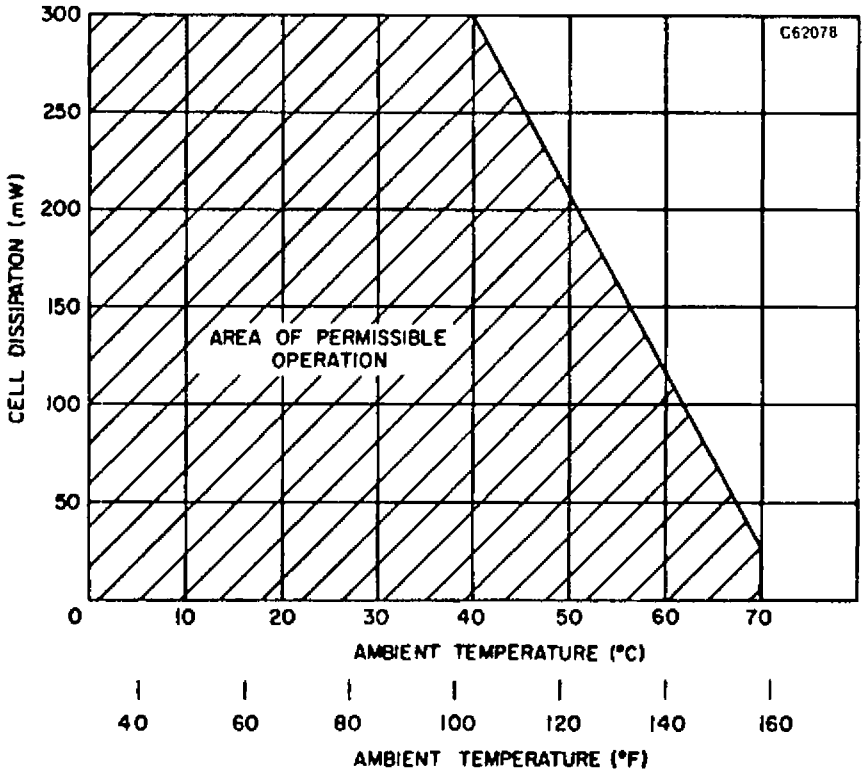
SPECTRAL CHARACTERISTIC OF HUMAN EYE, TUNGSTEN AND FLUORESCENT LAMPS



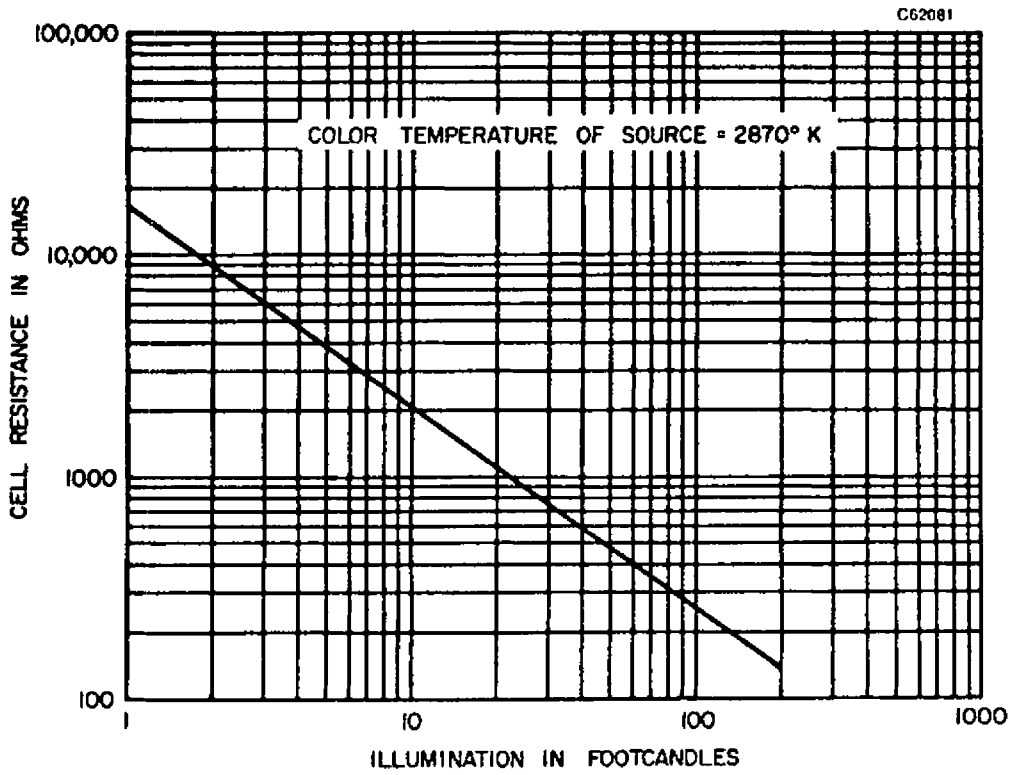
AVERAGE CHARACTERISTICS



PERMISSIBLE DISSIPATION AS A FUNCTION OF AMBIENT TEMPERATURE



AVERAGE CHARACTERISTICS



ADVANCE DATA

MECHANICAL DATA

Bulb	T-6½
Base	E9-1 Miniature Button
Outline	JEDEC 6-2
Basing	9PY
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1]

Bulb Temperature (Measured per JEDEC pub. JO-H1)	+180	°C
Operational Altitude	80,000	Ft.
Radiation Environment		
Total Dosage - (Neutrons/Sq. Cm)	10^{16}	nvt
Dose Rate - (Neutrons/Sq. Cm/Sec.)	10^{12}	nv

DURABILITY CHARACTERISTICS[2]

Impact Acceleration[3]	500	G
Vibration Acceleration for an Extended Period[4]	10	G
On - Off Heater Cycles[5]	2000	

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Parallel[13]	Series[14]	
Heater Voltage	6.3	12.6	Volts
Heater Current	460	230	mA
Maximum Heater-Cathode Voltage (Peak)		200	Volts

CONTROLLED DETRIMENTS

Minimum Interelectrode Insulation[6]	100	Megohms
Maximum Total Grid Current[7]	-0.5	μAdc
Maximum Vibration Output as Equivalent Grid Voltage[8]	7.9	mVac
Maximum Heater-Cathode Leakage[9]	5.0	μAdc

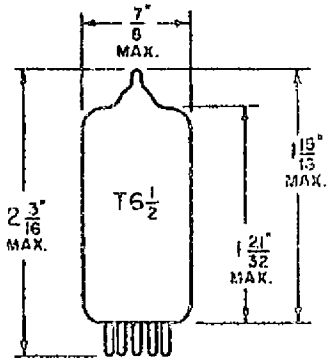
DIRECT INTERELECTRODE CAPACITANCES — Unshielded

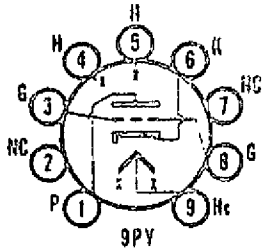
Grid to Plate	2.9	pf
Input: g to (h+k)	10.0	pf
Output: p to (h+k)	1.2	pf

QUICK REFERENCE DATA

The Type 8212 is a miniature medium mu triode intended primarily for cathode follower applications. It is characterized by long life and stable performance under conditions of high altitude, severe shock, vibration and high temperature.

The 8212 is manufactured and inspected to meet the applicable MIL-E-1 specification.





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

January 25, 1963

146 (10-58)

from JEDEC release #4160, Feb. 25, 1963

RATINGS[1] (Absolute Values)

Maximum Heater Voltage Variation	±10% Volts
Maximum Plate Voltage	300 Vdc
Maximum Cathode Current	75 mAdc
Maximum Negative Grid Voltage	-40 Volts
Maximum Plate Dissipation	10.0 Watts
Maximum Grid Circuit Resistance	0.5 Meg

Pulse Service (See Chart)

Maximum Heater Voltage Variation	+5.0 -0 Percent
Maximum Negative Grid Voltage	-40 Vdc
Maximum Plate Dissipation	10.0 W
Maximum Average Plate Voltage	150 Vdc
Maximum Instantaneous Forward Plate Voltage[12]	300 v
Maximum Instantaneous Heater to Cathode Voltage	100 v
Maximum Grid Dissipation	0.6 W
Maximum Instantaneous Grid to Cathode Voltage	±60 v

AVERAGE CHARACTERISTICS

Heater Voltage	12.6 V
Plate Voltage	105 Vdc
Grid Voltage	0 Vdc
Cathode Resistor	75 Ohms
Plate Current	25 mAdc
Transconductance	29,000 µmhos
Amplification Factor	28
Plate Resistance (approx.)	965 Ohms
Grid Voltage for Ib = 25 µA (Max.)	-7.5 Vdc

Plate Current[10]: With Ef = 12.6 V; Eb = 105 Vdc; Ec = -20 Vdc; Prr = 10,000 pps; tp = 10 µsec.; egk = 0 V. 100 mAdc

Pulse Cathode Current: With Ef = 12.6 V; Eb = 150 Vdc; Ec = -30 Vdc; egk = +30 V (Measured between grid and cathode pins); tp = 10 µsec.; prr = 2,000 pps; duty cycle = 2.0%. 3000 ma

Minimum Pulse Plate to Cathode Currents Ratio[11]	0.7
Equivalent Noise Resistance (at 50 Mc)	200 Ohms
Hot Input Capacitance (at 50 Mc)	20 pf

NOTES:

1. Limiting values beyond which normal tube life and normal tube performance may be impaired.

2. Tests performed as a measure of the mechanical durability of the tube structure.

3. Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = 3/4 milliseconds.

4. Vibrational forces applied in any direction for a period of 6 hours over the range 30 cps to 3000 cps.

5. One cycle consists of the application of Ef = 15 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.

6. Measure with Ef = 12.6 V; Eg-all = -100 Vdc; Ep-all = -300 Vdc; Cathode is positive so that no cathode emission occurs.

7. Measure with Ef = 12.6 V; Ec = 0 Vdc; Eb = 105 Vdc; Rk = 75 Ohms.

8. Test with Ef = 12.6 V; Eb = 150 Vdc; Ec = 0 Vdc; Rk = 75 Ohms; Rp = 2000 Ohms; F = 40 cps; Acc = 10 g; Ck = 1000 μf.

9. Measure with Ef = 12.6 V; Ehk = ±100 Vdc.

10. Measured by method using recurrent wave form. Grid pulse is square wave producing specified egk directly at grid terminal with respect to cathode. Plate current is measured by high impedance oscilloscope or equivalent device connected across 1 ohm resistor in plate circuit.

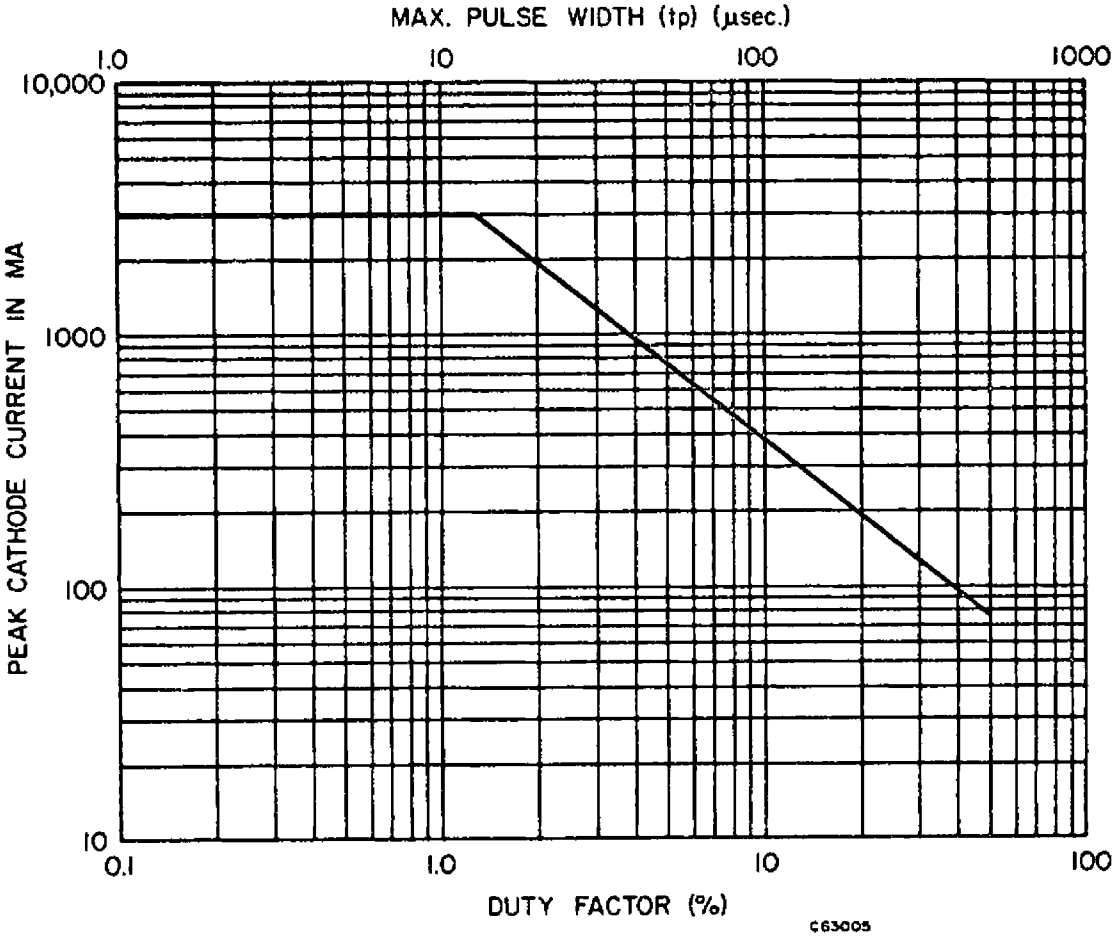
11. Grid pulse is square wave. Peak currents measured using high impedance oscilloscope or equivalent device connected across a cathode or plate resistor of 1.0 ohms.

12. Applies only to the spike occuring at the leading edge of the plate waveform. The spike duration must be limited to 0.1 of tp.

13. Heaters paralled connected, tie pins 4 and 5 together, use center tap pin 9.

14. Heater series connected, use pins 4 and 5.

RATING CHART



RATING CHART INTERPRETATION

The area below and to the left of the line establishes permissible peak cathode current for duty factors up to 50 percent. At duty factors greater than 50 percent the maximum average DC current of 75 milliamperes shall be the rating. Three thousand milliamperes is the maximum peak cathode current rating at any duty factor below 1.3 percent. Duty factor is defined as the ratio of the average current to the maximum peak current occurring in any 1000 microsecond period.

ADVANCE DATA

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button
Outline	See Drawing
Basing	8LT
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1]

Bulb Temperature (Measured per JEDEC pub. JO-H1)	+180 °C
Operational Altitude	80,000 Ft.
Radiation Environment	
Total Dosage - (Neutrons/Sq. Cm)	10^{16} nvt
Dose Rate - (Neutrons/Sq. Cm/Sec.)	10^{12} nv

DURABILITY CHARACTERISTICS[2]

Impact Acceleration[3]	500 G
Vibration Acceleration for an Extended Period[4]	10 G
On - Off Heater Cycles[5]	2000

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Parallel[14]	Series[15]	
Heater Voltage	6.3	12.6	Volts
Heater Current	380	190	mA
Maximum Heater-Cathode Voltage (Peak)		200	Volts

CONTROLLED DETRIMENTS

Minimum Interelectrode Insulation[6]	100 Megohms
Maximum Total Grid Current[7]	-0.5 μAdc
Maximum Vibration Output as Equivalent Grid Voltage[8]	5.3 mVac
Maximum Heater-Cathode Leakage[9]	10.0 μAdc

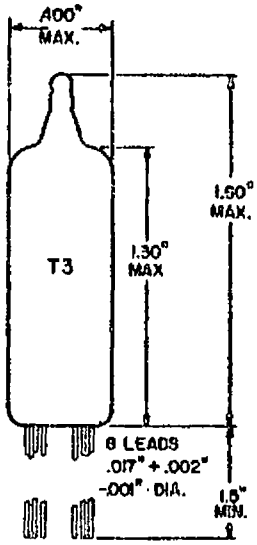
DIRECT INTERELECTRODE CAPACITANCES — Shielded[10]

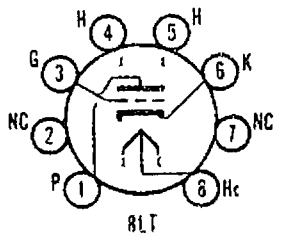
Grid to Plate	1.9 pf
Input: g to (h+k)	7.0 pf
Output: p to (h+k)	3.2 pf

from JEDEC release #4160, Feb. 25, 1963

QUICK REFERENCE DATA

The Type 8213 is a subminiature medium mu triode intended primarily for cathode follower applications. It is characterized by long life and stable performance under conditions of high altitude, severe shock, vibration, and high temperature. The 8213 is manufactured and inspected to meet the applicable MIL-E 1 specifications.





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

January 25, 1963

RATINGS[1] (Absolute Values)

Maximum Heater Voltage Variation	±10% Volts
Maximum Plate Voltage	300 Vdc
Maximum Cathode Current	50 mAdc
Maximum Negative Grid Voltage	-40 Volts
Maximum Plate Dissipation	5.0 Watts
Maximum Grid Circuit Resistance	0.5 Meg

Pulse Service (See Chart)

Maximum Heater Voltage Variation	+5.0 -0 Percent
Maximum Negative Grid Voltage	-40 Vdc
Maximum Plate Dissipation	5.0 W
Maximum Average Plate Voltage	150 Vdc
Maximum Instantaneous Forward Plate Voltage[13]	300 v
Maximum Instantaneous Heater to Cathode Voltage	100 v
Maximum Grid Dissipation	0.3 W
Maximum Instantaneous Grid to Cathode Voltage	±50 v

AVERAGE CHARACTERISTICS

Heater Voltage	12.6 V
Plate Voltage	105 Vdc
Grid Voltage	0 Vdc
Cathode Resistor	75 Ohms
Plate Current	23 mAdc
Transconductance	23,000 µmhos
Amplification Factor	31
Grid Voltage for Ib = 10 µA (Max.)	-6.0 Vdc
Plate Resistance (Approx.)	1348 Ohms
Plate Current[11]: With Ef = 12.6 V; Eb = 105 Vdc; Ec = -20 Vdc; Prr = 10,000 pps; tp = 10 µsec.; egk = 0 V.	80 mAdc
Pulse Cathode Current: With Ef = 12.6 V; Eb = 150 Vdc; Ec = -30 Vdc; egk = +40 V (Measured between grid and cathode pins); tp = 10 µsec.; prr = 1,000 pps; duty cycle = 1.0%.	1700 ma
Minimum Pulse Plate to Cathode Currents Ratio[12]	0.7
Equivalent Noise Resistance (at 50 Mc)	250 Ohms
Hot Input Capacitance (at 50 Mc)	12 pf

NOTES:

1. Limiting values beyond which normal tube life and normal tube performance may be impaired.

2. Tests performed as a measure of the mechanical durability of the tube structure.

3. Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = 3/4 milliseconds.

NOTES: (Cont.)

4. Vibrational forces applied in any direction for a period of 6 hours over the range 30 cps to 3000 cps.

5. One cycle consists of the application of Ef = 15 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.

6. Measure with Ef = 12.6 V; Eg-all = -100 Vdc; Ep-all = -300 Vdc; Cathode is positive so that no cathode emission occurs.

7. Measure with Ef = 12.6 V; Ec = 0 Vdc; Eb = 105 Vdc; Rk = 75 Ohms.

8. Test with Ef = 12.6 V; Eb = 150 Vdc; Ec = 0 Vdc; Rk = 75 Ohms; Rp = 2000 Ohms; F = 40 cps; Acc = 15 g; Ck = 1000 µf.

9. Measure with Ef = 12.6 V; Ehk = ±100 Vdc.

10. Capacitances are measured with external shield No. 318.

11. Measured by method using recurrent wave form. Grid pulse is square wave producing specified egk directly at grid terminal with respect to cathode. Plate current is measured by high impedance oscilloscope or equivalent device connected across 1 ohm resistor in plate circuit.

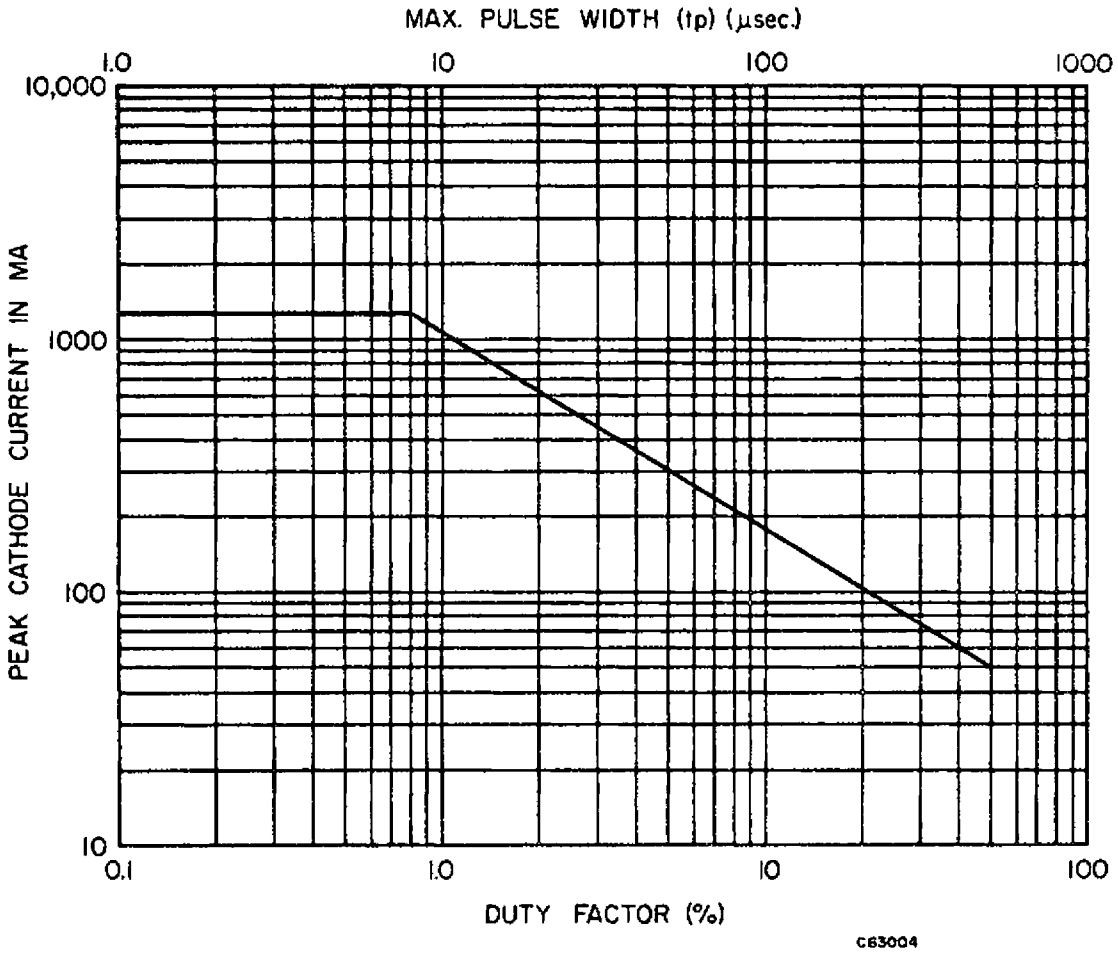
12. Grid pulse is square wave. Peak currents measured using high impedance oscilloscope or equivalent device connected across a cathode or plate resistor of 1.0 ohms.

13. Applies only to the spike occurring at the leading edge of the plate waveform. The spike duration must be limited to 0.1 of tp.

14. Heater parallel connected, tie pins 4 and 5 together, use center tap pin 8.

15. Heater series connected, use pins 4 and 5.

RATING CHART



RATING CHART INTERPRETATION

The area below and to the left of the line establishes permissible peak cathode current for duty factors up to 50 percent. At duty factors greater than 50 percent the maximum average DC current of 50 milliamperes shall be the rating. One thousand two hundred fifty milliamperes is the maximum peak cathode current rating at any duty factor below 0.8 percent. Duty factor is defined as the ratio of the average current to the maximum peak current occurring in any 1000 microsecond period.

GENERAL DATA

Spectral Response	See Curve
Wavelength of Max. Response	6100 ± 400 Angstroms
Sensitive Material	Cadmium-Sulfide
Sensitive Area	Viewed from End
Construction	Hermetically Sealed in Glass with Flexible Leads
Outline	See Drawing
Operating Position	Any

ELECTRICAL DATA

RATINGS (Absolute Maximum Values)

Breakdown Voltage[2]	300	Volts
Dissipation (See Curve)		
T-amb = 25°C	50	mW
T-amb = 70°C	5	mW
Ambient Temperature Range	-40 to +70	°C
Illumination	Note 3	

CHARACTERISTICS

Cell Resistance[4]		
Illumination 2 FC		
Color Temperature 2870°K	40,000	Ohms
Dark Resistance[5]	10.0	Megohms Min.

NOTES:

1. Minute increases in relative humidity will produce change in color.

2. Measured with cell in complete darkness at a pulse rate of 100 pps, 100 μ sec. duration. Voltage in excess of the rated value may damage the cell. Max. DC or AC peak voltage is limited by max. dissipation and min. dark resistance rating.

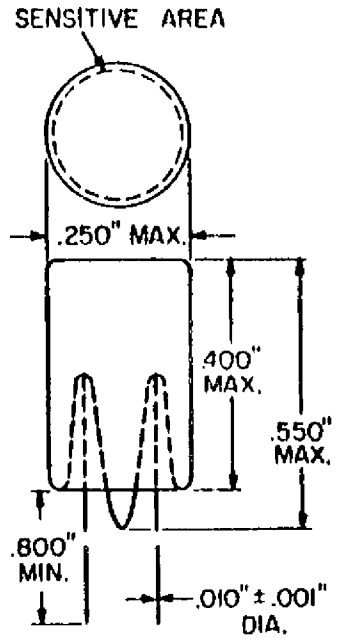
3. Care should be exercised to prevent localized overheating of the sensitive surface when the cell is used with a lens system.

4. Measured after 60 minutes minimum exposure to approximately 50 FC illumination (ambient room light).

5. Measured in complete darkness, 10 seconds after removal of 2 FC illumination.

QUICK REFERENCE DATA

The Sylvania Type 8318 is a miniature cadmium-sulfide photoconductive cell featuring high sensitivity and hermetically sealed-in-glass construction. The cell is gaseous back-filled for a high dissipation safety factor and includes a blue-dot compound which turns pink[1] if the cell envelope becomes damaged. The 8318 is designed for use in a wide variety of industrial applications.



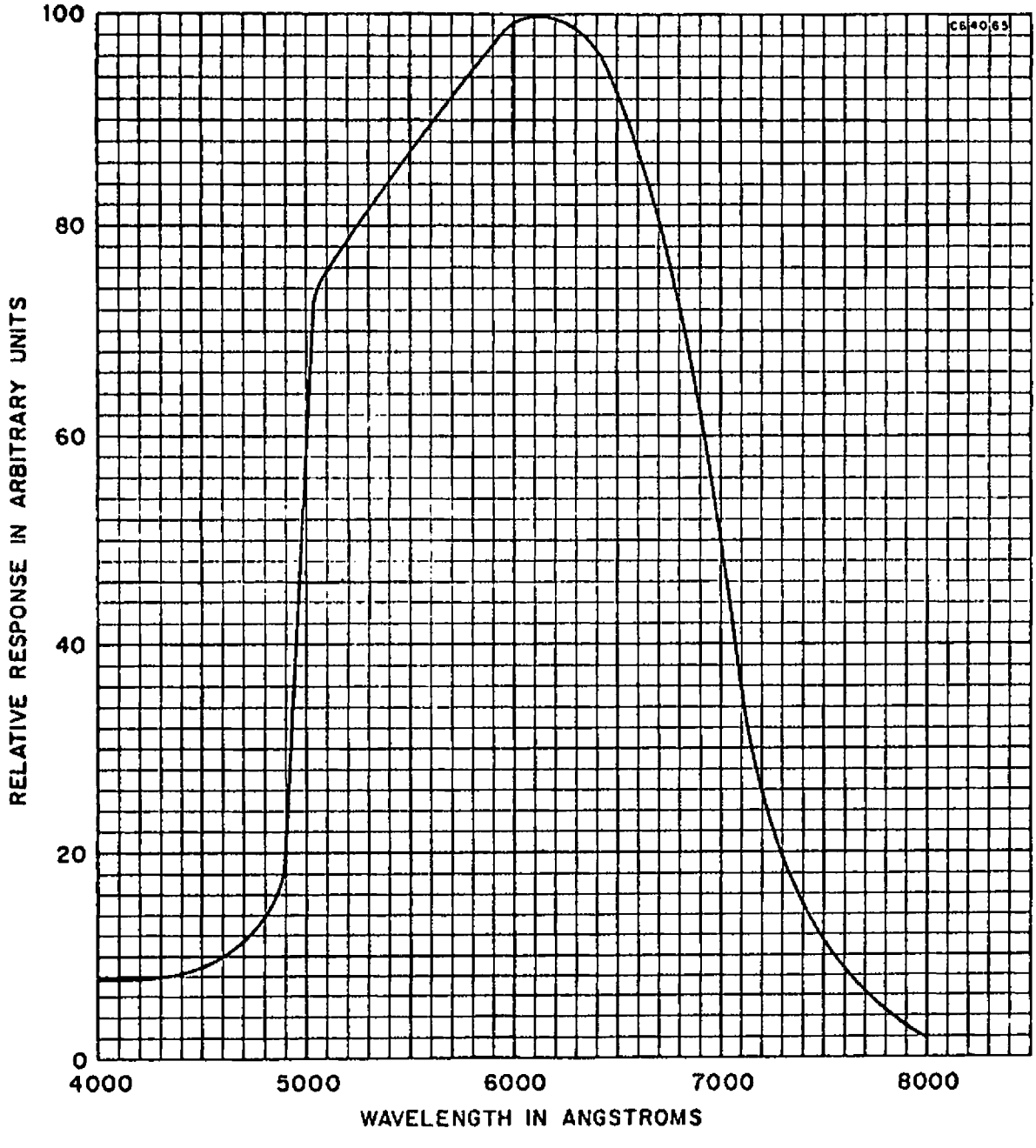
SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
EMPORIUM, PA.

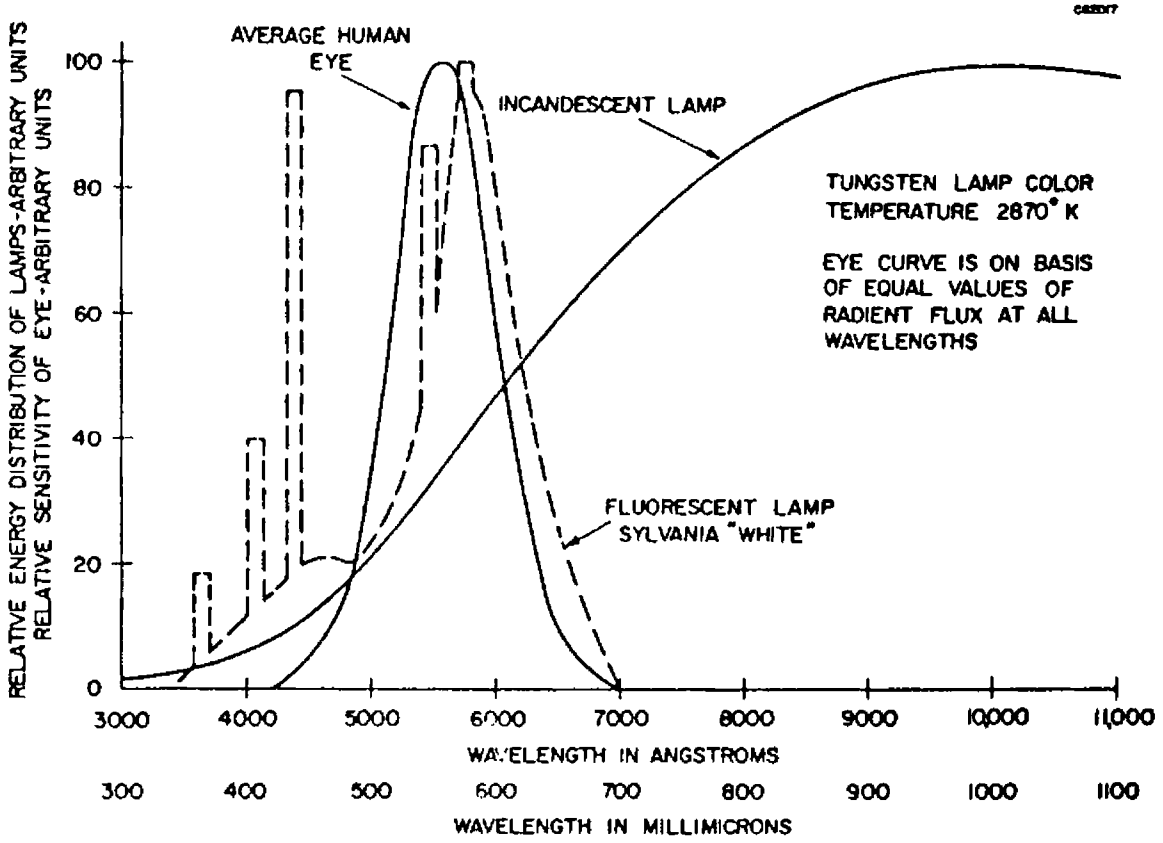
A Technical Publication
July 9, 1964
Page 1 of 4

from JEDEC release #3752A, Aug. 31, 1964

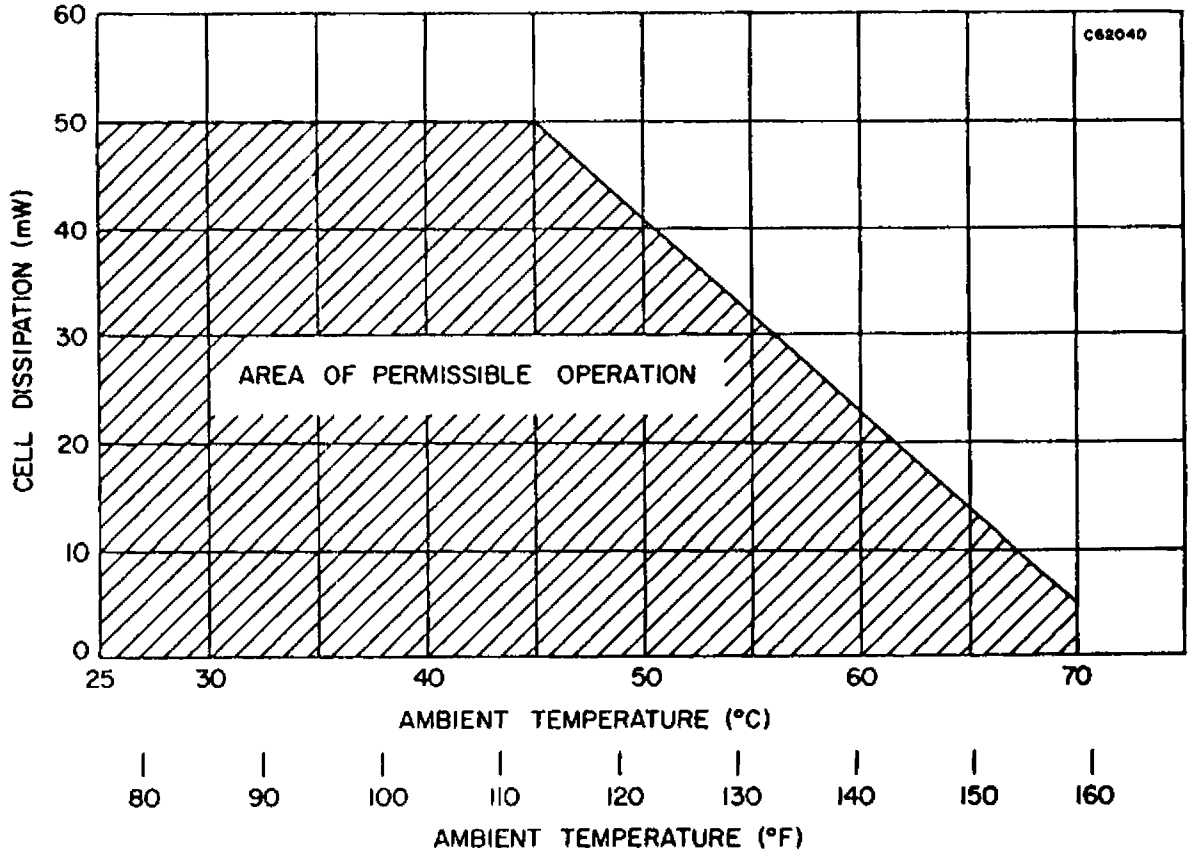
SPECTRAL RESPONSE



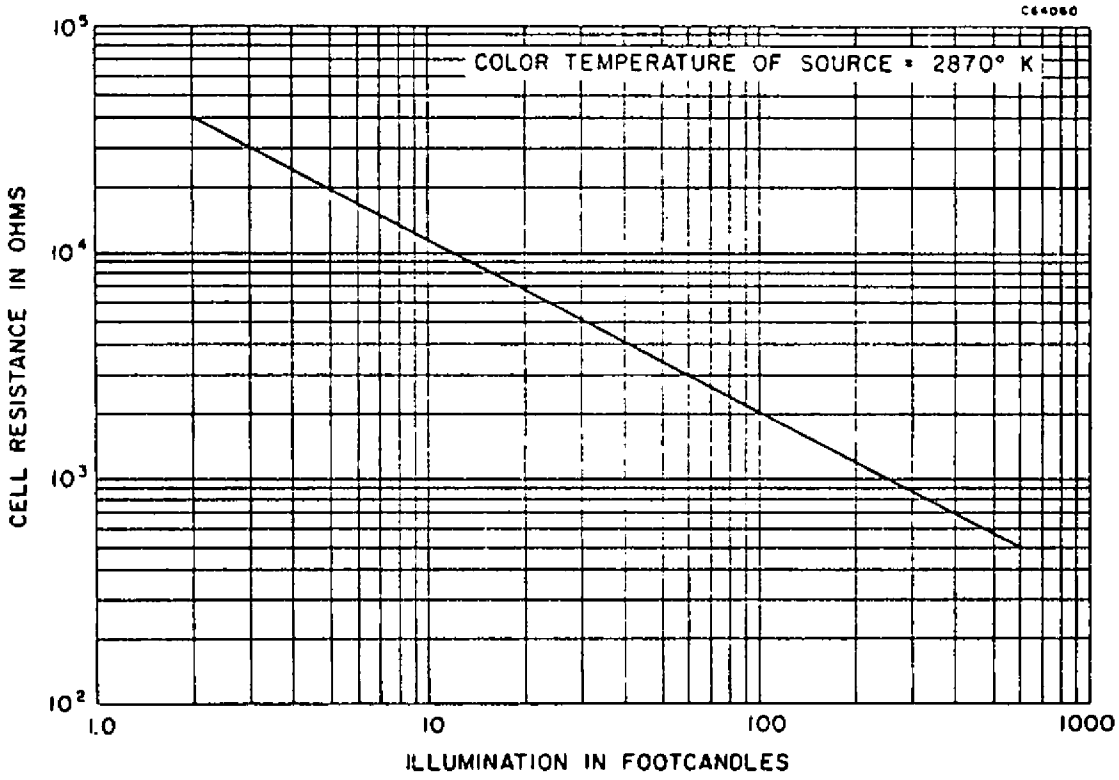
SPECTRAL CHARACTERISTIC OF HUMAN EYE,
TUNGSTEN AND FLUORESCENT LAMPS



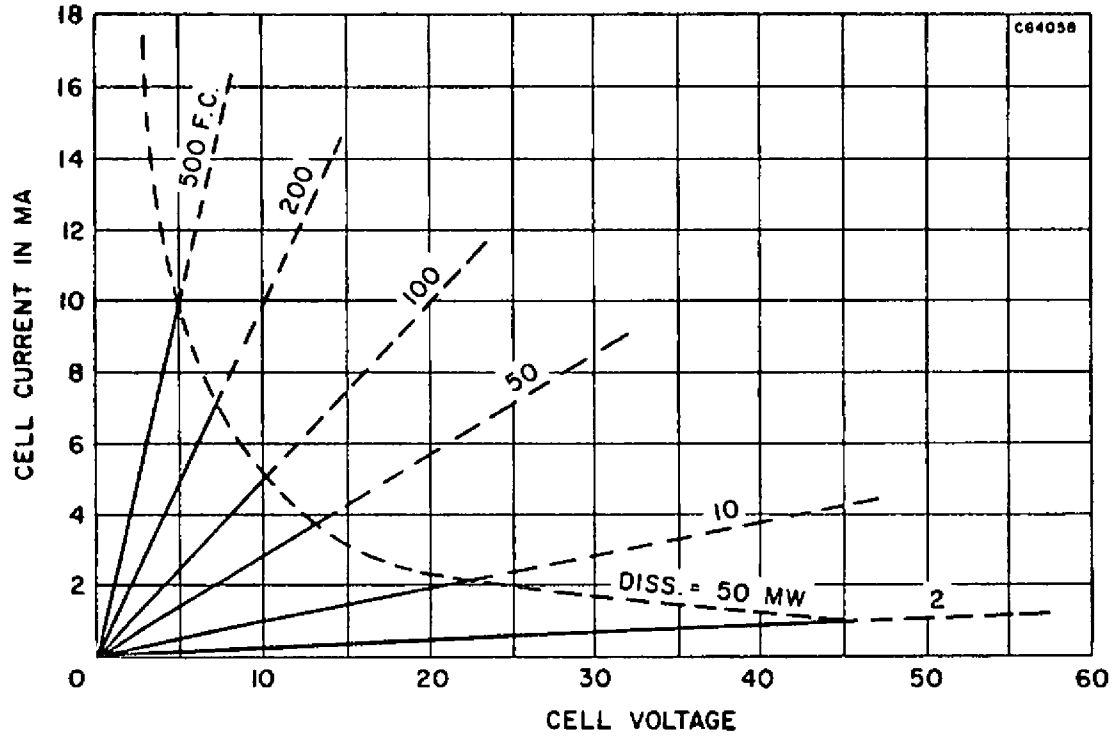
PERMISSIBLE DISSIPATION AS A FUNCTION OF AMBIENT TEMPERATURE



CELL RESISTANCE VS ILLUMINATION



CELL CURRENT AND DISSIPATION VS VOLTAGE



ADVANCE DATA

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JEDEC 3-1
Basing	8LD
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature	180	°C
Altitude[2]	80,000	Ft.
Radiation[3]		
Total Dosage (Neutrons/sq. cm)	10^{16}	nvt
Dose Rate (Neutrons/sq. cm/sec.)	10^{12}	nv

DURABILITY CHARACTERISTICS[4]

Impact Acceleration (3/4 msec Duration)[5]	500	G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[6]	2.5	G	Max.
On-Off Heater Cycles[7]	2000		Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[8]	6.3	V
Heater Current	150	mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[9]

Grid to Plate	1.8	pf
Input	4.2	pf
Output	2.2	pf
Heater to Cathode	2.2	pf

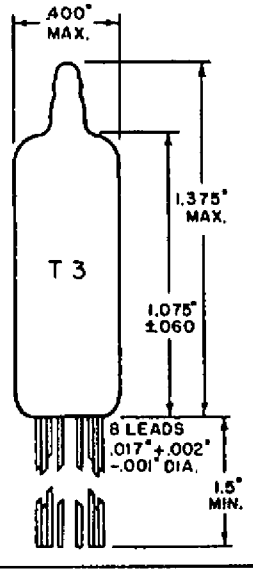
CONTROLLED DETRIMENTS

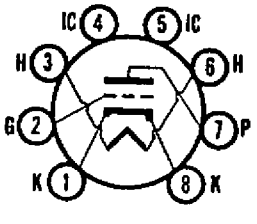
Interelectrode Insulation[10]	100	Meg.	Min.
Total Grid Current[11]	-0.4	μAdc	Max.
Grid Emission[12]	-0.5	μAdc	Max.
Vibration Output as Equivalent Ec[13]	4.0	mVac	Max.
Heater-Cathode Leakage[14]	20	μAdc	Max.

QUICK REFERENCE DATA

The Sylvania Type 8319 is a subminiature strap frame grid, high-mu triode featuring low heater power, high Gm and Gm/ma. It is intended for grounded cathode IF preamp, RF amplifier and mixer applications and is operable into UHF.

The Type 8319 is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude.





8LD

SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

RECEIVING TUBE
OPERATIONS

EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

April 10, 1963

from JEDEC release #4249, May 6, 1963

RATINGS[1] (Absolute Maximum)

Heater Voltage[8]	6.3 (±10%)	V
Plate Voltage	165	Vdc
Peak Plate Forward Voltage	330	v
Plate Dissipation	1.0	W
Plate Current	20	mAdc
DC Grid Voltage		
Positive Value	0	Vdc
Negative Value	55	Vdc
Grid Current	3.0	mAdc
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	100	v
Heater Negative with Respect to Cathode	100	v
Grid Circuit Resistance	1.1	Meg.

The spacing between Grid No. 1 and Cathode is of such a low order of magnitude as to preclude the use of excessive voltages between these elements in commercial tube checkers and shorts indicating devices, particularly where the tube is mechanically excited. The DC or peak AC voltage applied must not exceed 50 volts.

CHARACTERISTICS

Plate Voltage	100	Vdc
Cathode Resistor	160	Ohms
Plate Current	7.5	mAdc
Transconductance	14,000	µmhos
Amplification Factor	55	
Grid Voltage for Ib = 20 µAdc (Approx.)	-4.0	Vdc

NOTES:

1. Limitations beyond which normal tube performance and tube life may be impaired.

2. If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.

3. The radiation ratings are confirmed by a qualification test. The test is conducted in a suitable reactor furnishing mixed pile radiation at no less than 90% of the specified neutron dose rate. The tubes are measured for electrical parameters both before and after irradiation.

4. Tests performed as a measure of the mechanical durability of the tube structure.

5. Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = 3/4 milliseconds.

6. Vibrational forces applied in any direction for a period of 96 hours.

NOTES: (Cont'd)

7. One cycle consists of the application of Ef = 7.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.

8. Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value.

9. External shield No. 318.

10. Measure with Ef = 6.3 V; Eg-all = -100 Vdc; Ep-all = -300 Vdc; cathode is positive so that no cathode emission occurs.

11. Measure with Ef = 6.3 V; Eb = 100 Vdc; Ec = -1.5 Vdc.

12. Preheat for five minutes with Ef = 7.5 V; Eb = 100 Vdc; Rk = 160 Ohms; Rg = 1.0 Meg; then test with Ef = 7.5 V; Eb = 100 Vdc; Ec1 = -4.0 Vdc; Rg = 1.0 Meg.

13. Test with Ef = 6.3 V; Eb = 100 Vdc; Ec = 0; Rk = 160 Ohms; Rp = 10,000 Ohms; Ck = 1000 μf; F = 40 cps; Acc = 15 g.

14. Measured with Ef = 6.3 V; Ehk = ±100 Vdc.

MECHANICAL DATA

Bulb	T-5 ½
Base	E7-1, Miniature Button 7-Pin
Outline	5-1
Basing	7DK
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1]

Operational Altitude	80,000 Ft.
Radiation Environment	
Total Dosage—(Neutrons/Sq. Cm)	10^{16} nvt
Dose Rate —(Neutrons/Sq. Cm/Sec.)	10^{12} nv

DURABILITY CHARACTERISTICS[2]

Impact Acceleration[3]	500 G
Vibration Acceleration for an Extended Period[4]	2.5 G
On-Off Heater Cycles[5]	2000

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	225 mA
Maximum Heater-Cathode Voltage	100 Volts

CONTROLLED DETRIMENTS

Minimum Interelectrode Insulation[6]	100 Megohms
Maximum Total Grid Current[7]	−1.5 μAdc
Maximum Vibration Output as Equivalent Grid Voltage[8]	3.0 mVac
Maximum Heater-Cathode Leakage[9]	10 μAdc

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[10]	Unshielded
Grid to Plate	1.7	1.7 pf
Input: g to (h+k+sld)	3.3	2.9 pf
Output: p to (h+k+sld)	1.8	0.25 pf
Grounded Grid		
Input: k to (g+h+sld)	5.2	5.5 pf
Output: p to (g+h+sld)	3.0	1.8 pf
Heater to Cathode	2.9	3.0 pf

RATINGS[1] (Absolute Maximum Values)

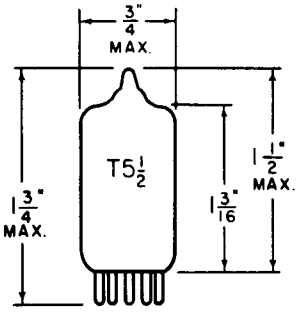
Heater Voltage Variation	±10 % Volts
Plate Voltage	330 Vdc
Average Cathode Current	33 mAdc
Plate Dissipation	4.4 Watts
Grid Circuit Resistance	1.0 Megohm

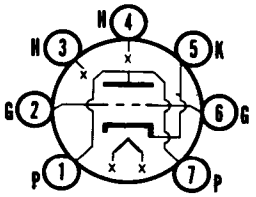
AVERAGE CHARACTERISTICS

Conditions	
Heater Voltage	6.3 V
Plate Voltage	200 Vdc
Grid Voltage	0 Vdc
Cathode Resistor	100 Ohms
Plate Current	18 mAdc
Transconductance	10,750 μmhos
Amplification Factor	55
Grid Voltage for Ib = 20 μA (Approx.)	−7.0 Vdc

QUICK REFERENCE DATA

The Sylvania Type 8334 is a miniature high mu triode designed for use as a grounded grid amplifier in UHF applications. The tube is manufactured and inspected to meet the applicable Mil-E-1 specification.





7 DK

SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

RECEIVING TUBE
OPERATIONS

EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

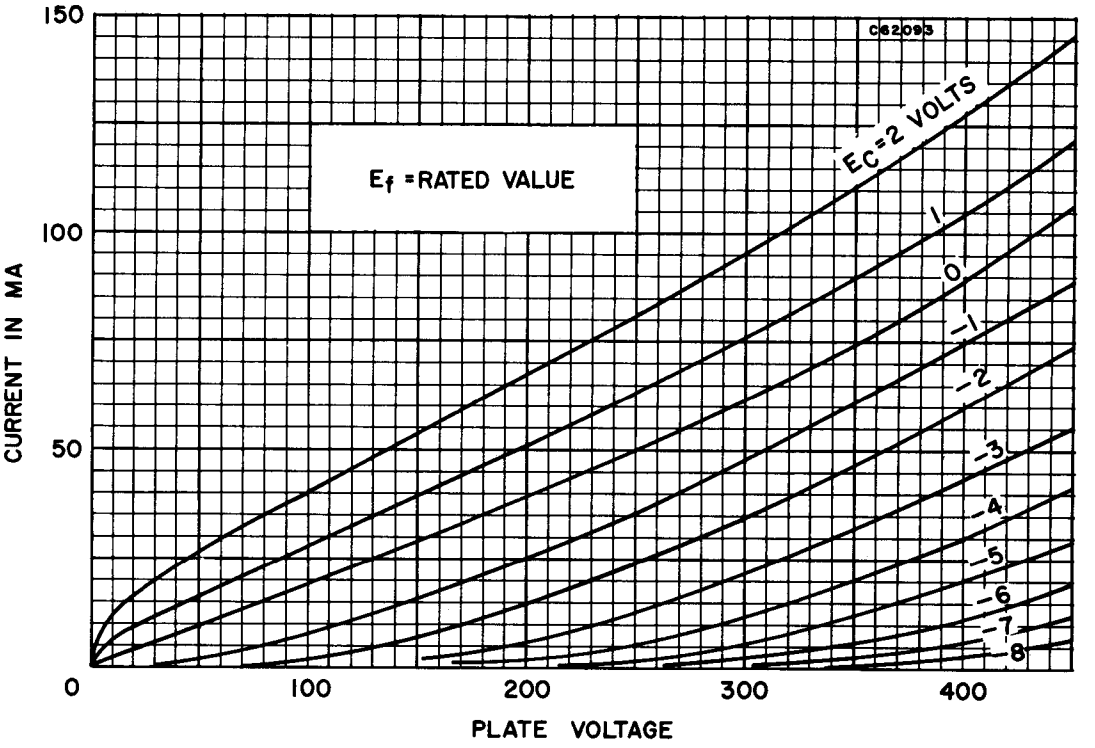
APRIL, 1963

File Under
RECEIVING TUBES

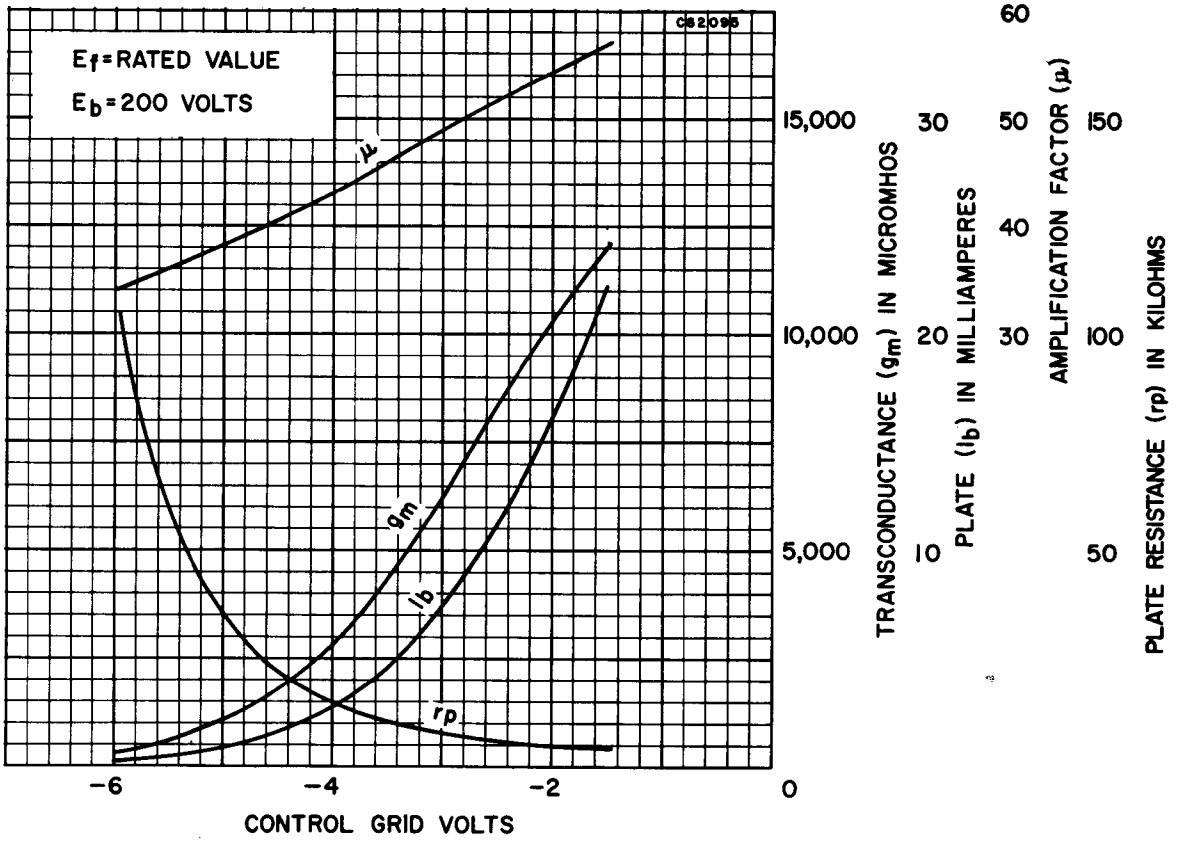
NOTES:

1. *Limiting values beyond which normal tube life and normal tube performance may be impaired.*
2. *Tests performed as a measure of the mechanical durability of the tube structure.*
3. *Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = ¾ milliseconds.*
4. *Vibrational forces applied in any direction for a period of 96 hours.*
5. *One cycle consists of the application of Ef = 7.5 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.*
6. *Measure with Ef = 6.3 V Eg-all = −100 Vdc; Ep-all = −300 Vdc; Cathode is positive so that no cathode emission occurs.*
7. *Measure with Ef = 6.3 V; Eb = 250 Vdc; Ec = 0 Vdc; Rk = 250 Ohms.*
8. *Test with Ef = 6.3 V; Eb = 200 Vdc; Ec = 0 Vdc; Rk = 100 Ohms; Rp = 2,000 Ohms; F = 25 cps; Acc = 2.5 G; Ck = 1,000 μf.*
9. *Measure with Ef = 6.3 V; Ehk = ±100 Vdc.*
10. *Capacitances are measured with External Shield No. 316.*

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



GENERAL DATA

Spectral Response	See Curve
Wavelength of Max. Response	6100 ± 400 Angstroms
Sensitive Material	Cadmium-Sulfide
Shape of Sensitive Area	Circular
Construction	Hermetically Sealed in Glass Flexible Leads
Outline	See Drawing
Operating Position	Any

ELECTRICAL DATA

RATINGS (Absolute Maximum Values)

Breakdown Voltage[2]	400 VAC
Dissipation	
T-amb = 25°C	300 mW
T-amb = 70°C	25 mW
Ambient Temperature Range	-40 to +70 °C
Illumination	Note 3

CHARACTERISTICS

Cell Resistance[4]	
Illumination 2 FC	
Color Temperature 2870°K	750 Ohms
Dark Resistance[5]	75,000 Ohms Min.

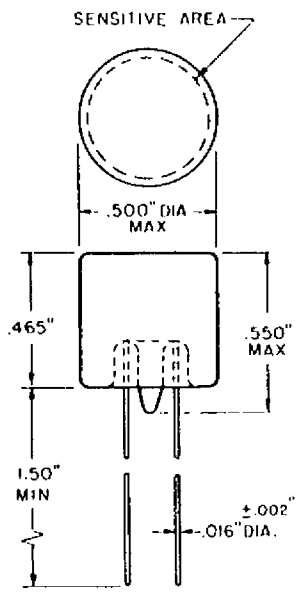
NOTES:

1. *Minute increases in relative humidity will produce change in color.*
2. *Measured with cell in complete darkness at a pulse rate of* 120 *pps,* 50 *μ sec. duration. Voltage in excess of the rated value may damage the cell. Maximum DC voltage is limited by maximum dissipation and minimum dark resistance rating.*
3. *Care should be exercised to prevent localized overheating of the sensitive surface when the cell is used with a lens system.*
4. *Measured after 60 minutes exposure to approximately 50 FC illumination (ambient room light).*
5. *Measured in complete darkness, 10 seconds after removal of 2 FC illumination.*

QUICK REFERENCE DATA

The Sylvania Type 8345 is a cadmium sulfide photoconductive cell featuring high sensitivity and hermetically sealed-in-glass construction. The cell is backfilled with gas for a high dissipation safety factor and high voltage capability and includes a blue-dot compound which turns pink[1] if the cell envelope becomes damaged. The 8345 has a resistance of 750 ohms at 2 F.C. It is designed for use in a wide variety of industrial applications, and is particularly suited to direct operation of relays.

OUTLINE 8345



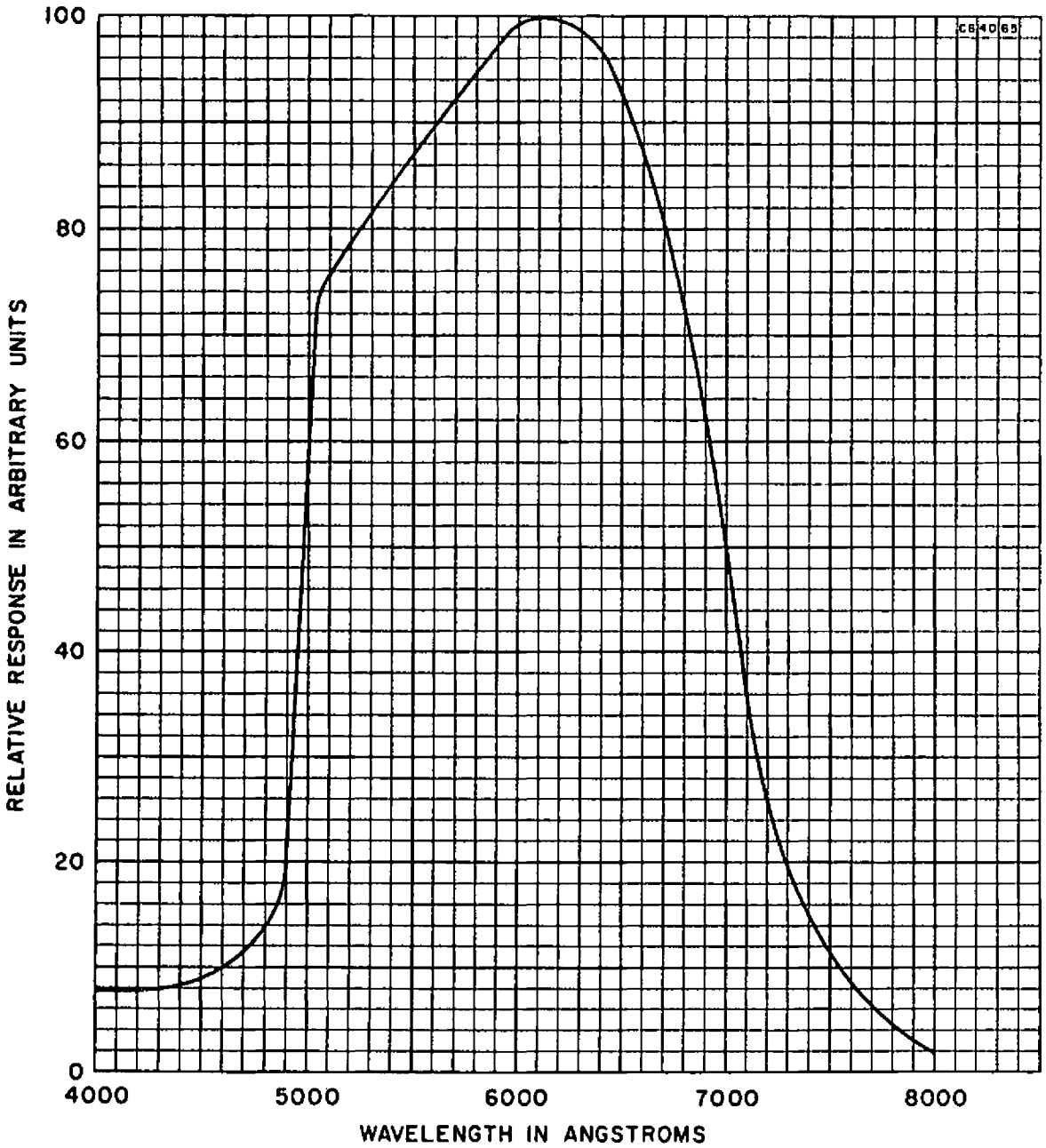
SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
EMPORIUM, PA.

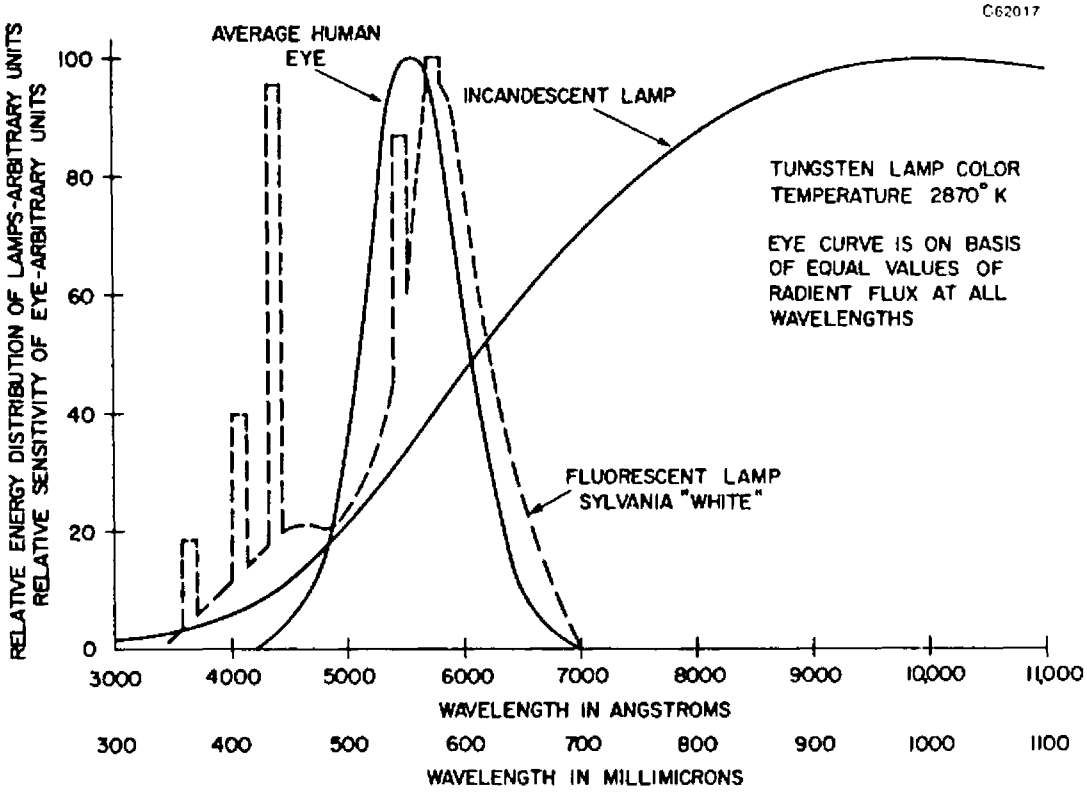
A Technical Publication
MAY, 1965
PAGE 1 OF 4
File Under
PHOTOCONDUCTORS

from JEDEC release #3937B, July 26, 1965

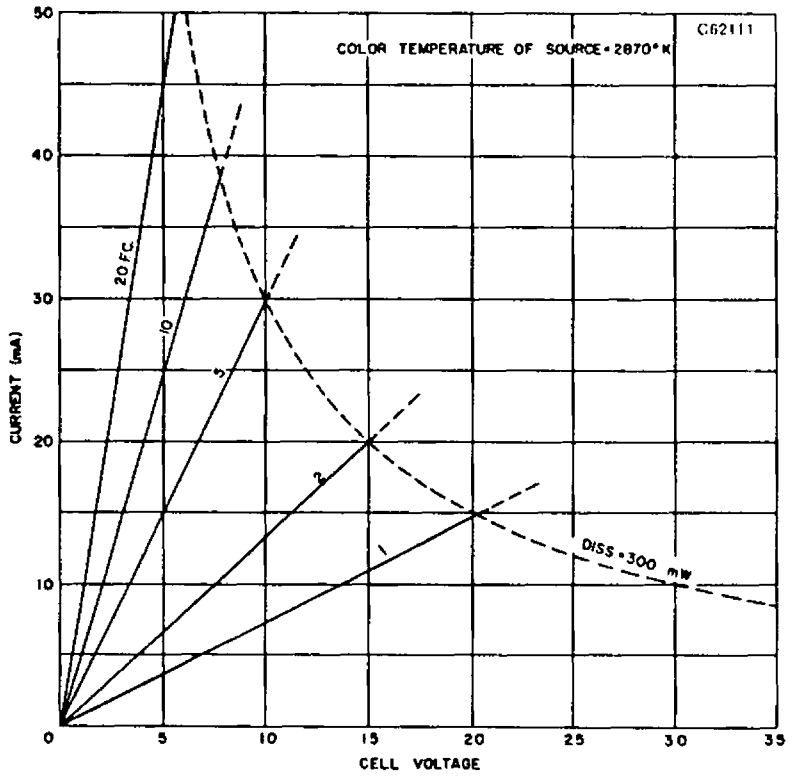
SPECTRAL RESPONSE



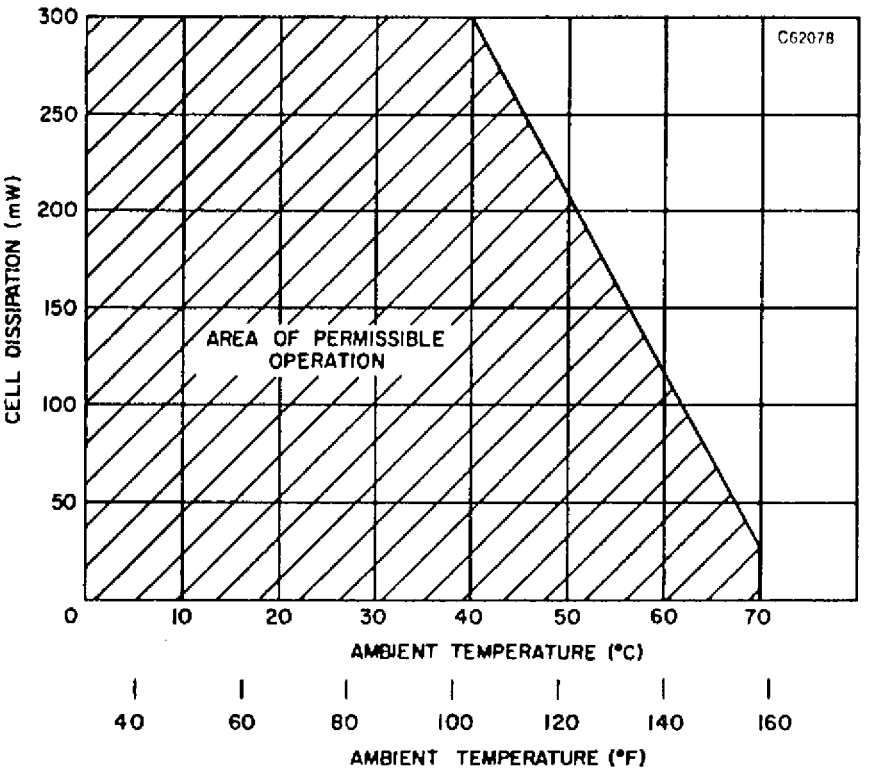
SPECTRAL CHARACTERISTIC OF HUMAN EYE, TUNGSTEN AND FLUORESCENT LAMPS



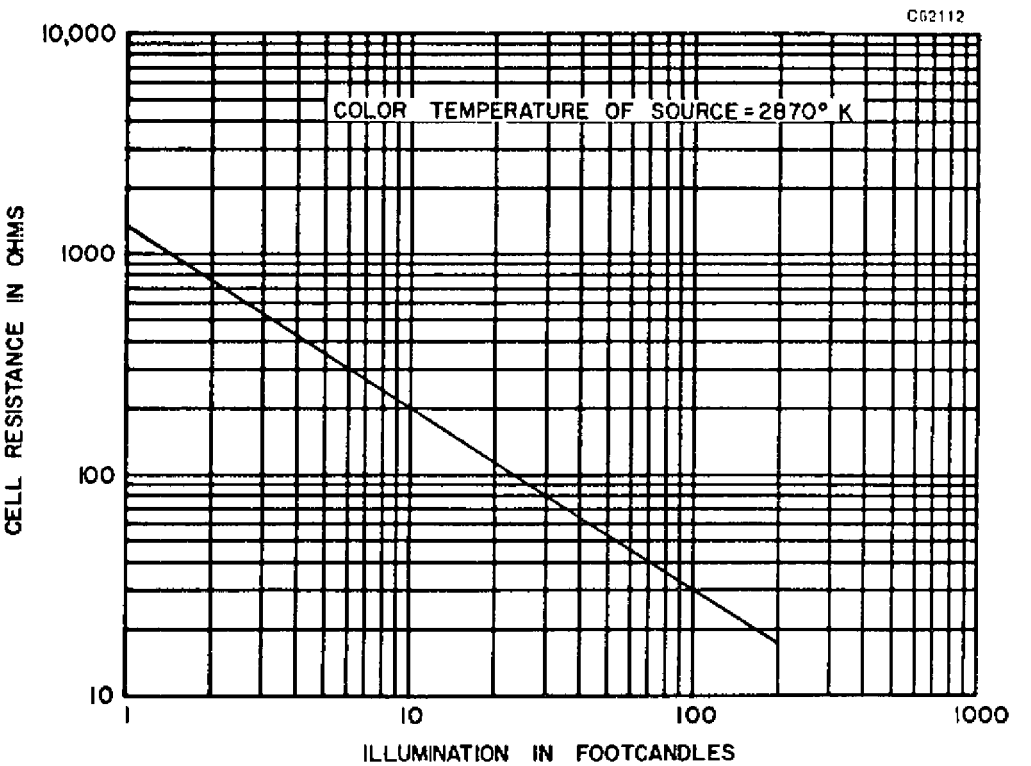
AVERAGE CHARACTERISTICS



PERMISSIBLE DISSIPATION AS A FUNCTION OF AMBIENT TEMPERATURE



AVERAGE CHARACTERISTICS



GENERAL DATA

Spectral Response	See Curve
Wavelength of Max. Response	6100 ± 400 Angstroms
Sensitive Material	Cadmium-Sulfide
Shape of Sensitive Area	Circular
Construction	Hermetically Sealed in Glass Flexible Leads
Outline	See Drawing
Operating Position	Any

ELECTRICAL DATA

RATINGS (Absolute Maximum Values)

Breakdown Voltage[2]	400 VAC
Dissipation	
T-amb = 25°C	300 mW
T-amb = 70°C	25 mW
Ambient Temperature Range	−40 to +70 °C
Illumination	Note 3

CHARACTERISTICS

Cell Resistance[4]	
Illumination 2 FC	
Color Temperature 2870°K	3000 Ohms
Dark Resistance[5]	300,000 Ohms Min.

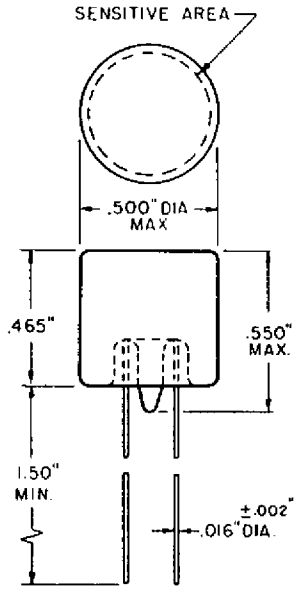
NOTES:

1. *Minute increases in relative humidity will produce change in color.*
2. *Measured with cell in complete darkness at a pulse rate of* 120 *pps,* 50 *μ sec. duration. Voltage in excess of the rated value may damage the cell. Maximum DC voltage is limited by maximum dissipation and minimum dark resistance rating.*
3. *Care should be exercised to prevent localized overheating of the sensitive surface when the cell is used with a lens system.*
4. *Measured after 60 minutes exposure to approximately 50 FC illumination (ambient room light).*
5. *Measured in complete darkness, 10 seconds after removal of 2 FC illumination.*

QUICK REFERENCE DATA

The Sylvania Type 8346 is a cadmium sulfide photoconductive cell featuring high sensitivity and hermetically sealed-in-glass construction. The cell is backfilled with gas for a high dissipation safety factor and high voltage capability and includes a blue-dot compound which turns pink[1] if the cell envelope becomes damaged. The 8346 has a resistance of 3000 ohms at 2 F. C. It is designed for use in a wide variety of industrial applications, and is particularly suited to direct operation of relays.

OUTLINE 8346



SYLVANIA ELECTRIC PRODUCTS INC.

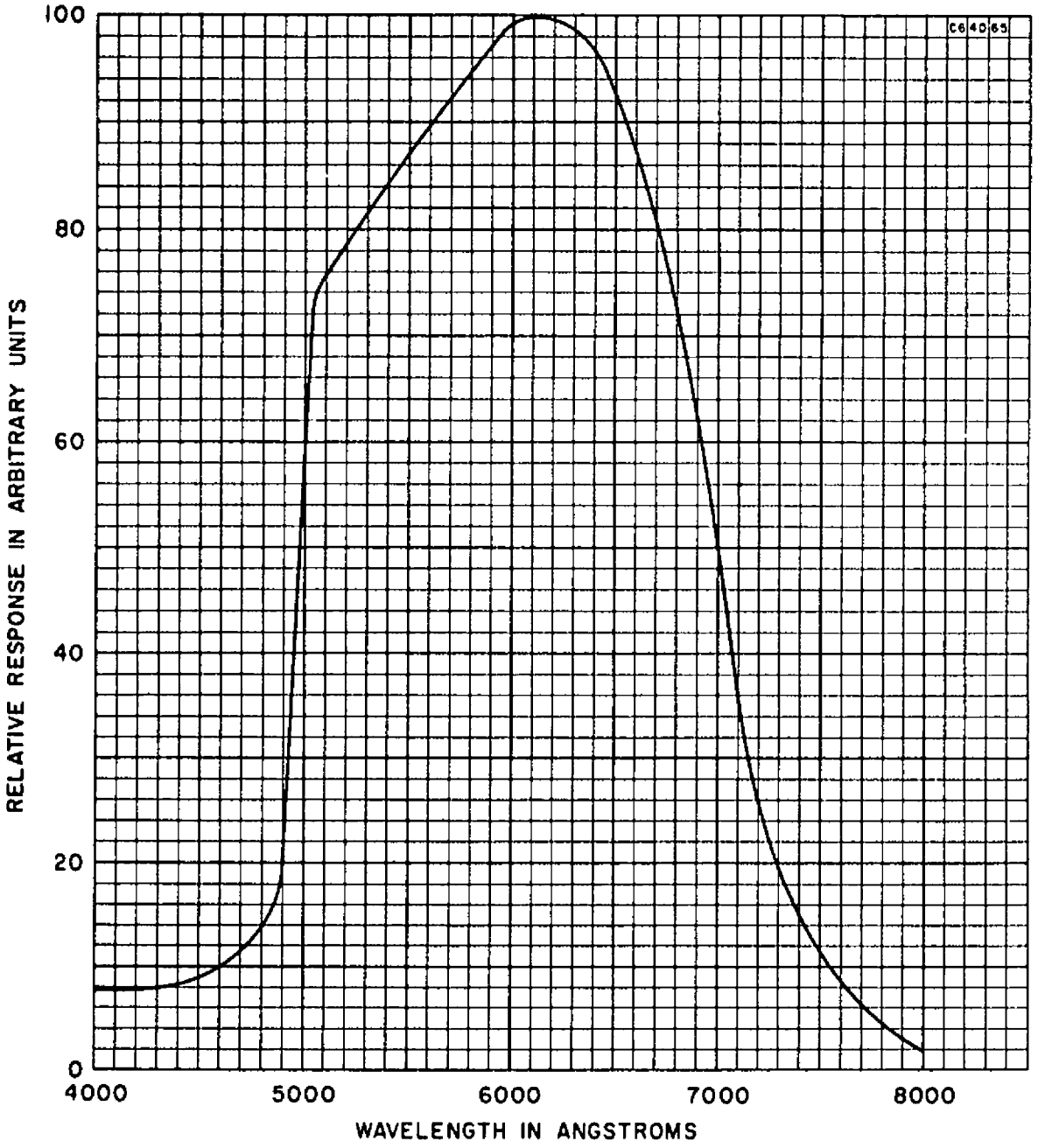
Electronic Components Group
ELECTRONIC TUBE DIVISION
EMPORIUM, PA.

A Technical Publication
MAY, 1965

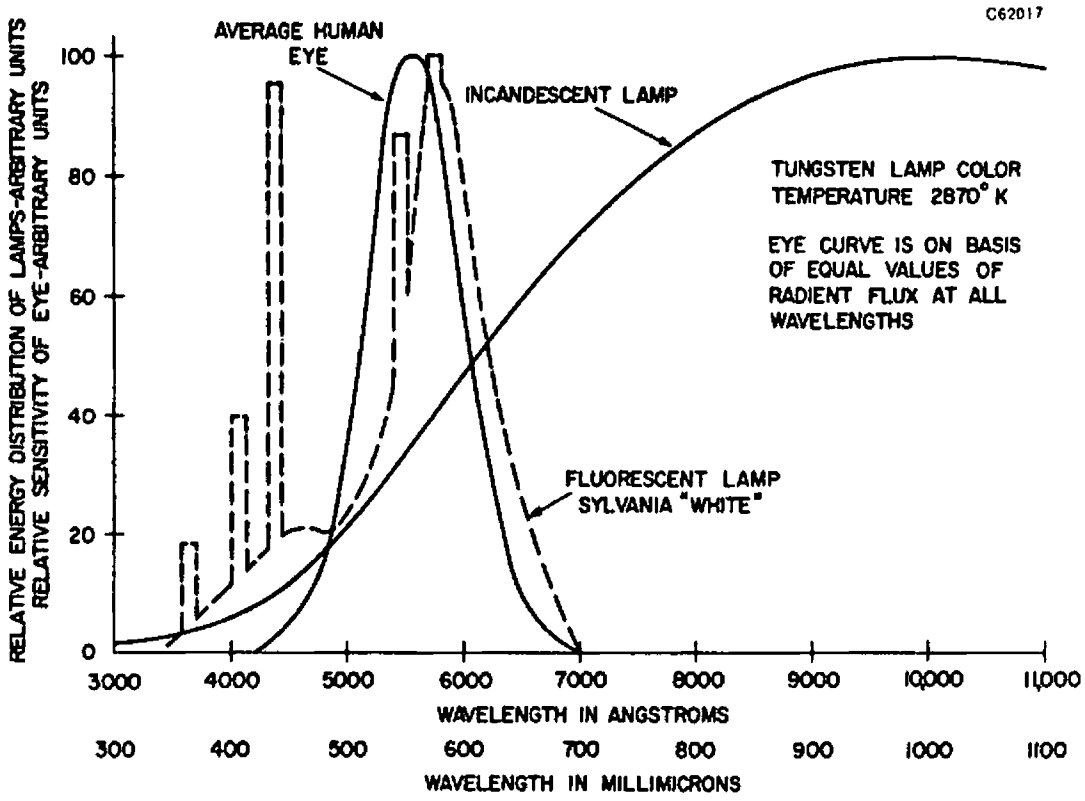
File Under
PHOTOCONDUCTORS

from JEDEC release #3896B, Oct. 4, 1965

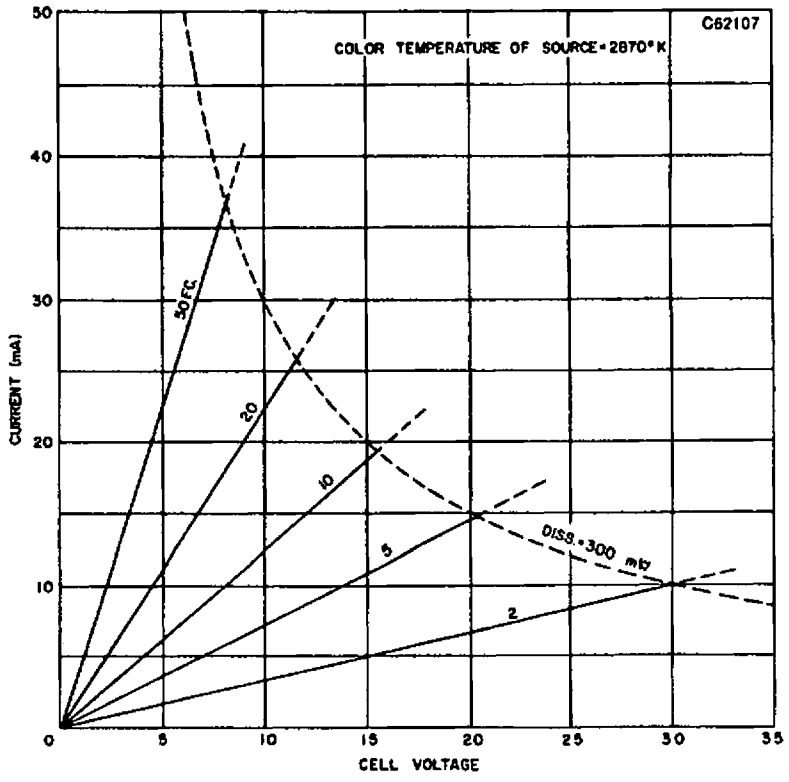
SPECTRAL RESPONSE



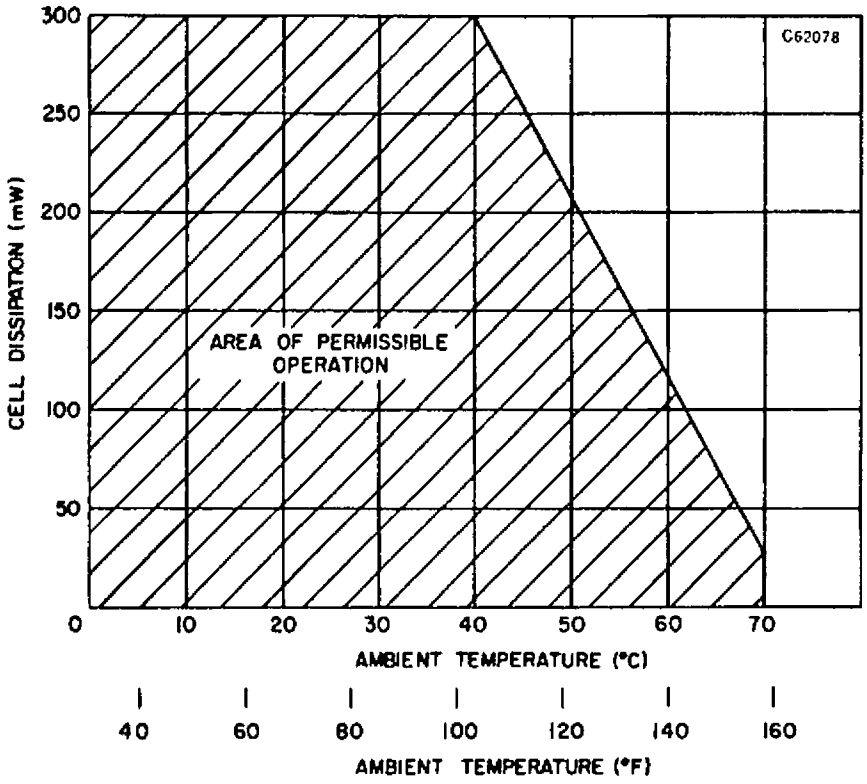
SPECTRAL CHARACTERISTIC OF HUMAN EYE, TUNGSTEN AND FLUORESCENT LAMPS



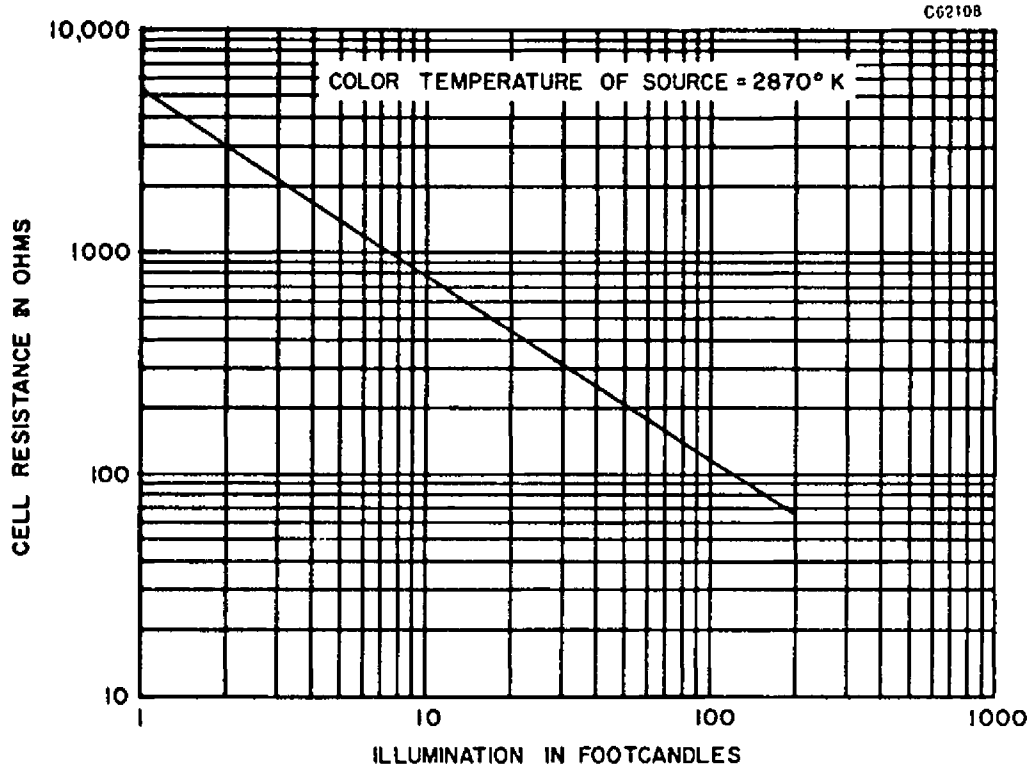
AVERAGE CHARACTERISTICS



PERMISSIBLE DISSIPATION AS A FUNCTION OF AMBIENT TEMPERATURE



AVERAGE CHARACTERISTICS



SYLVANIA

engineering data service

GENERAL DATA

Spectral Response	See Curve
Wavelength of Max. Response	6100 ± 400 Angstroms
Sensitive Material	Cadmium-Sulfide
Shape of Sensitive Area	Circular
Construction	Hermetically Sealed in Glass Flexible Leads
Outline	See Drawing
Operating Position	Any

ELECTRICAL DATA

RATINGS (Absolute Maximum Values)

Breakdown Voltage[2]	400 VAC
Dissipation	
T-amb = 25°C	300 mW
T-amb = 70°C	25 mW
Ambient Temperature Range	−40 to +70 °C
Illumination	Note 3

CHARACTERISTICS

Cell Resistance[4]	
Illumination 2 FC	
Color Temperature 2870°K	16,000 Ohms
Dark Resistance[5]	1,600,000 Ohms Min.

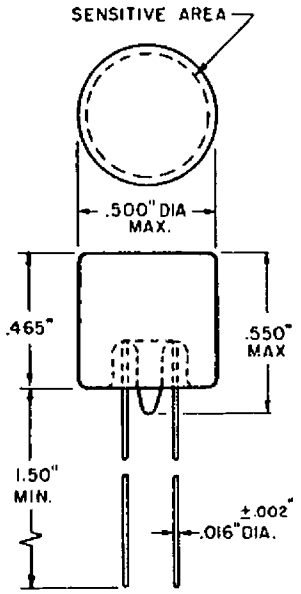
NOTES:

1. *Minute increases in relative humidity will produce change in color.*
2. *Measured with cell in complete darkness at a pulse rate of 120 pps, 50 μ sec. duration. Voltage in excess of the rated value may damage the cell. Maximum DC voltage is limited by maximum dissipation and minimum dark resistance rating.*
3. *Care should be exercised to prevent localized overheating of the sensitive surface when the cell is used with a lens system.*
4. *Measured after 60 minutes exposure to approximately 50 FC illumination (ambient room light).*
5. *Measured in complete darkness, 10 seconds after removal of 2 FC illumination.*

QUICK REFERENCE DATA

The Sylvania Type 8347 is a cadmium sulfide photoconductive cell featuring high sensitivity and hermetically sealed-in-glass construction. The cell is backfilled with gas for a high dissipation safety factor and high voltage capability and includes a blue-dot compound which turns pink[1] if the cell envelope becomes damaged. The 8347 has a cell resistance of 16,000 ohms at 2 F. C. It is designed for use in a wide variety of industrial applications, and is particularly suited to direct operation of relays.

OUTLINE 8347



SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
EMPORIUM, PA.

A Technical Publication

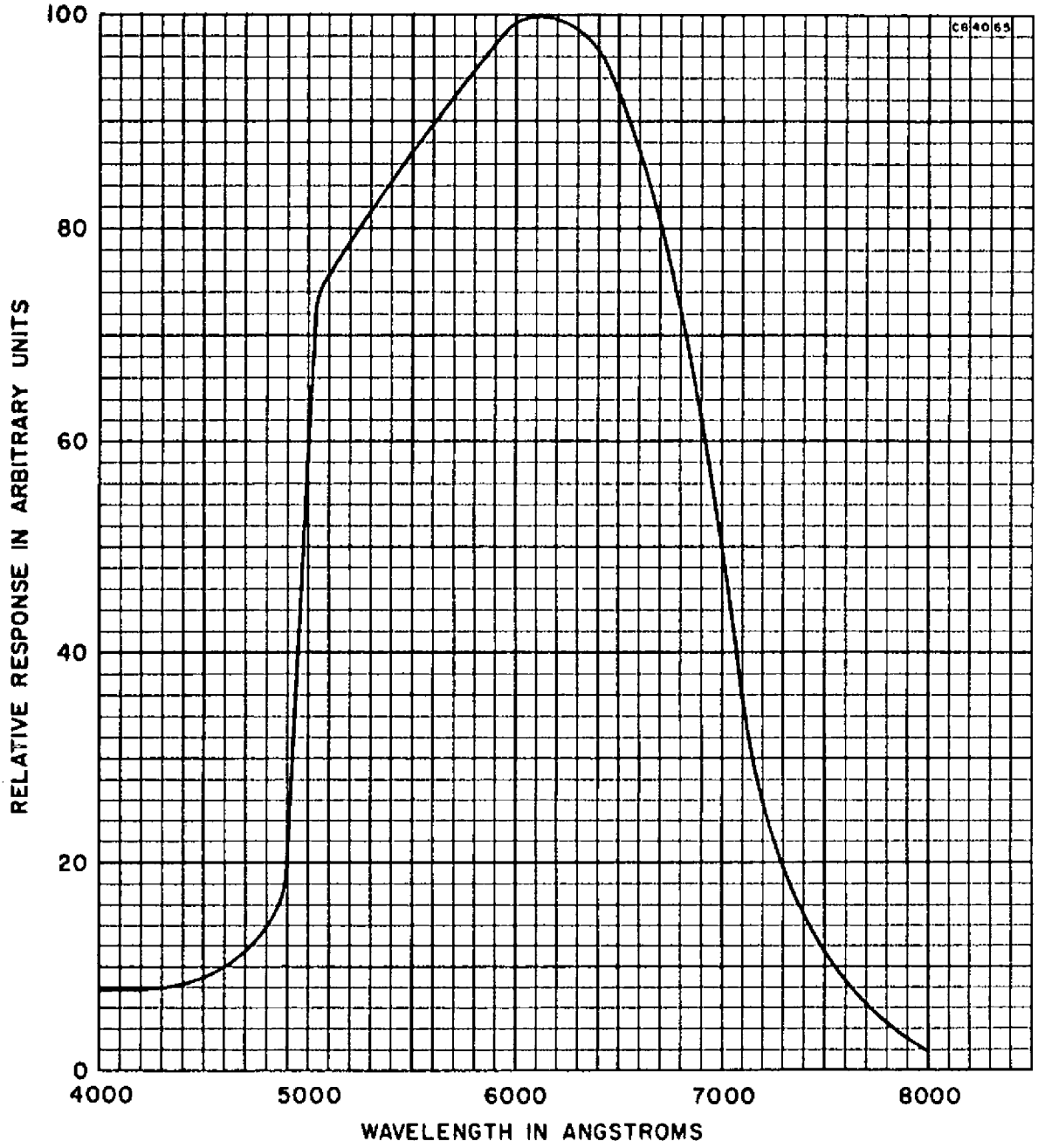
MAY, 1965

File Under

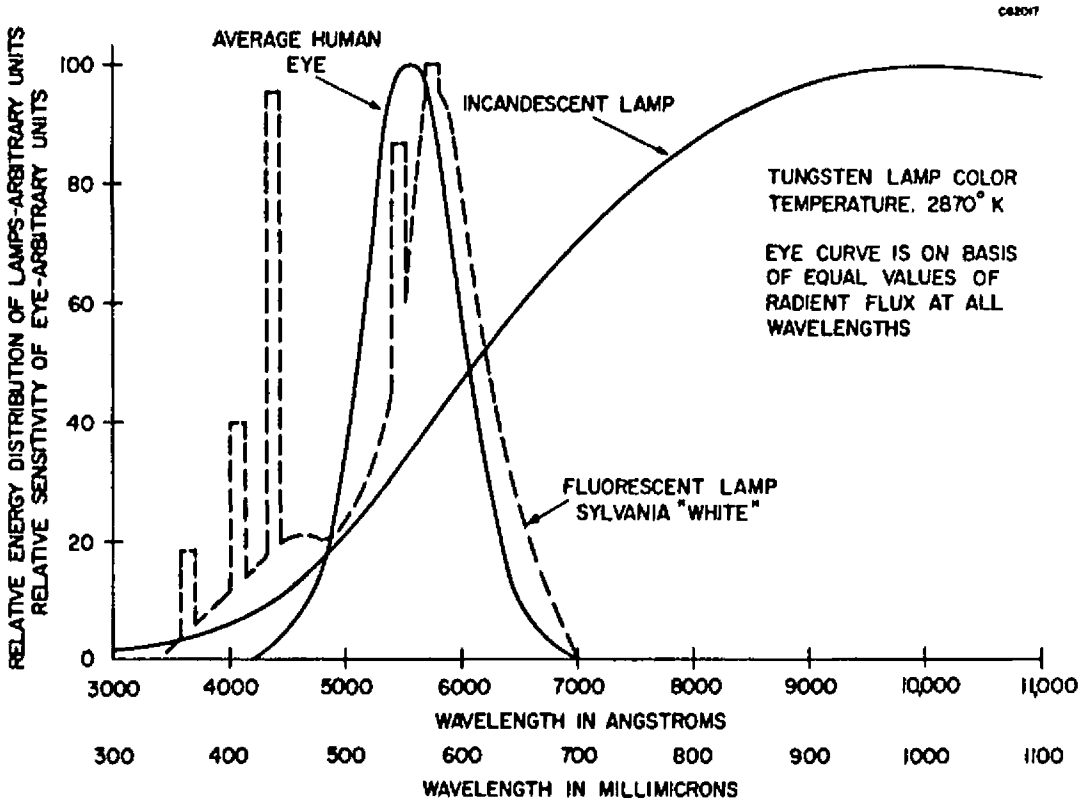
PHOTOCONDUCTORS

from JEDEC release #3896B, Oct. 4, 1965

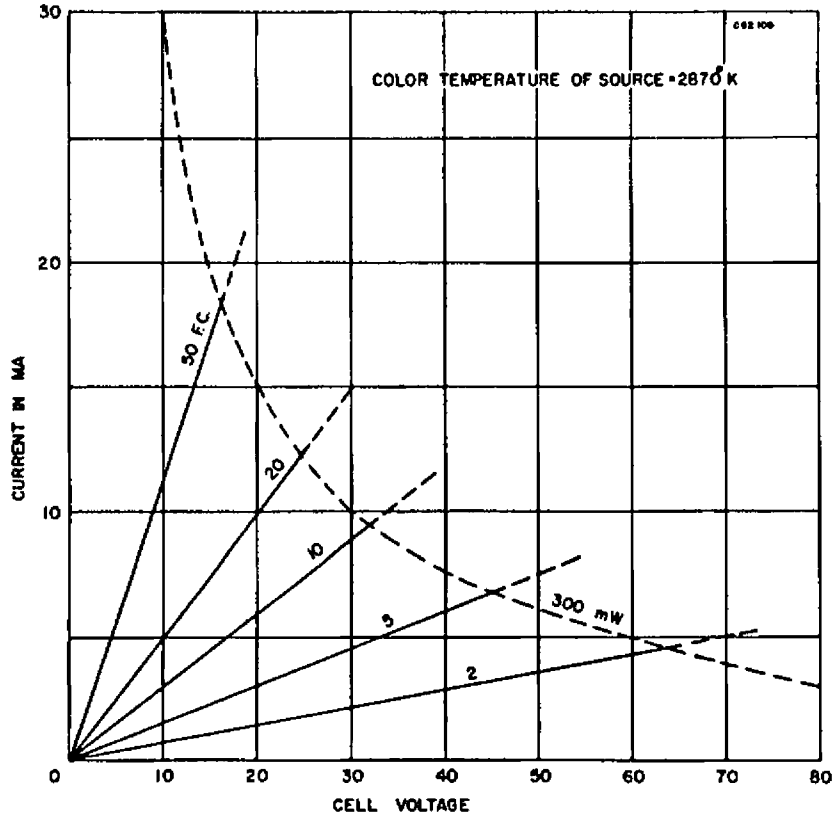
SPECTRAL RESPONSE



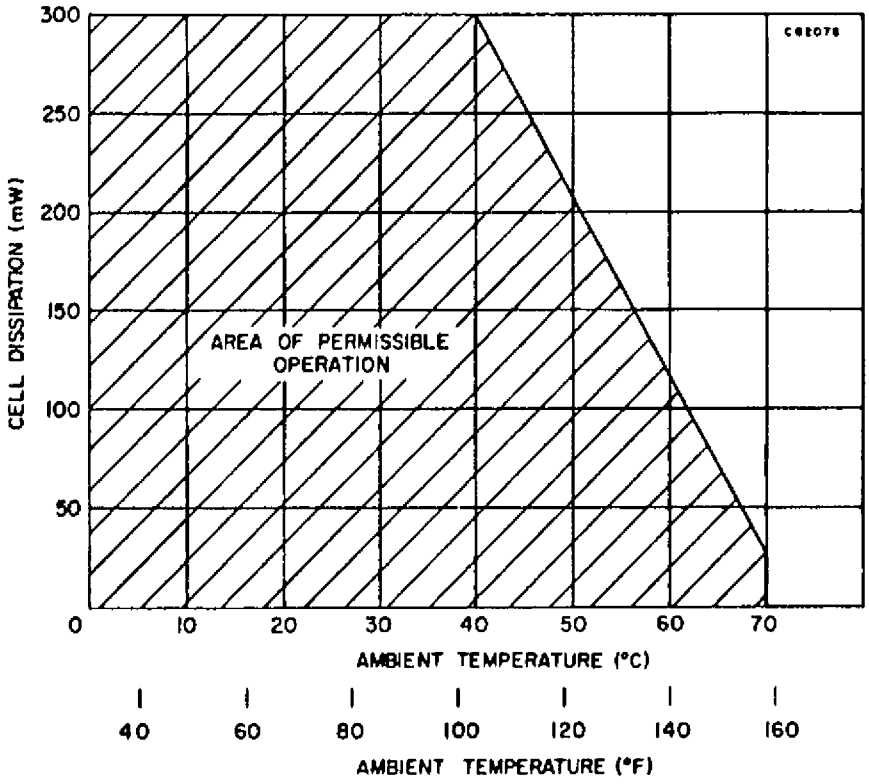
SPECTRAL CHARACTERISTIC OF HUMAN EYE, TUNGSTEN AND FLUORESCENT LAMPS



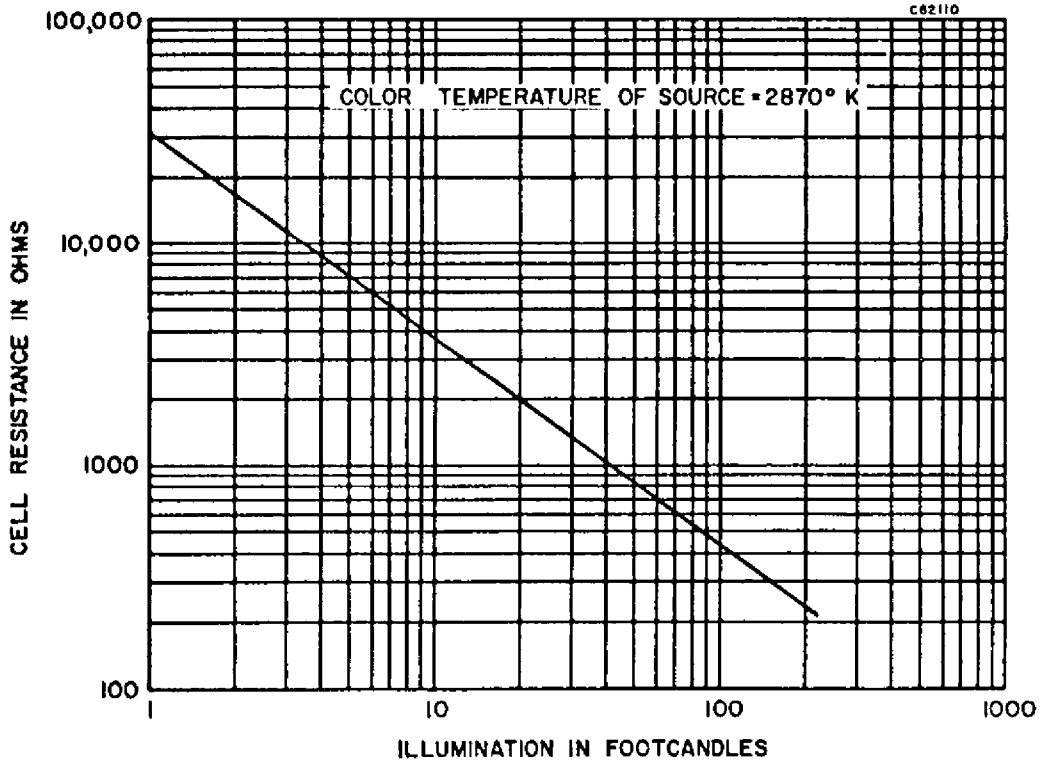
AVERAGE CHARACTERISTICS



PERMISSIBLE DISSIPATION AS A FUNCTION OF AMBIENT TEMPERATURE



AVERAGE CHARACTERISTICS



MECHANICAL DATA

Bulb	T-9
Base[1]	13 Pin
Outline	See Drawing
Basing	See Drawing
Output Cathodes	No. 0 thru 9
Zero Position	No. 0 Cathode Centered Between Pins 12 and 13 ± 10°
Mounting Position	Any

ELECTRICAL DATA

INTERELECTRODE CAPACITANCES (Approx.)

Any Cathode to All Other Elements	4.2 pf
Guide No. 2 to All Other Elements	10 pf
Guide No. 1 to All Other Elements	11 pf

RATINGS (Absolute Values)

	Min.	Max.
Anode Supply Voltage[2]	350	800 Volts
Voltage Between Electrodes (Other than Anode)	—	140 Volts
Transfer Voltage	35	140 Volts
Anode Current	0.3	0.6 Ma
Input Frequency	0	4 Kpps
Ambient Temperature	−55	+60°C

TYPICAL OPERATING CHARACTERISTICS

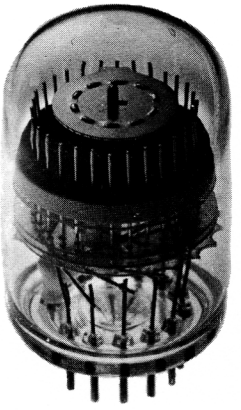
Anode Supply Voltage[2]	350 Volts	
Nominal Tube Drop	187 Volts	
Guide Bias	+35 Volts	Min.
Square Double Pulse Drive Amplitude (Each Pulse)[3]	−75 Volts	Min.
Square Double Pulse Width (Each Pulse)[3]	60 μSec.	Min.
Forced Reset Pulse Amplitude	−120 Volts	Min.
Forced Reset Pulse Width	50 μSec.	Min.
Cathode Load Resistor[4]	150 K-Ohms	Max.

NOTES:

1. *Sockets are available from Sylvania Electric Products Inc., 1035 Westminster, Williamsport, Pennsylvania. (Part No. 70-780-1)*
2. *A value for the anode resistor can be computed by subtracting the nominal tube drop from the supply voltage and dividing the remainder by the desired operating current.*
3. *Two separate pulses, back to back or with slight overlap, must be maintained.*
4. *The peak pulse output voltage can be determined by the IR drop across the chosen cathode resistor.*
5. *A counter tube brochure is available on request from Sylvania Electric Products Inc., 1100 Main Street, Buffalo 9, New York.*

QUICK REFERENCE DATA

The Type 8353 is a cold cathode, bidirectional decade counter tube with top viewed readout. It is designed to operate at inputs up to 4000 pulses per second. All 10 cathodes are brought out to individual base pins. Applications include computing, scaling, counting, frequency dividing, coding, modulating, matrixing, indexing, multiplexing, addition and subtraction. (See Note 5.)



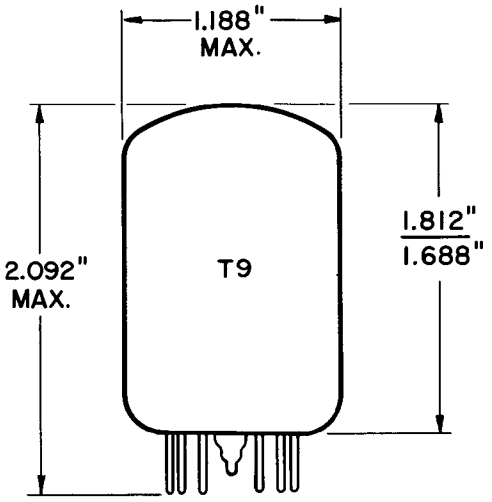
SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

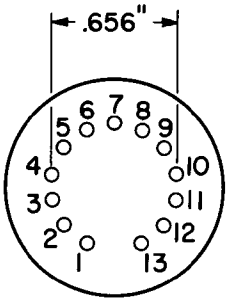
DECEMBER, 1963

File Under
SPECIAL PURPOSE
ELECTRONIC TUBES

OUTLINE



BASE CONNECTIONS



PIN NO.		
	1-K0	8-K3
	2-K9	9-K2
	3-K8	10-K1
	4-K7	11-G2
	5-K6	12-G1
	6-K5	13-Anode
	7-K4	

ADVANCE DATA

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	3-1
Basing	8DC
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature	+180 °C
Altitude	80,000 Ft.
Radiation	
Total Dosage (Neutrons/sq. cm)	10^{16} nvt
Dose Rate (Neutrons/sq. cm/sec.)	10^{12} nv

DURABILITY CHARACTERISTICS[5]

Impact Acceleration (3/4 msec Duration)[6]	500 G Max.
Fatigue (Vibrational Acceleration for Extended Periods)[7]	10 G Max.
On-Off Heater Cycles[8]	2000 Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[2]	26.5 V
Heater Current	45 mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[3]

Grid No. 1 to Plate	.020 pf Max.
Input	4.9 pf
Output	3.0 pf

CONTROLLED DETRIMENTS

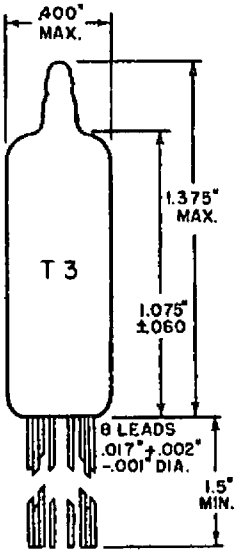
Interelectrode Insulation[9]	100 Megohm	Min.
Total Grid Current[10]	-0.3 μAdc	Max.
Grid Emission[11]	-0.5 μAdc	Max.
Vibration Output as Equivalent Grid One Voltage[12]	10.0 mVac	Max.
Heater-Cathode Leakage[13]	5.0 μAdc	Max.

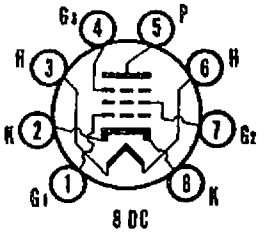
RATINGS[1] (Absolute Maximum)

Heater Voltage[2]	26.5 (±10%) V
Plate Voltage	55 Vdc

QUICK REFERENCE DATA

The Sylvania Type 8414 is a frame grid sharp cutoff pentode featuring high transconductance; and low grid to plate capacitance. The 8414 is well suited to VHF RF and IF amplifier and mixer service at 26.5-V heater and plate operation. It is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude.





SYLVANIA ELECTRONIC TUBES
A Division of
SYLVANIA ELECTRIC PRODUCTS, Inc.
RECEIVING TUBE OPERATIONS
EMPORIUM, PENNSYLVANIA

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

December 27, 1962

146 (10-58)

from JEDEC release #4095, Jan. 21, 1963

Grid No. 2 Voltage	55 Vdc
Cathode Current	10 mAdc
Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	100 v
Heater Negative with Respect to Cathode	100 v
Grid No. 1 Circuit Resistance	2.4 Meg

CHARACTERISTICS

Plate Voltage	26.5 Vdc
Grid No. 2 Voltage	26.5 Vdc
Grid No. 1 Resistor	2.2 Meg
Grid No. 3 Voltage[4]	0 V
Plate Current	4.5 mAdc
Grid No. 2 Current	1.5 mAdc
Transconductance	5,000 μmhos
Plate Resistance (approx.)	50 K Ohms
Grid Bias for Ib = 10 μa (approx.)	-4.0 Vdc

NOTES:

1. Limitations beyond which normal tube performance and tube life may be impaired.
2. Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 26.5 volts.
3. External shield connected to cathode is No. 318.
4. Connected to cathode.
5. Tests performed as a measure of the mechanical durability of the tube structure.
6. Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices.
7. Vibrational forces applied in any direction for a period of six hours repeatedly sweeping the range from 30 cps to 3,000 cps and back with the period of the sweep cycle being three minutes. Heater voltage only shall be applied.
8. One cycle consists of the application of 29.0 volts for one minute and interruption of the heater voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.
9. Measured with Ef = 26.5 V; Eg1-all = -100 Vdc; Ep-all = -100 Vdc; cathode is positive so that no cathode emission occurs.
10. Measured with Ef = 26.5V; Eb = 50 Vdc; Ec2 = 50 Vdc; Ec1 = -1.5 Vdc.
11. Preheated for five minutes with Ef = 31.5V; Eb = 26.5 Vdc; Ec2 = 26.5 Vdc; Rg1 = 2.2 meg; then tested with Ef = 31.5V; Eb = 26.5 Vdc; Ec2 = 26.5 Vdc; Ec1 = -4.0 Vdc.
12. Test with Ef = 26.5V; Eb = 26.5 Vdc; Ec2 = 26.5 Vdc; Rg1 = 2.2 meg; Rp = 10,000 Ohms; f = 40 cps; Acc = 15 g.
13. Measured with Ef = 26.5 V; Ehk = ±100 Vdc.

MECHANICAL DATA

Bulb	T-12
Base	Short Shell Octal 6-Pin
Outline	See Drawing
Basing	Modified 7S
Mounting Position	Any
Cathode	Coated Unipotential

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	1600 Ma
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
Total DC and Peak	200 Volts
Heater Positive with Respect to Cathode	
DC	100 Volts
Total DC and Peak	200 Volts

DIRECT INTERELECTRODE CAPACITANCES

Grid No. 1 to Plate	0.9 pf
Input	22 pf
Output	9.0 pf

RATINGS (Design Maximum Values)

Plate Voltage	660 Volts	Max.
Grid No. 2 Voltage	500 Volts	Max.
Plate Dissipation[1]	35 Watts	Max.
Grid No. 2 Dissipation[2]	5 Watts	Max.
Cathode Current	200 Ma	Max.
Grid No. 1 Circuit Resistance		
Fixed Bias	0.1 Megohm	Max.
Cathode Bias	0.25 Megohms	Max.

AVERAGE CHARACTERISTICS

Plate Voltage	300 Volts
Grid No. 2 Voltage	300 Volts
Grid No. 1 Voltage	−12 Volts
Plate Current	100 Ma
Grid No. 2 Current	5.5 Ma
Transconductance	23,000 μmhos
Plate Resistance	16,000 Ohms
Amplification Factor (Triode Connected)	16.5
Grid Voltage for Ib = 1 Ma	−37 Volts

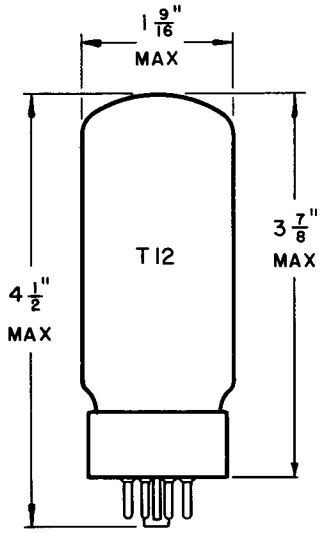
TYPICAL OPERATION

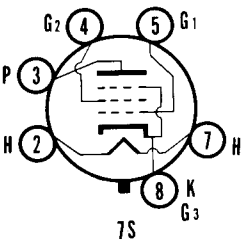
Class AB1 Ultra-Linear Push-Pull[3]

	Values for 2 Tubes
Plate Supply Voltage	445 Volts
Grid No. 1 Voltage	−25 Volts
Peak AF Grid to Grid Voltage	45 Volts
Zero Signal Plate Current	146 Ma
Maximum Signal Plate Current	314 Ma
Effective Load (Plate to Plate)	3500 Ohms
Total Harmonic Distortion	2.5 Percent
Maximum Signal Power Output	70 Watts

QUICK REFERENCE DATA

The Sylvania Type 8417 is a beam-power pentode featuring a T-12 bulb and an octal 6-pin base. It is intended for service in high power, high-fidelity audio equipments and is capable of 100 watts output in push-pull circuitry. It also finds application as a regulator tube.





SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
EMPORIUM, PA.

A Technical Publication

MAY, 1965

File Under

RECEIVING TUBES

TYPICAL OPERATION (Cont'd)

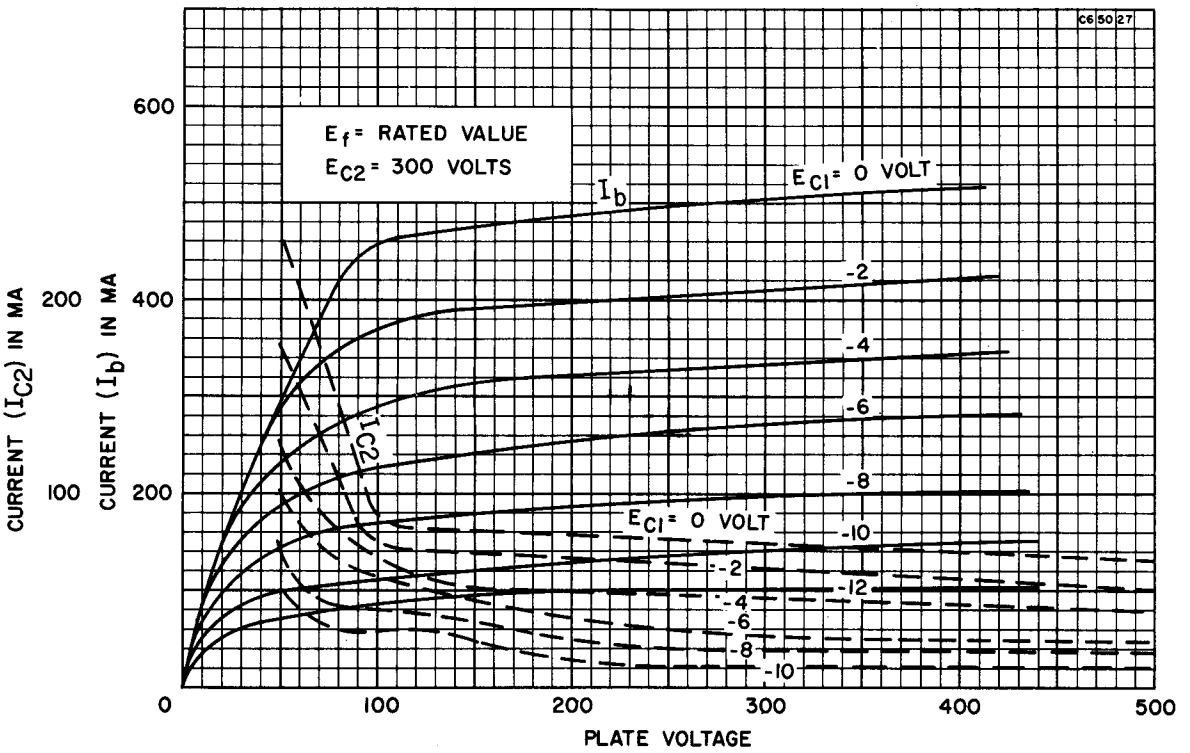
Class AB1 Pentode Connected

	Values for 2 Tubes	
Plate Supply Voltage	400	560 Volts
Grid No. 2 Supply Voltage	275	300 Volts
Grid No. 1 Voltage	−13	−15 Volts
Peak AF Grid to Grid Voltage	24	29 Volts
Zero Signal Plate Current	150	124 Ma
Maximum Signal Plate Current	294	290 Ma
Zero Signal Screen Current	4.4	3.6 Ma
Maximum Signal Screen Current	34	39 Ma
Effective Load (Plate to Plate)	2800	4200 Ohms
Total Harmonic Distortion	2.5	2.5 Percent
Maximum Signal Power Output	65	100 Watts

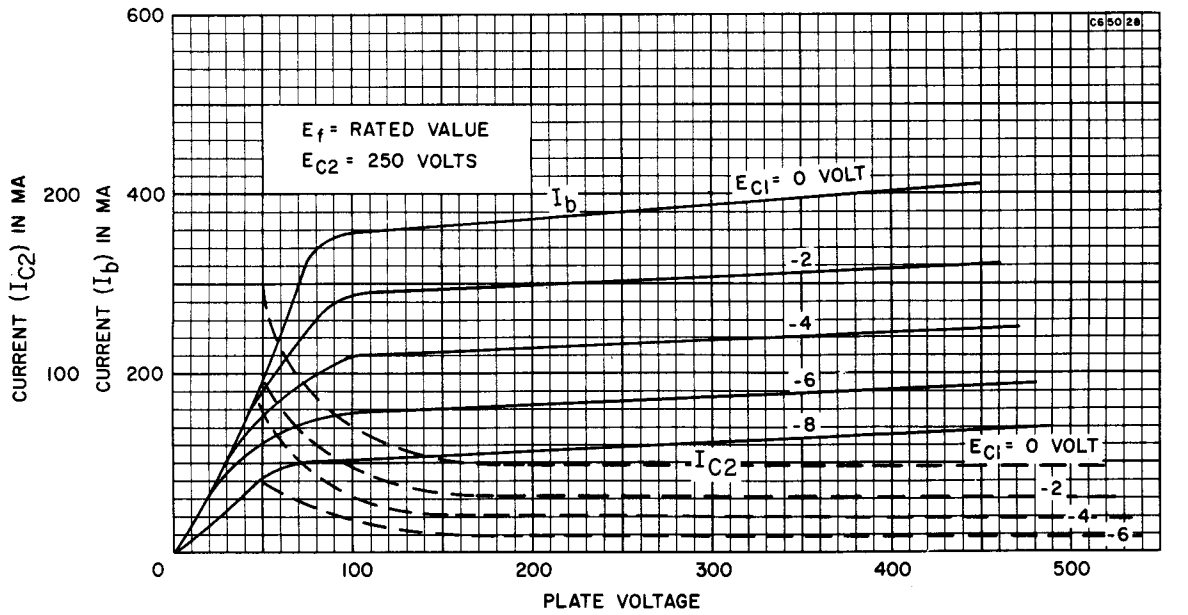
NOTES:

1. *It is essential to maintain free circulation of air around the tube for proper cooling.*
2. *Grid No. 2 dissipation may reach 8 watts during intervals of maximum speech and music signals.*
3. *Screen tapped at 40 % of primary turns. Plate current includes screen current.*

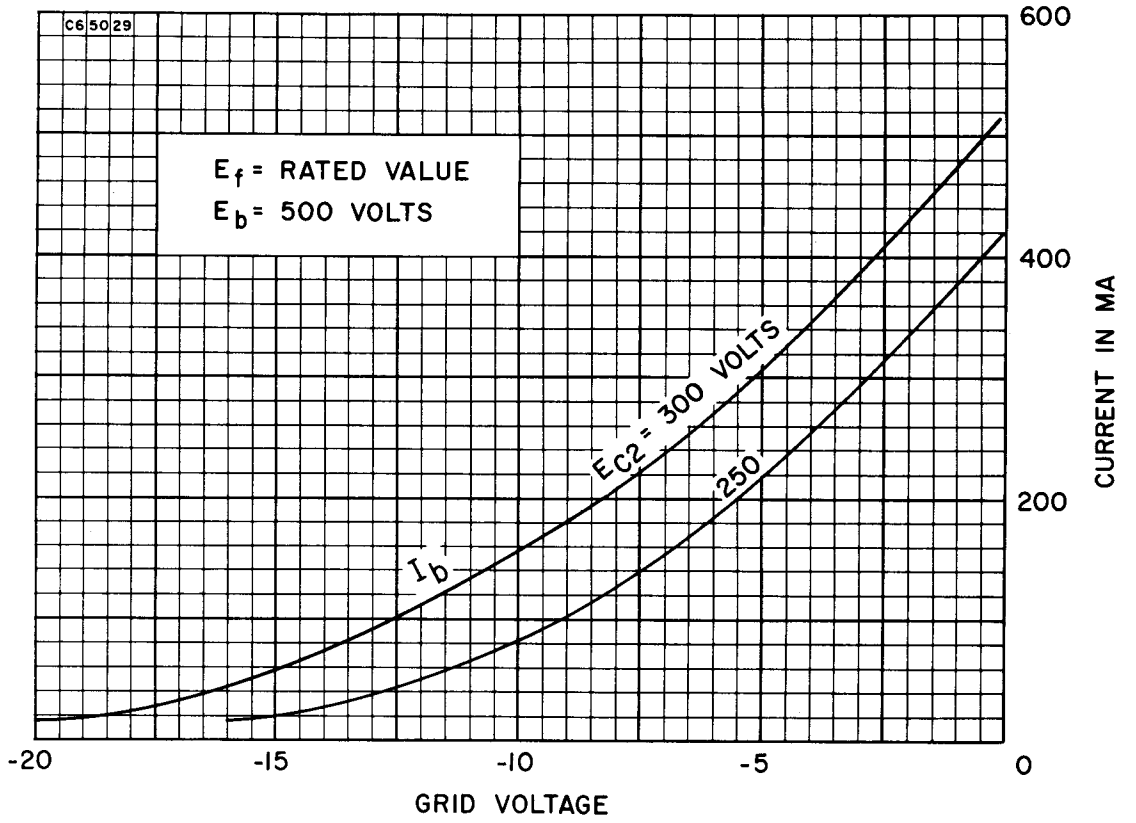
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS

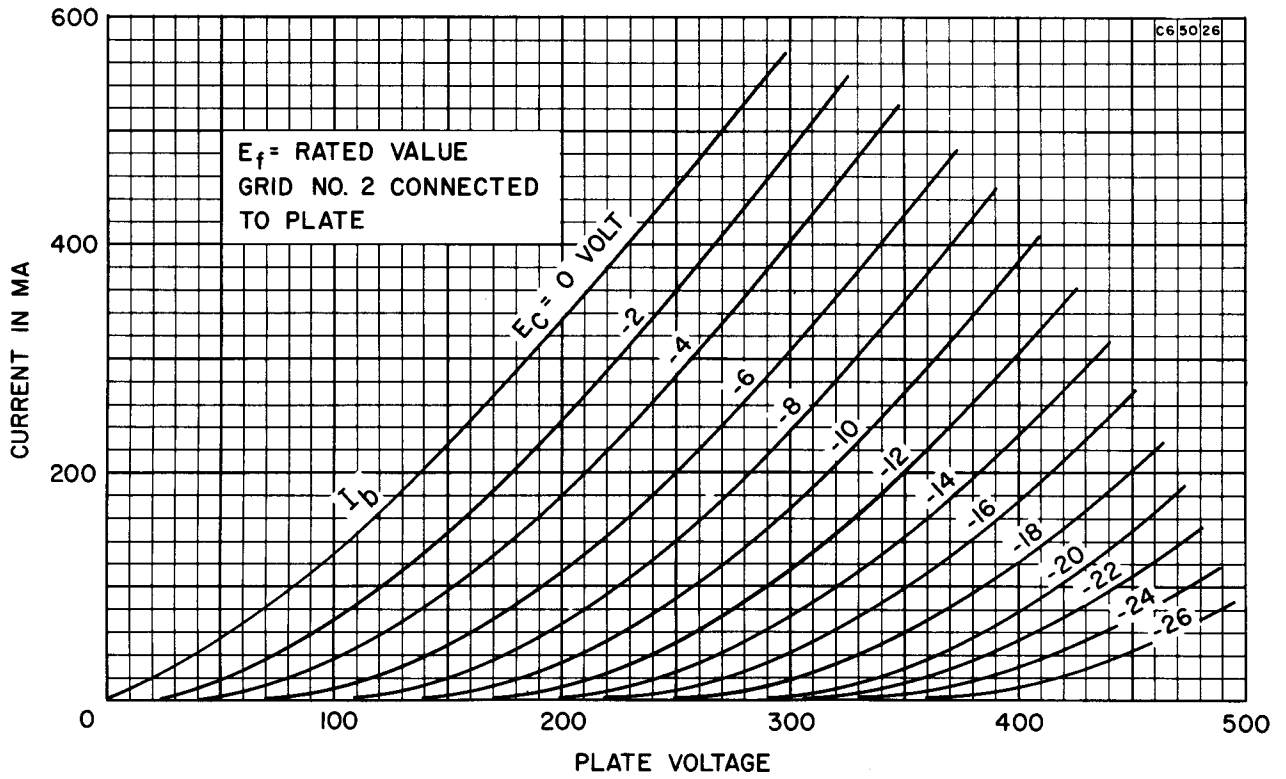


AVERAGE TRANSFER CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS

(Triode Connected)



ADVANCE DATA

MECHANICAL DATA

Bulb	T-6½
Base	E9-1, Miniature Button 9-Pin
Outline	6-2
Basing	9AJ
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

HEATER CHARACTERISTICS AND RATINGS

Average Characteristics

	Parallel Operation	
Heater Voltage[1]	12.6	Volts
Heater Current	180	Ma

Ratings (Design Maximum Values)

	Min.-Max.	
Heater Voltage[2]	11.4-13.8	Volts
Maximum Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
Total DC and Peak	200	Volts
Heater Positive with Respect to Cathode		
DC	100	Volts
Total DC and Peak	200	Volts

DIRECT INTERELECTRODE CAPACITANCES (Each Section)

	Shielded	Unshielded	
Grid to Plate	1.4	1.4	pf
Input: g to (h+k)	3.3	3.3	pf
Output: p to (h+k)	2.5	1.8	pf
Grid to Grid (Max.)	.005	.005	pf
Plate to Plate (Max.)	.015	.045	pf

RATINGS (Design Maximum Values)

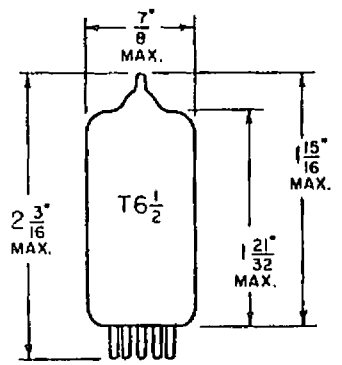
Continuous Class C Service at 175 Mc[4]

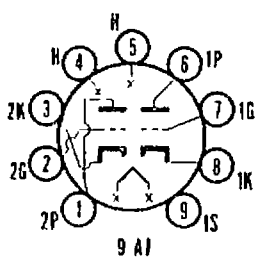
Plate Voltage	200	Volts	Max.
Plate Dissipation (Each Plate)	3.5	Watts	Max.
Plate Dissipation (Both Plates)	7.0	Watts	Max.
Plate Input (Each Plate)	5.5	Watts	Max.
Cathode Current (Each Cathode)	30	mAdc	Max.
Grid Current (Each Grid)	2.5	mAdc	Max.
Negative Grid Voltage	75	Volts	Max.
Grid Circuit Resistance			
Fixed Bias	0.1	Megohm	Max.
Cathode Bias	0.5	Megohm	Max.

QUICK REFERENCE DATA

The Sylvania Type 8431 is a T-6½ medium mu double triode designed for Continuous Class C Amplifier Service in the 200 megacycle range.

The rating values apply specifically to Sonobuoy and other battery applications where considerations of power output are paramount, and considerations of long life are of lesser importance.





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

February 7, 1963

146 (10-58)

from JEDEC release #4169, March 4, 1963

CHARACTERISTICS AND TYPICAL OPERATION

Class A1 Amplifier

Plate Voltage	90	Volts
Grid Voltage	-1.3	Volts
Plate Current	15	Ma
Transconductance	12,500	µmhos
Amplification Factor	33	

Class C RF Frequency Multiplier

	Doubler to 175 Mc	
Plate Voltage	160	Volts
For Grid Voltage	-70	Volts
Use Grid Resistor	33,000	Ohms
Peak RF Grid Voltage	77	Volts
Grid Current	2.5	Ma
Plate Current	26	Ma
Power Output[5] (Approx.)	1.0	Watt

NOTES:

1. For parallel operation of heaters, equipment should be designed that at normal supply voltage bogey tubes will operate at this value of heater voltage.

2. Heater voltage supply variations shall be restricted to maintain heater voltage within the specified values.

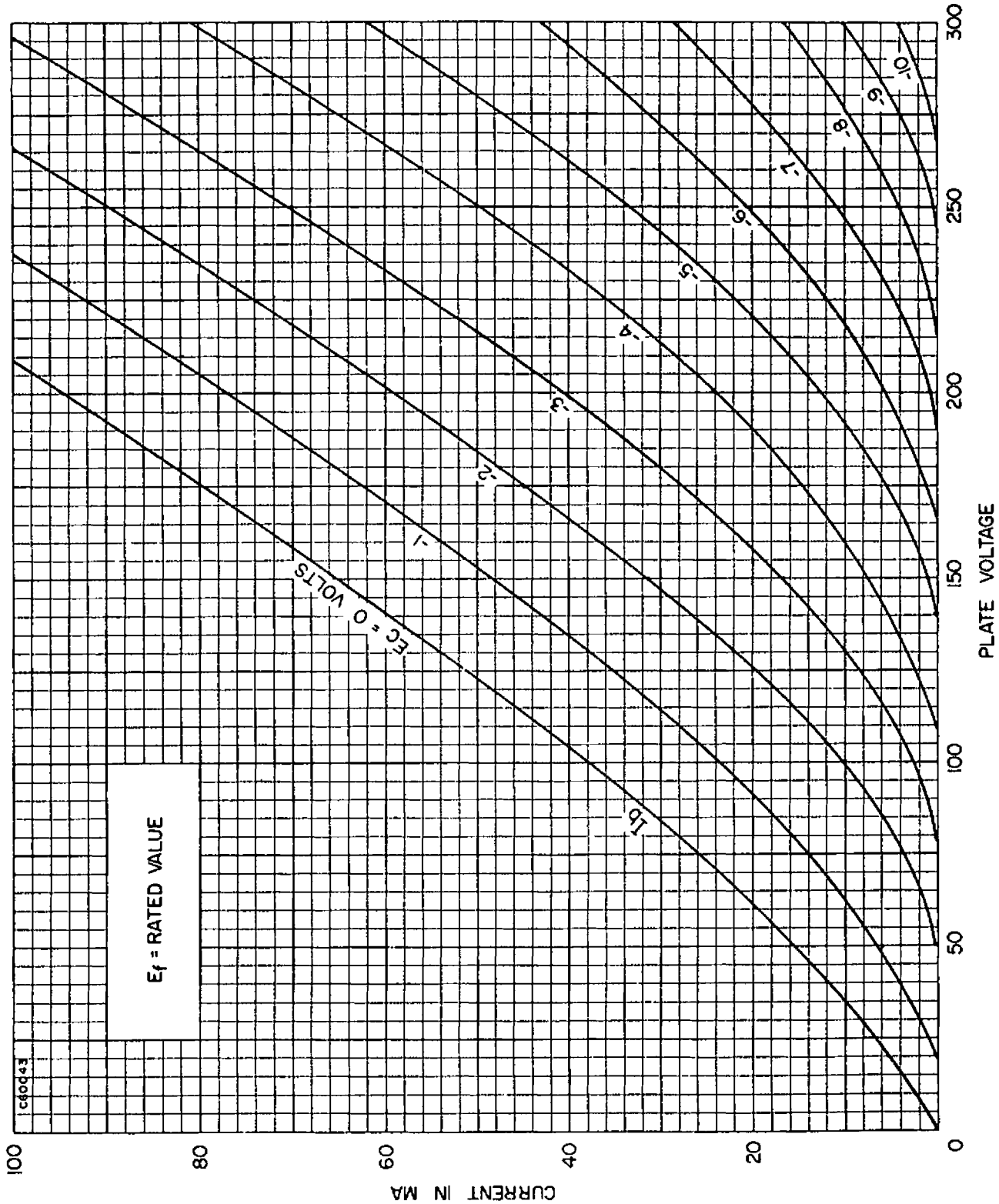
3. Shield No. 315.

4. The rating values apply specifically to Sonobuoy and other battery applications where considerations of power output are paramount, and considerations of long life are of lesser importance.

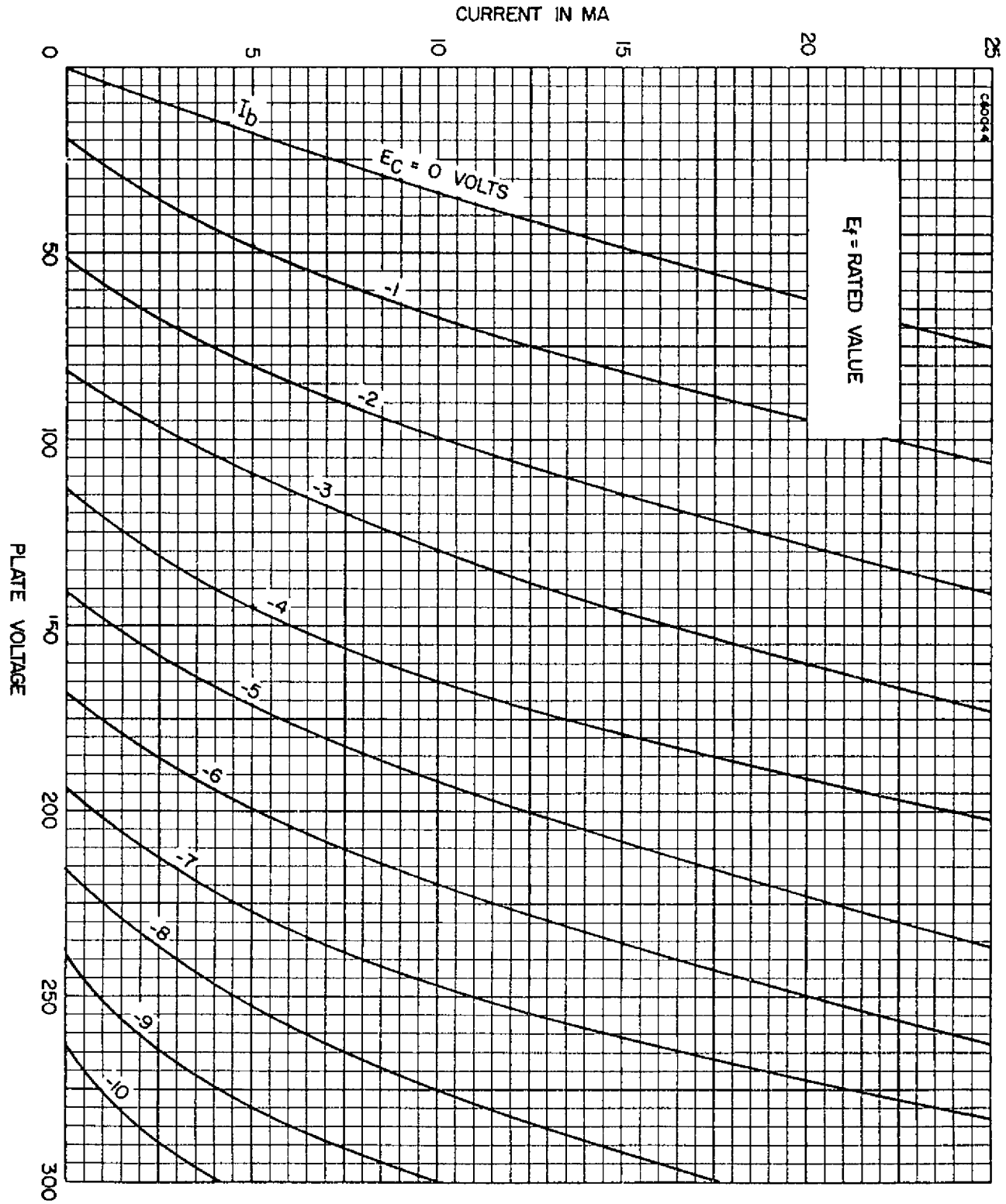
5. These values are for useful power and are as measured at the load of the output circuit.

6. To insure satisfactory operation in Sonobuoy applications Type 8431 is subjected to and must successfully pass an impact acceleration test at an acceleration level of 500 G.

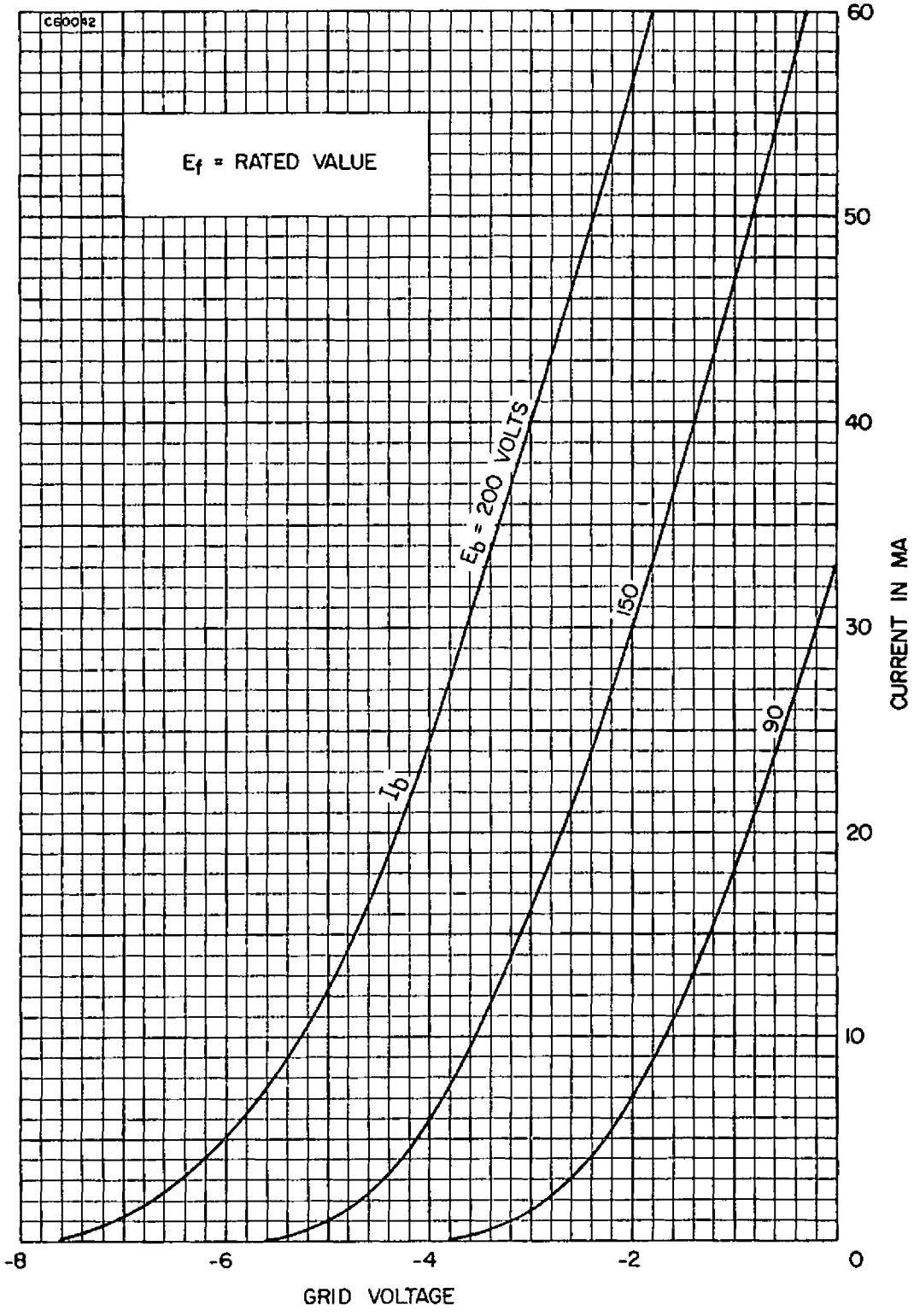
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



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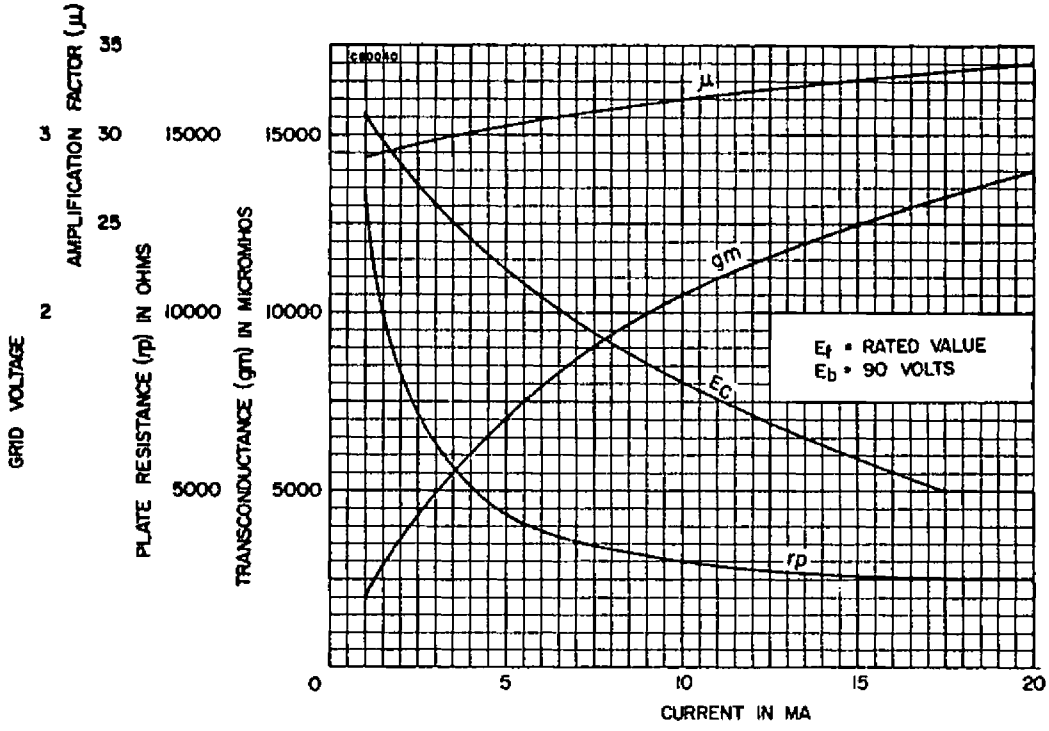

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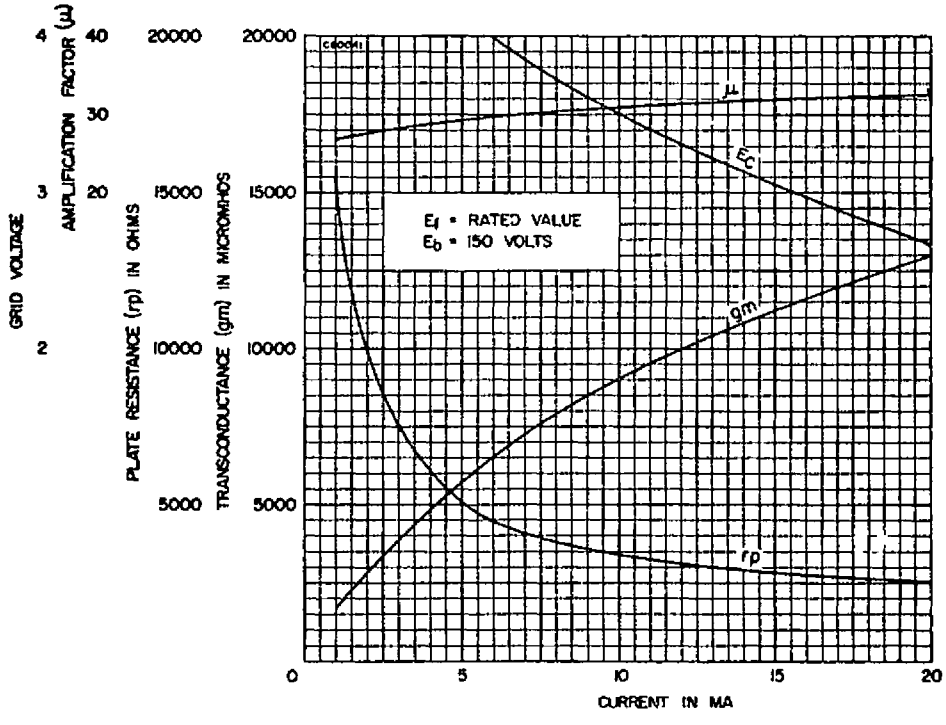
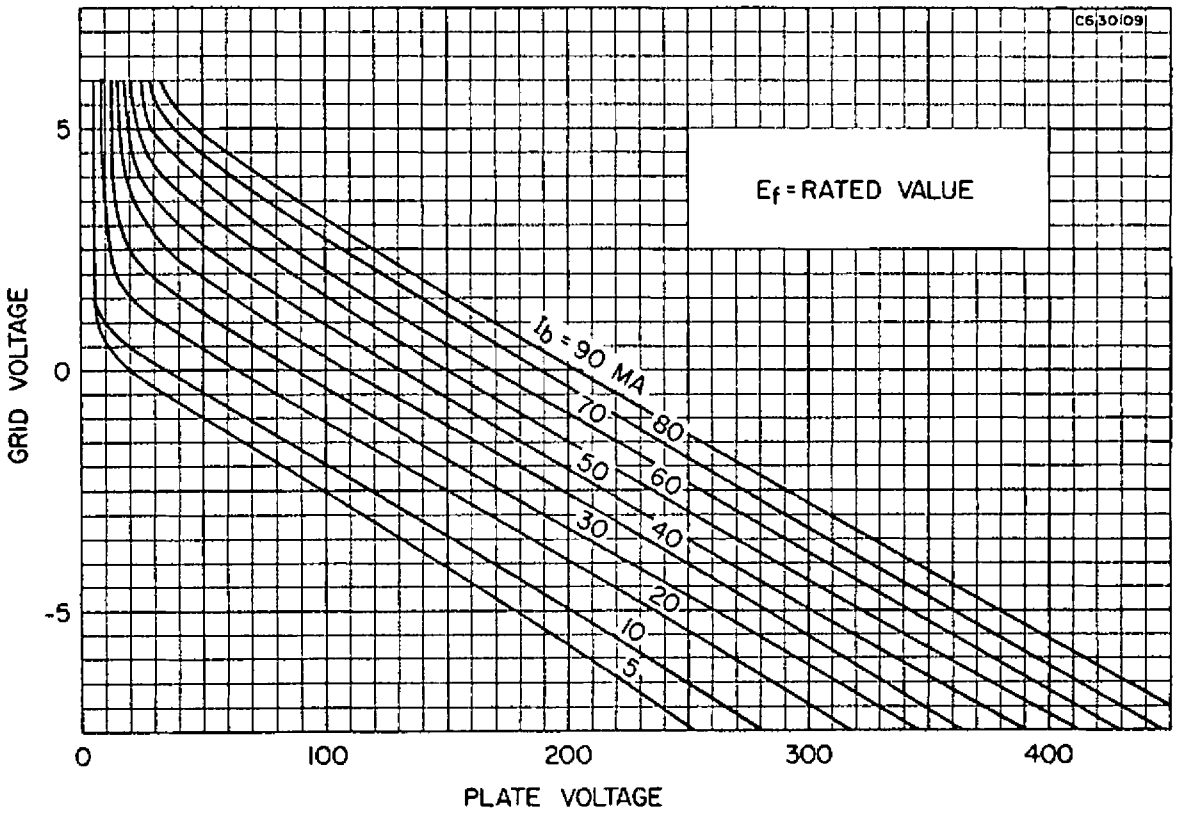
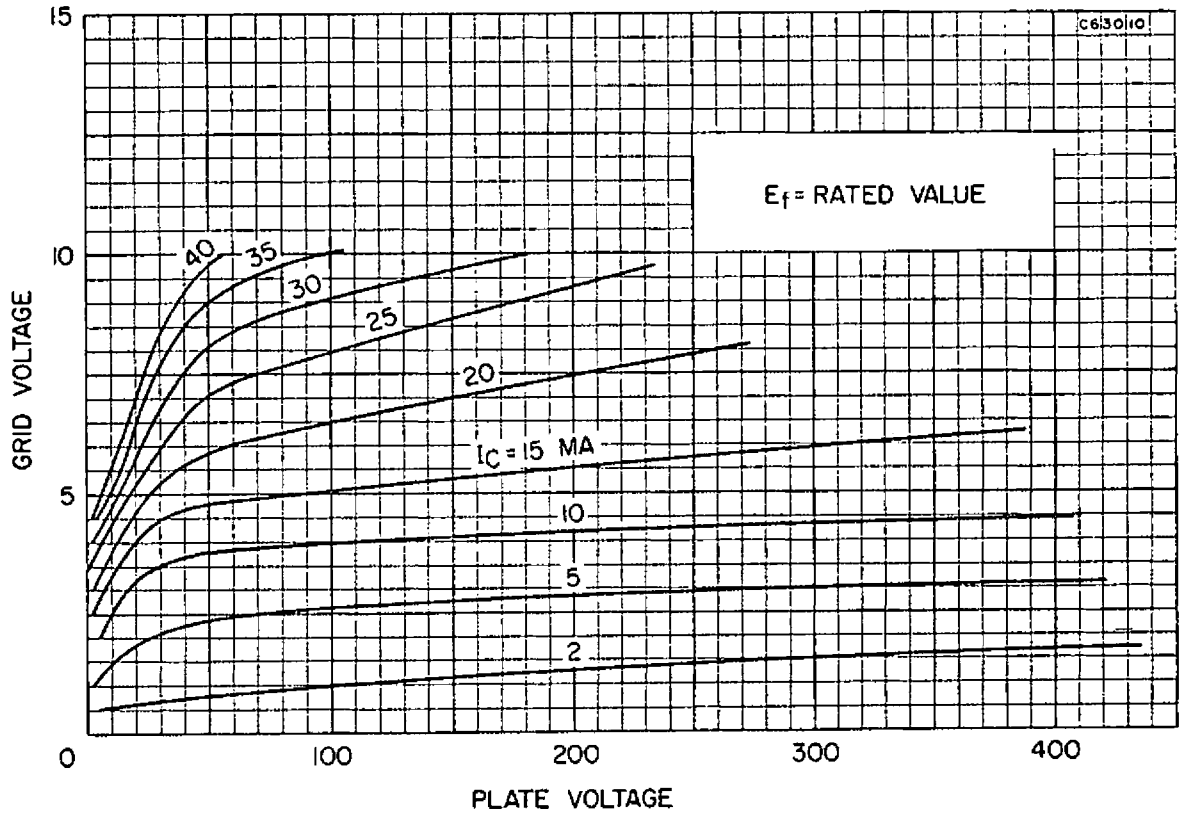



C6130109
E_f = RATED VALUE
I_b = 90 MA
80
70
60
50
40
30
20
10
5
GRID VOLTAGE
5
0
-5
0
100
200
300
400
PLATE VOLTAGE


C6130110
E_f = RATED VALUE
40
35
30
25
20
I_C = 15 MA
10
5
2
GRID VOLTAGE
15
10
5
0
100
200
300
400
PLATE VOLTAGE

ADVANCE DATA

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	3-1
Basing	8DC
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature	180	°C	
Altitude[2]	80,000	Ft.	
Radiation[3]			
Total Dosage (Neutrons/sq. cm)	10^{16}	nvt	
Dose Rate (Neutrons/sq. cm/sec.)	10^{12}	nv	

DURABILITY CHARACTERISTICS[4]

Impact Acceleration (3/4 msec Duration)[5]	500	G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[6]	2.5	G	Max.
On-Off Heater Cycles[7]	2000		Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[8]	6.3	V
Heater Current	125	mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[9]

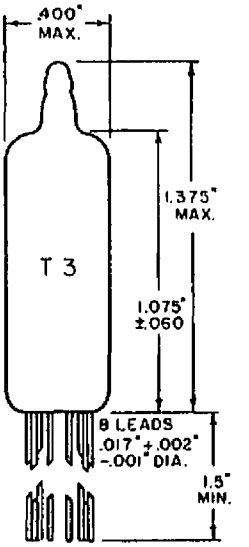
Grid No. 1 to Plate (Max.)	0.016	pf
Input	5.2	pf
Output	3.8	pf

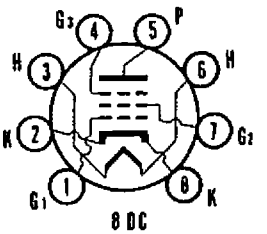
CONTROLLED DETRIMENTS

Interelectrode Insulation[10]	100	Meg.	Min.
Total Grid Current[11]	-0.3	μAdc	Max.
Grid Emission[12]	-0.5	μAdc	Max.
Vibration Output as Equivalent Eg[13]	1.2	mVac	Max.
Heater-Cathode Leakage[14]	20	μAdc	Max.

QUICK REFERENCE DATA

The Sylvania Type 8444 is a subminiature strap frame grid sharp cutoff pentode featuring high transconductance and low grid to plate capacitance. The 8444 is well suited to VHF, RF and IF amplifier and mixer service. It is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude.





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EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

April 10, 1963

146 (10-58)

from JEDEC release #4249, May 6, 1963

RATINGS[1] (Absolute Maximum)

Heater Voltage[8]	6.3 (±10%)	V
Instantaneous Plate Voltage	330	V
Plate Voltage	165	Vdc
Grid No. 3 Voltage	22	Vdc
Grid No. 2 Voltage	155	Vdc
Plate Dissipation	1.1	W
Grid No. 2 Dissipation	0.55	W
Cathode Current	16.5	mAdc
Grid No. 1 Voltage		
Positive Value	0	Vdc
Negative Value	55	Vdc
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	100	v
Heater Negative with Respect to Cathode	100	v
Grid No. 1 Circuit Resistance	1.1	Meg.

The spacing between grid No. 1 and cathode is of such a low order of magnitude as to preclude the use of excessive voltages between these elements in commercial tube checkers and shorts indicating devices, particularly where the tube is mechanically excited. The DC or peak AC voltage applied must not exceed 50 volts.

CHARACTERISTICS

Plate Voltage	100	Vdc
Grid No. 3 Voltage	0	Vdc
Grid No. 2 Voltage	100	Vdc
Cathode Resistor (Bypassed)	100	Ohms
Plate Current	8.5	mAdc
Grid No. 2 Current	2.8	mAdc
Transconductance	9000	µmhos
Plate Resistance	260,000	Ohms
Grid No. 1 Voltage for Ib = 10 µAdc (Approx.)	-4.8	Vdc

NOTES:

1. Limitations beyond which normal tube performance and tube life may be impaired.

2. If altitude rating is exceeded, reduction of instantaneous voltage (Ef excluded) may be required.

3. The radiation ratings are confirmed by a qualification test. The test is conducted in a suitable reactor furnishing mixed pile radiation at no less than 90% of the specified neutron dose rate. The tubes are measured for electrical parameters both before and after irradiation.

4. Tests performed as a measure of the mechanical durability of the tube structure.

NOTES: (Cont'd)

5. Force as applied in any direction by the Navy Type High Impact (Fly-weight) Shock Machine for Electronic Devices. Shock duration = 3/4 milliseconds.

6. Vibrational forces applied in any direction for a period of 96 hours.

7. One cycle consists of the application of Ef = 7.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.

8. Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.

9. External shield connected to cathode No. 318.

10. Measured with Ef = 6.3 V; Eg1-all = -100 Vdc; Ep-all = -300 Vdc; Cathode is positive so no cathode emission occurs.

11. Measured with Ef = 6.3 V; Eb = 125 Vdc; Ec2 = 125 Vdc; Rk = 160 ohms.

12. Preheated for five minutes with Ef = 7.5 V; Eb = 100 Vdc; Ec2 = 100 Vdc; Rk = 100 ohms; Rg1 = 1.0 Meg then tested with Ef = 7.5 V; Eb = 100 Vdc; Ec2 = 100 Vdc; Ec1 = -4.8 Vdc.

13. Test with Ef = 6.3 V; Eb = 100 Vdc; Ec2 = 100 Vdc; Rk = 100 ohms; Ck = 1000 μf; Rp = 10,000 ohms; F = 40 cps; Acc = 15 g.

14. Measure with Ef = 6.3 V; Ehk = ±100 Vdc.

MECHANICAL DATA

Bulb	See Drawing
Base	Modified E9-37
Basing	See Drawing
Mounting Position	Any

ELECTRICAL DATA

RATINGS (Absolute Maximum)

AC Supply Voltage	1000 Volts	Max.
Tube Current (Average)	10 Ma	Max.
Temperature Range	−20 to +100 °C	

AVERAGE OPERATING CHARACTERISTICS

Illumination	Candle Flame Approx. 4 to 5 Inches from Tube
AC Supply Voltage (RMS at 50/60 Cycles)	500 ± 50 Volts
Tube Voltage Drop	300 ± 15 Volts
Tube Current (Average)[1]	6 Ma
Sensitivity Range	1900 to 2900 Angstroms
Wave Length of Max. Sensitivity	2400 Angstroms
Background Noise (Cosmic Radiation at Sea Level)	1 PPM Max.

NOTE:

1. *Measured by moving coil instrument and bridge rectifier with Germanium diodes.*

APPLICATION DATA

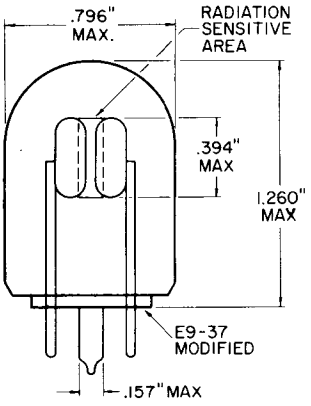
The ultraviolet-sensitive phototube P-568 is a gas filled electron tube. It consists of two symmetrically arranged electrodes, which are sealed into a bulb of special ultraviolet transmitting glass. This photocell operates on alternating voltage. If electromagnetic radiation from the ultraviolet part of the spectrum between approx. 1900 and 2900 angstroms hits an electrode which for the moment is negative, photoelectrons will be released from the metal surface. This effect is obtained by a special treatment of the electrodes. As soon as the instantaneous value of the voltage is high enough, an ionization process will be initiated in the space between the electrodes caused by the electrons which are accelerated towards the positive electrode. This ionization process releases a gas discharge. Thus the tube will become conductive as long as the voltage during the considered half-cycle lies above the quenching voltage for the gas discharge. The discharge is quenched at the end of the half cycle. During the subsequent half cycle the other electrode emits photoelectrons in the same way, provided that the radiation continues. As soon as the ignition voltage is reached another gas discharge takes place. If the intensity of the radiation is high enough, the tube ignites during each half cycle, i.e., a state of saturation is obtained, which corresponds to a constant maximum value of the alternating current flowing through the tube. Its height is dependent upon the outer limiting resistor and upon the frequency of the applied voltage.

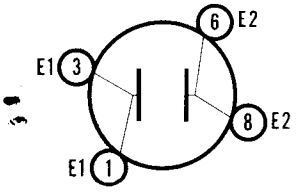
The high sensitivity of the tube to ultraviolet radiation may be realized from the fact that the UV portion of the radiation of an ordinary candle flame located a few inches from the tube is sufficient to saturate it. This photocell is blind to visible light and to UV radiation with a wave length above appriximate 2900 angstroms. The tube therefore represents an extremely sensitive flame detector. The high output current makes it possible to operate relays directly.

If the tube is used for quantitative measurements of radiation intensities, the frequency of the operating voltage must be so high that even with the highest intensity to be measured the state of saturation will not be reached.

QUICK REFERENCE DATA

The Sylvania Type P-568 is a gas filled phototube, sensitive only to ultraviolet radiation of wave lengths between 1900 and 2900 angstroms. It consists of two symmetrically arranged electrodes, sealed in an ultraviolet transmitting glass bulb. An output current of 6 Ma is readily obtainable for direct relay operations. Applications include flame detector for furnace control, fire detection, and ultraviolet radiation detection and measurements.





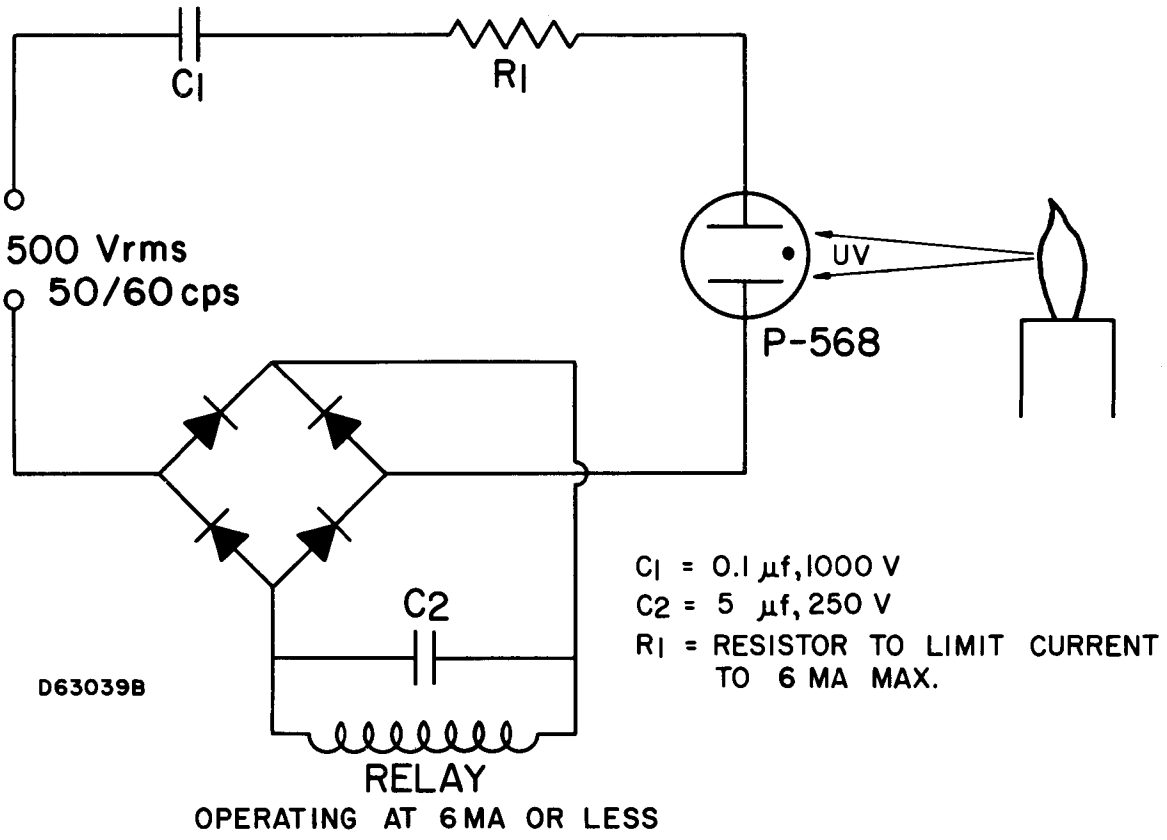
SYLVANIA ELECTRIC PRODUCTS INC.

INTERNATIONAL DIVISION
NEW YORK, N. Y.

A Technical Publication
NOVEMBER, 1964

File Under
PHOTOCONDUCTORS

AC OPERATED CONTROL CIRCUIT



C1 = 0.1 µf, 1000 V
C2 = 5 µf, 250 V
R1 = RESISTOR TO LIMIT CURRENT TO 6 MA MAX.

MECHANICAL DATA

Mounting Position	Any
Envelope	Nonex Glass
Terminal Connections	Unpolarized
Bulb	See Outline Drawing

ELECTRICAL DATA

Resistance, Cold	6.6 ohms
Resistance, Hot (evacuated — 100 ma current)[1]	15.5-17.0 ohms
Operating Voltage	1.5 volts

NOTE

1. *Value of hot resistance (to the nearest hundredth of an ohm) shall be indicated directly opposite (180°) the identification marking.*

DESCRIPTION:

The SYLVANIA Pirani Tube, type R1111, provides a convenient means of measuring low gas pressures directly. When used in conjunction with suitable auxiliary equipment, rapid, continuous readings may be obtained.

The SYLVANIA Pirani Tube consists essentially of a tungsten filament having a high temperature coefficient of resistance. Since the thermal conductivity of a gas varies with pressure, the temperature of the filament will also vary. This results in a change in resistance and provides the basis of measurement. The tube must be calibrated for each different gas.

With proper care, readings may be obtained with a precision of ±5%. The useful pressure range is from one to one thousand microns. A common application is as a pressure gage and leak detector in evacuating apparatus. It is also extremely useful in automatic pressure control and recording equipment.

ADVANTAGES:

1. A Pirani Tube provides a better spread in the micron range than other devices, resulting in more accurate readings.
2. They are more sensitive as leak detectors.
3. There is no chance of tube failure due to exposure to atmosphere.
4. Pirani gauges are compact and simple to operate.

TYPICAL CIRCUIT:

For best performance, the R1111 should be used in matched pairs in a bridge circuit as shown below. The long narrow stem of one tube is cut at a convenient point and sealed directly into the system under test. The other tube provides compensation for variations in voltage and ambient temperature. Depending on the application and the accuracy of results desired, the compensator tube may be left intact, opened to the surrounding air, or filled with a particular gas to a standard pressure. The installation should be shielded from sources of radiant heat and from air currents. So that they will be equally affected by the ambient, the two tubes should be mounted as closely together as possible.

QUICK REFERENCE DATA

A hot filament Pirani tube used to measure vacuum pressures down to 1 micron.



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RECEIVING TUBE
OPERATIONS
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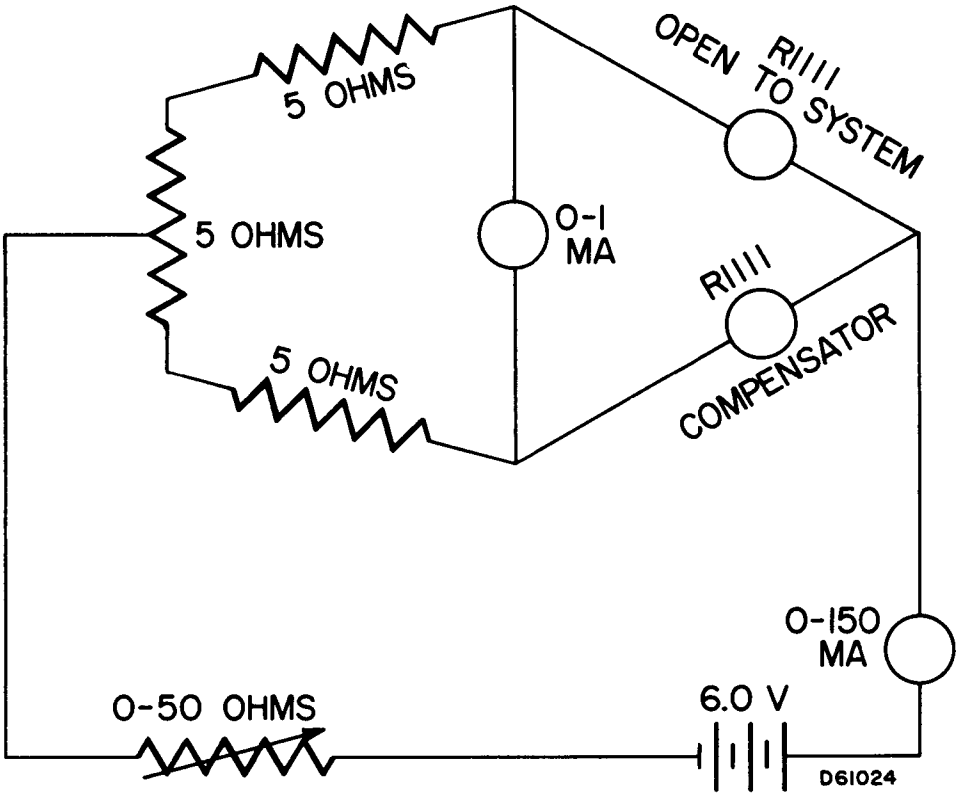
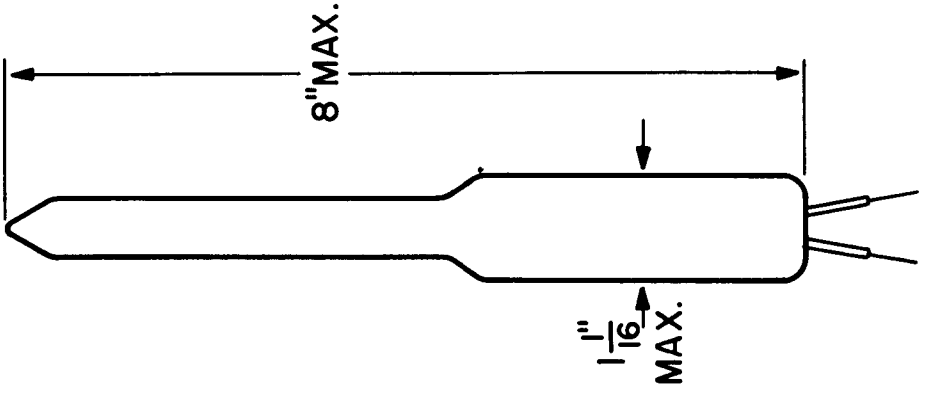
EMPORIUM, PENNSYLVANIA
DECEMBER, 1963

File Under
SPECIAL PURPOSE
ELECTRONIC TUBES

TYPICAL CIRCUIT



OUTLINE



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RT434

MECHANICAL DATA

Maximum Overall Length	2⅜ Inches
Maximum Overall Diameter	.812 Inches

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	400 Ma

DIRECT INTERELECTRODE CAPACITANCES (Average)

Grid to Plate	1.45 $\mu\mu$f
Grid to Cathode	1.35 $\mu\mu$f
Plate to Cathode	.040 $\mu\mu$f

RATINGS (Absolute Values)

Heater Voltage (AC or DC)	6.3 Volts	
Heater Current	400 Ma	
Plate Dissipation	5 Watts	Max.
Plate Voltage	350 Volts	Max.
Operating Frequency	3300 Mc	Max.
Seal Temperature	175° C	Max.

CHARACTERISTICS

Conditions (E_b=180 volts dc, R_k=400 ohms)

Transconductance	4230 μmhos
Amplification Factor	25
Plate Current	16.5 Ma

TYPICAL OPERATING CONDITIONS

UHF CW Oscillator — 1000 MC

Plate Voltage	80 Volts
Plate Current	16.5 Ma
Grid Resistor	1000 Ohms
Power Output	500 MW

UHF CW Oscillator — 3300 MC

Plate Voltage	200 Volts dc
Plate Current	24 Ma dc
Cathode Resistor	Adjust for Plate Current
Power Output	200 MW

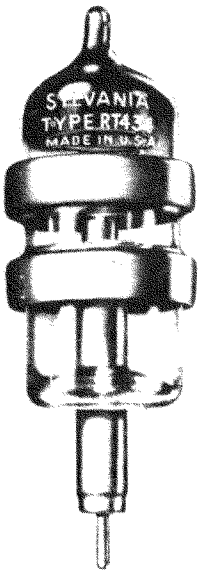
APPLICATION DATA

Sylvania Type RT 434 was designed primarily for use in microwave circuits as a CW Oscillator at frequencies up to 3300 MC. This planar-electrode, disc-seal triode may be used as an integral part of a tuned cavity. Its low internal lead inductance makes this tube well adapted to lumped-constant circuits. The mechanical configuration was designed for use in butterfly type circuits.

Frequency ratios of about 4 to 1 (250 MC to 1000 MC) for continuous tuning can be obtained up to 1000 MC with no dead spots throughout the range. Ratios of about 3 to 1 can likewise be obtained up to 3300 MC.

QUICK REFERENCE DATA

The Sylvania Type RT 434 is a general purpose medium mu triode intended primarily for service in microwave circuits as a cw oscillator at frequencies up to 3300 mc.



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ELECTRONICS DIVISION
WOBURN, MASS.

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4-53-44A

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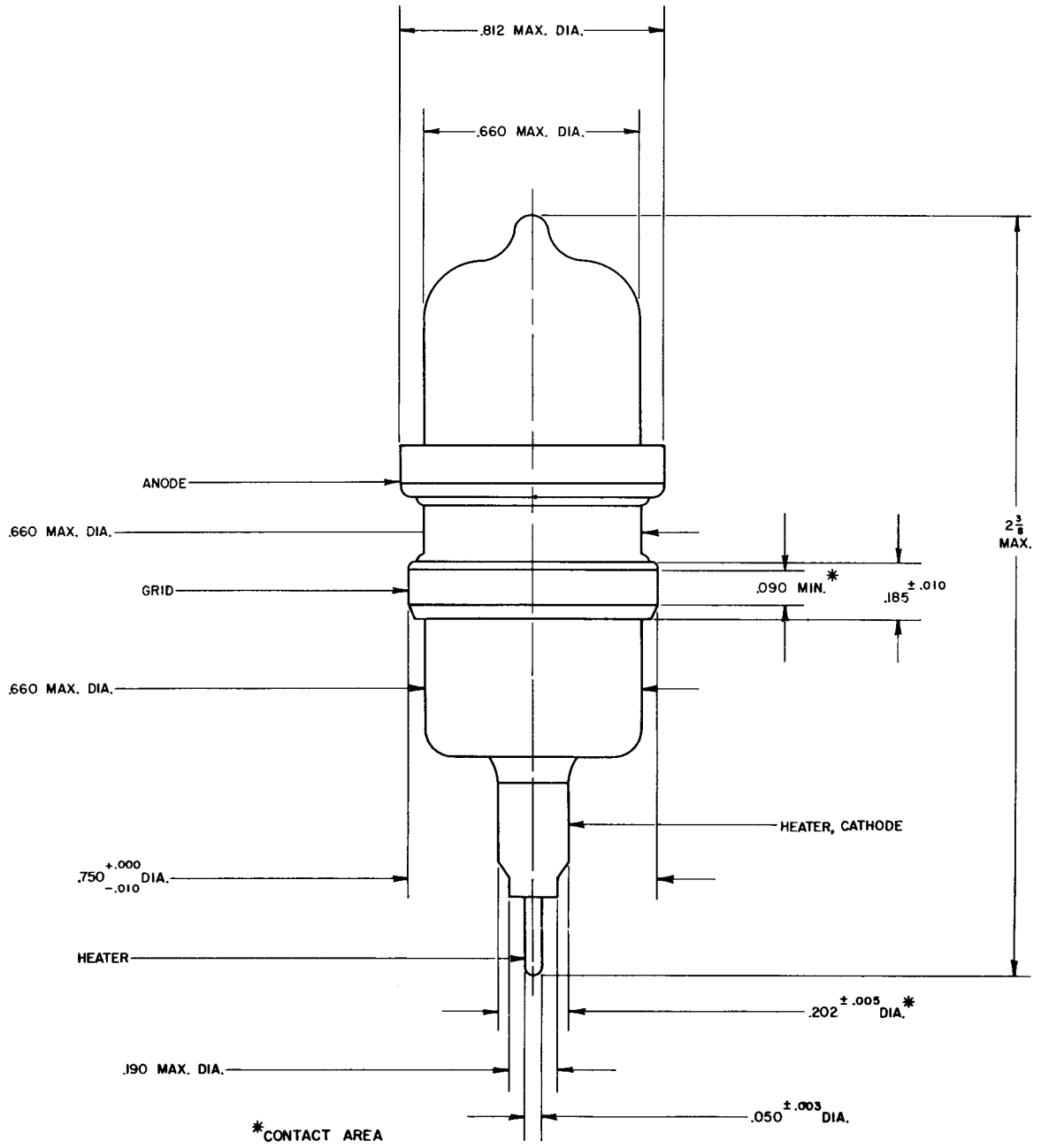
RT434

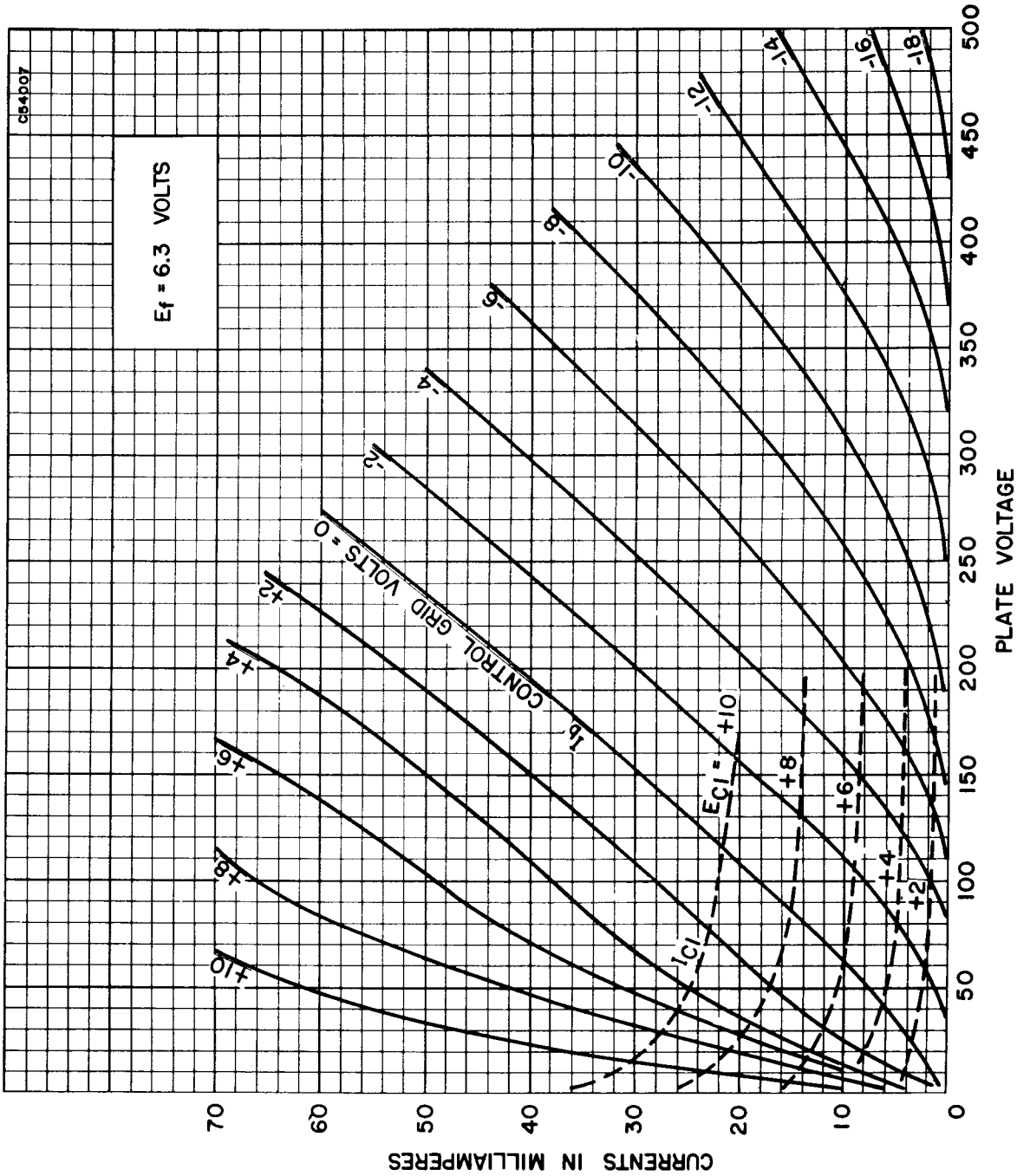
APPLICATION DATA CONT'D

The Sylvania Planar Type construction features a non-buckling, stretched, parallel-wire grid that results in stable, uniform operation; a unique cathode designed to minimize discontinuities in the cathode structure; and, a disc-seal construction that satisfies the requirements for low lead inductance.

OUTLINE DRAWING



AVERAGE PLATE CHARACTERISTICS



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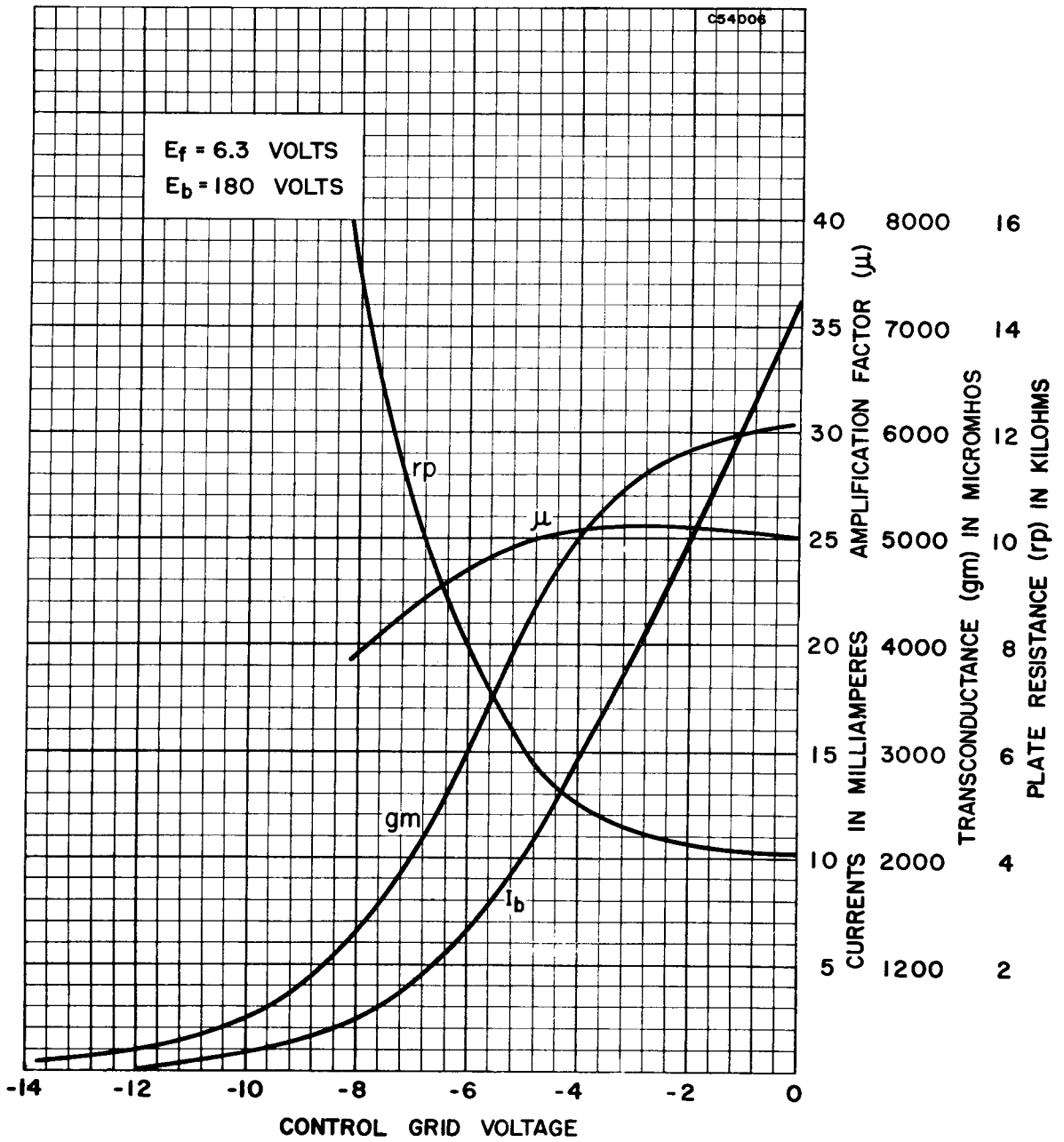
AVERAGE TRANSFER CHARACTERISTICS



DESCRIPTION: S340 GAS TRIGGER TUBE

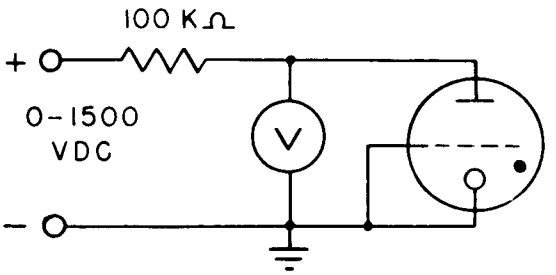
The Sylvania Type S340 is an inert-gas-filled internally-triggered cold cathode trigger tube designed for electronic relay and switching service. The S340 is similar to the OA5 in electrical characteristics except that it is capable of withstanding higher peak and average currents. This tube is also distinguished for its heavy duty ruggedness and ability to withstand great shock and vibrational stress and strain. It will operate satisfactorily under extremes of temperature and pressure, such as those encountered in high altitude flying. A typical application is in the ignition system of a jet engine.

ELECTRICAL CHARACTERISTICS:

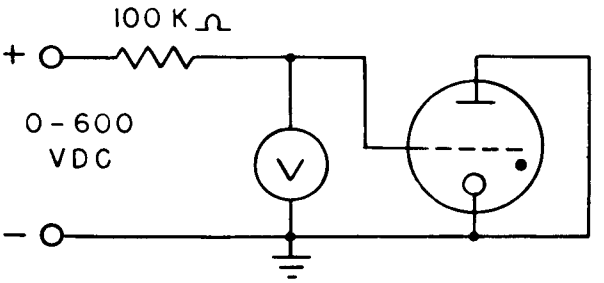
	CONDITIONS	MIN.	MAX.
Trigger Voltage (E_t)		—	400 Vdc
Anode Hold Off Potential (E_{ah})	NOTE 1	1300	— Vdc
Grid Hold Off Potential (E_{gh})	NOTE 2	150	250 Vdc
Anode Operating Voltage	NOTE 3	325	1000 Vdc

NOTES:

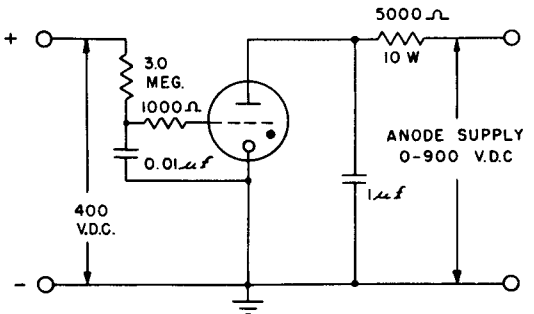
NOTE 1: E_{ah}—*The voltage at which the anode conducts with the grid and cathode at ground potential as evaluated in the circuit below.*



NOTE 2: E_{gh}—*The voltage at which the grid conducts with the anode and cathode at ground potential as evaluated in the circuit below.*

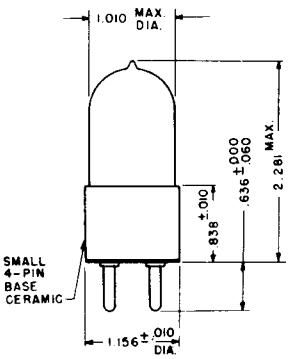


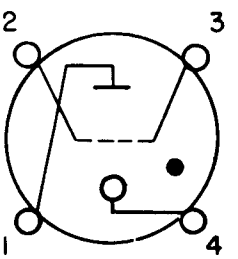
NOTE 3: *Typical Operating Circuit.*



MECHANICAL DATA

OUTLINE DRAWINGS





BASE CONNECTIONS

(Bottom View)
Pin 1: Plate
Pin 2: Grid
Pin 3: Grid
Pin 4: Cathode

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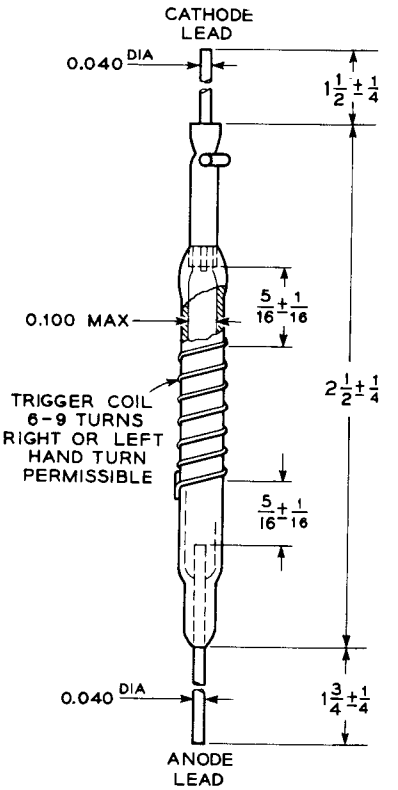
S413

DESCRIPTION: High Intensity Strobotron

Sylvania Strobotron Type S413 is a high-intensity strobotron which produces bluish-white light pulses at frequencies below 100 flashes per second. It was designed to fill the need for a reasonably priced, compact, slow-rate strobotron suitable for true-color viewing of relatively low-frequency rotary and reciprocatory motion. The stroboscopic effect of the repetitive, synchronized light flashes "freezes" the motion permitting either visual or photographic examination. Designed for triggering by an ignition coil discharge, the S413 is especially useful in automotive timing, spot viewing of ink flow and registry in multi-color printing, adjustment of packaging machinery, wheel balancing and similar applications. Careful control of the inside bore of the tube insures uniform production of tubes with a specified light output.



ELECTRICAL RATINGS

Dissipation ..... 3.5 watts max.

Tube dissipation in watts (w) may be determined by the formula $w\text{-}fCV^2/_2$

where C = discharge capacitance in microfarads (ufd)
V = Anode operating voltage in kilovolts (kv)
f = number of flashes per second

All maximum ratings specified below are applicable to the extent that the dissipation, as calculated by the formula above, does not exceed 3.5 watts.

Anode Operating Voltage
- Minimum ..... 425 Vdc
- Maximum ..... 750 Vdc

Trigger Voltage
- Minimum ..... 4 kv
- Maximum ..... 12 kv

Discharge Capacitance ..... 2 ufd max.
Frequency ..... 100 flashes/sec. max.

Typical Operation

Anode Voltage ..... 500 volts
Discharge Condenser ..... 1 ufd
Flashes Per Second 20
Trigger Voltage ..... 5 kv

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TYPICAL CIRCUITS

The circuits shown below are only two of many which may be used to operate the Sylvania S413. Appropriate circuits may be designed for many specific applications.

In designing circuits for tubes of this type, it is desirable that the time constant (RC) be as long as possible consistent with the desired maximum flash rate and operating voltage. Too short a time constant, at high repetition rates, may result in a continuous discharge due to insufficient deionization time.

In general, appropriate RC constants can be found to cover wide frequency ranges. However, extreme ranges may make it desirable to adjust the time constant at some intermediate point.

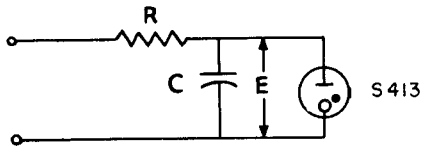
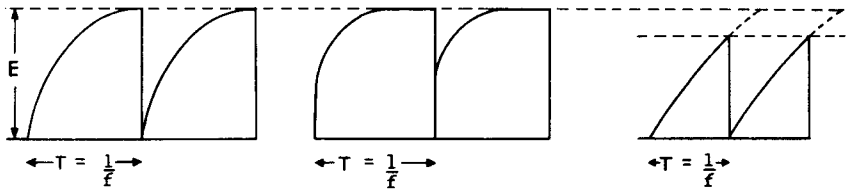


Figure 1
Basic RC circuit for use with Strobotron S413



(a) Correct Time Constant (b) Too Short Time Constant *(Tendency for continuous discharge)* (c) Too Long Time Constant *(Lowered operating voltage)*

Figure 2
Curves showing effect of proper and improper time constants.

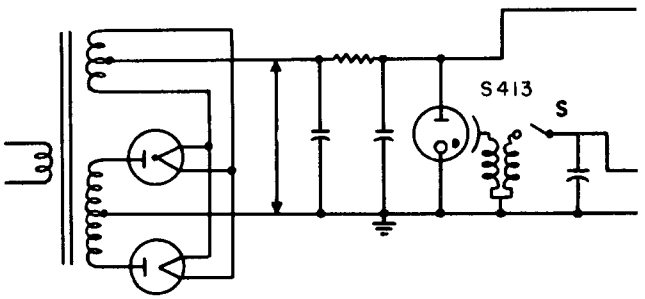
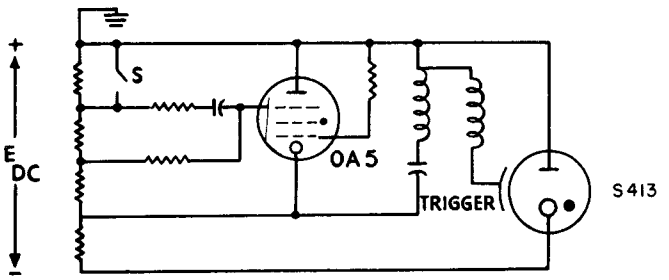


Figure 3
Basic Strobotron Triggering Circuit

Figure 4
Typical Strobotron Triggering Circuit Using Sylvania Type 045 Triggertube



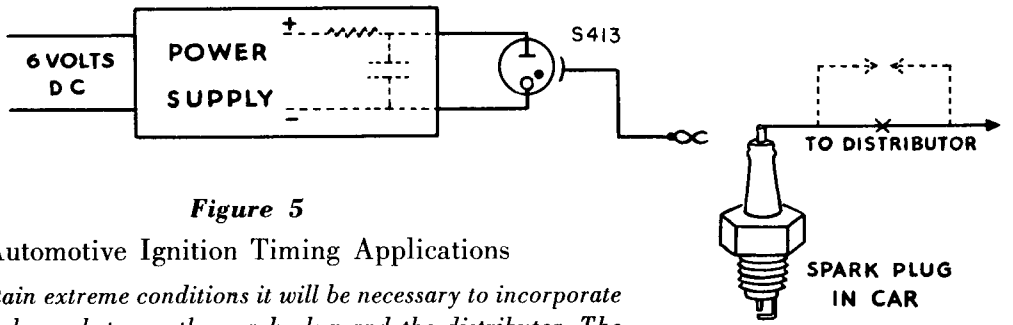


Figure 5
Automotive Ignition Timing Applications

(Under certain extreme conditions it will be necessary to incorporate an additional gap between the spark plug and the distributor. The trigger lead of the strobotron should then be connected to the side of the gap nearest the distributor.)

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SA309

MECHANICAL DATA

Bulb	T-8
Base	Small 6-Pin, AG-7, with Even Numbered Pins Removed
Maximum Bulb Diameter	1.015 Inches
Maximum Seated Height	$1\frac{15}{16}$ Inches
Cathode	Cold Cathode
Mounting Position	Any
Color of Discharge	Blue-White

ELECTRICAL DATA

RATINGS

	Min.	Max.	
Anode Voltage	425	600	Volts
Trigger Voltage	4	12	Kv
Dissipation[1]		3.5	Watts
Frequency[2]		100	pps

TYPICAL OPERATION

Anode Voltage	500 Volts
Discharge Capacitor	1 μfd
Flashes per Second	20
Trigger Voltage	5 Kv
Light Output, Approx., in Lumen Secs. per Flash	5

NOTES:

1. *Tube dissipation in watts is equal to* $\frac{f\,C\,(V)^2}{2}$ *where C is the discharge capacitance in μfd, V is the voltage in kilovolts, and f is the number of flashes or pulses per second.*

2. *Tube frequency may be increased provided total dissipation of 3.5 watts is not exceeded.*

APPLICATION DATA

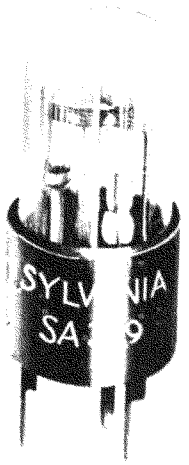
Sylvania Strobotron Type SA309 is a high-intensity strobotron which produces bluish-white light pulses at frequencies of the order of 100 flashes per second. It is designed to fill the need for a reasonably priced, compact, slow-rate strobotron suitable for true-color viewing of relatively low-frequency rotary and reciprocatory motion. The stroboscopic effect of the repetitive, synchronized light flashes "freezes" the motion permitting either visual or photographic examination. The SA309 is especially useful in automotive timing, spot viewing of ink flow and registry in multi-color printing, adjustment of packaging machinery, wheel balancing and similar applications.

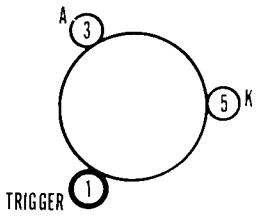
In designing circuits for the Sylvania Type SA309, it is desirable that the time constant (RC) be as long as possible consistent with the selected operating voltage and with the desired maximum flash rate. Too short a time constant, at high repetition rates, may result in a continuous discharge due to insufficient deionization time.

(Continued on reverse side)

QUICK REFERENCE DATA

The Sylvania Type SA309 is a high-intensity strobotron designed for visual or photographic examination of rotary and reciprocatory motion.





SA 309

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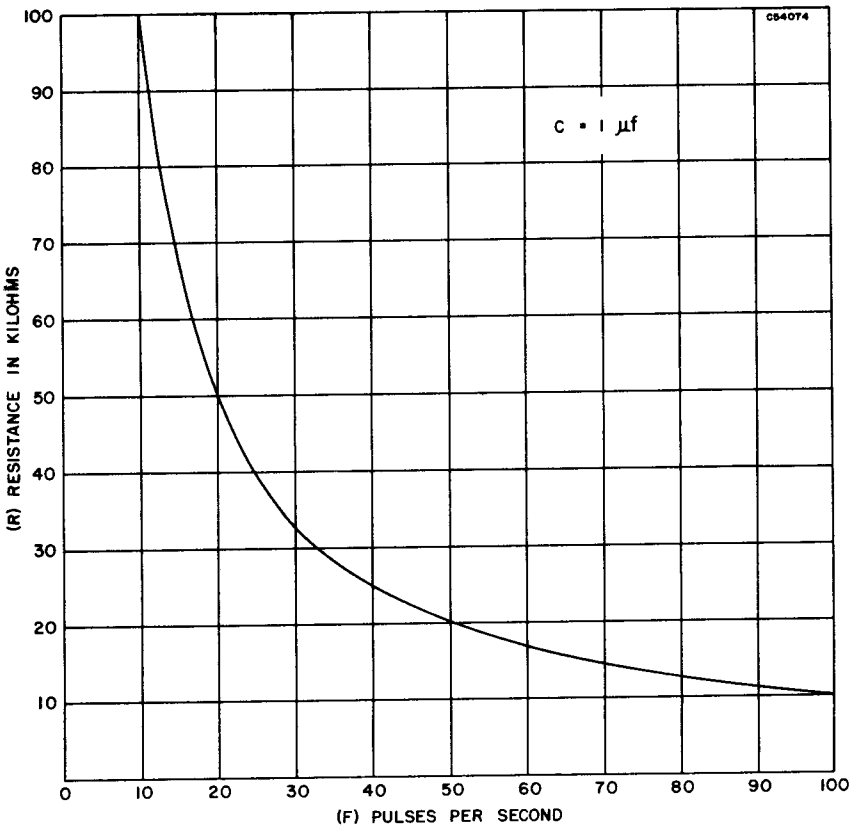
ELECTRONICS DIVISION
WOBURN, MASS.

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

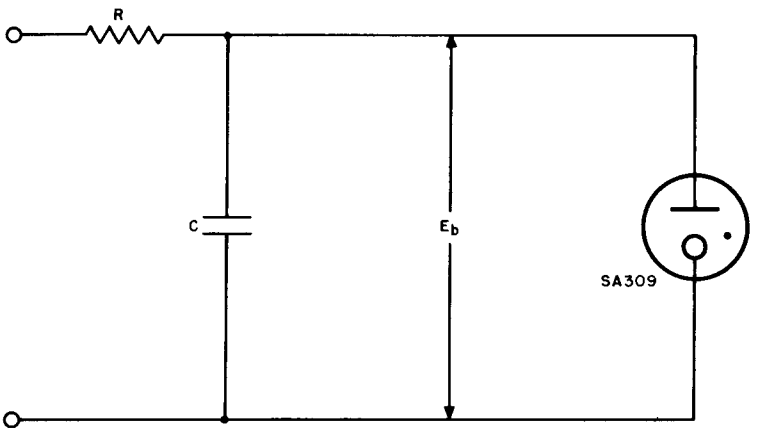
9-54-30

APPLICATION DATA

Too long a time constant may effectively lower the tube voltage by permitting the tube to be triggered before it reaches the operating voltages necessary to produce full light output. The ionization time of the tube itself is generally well below 10 microseconds. The deionization time depends upon the tube and the circuit. The graph below shows the value of resistance to use with a 1μfd condenser to achieve a given flash rate (pps).



GRAPH SHOWING VALUE OF RESISTANCE TO USE WITH 1μf CAPACITOR TO ACHIEVE A GIVEN FLASH RATE, PPS



$T = 1/f = RC$

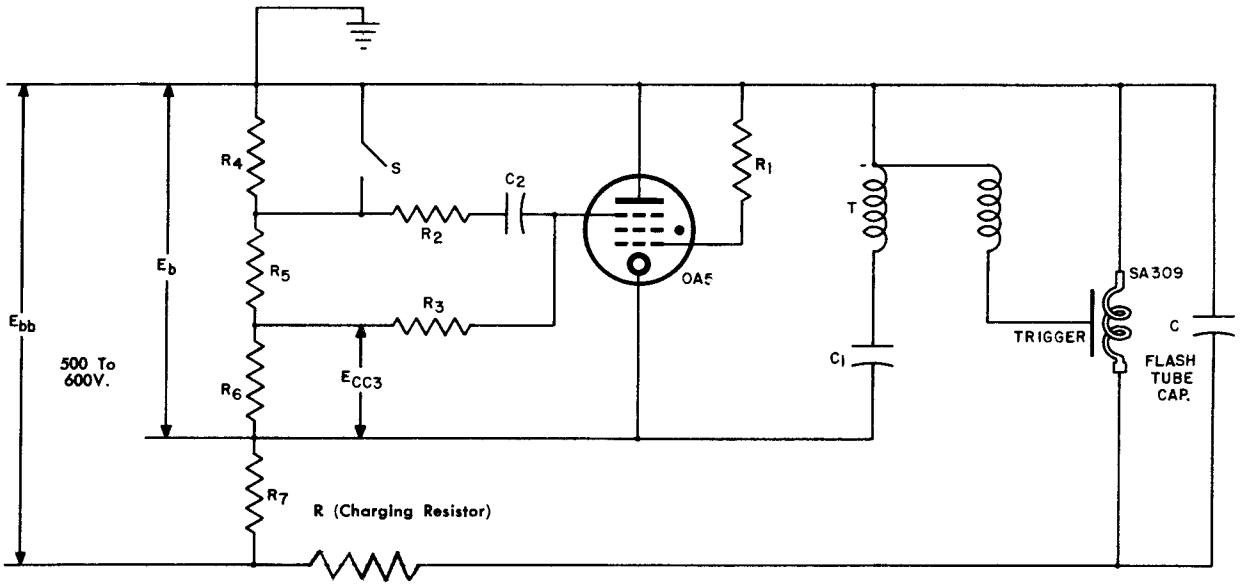
where:

R = Resistance in Megohms
C = Capacitance in $\mu\mu$f

T = Time in Seconds
f = Pulses/sec.

BASIC RC CIRCUIT FOR USE WITH THE TYPE SA309 STROBOTRON

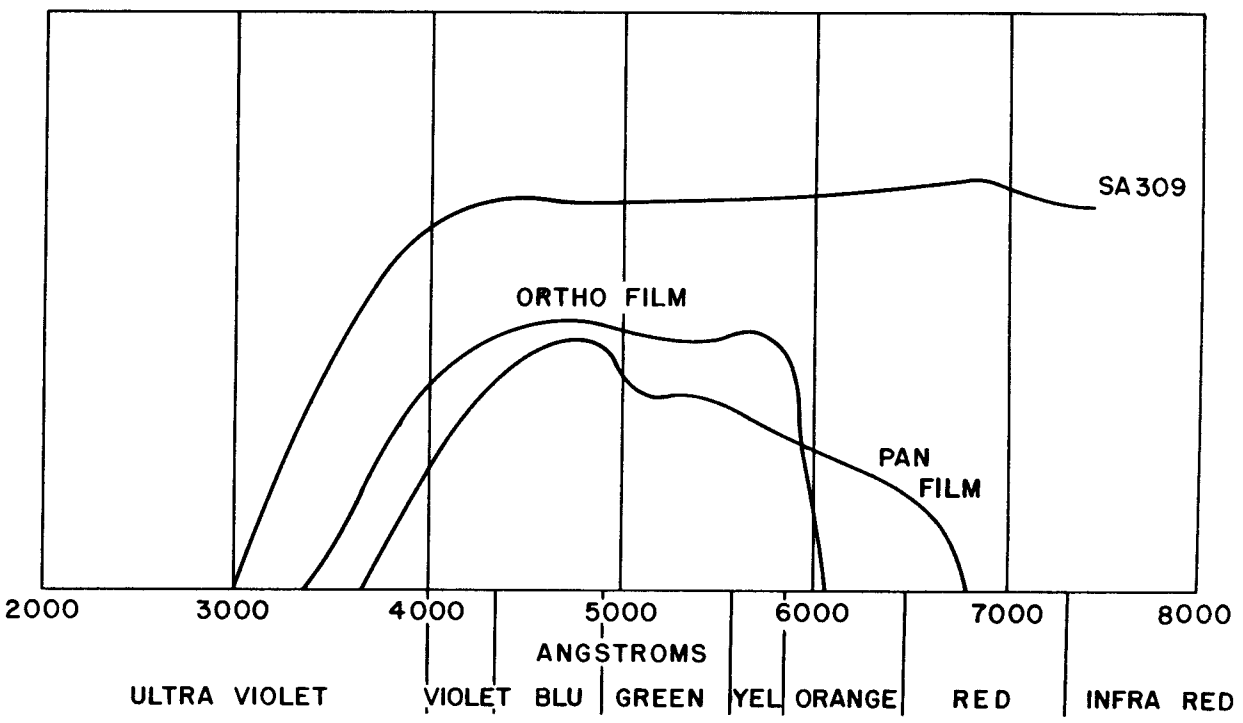
APPLICATION DATA CONT'D



$R_1, R_3 = 10$ Meg. $R_5 = 3.9$ Meg. $C_1 = 0.1 - 0.25$ μfd
$R_2 = 240$ K $R_6 = 1.0$ Meg. $C_2 = .01$ μfd
$R_4 = 2$ Meg. $R_7 = 0.5$ Meg. $C = 1.0$ μfd

SYNCHRONOUS SWITCH TRIPPING CIRCUIT FOR USE WITH THE SA309 STROBOTRON

RELATIVE SPECTRAL RESPONSE



CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic
Phosphor*	P7
Fluorescence	Blue-White
Phosphorescence	Yellow
Persistence	Long
Faceplate	Gray Filter Glass

*In addition to the P7 screen shown, the SC-2558 can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Amperes
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	10 μμf
Grid No. 1 to All Other Electrodes	8 μμf
Between Deflecting Plates 1-2	4 μμf
Between Deflecting Plates 3-4	2 μμf
Deflecting Plate 1 to All Other Electrodes Except D2	8 μμf
Deflecting Plate 2 to All Other Electrodes Except D1	8 μμf
Deflecting Plate 3 to All Other Electrodes Except D4	6 μμf
Deflecting Plate 4 to All Other Electrodes Except D3	6 μμf

MECHANICAL DATA

Minimum Useful Screen Diameter	11 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14J
Weight (Approx.)	12 Pounds
J1-21 Contact Aligns with Trace D1-D2	± 10 Degrees
J1-21 Contact Aligns with Pin No. 5	± 10 Degrees
Positive Voltage on D1 Deflects Beam Approx. Toward Pin No. 5	
Positive Voltage on D3 Deflects Beam Approx. Toward Pin No. 1	

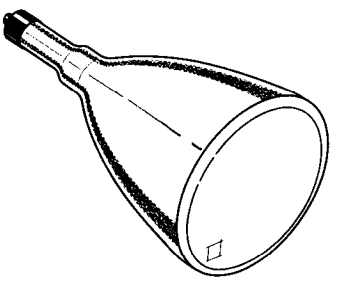
RATINGS

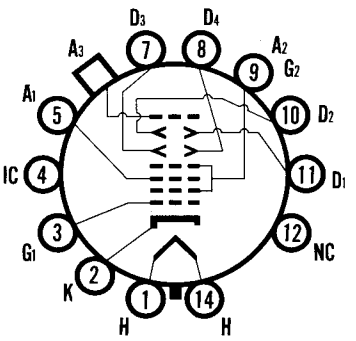
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Input[1]	6 Watts
Anode No. 3 Voltage	12,000 Volts dc
Anode No. 2 Voltage	6,000 Volts dc
Anode No. 1 Voltage	2,500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	200 Volts dc
Positive Bias Value	0 Volts dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	200 Volts
Heater Positive with Respect to Cathode	200 Volts
Peak Voltage Between Anode No. 2 And Any Deflecting Plate	750 Volts
Ratio Post Accelerator Voltage to Anode Voltage	2.3:1

QUICK REFERENCE DATA

Oscilloscope Tube
12" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Post Deflection Acceleration





14-J

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

JUNE, 1960

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

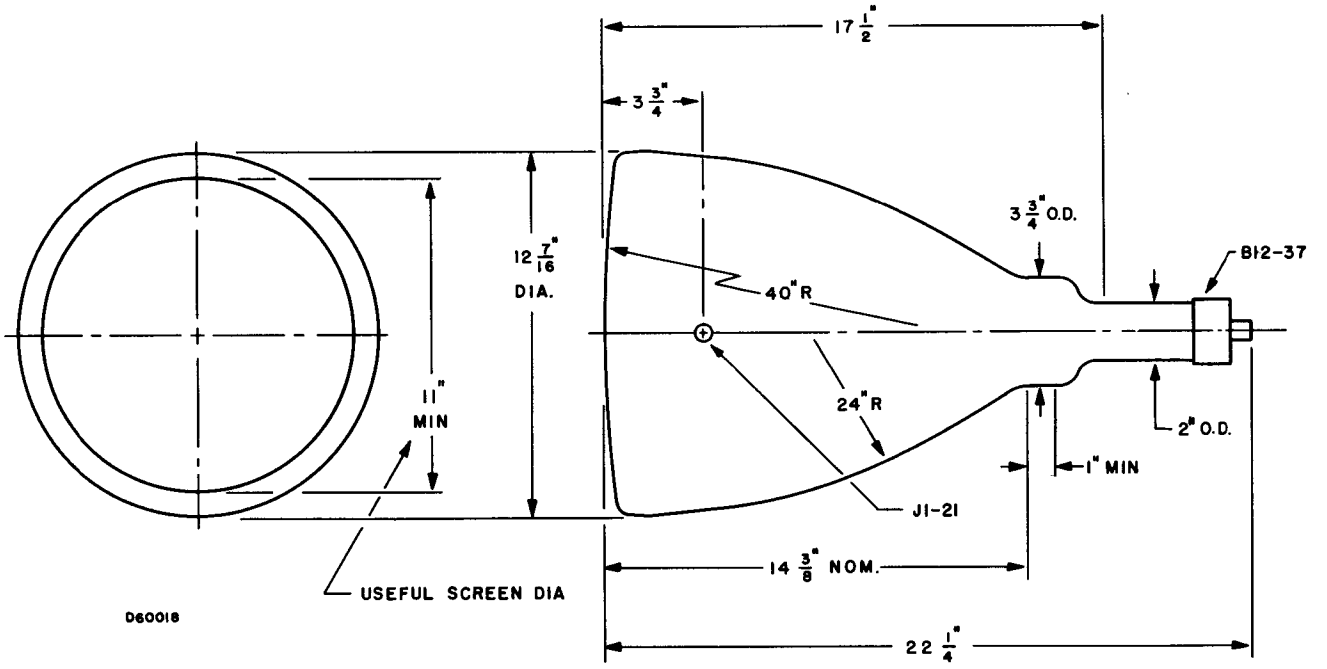
Anode No. 3 Voltage	10,000 Volts dc
Anode No. 2 Voltage	5,000 Volts dc
Anode No. 1 Voltage for Focus	1300 to 2200 Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	−60 to −100 Volts dc
Deflection Factor[3]	
Deflecting Plates 1-2	105 to 145 Volts dc/Inch
Deflecting Plates 3-4	80 to 115 Volts dc/Inch
Modulation[4]	30 Volts Max.
Line Width "A"[4]	.5 mm
Focus Electrode Current[4]	−15 to +10 μa dc
Spot Position, Undeflected	Within 30 mm Square
Angle Between D1-D2 Trace and D3-D4 Trace	90 ± 2 Degrees

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Resistance in Any Deflection Plate Circuit	5.0 Megohms Max.

NOTES:

1. *Anode input equals the product of anode No. 2 voltage and average anode No. 2 current.*
2. *For visual extinction of undeflected focused spot.*
3. *Deflection plates 1 and 2 are nearer the screen. Plates 3 and 4 are more sensitive and with post acceleration may produce less than full screen coverage.*
4. *Measured in accordance with MIL-E-1C specification at a post accelerator current (1A3) equal to 25 μa.*



X-RAY WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's maximum anode voltage or 16,000 volts, whichever is less.

DESCRIPTION

The Sylvania Type SC-2751P1B is a compact, rectangular direct view oscilloscope tube designed for portable oscilloscope and radar applications. It features a high efficiency 1.5 v, 140 ma heater for battery economy and lightweight design. The tube is pre-aligned, then potted in its integral magnetic shield with flexible, color coded leads for all tube connections.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic
Phosphor*	P-1
Fluorescence	Green
Phosphorescence	Green
Persistence	Medium
Faceplate	Flat, Clear

*In addition to the type shown, the SC-2751B can be supplied with several other screen phosphors.

MECHANICAL DATA

Minimum Useful Screen Dimensions	
Horizontal	2¾ Inches
Vertical	1⅛ Inches
Bulb	LEA 448 or Equiv.
Base	B8-181
Basing	Color Coded Leads
Anode No. 2 Contact	J1-22
Angle Between D1-D2 and D3-D4 Trace	90 ± 1 Degree
Angle Between D1-D2 Trace and Major Axis of Tube Face	0 ± 1½ Degrees

Deflection Plates
D1 and D2 are nearer to the tube face
D3 and D4 are nearer the base

Positive Voltage on D1 (Blue Lead) with Respect to D2 will Deflect the Beam Approx. Toward the White Lead

Positive Voltage on D3 (Gray Lead) with Respect to D4 will Deflect the Beam Approx. Toward the Red Lead

ELECTRICAL DATA

Heater Voltage	1.5 Volts
Heater Current	0.140 ± 10 % Ampere
Direct Interelectrode Capacitances (Approx.)[1]	
Grid No. 1 to All Other Electrodes	4.5 pf
Between Deflection Plates 1-2	2.0 pf
Between Deflection Plates 3-4	2.5 pf
Deflection Plate 1 to All Other Electrodes	6.5 pf
Deflection Plate 2 to All Other Electrodes	6.0 pf
Deflection Plate 3 to All Other Electrodes	5.5 pf
Deflection Plate 4 to All Other Electrodes	5.5 pf

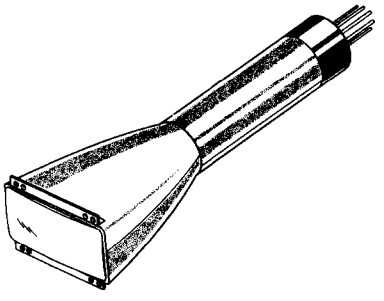
RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	2750 Volts dc
Anode No. 2 Input	6.0 Watts
Anode No. 1 Voltage (Focusing Electrode)	1100 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	200 Volts dc
Positive Bias Value	0 Volt
Positive Peak Value	2 Volts
Peak Voltage Between Anode No. 2 and Any Deflection Plate	550 Volts
Altitude	35,000 Feet

QUICK REFERENCE DATA

1½" x 3" Direct Viewed Rectangular Glass Type
Clear, Pressed Faceplate
Electrostatic Deflection
Electrostatic Focus
High Deflection Sensitivity
Very Low Heater Power
Integral, Potted, Magnetic Shield
Flexible Color Coded Leads



BASE LEADS COLOR CODE

H — Brown
HK — White
G1 — Green
A1 — Red
A2 — Orange
D1 — Blue
D2 — Violet
D3 — Gray
D4 — Black

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

JUNE, 1964

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage	2000 Volts dc	
Anode No. 1 Voltage for Focus	400 to 700 Volts dc	
Grid No. 1 Voltage Required for Cutoff[2]	−38 to −68 Volts dc	
Deflection Factors		
Deflection Plates 1-2	68 to 92 Volts dc/Inch	
Deflection Plates 3-4	28 to 38 Volts dc/Inch	
Spot Position (Undeflected, Focused)[3]	Within a 15 mm Square	
P1 Light Output[5]	20 Ft. L.	Min.
Modulation[6]	38 Volts dc	Max.
Line Width "A"[7]	0.65 mm	Max.

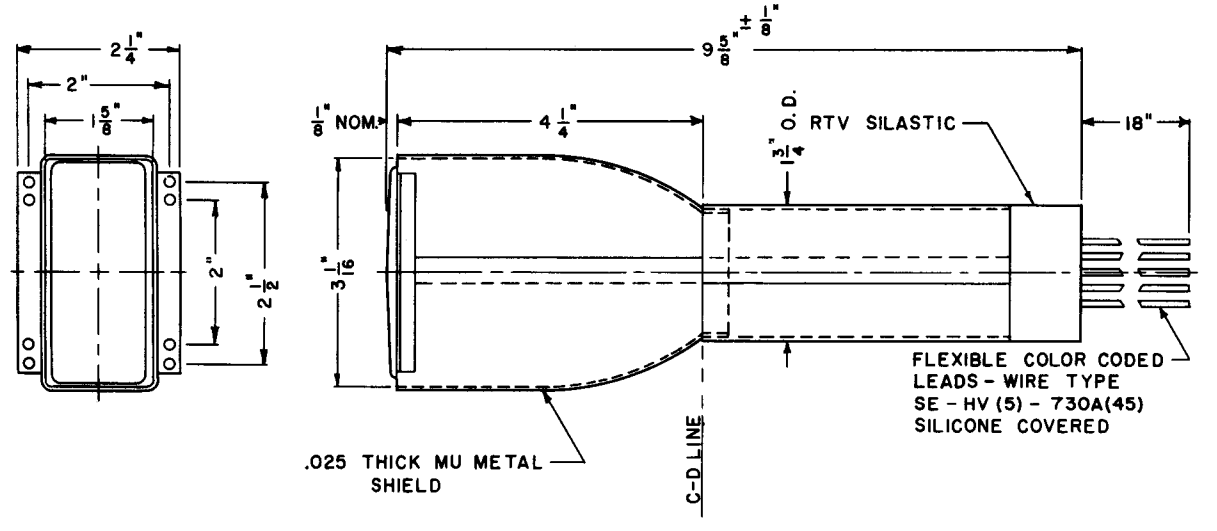
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.
Deflection Circuit Resistance[4]	1.0 Megohms	Max.

NOTES:

1. *Exclusive of the potted color coded leads.*
2. *Visual extinction of undeflected focused spot.*
3. *With the deflection plates connected to Anode No. 2. The square shall be centered on the tube face with its sides parallel to the deflection axes.*
4. *It is recommended that the deflecting electrode circuit resistances be approximately equal.*
5. *Raster size* $1\frac{1}{8}''$ *x* $1\frac{9}{16}''$.
6. *Measured at 20 Ft. L. on a raster* $1\frac{1}{8}''$ *x* $1\frac{9}{16}''$.
7. *Measured by compressed raster method starting with conditions of Note 6.*

OUTLINE



SYLVANIA engineering data service SC-2782*

DESCRIPTION

Sylvania Type SC-2782 is a 5-inch diameter Cathode-Ray Tube designed for high resolution photographic recording. Its electron-optical system and fine grain screen achieve very fine trace width with conventional focusing and deflection units and a simple beam-centering magnet. The tube has a flat, clear, non-browning optical glass faceplate for optimum photographic quality. An integral encapsulated high voltage connector is utilized to minimize corona at high altitude.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic	
Deflection Method	Magnetic	
Deflection Angle (approx.)	50	Degrees
Type*	**SC-2782**	
Phosphor	Fine Grain P11, Aluminized	
Fluorescence	Blue	
Persistence	Short	
Faceplate	Clear, Non-Browning Optical Glass	

**In addition to the type shown, the SC-2782 can be supplied with several other screen phosphors.*

ELECTRICAL DATA

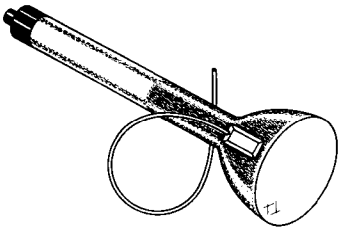
Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Ampere
Direct Interelectrode Capacitances (approx.)		
Grid No. 1 to all Other Electrodes	9	μμf
Cathode to all Other Electrodes	4.3	μμf
External Conductive Coating to Anode	500	μμf Max.
	100	μμf Min.

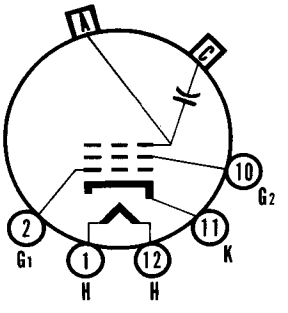
MECHANICAL DATA

Minimum Useful Screen Diameter	4¼	Inches
Overall Length	16 ± ⅜	Inches
Bulb	C40 Exp. 14 or Equivalent	
Anode Terminal	16", HV Cable, Corona Protected	
Base (Small Shell Duodecal 5-Pin)	B5-57	
Basing	12N	

QUICK REFERENCE DATA

- High Resolution Tube
- .001" Line Width
- 5-Inch, Flat, Optical Glass Faceplate
- Clear Non-Browning Faceplate
- Extremely Fine Grain Screen
- Aluminized Screen
- Magnetic Deflection
- Magnetic Focus
- No Ion Trap
- External Conductive Coating on Neck
- External Insulating Coating on Bulb





12-N

SYLVANIA
ELECTRONIC TUBES
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SENECA FALLS, NEW YORK

Prepared and Released By The
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EMPORIUM, PENNSYLVANIA
SEPTEMBER, 1959

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	25,000	Volts	dc
Grid No. 2 Voltage	2,500	Volts	dc
Grid No. 1 Voltage			
Negative Bias Value	150	Volts	dc
Positive Bias Value	0	Volts	dc
Positive Peak Value	0	Volts	
Peak Heater Cathode Voltage			
Heater Negative with Respect to Cathode			
During Warm-up Period Not to Exceed 15 Seconds	450	Volts	
After Equipment Warm-up	165	Volts	
Heater Positive with Respect to Cathode	165	Volts	

TYPICAL OPERATING CONDITIONS

Anode Voltage	20,000	Volts	dc
Grid No. 2 Voltage	2,000	Volts	dc
Grid No. 1 Voltage Required for Cutoff[1]	−33 to −77	Volts	dc
Focusing Coil Current (approx.)[2]	100	Ma	
Line Width[3]	0.001	Inch	

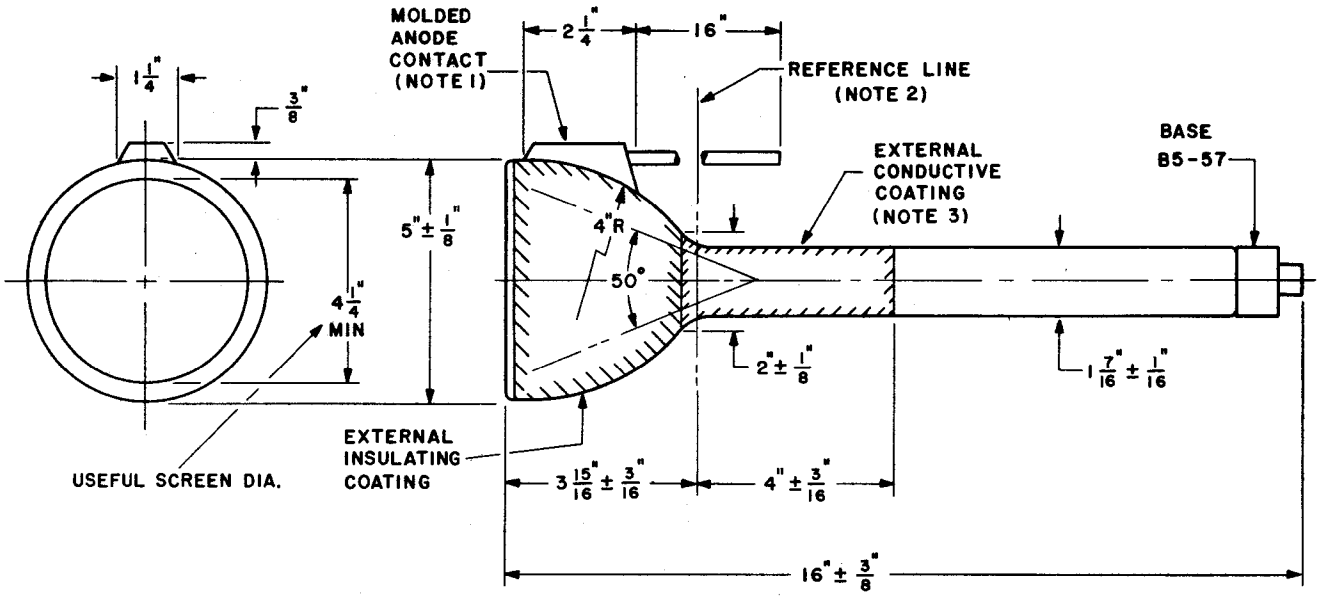
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms	Max.

NOTES:

1. *Visual extinction of undeflected focused spot.*
2. *For JEDEC focusing coil 106 or equivalent 2½" from reference line.*
3. *Line width measured at 5 μa by the shrinking raster method. Variable strength (0-10 gauss) beam centering magnet must be used for optimum line width.*

OUTLINE



D59023

DIAGRAM NOTES:

1. *The plane through the tube axis and vacant pin position No. 3 may vary from the plane through the axis and centerline of molded anode contact by an angular tolerance (measured about the tube axis) of ±30°. Molded anode contact is on same side as vacant pin No. 3.*
2. *Reference line is determined by the plane C-C' of reference line gauge (JEDEC No. G112), when gauge is seated on the glass cone.*
3. *External conductive coating must be grounded.*

A Technical Publication of
SYLVANIA ELECTRIC
PRODUCTS INC.
EMPORIUM, PA.



DESCRIPTION

Sylvania Type SC-2795 is an electrostatic charge printing tube designed for use in high speed printing equipment. It is a cathode-ray tube which has as a target for the beam, an array of fine, closely spaced, wires extending through the bulb wall. Deflection and modulation of the beam striking the wires will produce charge patterns on a dielectric in contact with the outer surface of the tube.

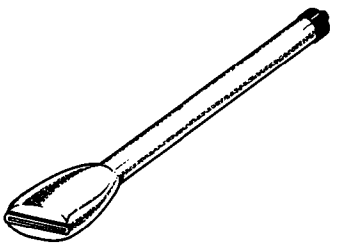
In the printing application, a moving strip of paper, used as the dielectric, has charge patterns deposited on it which can be developed and fixed to produce permanent visual records. Both black-and-white and half-tone copy can be produced.

The fine focus beam of the SC-2795, the small wire size and close spacing in the array, and the low capacitance between wire elements, permit high resolution along with extremely rapid printing. The SC-2795 can be used for single line scanning, and the .160" height of the array permits two-dimensional scanning for other types of operation. The useful printing width of the array is 2¾ inches.

The SC-2795 was developed for the A. B. Dick Company, 5700 West Touhy Avenue, Chicago 48, Illinois for use in their Videograph Data Presentation Systems.

QUICK REFERENCE DATA

Electrostatic Charge Printing Tube
Magnetic Deflection
Magnetic Focus
High Speed Printing
High Resolution
Printing Dimensions:
.16" x 2.75" Minimum

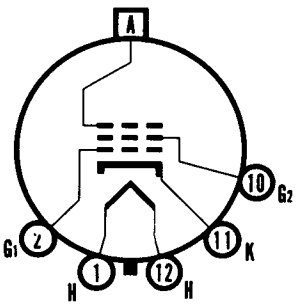


ELECTRICAL DATA

Focusing Method	Magnetic	
Deflection Method	Magnetic	
Horizontal Deflection Angle (Approx.)	24	Degrees
Heater Current at 6.3 Volts	600 ± 30	Ma
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5	μμf
Grid No. 1 to All Other Electrodes	8	μμf

MECHANICAL DATA

Printing Head		
0.001" Diameter Conductive Elements Spaced Approximately 0.004" on Centers in Both Directions.		
Minimum Useful Printing Array Width	2.750	Inches
Minimum Useful Printing Array Height	0.160	Inches
Array Thickness (Approx.)	.050	Inches
Overall Length	19 ± ⅜	Inches
Width	3¼ ± 1/32	Inches
Height	1¾ ± 1/32	Inches
Neck Length	14⅝ ± ¼	Inches
Neck Diameter	1 7/16 ± 1/16	Inches
Bulb Contact	C1-3	
Base	B5-57	
Basing	12D	
Weight (Approx.)	1	Pound



12-D

MAXIMUM RATINGS (Absolute Maximum System)

Unless Otherwise Specified, All Voltages are Positive with Respect to Cathode.

Maximum Anode Voltage	25,000	Volts	
Maximum Grid No. 2 Voltage	700	Volts	
Grid No. 1 Voltage			
Maximum Negative Value	155	Volts	dc
Maximum Negative Peak Value	200	Volts	
Maximum Positive Value	0	Volts	dc
Maximum Heater Voltage	6.9	Volts	
Minimum Heater Voltage	5.7	Volts	
Maximum Heater-Cathode Voltage			
Heater Negative with Respect to Cathode	200	Volts	
Heater Positive with Respect to Cathode	200	Volts	

SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA

DECEMBER, 1961

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS — Grid Drive Service

Unless Otherwise Specified, All Voltages are Positive with Respect to Cathode.

Anode Voltage	20,000	Volts	dc
Grid No. 2 Voltage	300	Volts	dc
Grid No. 1 Voltage for Cutoff	−40 to −77	Volts	dc
Focusing Coil Current[1]	70 ± 10	Ma	dc

NOTE:

1. *For JEDEC Focus Coil No. 122 or equivalent, with the combined Grid No. 1 bias voltage and video-signal voltage adjusted to produce 100 μa anode current. Distance from tube face to center of air gap on focus coil is 7⅜ inches.*

OUTLINE

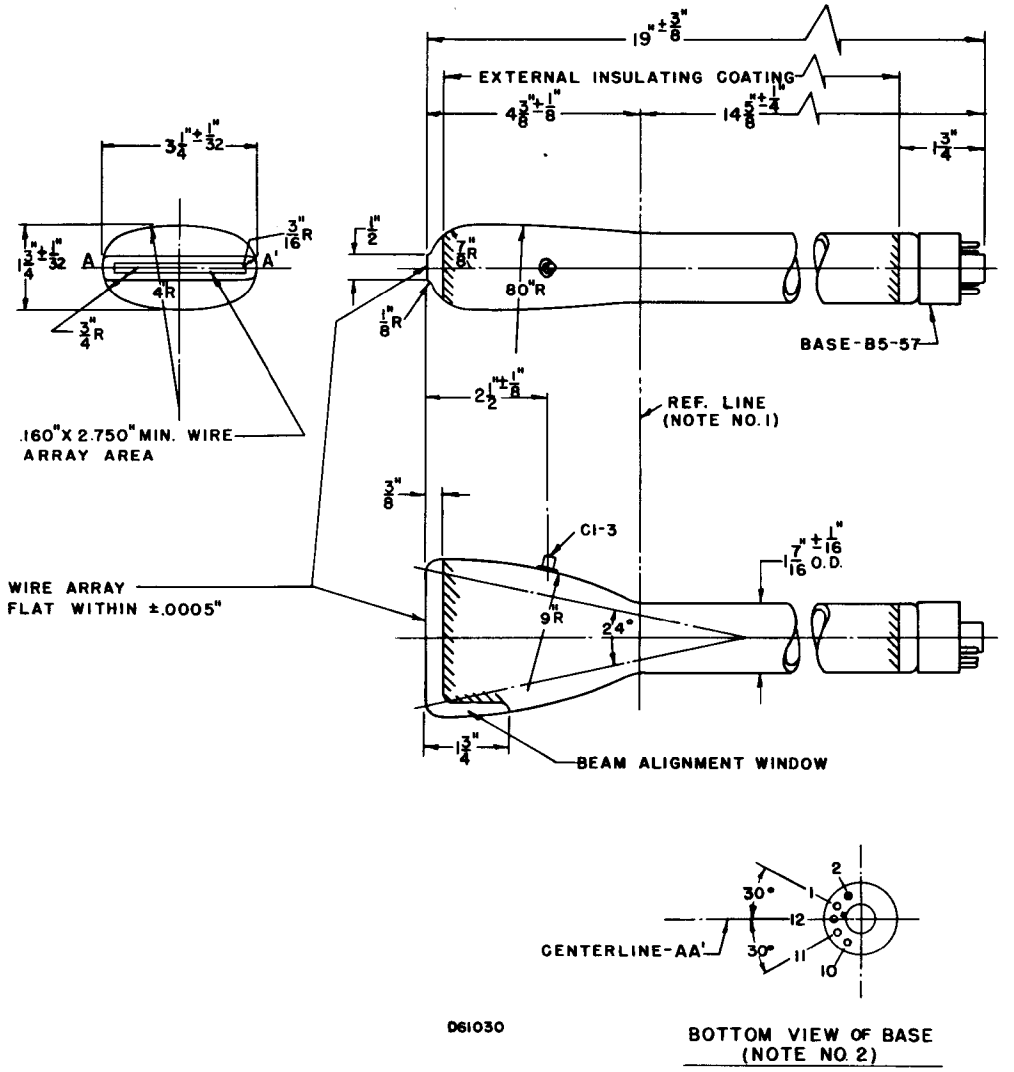


DIAGRAM NOTES:

1. *Reference line determined by plane where JEDEC Gauge No. 112 (a cylinder 1.500" + .003" — .000" I.D. and 2" long) will stop against body of bulb.*
2. *Base Pin No. 12 aligns with horizontal centerline (A-A') within 30° and is on the side opposite the anode contact, (C1-3).*

DESCRIPTION

The Sylvania Type SC-2840 is a 3-inch diameter, electrostatic focus and deflection cathode ray tube designed for compact analyzer equipment. It features short length and high brightness at low operating voltages.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic
Phosphor*	P1
Fluorescence	Green
Persistence	Medium
Faceplate	Clear

*In addition to the P1 phosphor the SC-2840 can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10 % Ampere
Direct Interelectrode Capacitances (Approx.)	
Grid to All Other Electrodes	5.0 pf
Between Deflecting Plates 1-2	1.5 pf
Between Deflecting Plates 3-4	1.5 pf
Deflecting Plate 1 to All Other Electrodes[1]	6.5 pf
Deflecting Plate 2 to All Other Electrodes[1]	8.5 pf
Deflecting Plate 3 to All Other Electrodes[1]	5.5 pf
Deflecting Plate 4 to All Other Electrodes[1]	6.5 pf

MECHANICAL DATA

Minimum Useful Screen Diameter	2¾ Inches
Base (Small-Shell Duodecal 10-Pin)	B10-75
or (Small-Shell Duodecal 12-Pin)	B12-43
Basing	12F

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

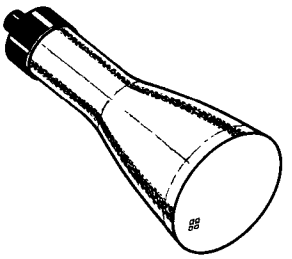
Anode No. 2 Voltage	2250 Volts dc
Anode No. 1 Voltage	1100 Volts dc
Grid Voltage	
Negative Bias Value	220 Volts dc
Positive Bias Value	0 Volt
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	140 Volts
Heater Positive with Respect to Cathode	140 Volts
Peak Voltage Between Anode No. 2 and Any Deflection Plate	550 Volts

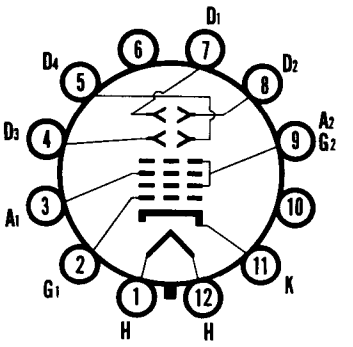
TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage[2]	1200 Volts dc
Anode No. 1 Voltage for Focus[3]	120 to 400 Volts dc
Grid Voltage Required for Cutoff[4]	−42 to −90 Volts dc
Deflection Factor[5,6]	
Deflecting Plates 1-2[7]	210 to 290 Volts dc/Inch
Deflecting Plates 3-4[8]	180 to 260 Volts dc/Inch

QUICK REFERENCE DATA

Special Purpose Tube
3" Direct Viewed
Short Length
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
High Brightness





12-F

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

JUNE, 1964

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

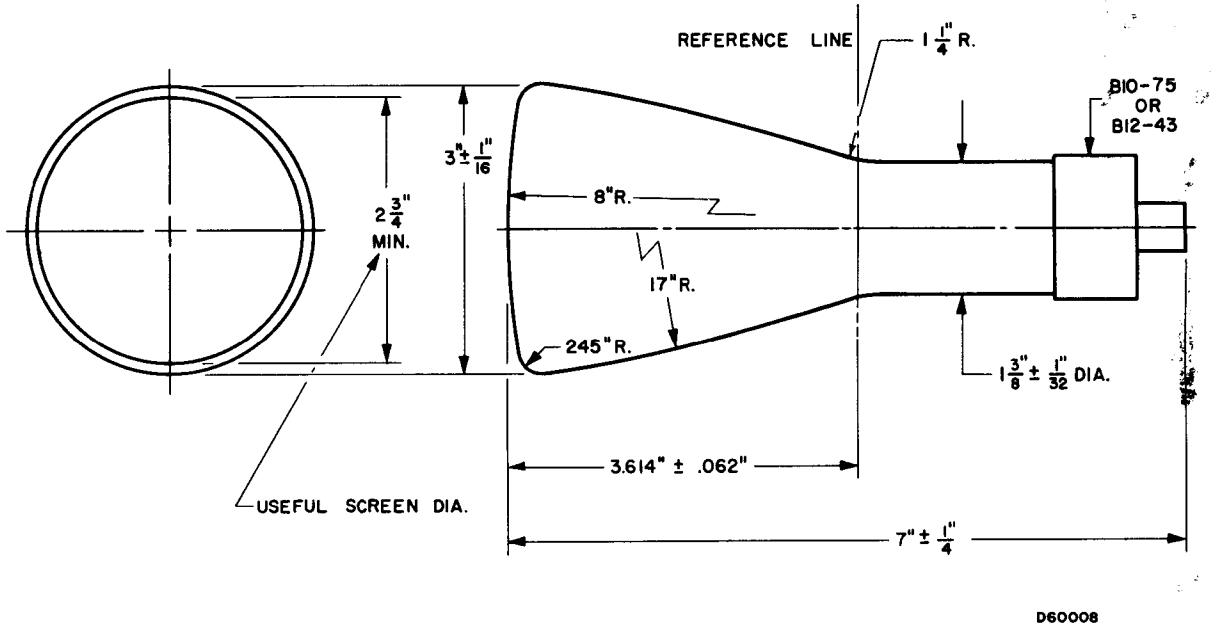
CIRCUIT VALUES

Grid Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5.0 Megohms Max.

NOTES:

1. *Positive voltage on D1 with respect to D2 will move the spot approximately in the direction of Pin No. 4, ±10°. Positive voltage on D3 with respect to D4 will move the spot approximately in the direction of Pin No. 1.*
2. *Brilliance and definition decrease with decreasing Anode No. 2 Voltage. In general, Anode No. 2 Voltage should not be less than 1200 volts.*
3. *Eg set at 22.5 volts above spot cutoff.*
4. *Visual extinction of undeflected focused spot.*
5. *Angle between trace produced by plates D1-D2 and the plane through the tube axis and Pin No. 4 does not exceed 15°.*
6. *Angle between D1-D2 trace and D3-D4 trace is 90° ± 3°.*
7. *Deflecting Plates 1-2 are nearer the screen.*
8. *Deflecting Plates 3-4 are nearer the base.*

OUTLINE



DESCRIPTION

The Sylvania Type SC-2854 is a 5-inch diameter, electrostatic focus and 53° magnetic deflection cathode ray tube designed to meet the high visibility requirements for airborne radar. Its special phosphor attains high brightness levels with a spectral distribution closely matched to the eye's peak sensitivity while providing persistence characteristics similar to those of the more common radar screens.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle (Approx.)	53 Degrees
Phosphor	Aluminized Special Phosphor
Fluorescence	Blue
Persistence	Long
Faceplate	Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (Approx.)	0.6 Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 pf
Grid No. 1 to All Other Electrodes	6 pf

MECHANICAL DATA

Minimum Useful Screen Diameter	4¼ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base (Medium Shell Octal 8-Pin)	B8-11 or B8-65
Basing	8EF
Bulb Contact Aligns with Pin No. 5	±10 Degrees

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	11,000 Volts	dc
Grid No. 4 (Focusing Electrode) Voltage	−550 to +1100 Volts	dc
Grid No 2 Voltage	770 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	200 Volts	dc
Positive Bias Value	0 Volt	
Positive Peak Value	0 Volt	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

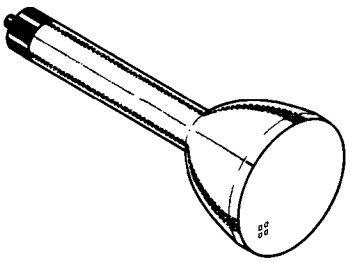
Anode Voltage[1]	7000 Volts	dc
Grid No. 4 Voltage for Focus[3]	0 to +250 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage[2]	−33 to −77 Volts	dc
Line Width[3,4]	0.40 mm	Max.

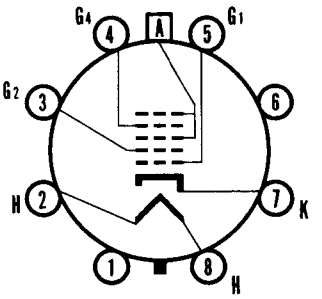
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Special Purpose Tube
5" Direct Viewed
Round Glass Type
Magnetic Deflection
Electrostatic Focus
High Resolution
High Visibility Screen





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SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

JUNE, 1964

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

NOTES:

1. *Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 4000 volts.*
2. *Visual extinction of undeflected focused spot.*
3. *With Eg1 adjusted for Ib = 100 μa and beam focused for minimum width of individual lines at center of screen.*
4. *Measured by compressed raster method, using 35 to 105 line pattern.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

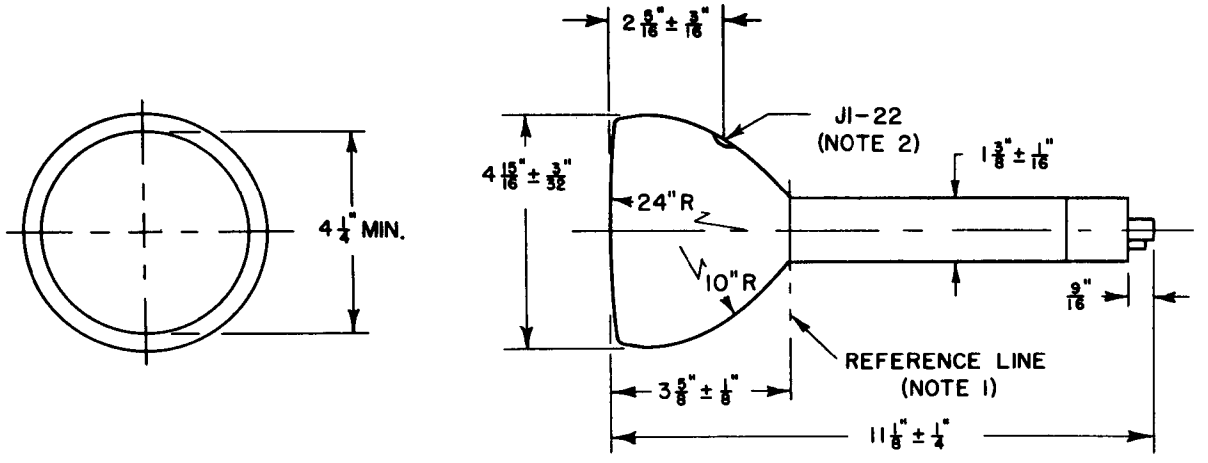


DIAGRAM NOTES:

1. *Reference line is determined by the point where 1.430 ± .003 inch diameter ring gauge 2 inches long will stop.*
2. *Anode contact (J1-22) aligns with base pin No. 5, ±10°.*

DESCRIPTION

The Sylvania SC-3016 is an electrostatic focus and deflection cathode ray tube, with a flat face 1⅛ inches in diameter, designed for compact equipments. The electron gun features high deflection sensitivity as well as the newly developed 1.5 volts - 140 ma. heater-cathode assembly. Any standard phosphor can be supplied.

The SC-3016 is cylindrical in shape, 1⅛ inches in diameter. An anode connection is brought out through the bulb and terminated in a standard J1-25 button. The cathode is internally connected to one leg of the heater. All deflection plate leads are brought out independently through the base.

ELECTRICAL CHARACTERISTICS

Ratings	Ef V	Ec1 Vdc	Eb1 Vdc	Eb2 Vdc	Ed V	Altitude Feet
Absolute Maximum	1.5±10 %	0	1100	2750	550	10,000
Absolute Minimum	—	−200	—	—	—	(Note 1)
Test Conditions	1.5	adj.	focus	1200	—	—

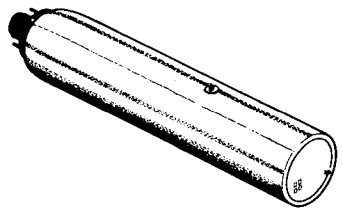
Characteristics	Condition	Approximate Values	
Heater Current	1.5V	140 ± 10 % Ma	
Angle Between Traces	—	90° ± 1°	
Line Width A	Note 2	0.4 mm	Max.
Grid Cutoff Voltage	—	−45 Vdc	Max.
Focus Voltage	Note 2	200-400 Vdc	
Deflection Factor, 1D2	—	124 ± 15 % Vdc/in.	
Deflection Factor, 3D4	—	49 ± 15 % Vdc/in.	

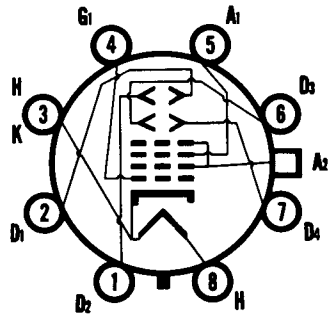
NOTES:

1. *A nominal rating of 10,000 feet has been specified. If higher values are required, additional insulation can be incorporated such that 50,000 feet can be attained.*
2. *Measured at a grid drive of 15 volts above spot cutoff voltage.*

QUICK REFERENCE DATA

1⅛" Direct Viewed
Round Glass Type
Flat Face
Electrostatic Deflection
Electrostatic Focus
Very Low Heater Power
High Deflection Sensitivity





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SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

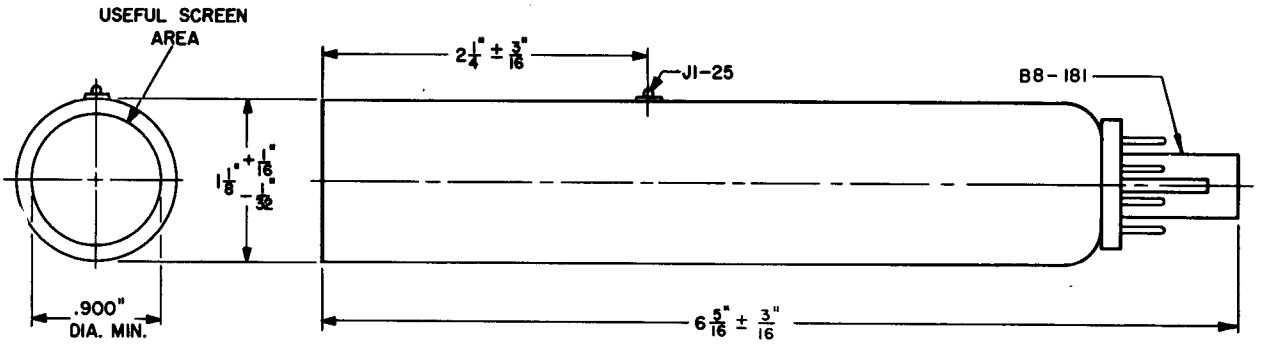
A Technical Publication

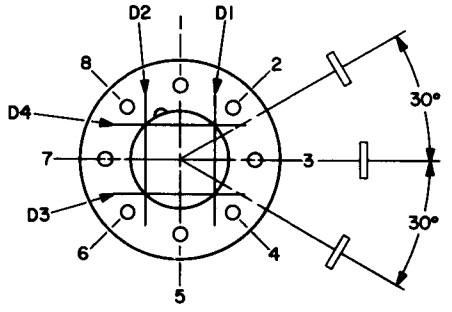
JULY, 1965

File Under

SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

OUTLINE





BOTTOM VIEW OF BASE

D600368

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SC-3042

DESCRIPTION

The SC-3042 is a 5" flat face, high resolution cathode ray tube with electrostatic deflection and focus. It is designed as a mono-accelerator to provide minimum pattern distortion and maximum sensitivity; and is intended for applications where line widths less than 0.010 inches are required. The SC-3042 can be supplied with any of the following phosphors for varied applications: P1, P2, P4, P7, P11, P12, P15, P16, P19, P20, P25.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic
Faceplate	Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Ampere

MECHANICAL DATA

Overall Tube Length	16¾ ± 3/16 Inches
Minimum Useful Screen Diameter	4½ Inches
Base (Medium Shell Diheptal 12 Pin)	B12-37
Basing	14G
Bulb	J42P
D1-D2 Trace Aligns with Pin No 5 and Tube Axis	±10 Degrees
Positive Voltage on D1 (Pin #11) deflects beam approximately toward Pin #5	
Positive Voltage on D3 (Pin #7) deflects beam approximately toward Pin #2	
Angle Between D1-D2 and D3-D4 Traces	90 ± 1 Degrees

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	5000 Volts	dc
Anode No. 1 (Focus Electrode) Voltage	3000 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	220 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Voltage Anode No. 2 to any Deflecting Plate	±550 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

TYPICAL OPERATING CONDITIONS

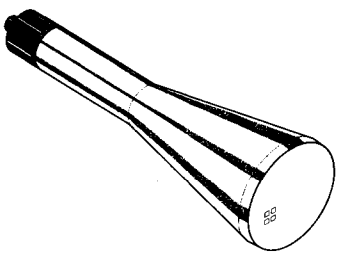
Anode No. 2 Voltage	3000 Volts	dc
Grid No. 1 Voltage (for Spot Cutoff)	-64 to -96 Volts	dc
Anode No. 1 Voltage (for Focus)	1000-1600 Volts	dc
Deflection Factors		
D1-D2	80-100 Volts/in.	
D3-D4	40-50 Volts/in.	
Line Width at 30 Volts Above Spot Cutoff[1]	.010 Inches	Max.
Useful Scan		
D1-D2	4½ Inches	Min.
D3-D4	4 Inches	Min.

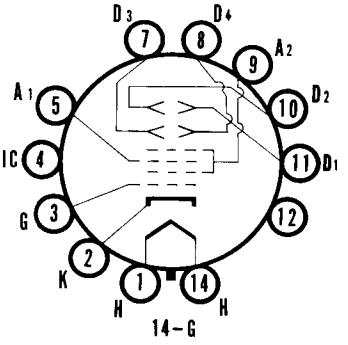
NOTE:

1. *For maximum resolution over entire screen, it is recommended that dynamic focusing be used.*

QUICK REFERENCE DATA

High Resolution Tube
5" Direct Viewed
Electrostatic Deflection
Electrostatic Focus
Flat Face
Clear Faceplate





SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

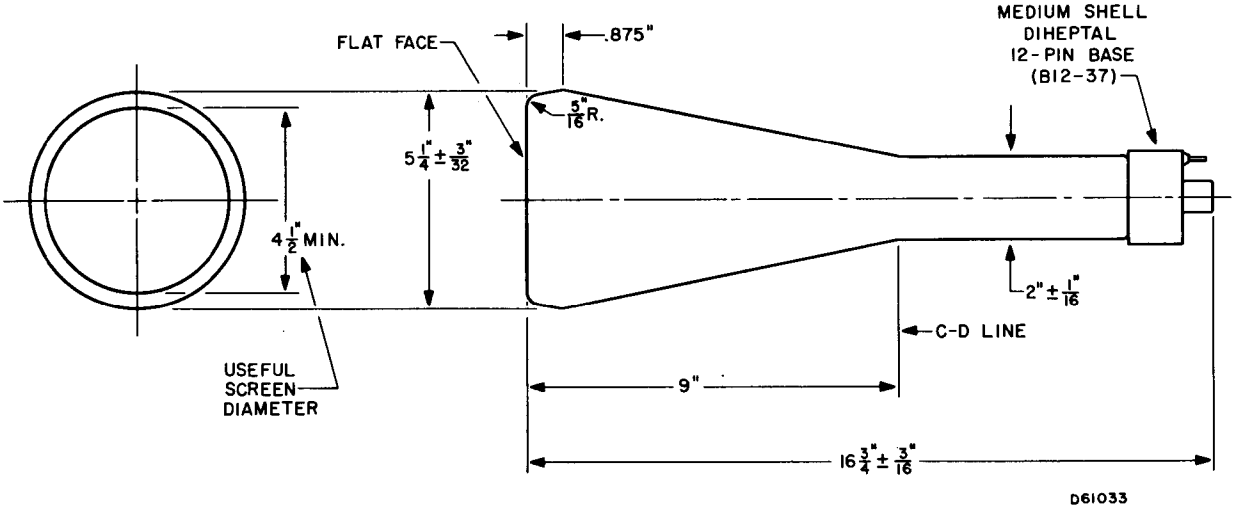
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

OCTOBER, 1961

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

OUTLINE


FLAT FACE
.875"
MEDIUM SHELL
DIHEPTAL
12-PIN BASE
(B12-37)
5/16" R.
5 1/4" ± 3/32"
4 1/2" MIN.
2" ± 1/16"
C-D LINE
USEFUL
SCREEN
DIAMETER
9"
16 3/4" ± 3/16"
D61033

DESCRIPTION

The Sylvania SC-3061 is a 3 gun, electrostatically focused and deflected cathode-ray tube, 10 inches in diameter, for displaying simultaneously, 3 independently controlled traces. It features monoaccelerator design for maximum pattern linearity and deflection factor uniformity. All deflection plate leads are brought through the neck. In addition to high vertical deflection sensitivity, an independent astigmatism electrode connection is provided, also brought through the neck, so that maximum resolution can be attained by the use of dynamic control of both focus and astigmatism voltages.

CHARACTERISTICS

GENERAL DATA[1]

Focusing Method	Electrostatic
Deflection Method	Electrostatic

Types*	SC-3061 P1	SC-3061 P2	SC-3061 P7	SC-3061 P11
Fluorescence	Green	Blue-Green	Blue	Blue
Phosphorescence	—	Green	Yellow	—
Persistence	Medium	Long	Long	Short

*In addition to the types shown, the SC-3061P- can be supplied with several other screen phosphors.

ELECTRICAL DATA

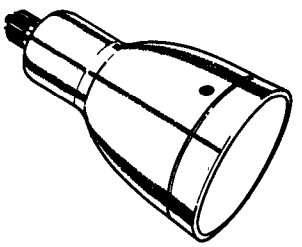
Heater Voltage	6.3 Volts
Heater Current (3 Guns in Parallel)	1.50 to 1.98 Amperes
Direct Interelectrode Capacitances (Approx.)	Each Gun
Cathode to All	5.5 μμf
Grid No. 1 to All*	6.5 μμf
D1 to D2	2.5 μμf
D3 to D4	1.5 μμf
D1 to All Other Electrodes	7.5 μμf
D2 to All Other Electrodes	7.5 μμf
D3 to All Other Electrodes	4.5 μμf
D4 to All Other Electrodes	4.5 μμf
*Value for B Gun Only:	10 μμf

MECHANICAL DATA

Overall Length	20½ ± ½ Inches
Minimum Useful Screen Diameter	9 Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Basing	See Diagram, Page 4
Base and Contact Alignment	See Diagram, Page 4
Positive Voltage on D1 (Gun B) Deflects the Beam Toward Base Key	±10 Degrees
Positive Voltage on D3 Deflects the Beam Approximately Toward Pin No. 11	
Bulb Contact (J1-22), is Oriented 45° ± 10° from D1-D2 Trace (Gun B) and is Aligned Approximately with Base Pin Position No. 6	
For Deflection Plate Lead Alignment with the Base and Bulb Contact—See Diagram	
Trace Alignment	
D1-D2 Trace Aligns with D3-D4 Trace (Each Gun)	90 ± 1 Degree
D1-D2 Traces of the 3 Guns are Parallel	±1 Degree

QUICK REFERENCE DATA

Three Independent Guns
10" Direct Viewed
Oscilloscope Tube
Round Glass Type
Electrostatic Focus
Electrostatic Deflection
Monoaccelerator Design
All Deflection Plate Leads
Brought Through the Neck Wall



For Basing
See Page 4

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OCTOBER, 1961

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	5500 Volts	dc
Focus Electrode Voltage	3000 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	220 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	dc
Peak Heater to Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	
Peak Voltage Between Anode and Astigmatism Electrode, or Any Deflecting Plate	750 Volts	

TYPICAL OPERATING CONDITIONS

Anode Voltage	5000 Volts	dc
Astigmatism Electrode Voltage	5000 Volts	dc
Focus Electrode Voltage	1500—2500 Volts	dc
Grid No. 1 Voltage[2]	−100 to −175 Volts	dc
Line Width "A"[3]	.016 Inches	Max.
Deflection Factors		
D1-D2	120 to 140 Volts Per Inch	
D3-D4	62 to 76 Volts Per Inch	
Deflection Factor Uniformity [4]	1½ Percent	Max.
Undeflected Spot Positions[5]	Within 1 Inch Square	
Useful Scan[6]		
D1-D2	±4⅛ Inches	
D3-D4	±1½ Inches	
Interaction Factor[7]	6×10^{-5} In./Volts	Max.
Pattern Distortion[8]		

CIRCUIT VALUES

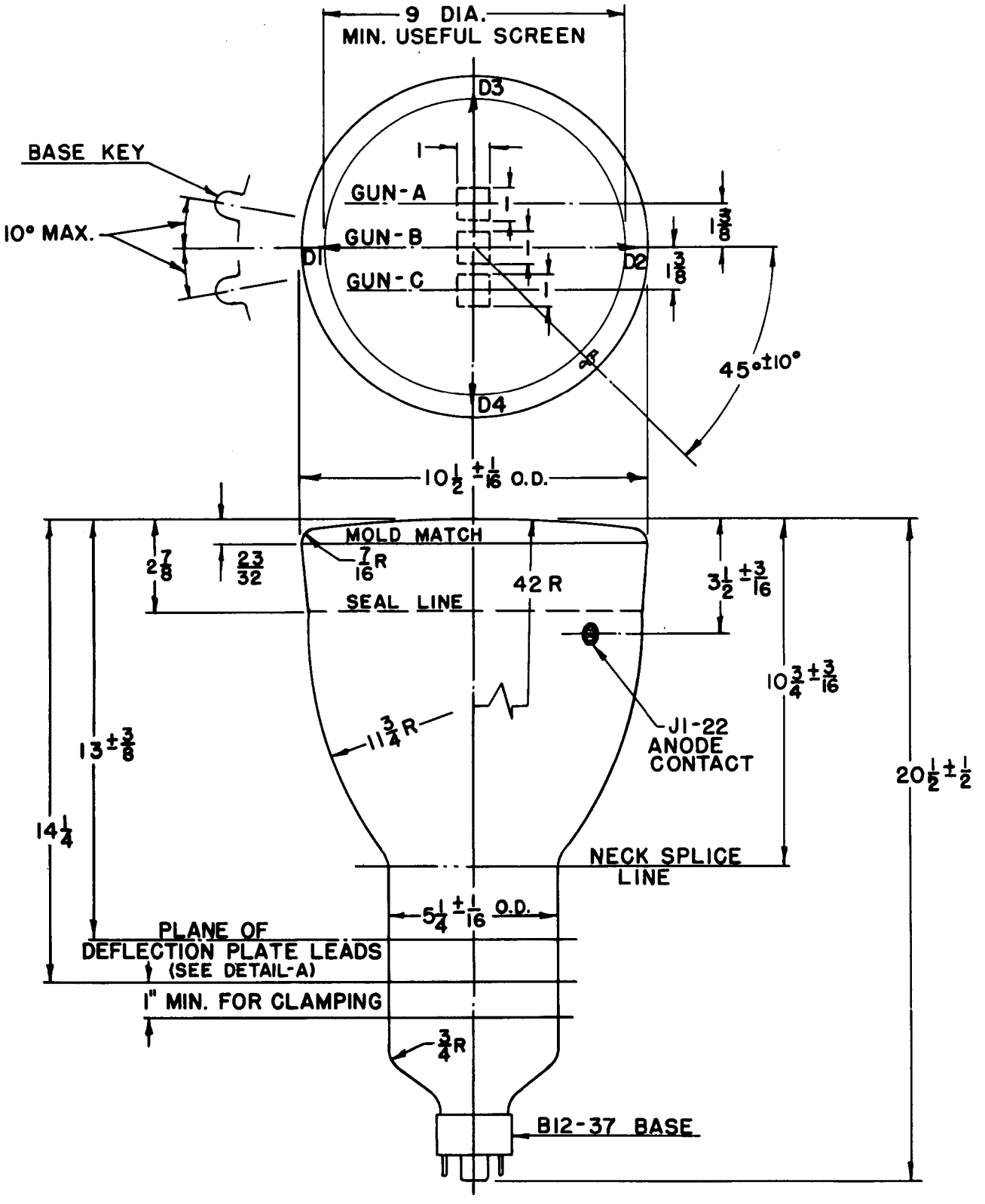
Grid No. 1 Circuit Resistance	1.5 Megohm	Max.
Deflection Circuit Resistance	1.0 Megohm	Max.

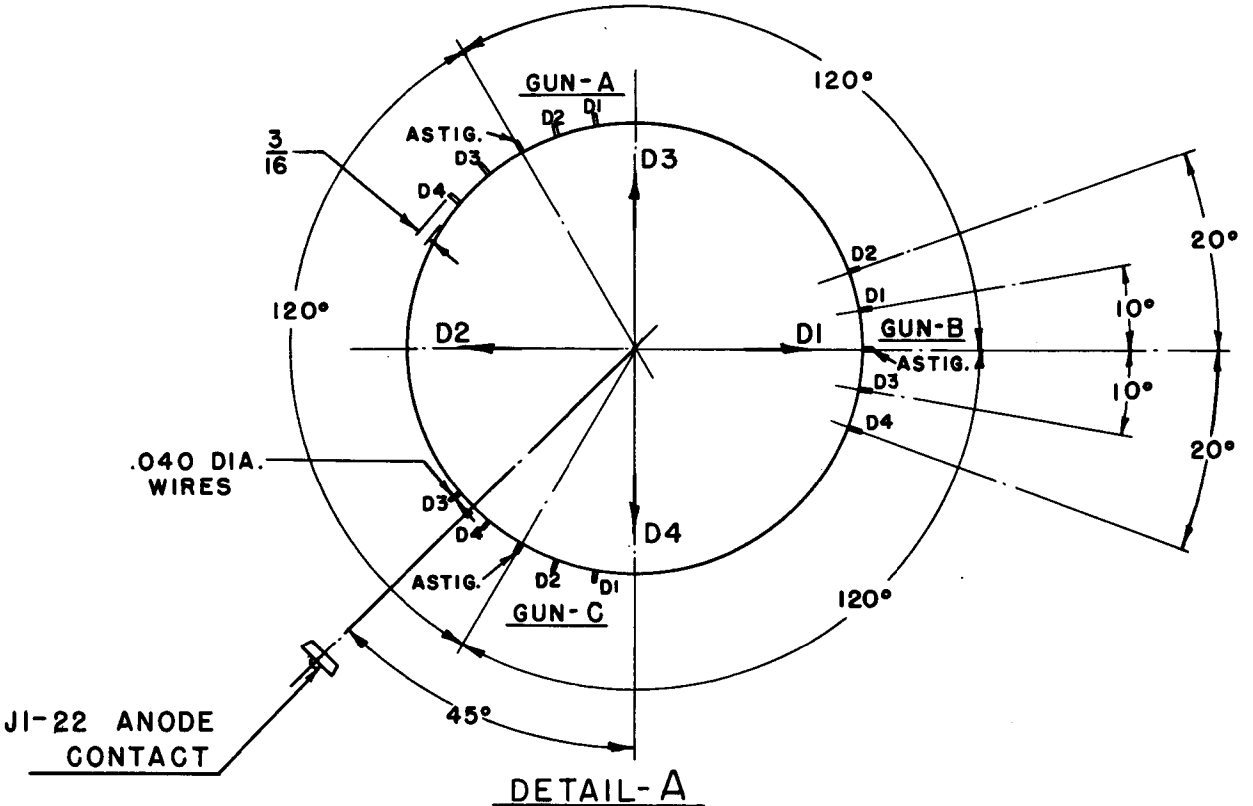
NOTES:

1. *Values are for each gun unless otherwise specified.*
2. *Visual extinction of undeflected focused spot.*
3. *Per MIL-E-1 and at a control grid voltage of 25 volts above spot cutoff.*
4. *The deflection factor (for both D1-D2 and D3-D4 plate pairs separately) for a deflection of 75% of the minimum useful scan will not differ from the deflection factor at 25% of the minimum useful scan by more than the indicated value.*
5. *(See Diagram) With the tube shielded, D3-D4 traces vertical, and base Pin No. 11 at top, the three spot positions shall be within three 1 inch squares, each square centered along the vertical centerline of the tube face. The middle square (Gun B) centered on the tube face center, the top square (Gun A) centered 1⅜ inches above the tube face center, and the bottom square (Gun C) centered 1⅜ inches below the tube face center. The slides of the 3 square shall be parallel to the deflection axes.*
6. *Useful scan shall be measured from the center of the square as specified in Note 5 for spot centering.*
7. *The deflection of one beam when balanced dc voltages are applied to the deflection electrodes of either of the other two guns shall be less than the specified value.*
8. *The total horizontal movement of the left or right end of an 8" horizontal trace, produced by any of the three guns, when deflected vertically ¾ inches above or below its normal position, shall not exceed .060 inches.*

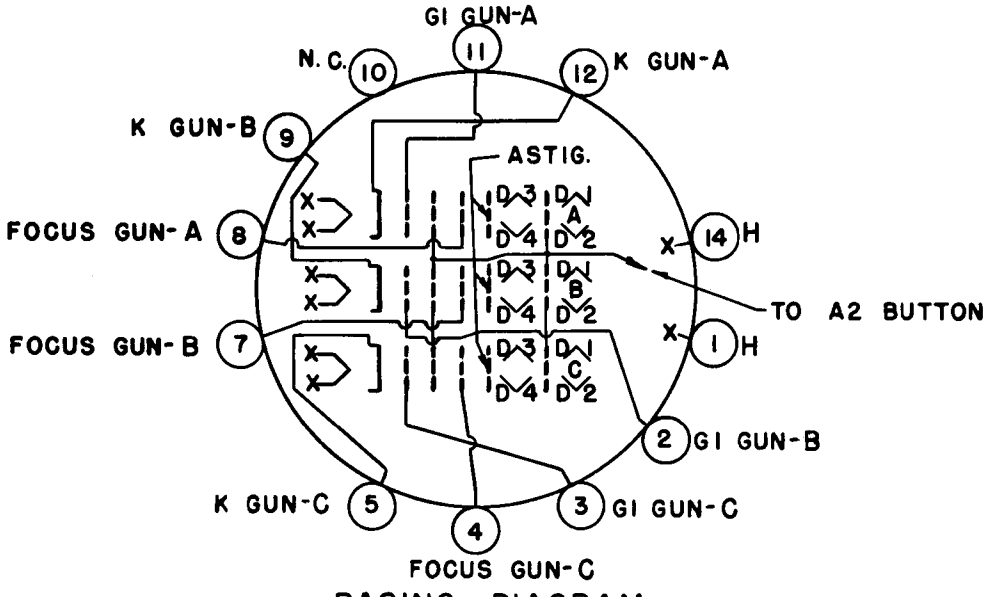
   The total vertical movement of the upper or lower end of a 1½ inch vertical trace produced by any of the three guns, when any one or all beams are deflected horizontally for the full 8 inches of sweep, shall be less than .075 inches.

OUTLINE


9 DIA.
MIN. USEFUL SCREEN
D3
D4
D1
D2
BASE KEY
10° MAX.
GUN-A
GUN-B
GUN-C
1
1 3/8
1 3/8
45°±10°
10 1/2 ± 1/16 O.D.
MOLD MATCH
7/16 R
2 7/8
23/32
42 R
SEAL LINE
3 1/2 ± 3/16
10 3/4 ± 3/16
J1-22
ANODE
CONTACT
11 3/4 R
13 ± 3/8
14 1/4
20 1/2 ± 1/2
NECK SPLICE
LINE
5 1/4 ± 1/16 O.D.
PLANE OF
DEFLECTION PLATE LEADS
(SEE DETAIL-A)
1" MIN. FOR CLAMPING
3/4 R
B12-37 BASE



DETAIL-A
VIEW FROM BASE END OF TUBE



BASING DIAGRAM
VIEW FROM BASE END

ADVANCE DATA

DESCRIPTION

The Sylvania SC-3090 is a three gun, electrostatically focused and deflected cathode ray tube with a 5 ½ x 5 ½ inch square face for displaying, simultaneously, three independently controlled traces. It features a spiral post deflection accelerator for high deflection sensitivity with minimum pattern distortion, an aluminized screen for increased brightness, and a gun structure designed for minimum beam tracking error.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic
Phosphor*	P19
Fluorescence	Orange
Phosphorescence	Orange
Persistence	Long

*In addition to the Type shown, the SC-3090 can be supplied with several other screen phosphors.

ELECTRICAL DATA[1]

Heater Voltage	6.3 Volts
Heater Current (3 Guns in Parallel)	1.50 to 1.98 Amperes
Direct Interelectrode Capacitances (Approx.)	
Cathode to All	6 pf
Grid No. 1 to All	6 pf
D1 to D2	3.5 pf
D3 to D4	3 pf
D1 to All	10 pf
D2 to All	10 pf
D3 to All	10 pf
D4 to All	10 pf

MECHANICAL DATA

Overall Length	21 ½ ± ⅜ Inches
Minimum Useful Screen Dimensions	4 ½ Inch Square
Bulb Contact (Recessed Small Ball Cap)	J1-22
Neck Contacts (Small Ball Caps)	J1-25
Base	B25-139
Basing	See Diagram
Bulb	J55A

Base Alignment

Base Pin No. 12 Aligns with the Axis of the Tube Face within 10° and is on the Same Side as the Bulb Contact

Trace Alignment

Trace and Tube Face Alignment[2]	2 Degrees Max.

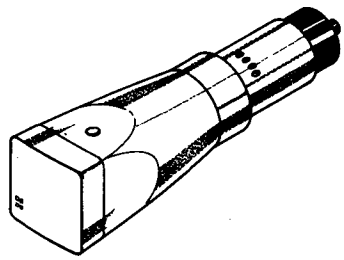
Positive Voltage on D1 (A gun, pin 5; B gun, pin 12; C gun, pin 21) Deflects the Beam Toward the Base Key.

Positive Voltage on D3 (A gun, pin 6; B gun, pin 10; C gun, pin 7) Deflects Beam Toward Bulb Contact

For Each Gun, Angle Between D1-D2 and D3-D4 Traces	90 ± 1 Degrees
Angle Between Corresponding Traces, All 3 Guns	1 Degree Max.

QUICK REFERENCE DATA

Three Independent Guns
5½" x 5½" Direct Viewed
Oscilloscope Tube
Electrostatic Focus
Electrostatic Deflection
Spiral Post Deflection Accelerator
Aluminized Screen



For Basing
Diagram See
Page 4

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JULY, 1963

File Under
SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

MAXIMUM RATINGS (Absolute Maximum Values)[1]

Anode No. 3 Voltage	10,500 Volts	dc
Anode No. 2 Voltage	3500 Volts	dc
Ratio Anode No. 3 Voltage to Anode No. 2 Voltage	4.0	
Intergun Shield Voltage	3500 Volts	dc
Anode No. 1 Voltage for Focus	1750 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	200 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Heater to Cathode Voltage		
Heater Negative with Respect to Cathode	180 Volts	
Heater Positive with Respect to Cathode	180 Volts	
Peak Voltage Between Anode No. 2 or Intergun Shield, and any Deflection Plate	750 Volts	

TYPICAL OPERATING CONDITIONS[1]

Anode No. 3 Voltage	7500 Volts	dc
Anode No. 2 Voltage	2300 Volts	dc
Intergun Shield Voltage	2300 Volts	dc
Anode No. 1 Voltage for Focus	460 to 775 Volts	dc
Grid No. 1 Voltage[3]	−45 to −80 Volts	dc
Anode No. 3 Helix Current[4]	30 μadc	Max.
Line Width "A"[5]	.50 mm	Max.
Line Width "B"[5]	.65 mm	Max.
Modulation[5]	16 Volts dc	Max.
Deflection Factors		
D1-D2	55 to 88 Vdc/in.	
D3-D4	53 to 75 Vdc/in.	
Deflection Factor Uniformity (per MIL-E-1)	2 Percent	
Interaction Factor[6]	6×10^{-5} in/Vdc	
Pattern Distortion[7]	2.5 Percent	
Tracking Error[8]		
Spot Position[9]		

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.
Deflection Circuit Resistance	1.0 Megohms	Max.

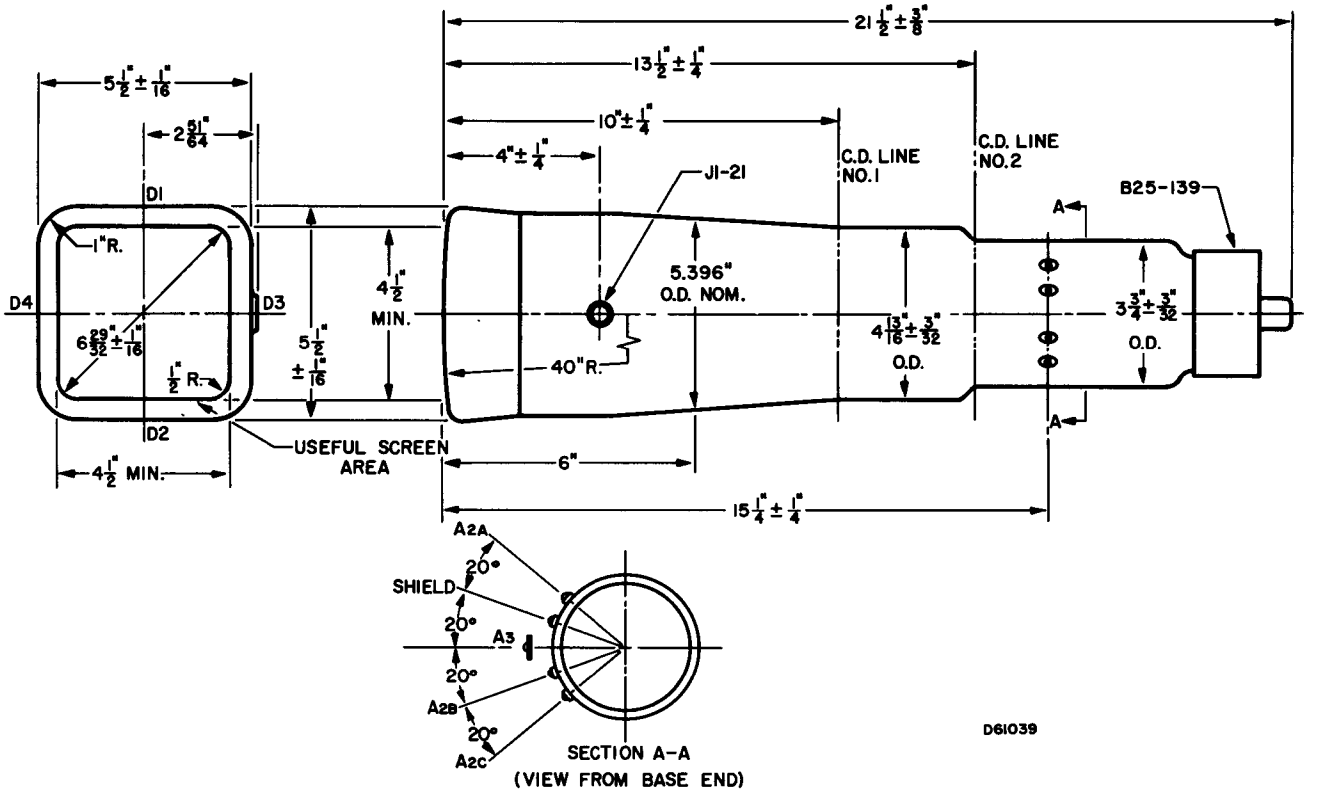
NOTES:

1. *Values are for each gun unless otherwise specified.*
2. *The angle between the D1-D2 trace of any gun, when positioned at the center of the tube, and the edge of the tube face, on the side having the bulb contact, will not exceed 2°.*
3. *Visual extinction of undeflected focused spot.*
4. *When the tube is cutoff (no beam current), the Anode No. 3 will draw 30 μadc maximum.*
5. *Per MIL-E-1 at Ib3 = 2 μadc. Ib3 is beam current to the screen. To determine Ib3, measure current at the Anode No. 3 terminal and subtract the Anode No. 3 helix current with no beam current flowing (tube cutoff).*
6. *The deflection of one beam when balanced dc voltages are applied to the deflection electrodes of either of the other two guns will not be greater than the specified amount.*
7. *The edges of a raster pattern whose mean dimensions are 75 % of the useful screen width, will not deviate from the mean dimension by more than the amount specified.*
8. *Tracking area A is a circle, 4 inches in diameter, centered on the geometric center of the tube face. Tracking area B is that area outside of Area A but within a 4 x 4 inch square centered on the geometric center of the tube face, and with the sides parallel to the deflection axes. After compensation for spot centering and deflection factor differences, the greatest distance between the spots within tracking area A will be 0.055 inches, and within tracking area B, 0.075 inches.*
9. *With the tube shielded, the undeflected focused spots of all three guns will fall within a square, 15 mm on a side, centered on the tube face, with its sides parallel with the deflection axes.*

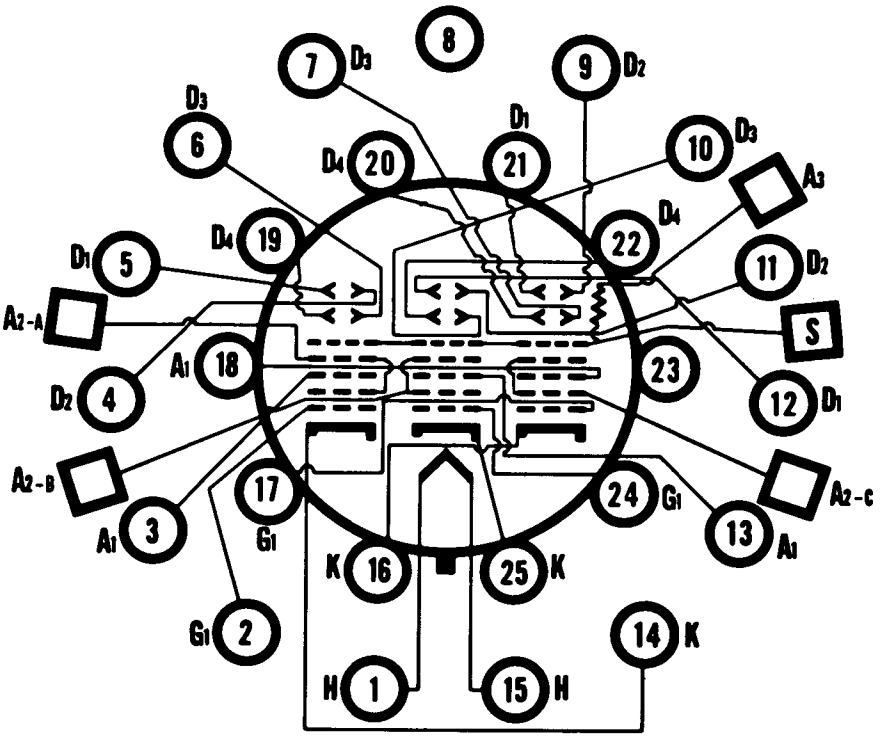
WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE



BASING DIAGRAM



GUN-A

Pin No.	Element
14	Cathode
2	Grid No. 1
3	Anode No. 1
5	Deflector D1
4	Deflector D2
6	Deflector D3
19	Deflector D4

GUN-B

Pin No.	Element
25	Cathode
24	Grid No. 1
13	Anode No. 1
12	Deflector D1
11	Deflector D2
10	Deflector D3
22	Deflector D4

GUN-C

Pin No.	Element
16	Cathode
17	Grid No. 1
18	Anode No. 1
21	Deflector D1
9	Deflector D2
7	Deflector D3
20	Deflector D4

1 and 15 Heater (Common) S-Shield

DESCRIPTION

The Sylvania Type SC-3093 is a compact, 3″ monoscope tube designed for use in conjunction with high speed electrostatic printing equipment.
It features a useful target area approximately 2 x 2″, on which any pattern or up to 64 alpha numeric characters can be furnished. Artwork supplied on the target can be made according to individual customer's specifications.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10 % Amperes

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

All Voltages Measured with Respect to Cathode

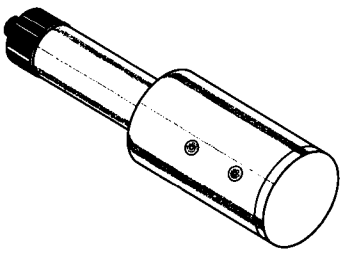
Collector	2500 Volts dc
Target	2500 Volts dc
Anode No. 1 (Focusing Electrode)	1000 Volts dc
Anode No. 2 (Accelerator)	2500 Volts dc
Negative Grid No. 1 (Control Grid)	200 Volts dc
Peak Heater Cathode Voltage	
Heater Negative with Respect to Cathode	200 Volts
Heater Positive with Respect to Cathode	200 Volts

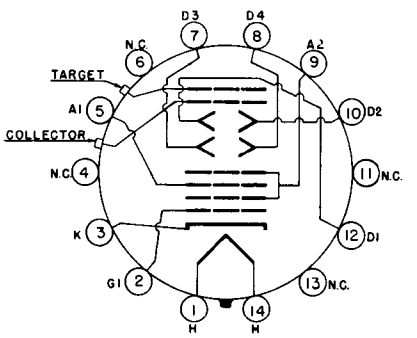
TYPICAL OPERATING CONDITIONS

Cathode-to-Target Voltage	1100-1600 Volts
Collector-to-Target Voltage	+50 Volts
Anode No. 2-to-Target	+110 to +225 Volts
Anode No. 1-to-Cathode	21 to 38 % of E_{A2}
Deflection Factors:	
D3-D4	62-81 Volts dc/Inch/kv.
D1-D2	75-98 Volts dc/Inch/kv.

QUICK REFERENCE DATA

3″ Diameter Monoscope
Round Glass Type
2 x 2″ Target Plate
Electrostatic Focus
Electrostatic Deflection





SYLVANIA ELECTRIC PRODUCTS INC.

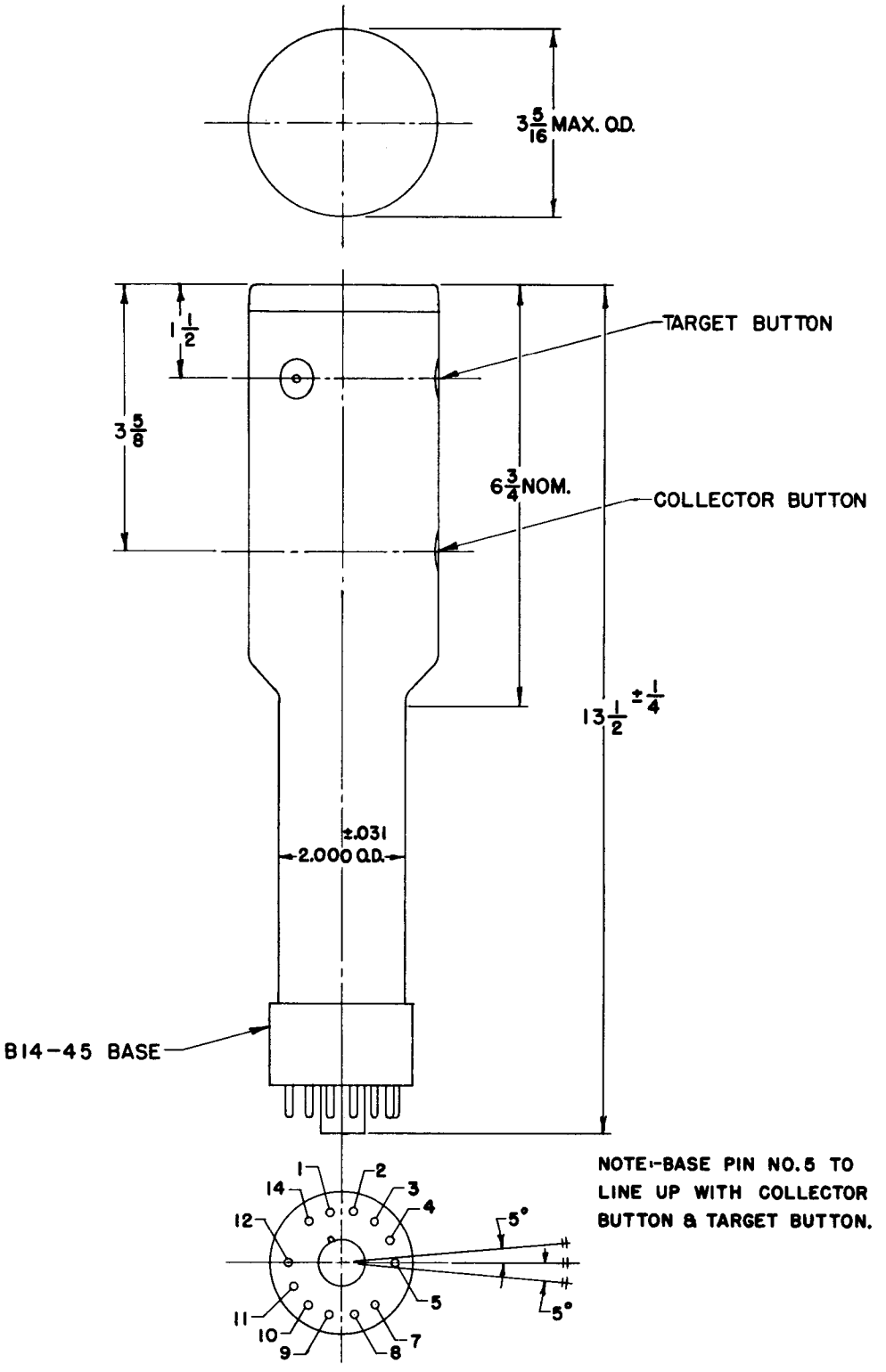
Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

JUNE, 1964

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

OUTLINE



NOTE:-BASE PIN NO. 5 TO LINE UP WITH COLLECTOR BUTTON & TARGET BUTTON.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angle (Approx.)	50	Degrees
Phosphor*	**P4**	**P11**
Fluorescence	White	Blue
Phosphorescence	White	Blue
Persistence	Med. Short	Short

*In addition to the phosphors shown the SC-3122 can be supplied with several other phosphors.

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10 %	Ampere
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	5	pf
Grid No. 1 to All Other Electrodes	6	pf

MECHANICAL DATA

Minimum Useful Screen Diameter	9	Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duodecal 6-Pin)	B6-63	
Basing	12M	
Bulb Contact Aligns with Vacant Pin Position No. 3	±10	Degrees

MAXIMUM RATINGS (Absolute Maximum Values)

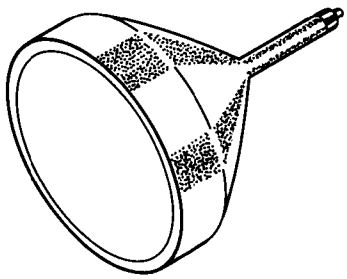
Anode Voltage	22,000 Volts	dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to 1100 Volts	dc
Grid No. 2 Voltage	770 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	200 Volts	dc
Positive Bias Value[1]	0 Volt	dc
Positive Peak Value	0 Volt	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	dc
Heater Positive with Respect to Cathode	200 Volts	dc

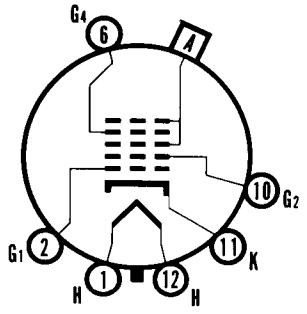
TYPICAL OPERATING CONDITIONS

Anode Voltage[2]	20,000 Volts	dc
Grid No. 4 Voltage for Focus[3]	0 to 300 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage for Cutoff[4]	−28 to −72 Volts	dc
Resolution at Ib = 50 μa	700 Lines	Min.

QUICK REFERENCE DATA

Monitor Tube
Electrostatic Focus
Magnetic-Deflection
10″ Diameter
Flat Face





12-M

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication
MAY, 1965

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

MAXIMUM CIRCUIT VALUE

Grid No. 1 Circuit Resistance . . . . . 1.5 Megohms Max.

NOTES:

1. *At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts. To prevent burning, minimum beam current densities should be employed.*
2. *Brilliance and definition decrease with decreasing anode voltage. In general, anode voltage should not be less than 7,000 volts.*
3. *With Eg1 adjusted for Ib = 50 microamperes.*
4. *Visual extinction of focused raster. Extinction of stationary focused spot will require values of about 5 volts more negative.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

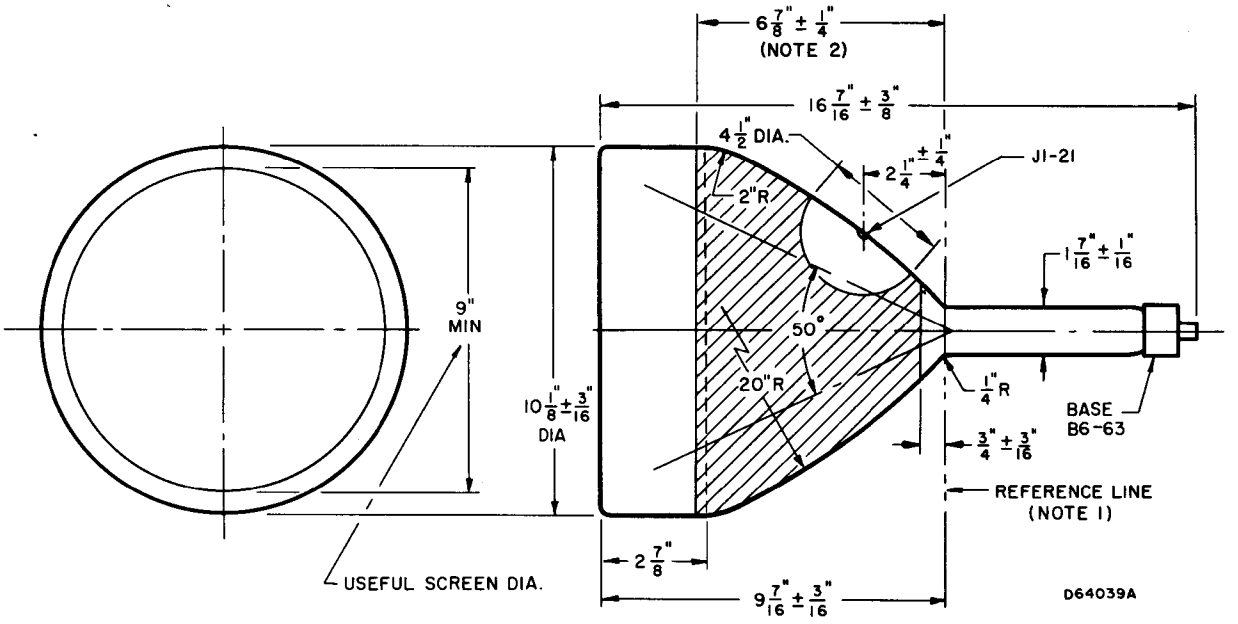


DIAGRAM NOTES:

1. *Reference line is the point where a 1.500" $^{+.003"}_{-.000"}$ diameter ring gauge 2" long will stop against the bulb.*
2. *With external conductive coating, tube is designated as the SC3122P-A. Capacitance value will be between 500 pf and 2500 pf*

SYLVANIA

engineering data service

SYLVANIA
SC-3144
SC-3154

DESCRIPTION

Sylvania Types SC-3144 and SC-3154 are electrostatic charge printing tubes designed for use in high speed printing equipment. Each is a cathode-ray tube which has as a target for the beam, an array of fine, closely spaced wires extending through the bulb wall. Deflection and modulation of the beam striking the wires will produce charge patterns on a dielectric in contact with the outer surface of the tube.

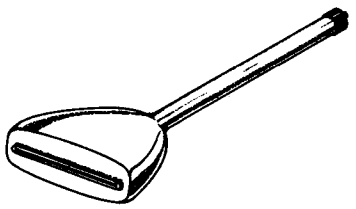
In the printing application, a moving strip of paper, used as the dielectric, has charge patterns deposited on it which can be developed and fixed to produce permanent visual records. Both black-and-white and half-tone copy can be produced.

The fine focus beam, the small wire size and close spacing in the array, and the low capacitance between wire elements, permit high resolution along with extremely rapid printing. Both types can be used for single line scanning, and the .160" height of the array of the SC-3154 permits two-dimensional scanning for other methods of operation. The useful printing width of the array is 8.6 inches.

The SC-3144 and SC-3154 were developed for the A. B. Dick Company, 5700 West Touhy Avenue, Chicago 48, Illinois for use in their Videograph Data Presentation Systems.

QUICK REFERENCE DATA

Electrostatic Charge
Printing Tube
Magnetic Deflection
Magnetic Focus
High Speed Printing
High Resolution
Min. Printing Dimensions:
.05" x 8.6" (SC-3144)
.16" x 8.6" (SC-3154)

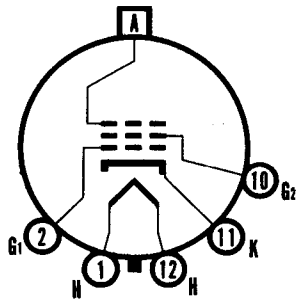


ELECTRICAL DATA

Focusing Method	Magnetic
Deflection Method	Magnetic
Horizontal Deflection Angle (Approx.)	52 Degrees
Heater Current at 6.3 Volts	600 ± 30 Ma
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 μμf
Grid No. 1 to All Other Electrodes	8 μμf

MECHANICAL DATA

Printing Head	
0.001" Diameter Conductive Elements Spaced Approximately 0.004" on Centers in Both Directions.	
Minimum Useful Printing Array Width	8.6 Inches
Minimum Useful Printing Array Height	
SC-3144	0.050 Inches
SC-3154	0.160 Inches
Array Thickness (Approx.)	0.50 Inches
Overall Length	26 ± 3/8 Inches
Width	10 5/8 ± 1/8 Inches
Height	3 7/16 + 1/16 − 1/8 Inches
Neck Length	17 ± 3/16 Inches
Neck Diameter	1 7/16 ± 1/16 Inches
Bulb Contact	C1-3
Base	B5-57
Basing	12D
Weight (Approx.)	6 Pounds



12-D

MAXIMUM RATINGS (Absolute Maximum System)

Unless Otherwise Specified, All Voltages are Positive with Respect to Cathode.

Maximum Anode Voltage	25,000 Volts	
Maximum Grid No. 2 Voltage	700 Volts	
Grid No. 1 Voltage		
Maximum Negative Value	155 Volts	dc
Maximum Negative Peak Value	200 Volts	
Maximum Positive Value	0 Volts	dc
Maximum Heater Voltage	6.9 Volts	
Minimum Heater Voltage	5.7 Volts	
Maximum Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

DECEMBER, 1961

File Under
SPECIAL AND GENERAL PURPOSE
CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS — Grid Drive Service

Unless Otherwise Specified, All Voltages are Positive with Respect to Cathode.

Anode Voltage[1]	10,000 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage (For Cutoff)	−40 to −77 Volts	dc
Focusing Coil Current[2]	50 ± 10 Ma	dc

NOTES:

1. *Anode voltage of 20,000 volts dc recommended for high resolution, two-dimensional scan on SC-3154.*
2. *For JEDEC Focus Coil No. 122 or equivalent, with the combined Grid No. 1 bias voltage and video-signal voltage adjusted to produce 100 μa anode current. Distance from the tube face to center of air gap on focus coil is 12 inches.*

OUTLINE

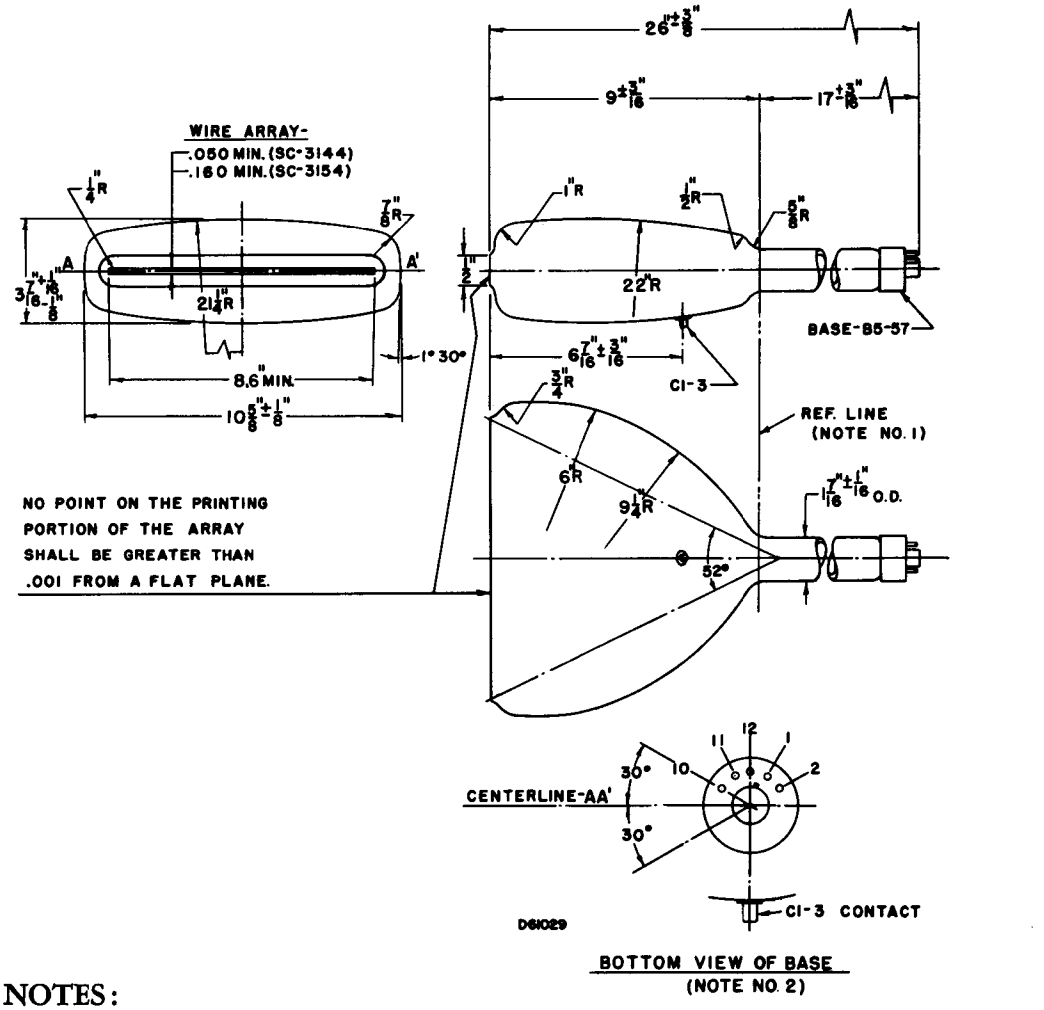


DIAGRAM NOTES:

1. *Reference line determined by plane where JEDEC Gauge No. 112 (a cylinder 1.500" + .003" − .000" I.D. and 2" long) will stop against body of bulb.*
2. *Vacant base pin positions No. 3 and No. 9 align with horizontal centerline (A-A') within 30°. Base Key is on side opposite the anode contact (C1-3).*

ADVANCE DATA

DESCRIPTION

Sylvania Type SC-3168 is a 5-inch diameter cathode-ray tube designed for high resolution photographic recording. Its electron-optical system, very low deflection angle, and fine grain screen achieve very fine trace width with conventional focusing and deflection units and a simple beam-centering magnet. The tube has a flat, clear, non-browning optical glass faceplate for optimum photographic quality. An integral encapsulated high voltage connector is utilized to minimize corona at high altitude.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angle (Approx.)	16 Degrees
Phosphor*	Fine Grain P11, Aluminized
Fluorescence	Blue
Persistence	Short
Faceplate	Clear, Non-Browning Optical Glass

*In addition to the type shown, the SC-3168 can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 10 % Ampere	
Direct Interelectrode Capacitances (Approx.)		
Grid No. 1 to All Other Electrodes	9 pf	
Cathode to All Other Electrodes	4.3 pf	
External Conductive Coating to Anode	500 pf	Max.
	100 pf	Min.

MECHANICAL DATA

Minimum Useful Screen Diameter	4 ¼ Inches
Overall Length	26 ± ⅜ Inches
Bulb	See Outline Drawing
Anode Terminal	16", HV Cable, Corona Protected
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12N

MAXIMUM RATINGS (Absolute Maximum Values)

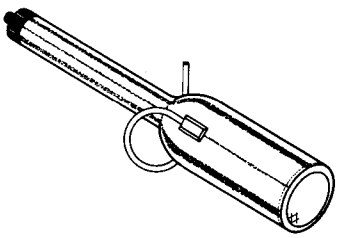
Anode Voltage	25,000 Volts	dc
Grid No. 2 Voltage	2500 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	150 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	0 Volts	
Peak Heater Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-upPeriod	165 Volts	
Heater Positive with Respect to Cathode	165 Volts	

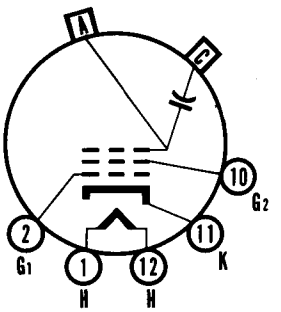
TYPICAL OPERATING CONDITIONS

Anode Voltage	20,000 Volts	dc
Grid No. 2 Voltage	2000 Volts	dc
Grid No. 1 Voltage Required for Cutoff[1]	−33 to −77 Volts	dc
Focusing Coil Current (Approx.)[2]	80 Ma	
Line Width[3]	0.002 Inch	

QUICK REFERENCE DATA

High Resolution Tube
.002" Line Width
5-Inch, Flat, Optical Glass Faceplate
Clear Non-Browning Faceplate
Extremely Fine Grain Screen
Aluminized Screen
Magnetic Deflection
Magnetic Focus
No Ion Trap
External Conductive Coating on Neck





12-N

SYLVANIA
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PICTURE TUBE
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SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
JULY, 1963

File Under
SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

CIRCUIT VALUES

Grid No. 1 Circuit Resistance . . . . . 1.5 Megohms Max.

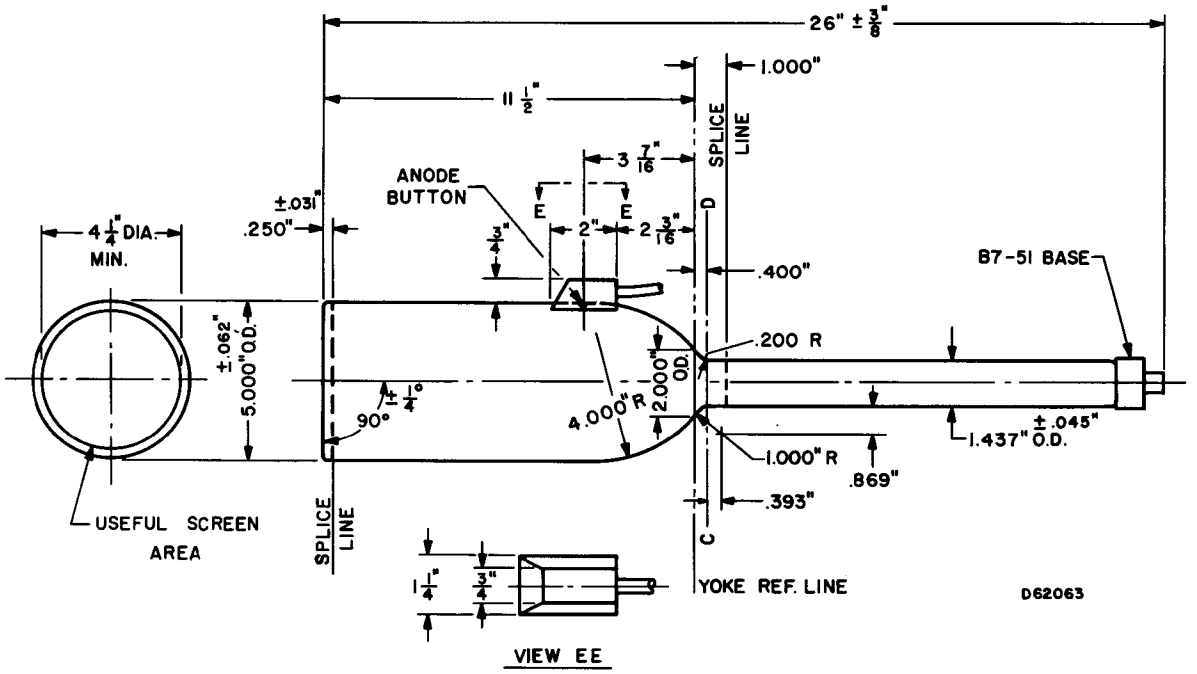
NOTES:

1. *Visual extinction of undeflected focused spot.*
2. *For JEDEC focusing coil 106 or equivalent 2 ½" from reference line.*
3. *Line width measured at 5 μa by the shrinking raster method. Variable strength (0-10 gauss) beam centering magnet must be used for optimum line width.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage of 16,000 volts, whichever is less.

OUTLINE



DESCRIPTION

The Sylvania Types SC-3179 and SC-3180 are short, electrostatic focus, magnetic deflection cathode-ray tubes with necks located off the bulb axis, intended for sector-scan radar applications. They feature low grid drive characteristic, small neck diameter to permit use of light weight, efficient deflection yokes, and 6.3 Volt, 300 Ma heaters. These types are similar except that SC-3179 has one inch shorter bulb body than SC-3180.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Maximum Deflection Angle (from Axis, Approx.)	SC-3179: 36°; SC-3180: 30 Degrees

Phosphor*	Fluorescence	Phosphorescence	Persistence
P7	Blue-White	Yellow	Long
P19	Orange	Orange	Long
P25	Orange	Orange	Long

Screen	Aluminized
Faceplate	Clear, Spherical

*In addition to the types shown, the SC-3179 and SC-3180 can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.3 ± 10 % Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	3 pf
Grid No. 1 to All Other Electrodes	6.5 pf

MECHANICAL DATA

Minimum Useful Screen Diameter	4¼ Inches
Bulb	SC-3179: J39½S; SC-3180: LEA-698
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base (9-Pin Miniature)[1]	E9-37
Basing	See Diagram
Weight	1¾ Pound

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	12,500 Volts dc
Grid No. 4 Voltage (Focusing Electrode)	−100 to +500 Volts dc
Grid No. 2 Voltage	500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	100 Volts dc
Positive Bias Value	0 Volt
Positive Peak Value	0 Volt
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	180 Volts
Heater Positive with Respect to Cathode	180 Volts

TYPICAL OPERATING CONDITIONS[4]

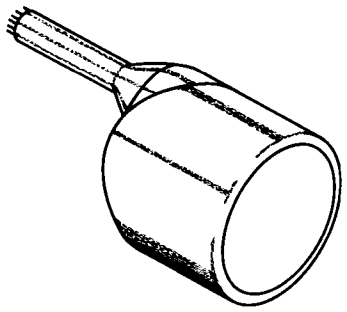
Anode Voltage	8000 Volts dc	
Grid No. 4 Voltage for Focus[2]	−40 to +250 Volts dc	
Grid No. 2 Voltage	250 Volts dc	
Grid No. 1 Voltage Required for Spot Cutoff	−10 to −25 Volts dc	
Line Width "A"[3]	0.014 Inch	Max.
Modulation[3]	20 Volts dc	Max.

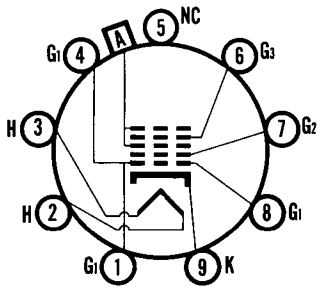
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

Radar Indicator
Sector Scan
5" Direct Viewed
Round Glass Type
Offset Neck
Aluminized Screen
Magnetic Deflection
Electrostatic Focus
⅞ Inch Neck Diameter
6.3 Volt—300 Ma Heater
SC-3179: Short Length





SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

JUNE, 1964

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

NOTES:

1. *A socket with a center opening to clear the tubulation must be used. Care should be exercised to avoid damage to the tubulation.*
2. *With Grid No. 1 Voltage adjusted to give an anode current of 100 μa.*
3. *Measured per Mil-E-1 specifications at an anode current of 100 μa.*
4. *The P19 and P25 screens can be permanently damaged if current density is permitted to rise too high. To prevent burning, minimum beam current densities should be employed.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE—SC-3180

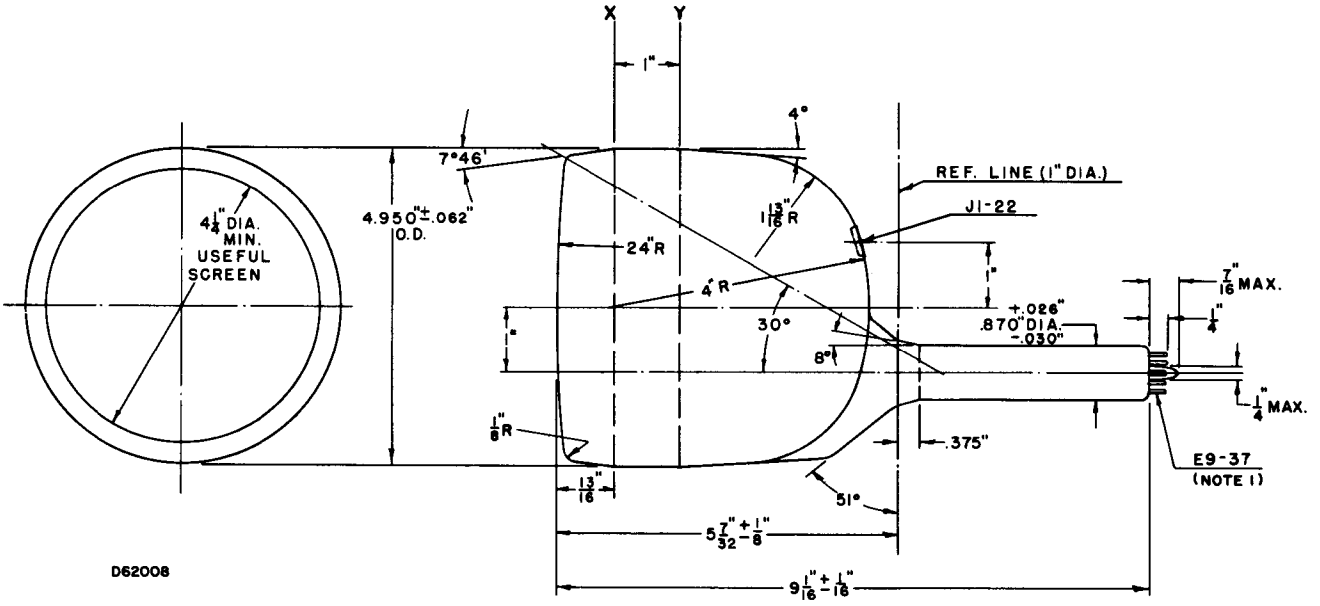


DIAGRAM NOTE:

1. *Mid-plane between base pins No. 1 and No. 9 aligns with bulb contact (J1-22), ±30°.*

OUTLINE—SC-3179

Dimensions are similar to SC-3180 except that X and Y planes are common, reducing body length to 4 7/32" and overall length to 8 1/16", and increasing deflection angle to 36 degrees approximate.

ADVANCE DATA

DESCRIPTION

Sylvania Type SC-3185 is a 21-inch rectangular cathode-ray tube for character writing and television display applications. It has two pairs of electrostatic deflection plates having high sensitivity and limited scan, for writing alpha-numeric characters and symbols, and uses 72 degree magnetic deflection for positioning the characters and for full-screen scanning.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Character Writing	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Vertical	53 Degrees
Horizontal	67 Degrees
Diagonal	72 Degrees
Phosphor*	P4
Fluorescence	White
Persistence	Short to Medium
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	75 Percent

*In addition to the type shown, the SC-3185 can be supplied with several other phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 5 % Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 pf
Grid No. 1 to All Other Electrodes	6.5 pf
D1 to D2	2 pf
D3 to D4	2.5 pf

MECHANICAL DATA

Minimum Useful Screen Dimensions	19 1/16 x 15 1/16 Inches
Minimum Useful Screen Area	262 Sq. Inches
Bulb	J171B or J171F
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Neck Contacts (5)	J1-25
Base (Short Small Shell Duodecal 6-Pin)	B6-203
Basing	See Diagram

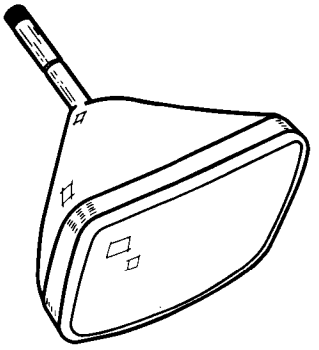
RATINGS

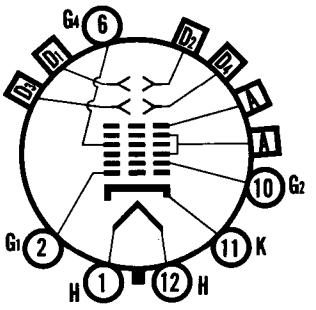
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage[1]	22,000 Volts
Grid No. 4 (Focusing Electrode) Voltage	−550 to +1100 Volts
Grid No. 2 Voltage	700 Volts
Grid No. 1 Voltage	
Negative Bias Value	180 Volts
Negative Peak Value	220 Volts
Positive Bias Value	0 Volts
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period Not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts
Peak Voltage Between Anode and Any Deflection Plate	550 Volts

QUICK REFERENCE DATA

Character Writing Tube
21" Direct Viewed
Rectangular Glass Type
Spherical Faceplate
Gray Filter Glass
Low Voltage Electrostatic Focus
Electrostatic Character Writing
Magnetic Deflection
No Ion Trap
Aluminized Screen





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE
OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
JULY, 1963

File Under
SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage[1]	15,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage Required for Cutoff[2]	−35 to −72 Volts	dc
Deflection Factors (Approx.)[3]		
D1-D2	170 Volts	dc/In.
D3-D4	185 Volts	dc/In.

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5 Megohms Max.

NOTES:

1. *Connect both bulb and neck anode contacts to anode supply.*
2. *Visual extinction of focused raster. Extinction of the stationary focused spot will require that these values be about 5 volts more negative.*
3. *Useful electrostatic deflection is limited to ±1 inch on each axis.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

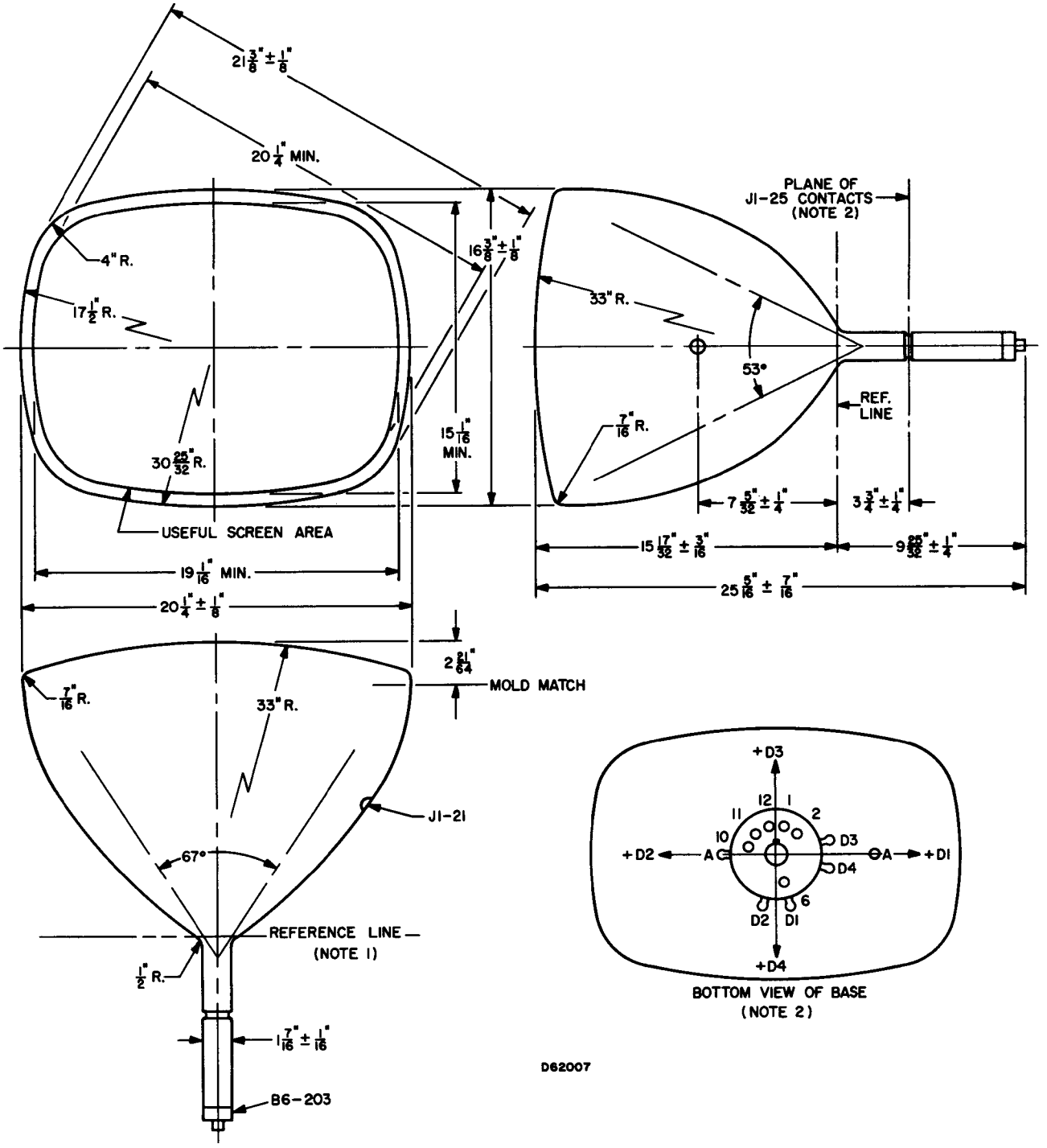


DIAGRAM NOTES:

1. *With the tube neck inserted through the flared end of Reference-Line Gauge (JEDEC No. 110) and with the tube seated in the gauge, the reference line is determined by the intersection of the Plane C-C' (face of the flared end) of the gauge with the glass funnel.*
2. *Deflection plates and anode are connected to J1-25 contacts which are recessed into neck. Alignment of contacts and orientation of deflection plates are shown at lower right.*

DESCRIPTION

A flat face 5″ high resolution electrostatically deflected and focused cathode ray tube. Monoaccelerator construction is employed for maximum resolution and minimum deflection defocusing and pattern distortion. Deflection electrodes are brought out through the neck wall to minimize lead inductance and capacitance.

CHARACTERISTICS

GENERAL DATA

Focus Method	Electrostatic
Deflection Method	Electrostatic
Phosphor*	P11

*The tube can be supplied in any of several standard phosphors if required.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.600 ± 10 % Ampere

MECHANICAL DATA

Overall Length	$18\frac{5}{8} \pm \frac{3}{8}$ Inches
Face to Neck Contacts	$11\frac{1}{4} \pm \frac{1}{4}$ Inches
Neck Diameter	2 Inches
Face Diameter	5 Inches
Base	B12-37
Medium Shell Diheptal	12 Pin
Neck Buttons (7)	J1-25
	4 Deflection Plates
	1 A2 Contact
	1 Focus Contact
	1 Astigmatism
Bulb	J42P
Basing	See Diagram
Trace Angle Between 1D2 and 3D4 Traces	90 ± 1 Degree

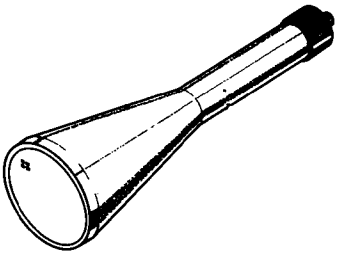
Dynamic Focusing is Recommended for Optimum Operation.

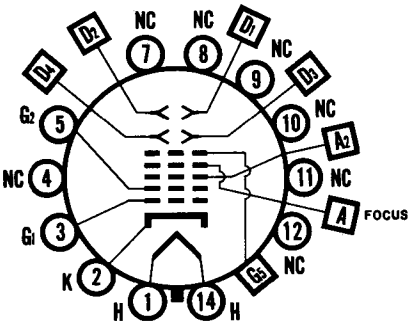
MAXIMUM RATINGS

Anode A2 Voltage	11 Kv
Anode A1 Voltage	6 Kv
G2 Voltage	4 Kv
Grid No. 1 Voltage	
Negative Bias Value	220 Volts
Positive Bias Value	0 Volt
Positive Peak Value	2 Volts
Peak Heater Cathode Voltage	
Heater Negative with Respect to Cathode	200 Vdc
Heater Positive with Respect to Cathode	0 Vdc
Peak Voltage Between Anode No. 2 and Any Deflection Plate	800 Vdc

QUICK REFERENCE DATA

- High Resolution for Photographic Recording
- 5″ Flat Face
- High Resolution
- Electrostatic Focus
- Electrostatic Deflection
- Monoaccelerator Construction
- Deflection Contacts Brought Out Through Neck
- SC-3195B—Aluminized Screen





SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

APRIL, 1964

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

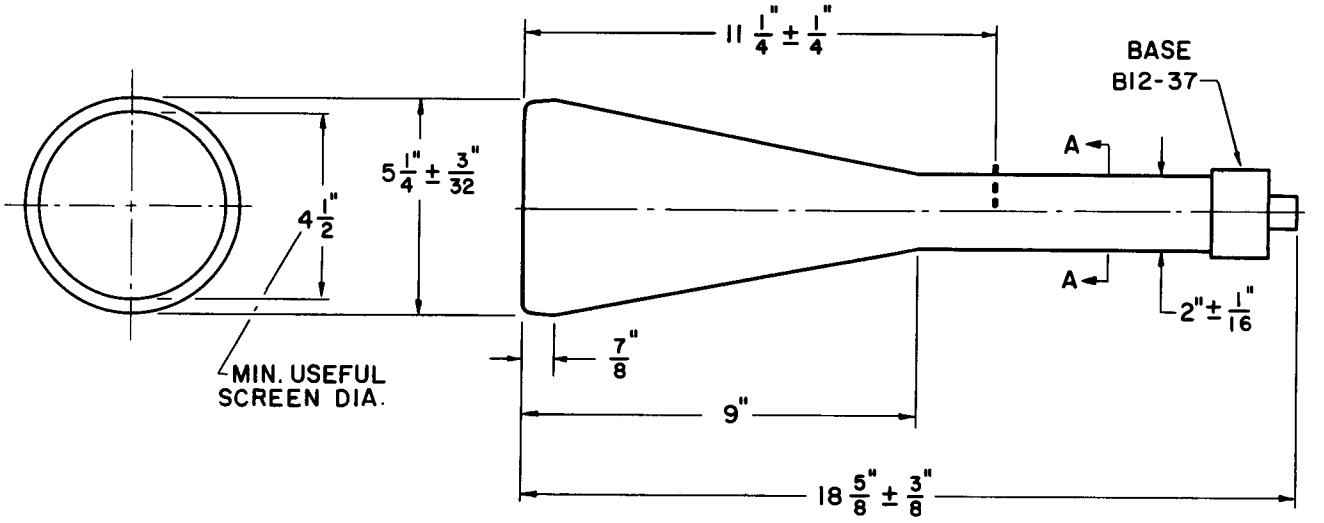
TYPICAL OPERATING CONDITIONS

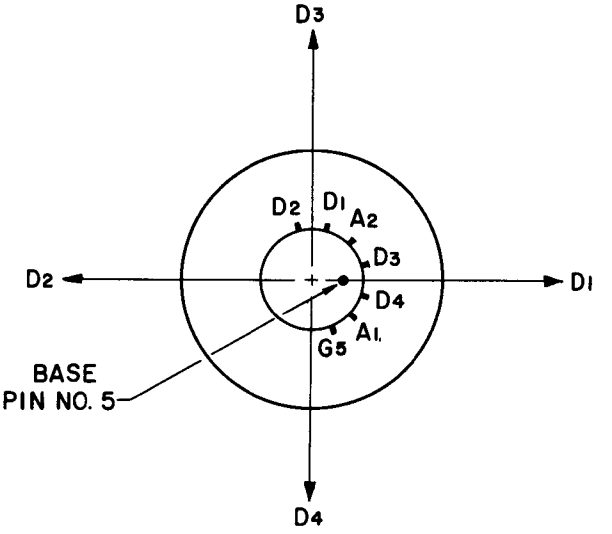
A2 Voltage	10,000 Volts DC
Astigmatism Voltage (G5)	10,000 ± 50 Volts
A1 Voltage (Focus)	4500-5500 Volts DC
G2 Voltage	2000 Volts DC
G1 Voltage for Cutoff	150 ± 20 % Volts
Deflection Factors	
1D2	285 ± 20 % Volts/In.
3D4	150 ± 20 % Volts/In.
Scan Size Minimum	
1D2	4 Inches
3D4	4 Inches
Line Width at 20 Volts Drive	0.003 Inches
Undeflected Spot Position	15 MM Sq.

GENERAL CONSTRUCTION AND QUALITY

The tube will be constructed and tested to comply with the applicable MIL-E-1D specifications.

OUTLINE





D64005

SECTION A-A
VIEW FROM BASE END OF TUBE

DESCRIPTION

The Sylvania Type SC-3304 is a cathode ray tube with a fiber optics strip inserted into the faceplate. This tube is designed for high resolution photographic recording. The fiber optics strip has an active area 2¾" long by ¼" wide. The electron-optical system and fine grain screen achieve very fine trace width with conventional focusing and deflection units and a simple beam-centering magnet.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angle (Approx.)	30 Degrees
Phosphor*	Fine Grain P11, Aluminized
Fluorescence	Blue
Persistence	Short
Faceplate	Fiber Optics

*In addition to the phosphor shown, the SC-3304 can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10 % Ampere
Direct Interelectrode Capacitances (Approx.)	
Grid No. 1 to All Other Electrodes	9 pf
Cathode to All Other Electrodes	4 pf

MECHANICAL DATA

Minimum Useful Fiber Optics Screen Size	2¾" x ¼"
Overall Length	16 ± ⅜ Inches
Base	B8-181
Basing	See Diagram

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	25,000 Volts dc
Grid No. 2 Voltage	2500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	150 Volts dc
Positive Bias Value	0 Volt
Positive Peak Value	0 Volt
Peak Heater Cathode Voltage	
Heater Negative with Respect to Cathode During Warm-up Period Not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	165 Volts
Heater Positive with Respect to Cathode	165 Volts

TYPICAL OPERATING CONDITIONS

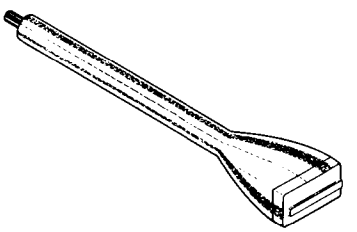
Anode Voltage	20,000 Volts dc
Grid No. 2 Voltage	2000 Volts dc
Grid No. 1 Voltage Required for Cutoff[1]	−33 to −77 Volts dc
Focusing Coil Current (Approx.)[2]	100 Ma
Line Width[3]	0.001 Inch

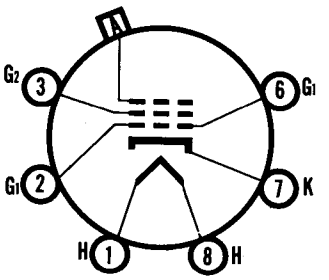
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

QUICK REFERENCE DATA

High Resolution Tube
.001" Line Width
Fiber Optics Strip
(inserted in faceplate)
Extremely Fine Grain Screen
Magnetic Deflection
Magnetic Focus
No Ion Trap
Aluminized Screen





SC-3304

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

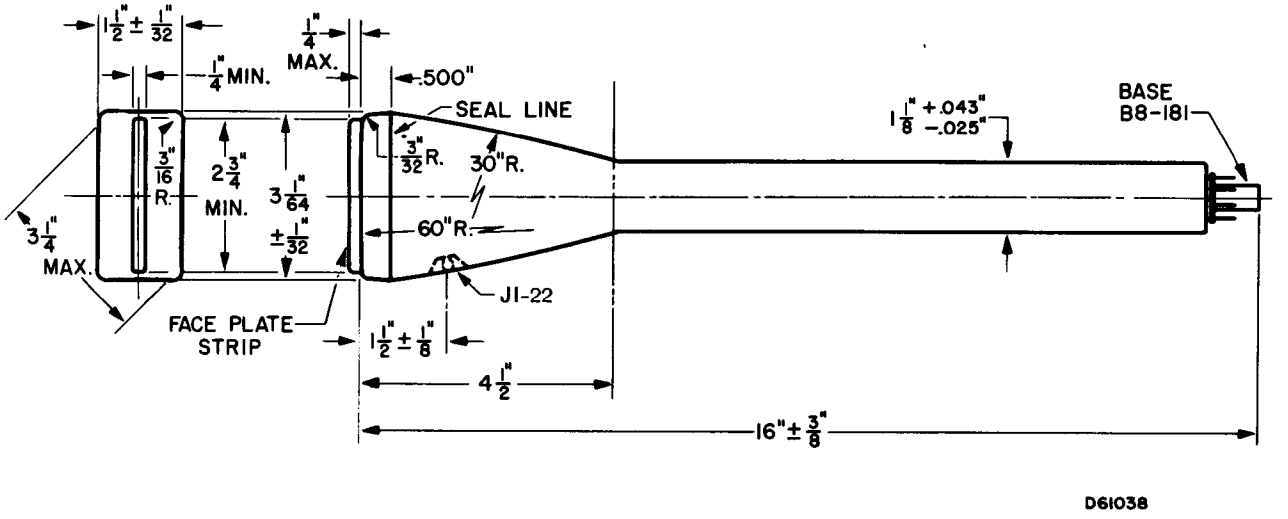
JUNE, 1964

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

NOTES:

1. *Visual extinction of undeflected focused spot.*
2. *For JEDEC focusing coil 106 or equivalent 2½" from reference line.*
3. *Line width measured at 5 μa by the shrinking raster method. Variable strength (0-10 gauss) beam centering magnet must be used for optimum line width.*

OUTLINE



Base Alignment:

Centerline between Pin positions 4 and 5 aligns with major axis of tube face within 30°, and is on same side as anode contact (J1-22).

ADVANCE DATA

DESCRIPTION

The Sylvania SC-3369 is a 16″ diameter, all glass cathode ray tube for character writing applications. Two pairs of electrostatic deflection plates are provided for character generation while character positioning is by means of magnetic deflection. The tube is electrostatically focused and has an aluminized screen.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method[1]	Electrostatic and Magnetic
Bulb	J127B
Phosphor Number	P7
Fluorescent Color	Blue
Phosphorescent Color	Yellow
Persistence	Long

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current at 6.3 Volts	0.6 ± 10 % Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	3.8 pf
Grid No. 1 to All Other Electrodes	7.5 pf
D1 to D2	1.0 pf
D3 to D4	1.0 pf
D1 to All Other Electrodes	2.8 pf
D2 to All Other Electrodes	2.8 pf
D3 to All Other Electrodes	3.1 pf
D4 to All Other Electrodes	2.8 pf

RATINGS (Design Center Values)

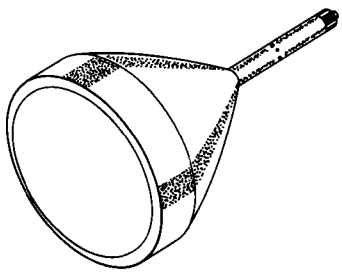
Accelerator Voltage	15,000 Volts dc	Max.
Accelerator Input	8 Watts	Max.
Focusing Electrode Voltage	5600 Volts dc	Max.
Grid No. 2 Voltage	700 Volts dc	Max.
Grid No. 1 Voltage		
Negative Bias Value	300 Volts dc	Max.
Positive Bias Value	0 Volt dc	Max.
Positive Peak Value	0 Volt	Max.
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	410 Volts	Max.
After Equipment Warm-up Period	180 Volts	Max.
Heater Positive with Respect to Cathode	180 Volts	Max.
Peak Voltage Between Accelerator and Any Deflection Electrode	500 Volts	Max.

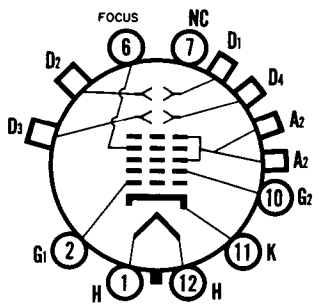
TYPICAL OPERATING CONDITIONS

Accelerator Voltage	12,000 Volts dc
Focusing Electrode Voltage	3000 to 4400 Volts dc
Grid No. 2 Voltage	400 Volts dc
Grid No. 1 Voltage[3]	−35 to −70 Volts dc
Modulation[2]	30 Volts Max.
Line Width "A"[2]	0.012 Inch Max.
Deflection Factors	
D1 and D2	315 to 385 Volts dc/Inch
D3 and D4	330 to 410 Volts dc/Inch
Focusing Electrode Current For Any Operating Condition	−10 to +5 μA
Spot Position (Focused and Undeflected)[4]	Within a 25 mm Square
Maximum Grid No. 2 Current For Any Operating Position	5 μA

QUICK REFERENCE DATA

Character Writing Tube
16″ Diameter
Electrostatic and Magnetic Deflection
Electrostatic Focus
Aluminized Screen





SC-3369

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

SEPTEMBER, 1964

File Under

SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Resistance in Any Deflecting-Electrode Circuit[5]	5.0 Megohms Max.

NOTES:

1. *The electrostatic deflection plates are designed to form a ½ inch square raster which can be deflected to any portion of the screen by the magnetic deflection yoke. Larger rasters may be used with a corresponding decrease in magnetic deflection area.*
2. *Measured in accordance with MIL-E-1 specifications, with Ib = 25 μA.*
3. *Visual extinction of the undeflected focused spot.*
4. *Connect deflecting electrodes to accelerator.*
5. *It is recommended that the deflecting electrode-circuit resistances be approximately equal.*

OUTLINE

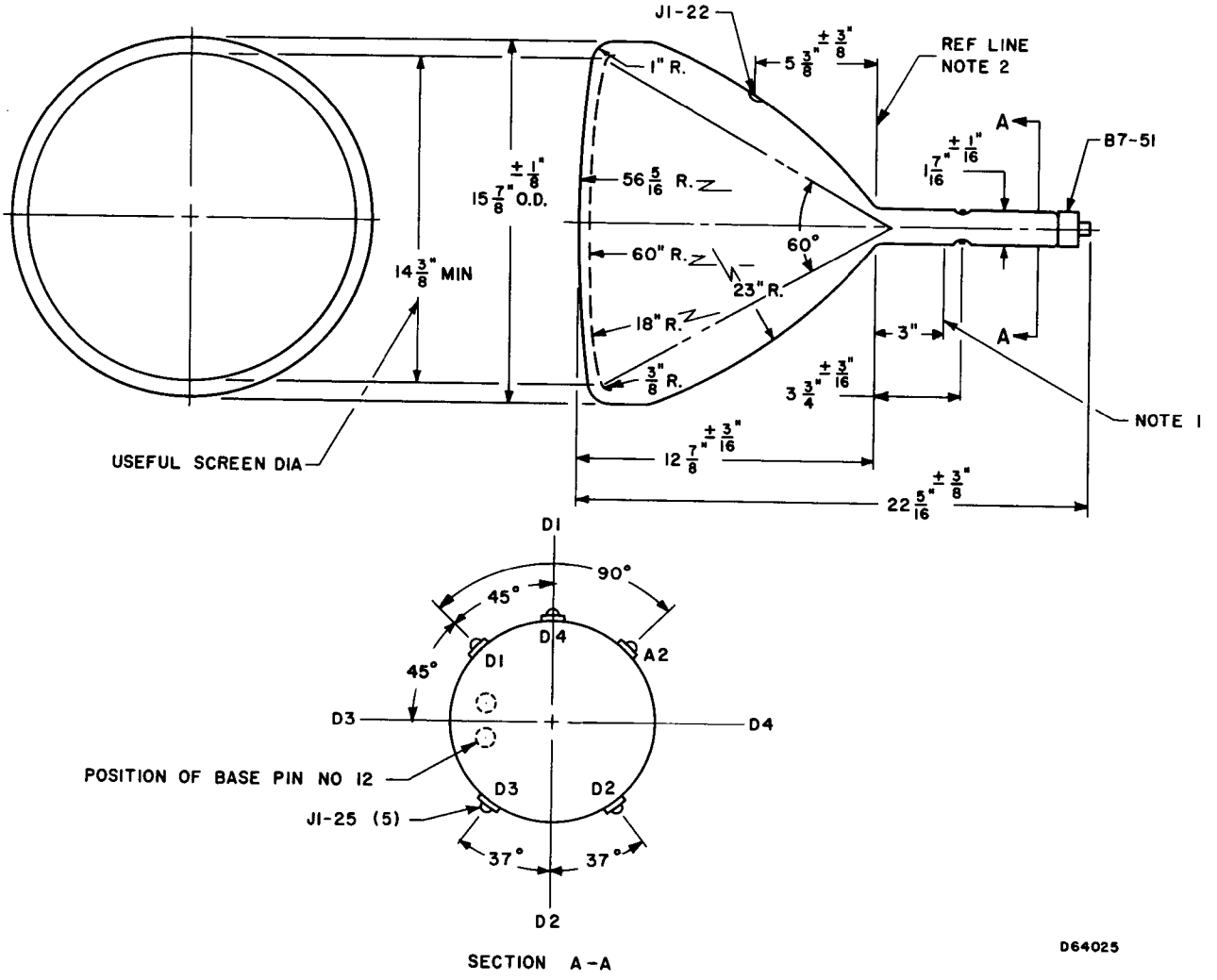


DIAGRAM NOTES:

1. *The magnetic deflection field should not extend below this line.*
2. *Point where JEDEC G-112 reference line gauge will stop.*

DESCRIPTION

Sylvania Types SC-3377, SC-3511, SC-3551, and SC-3802 are electrostatic focus and deflection cathode ray tubes with very high deflection sensitivity.

These types use helical-resistor post-deflection acceleration to achieve high writing rate, high deflection sensitivity, and freedom from pattern distortion.

The high deflection sensitivity and low heater power make these tubes particularly suitable for compact, transistorized portable equipments.

CHARACTERISTICS

GENERAL DATA

Focusing Method			Electrostatic
Deflection Method			Electrostatic
Screen Types*	Fluorescence	Phosphorescence	Persistence
P1	Green	—	Medium
P2	Blue-Green	Green	Long
P7	Blue-White	Yellow	Long
P11	Blue	—	Short
Faceplate			Clear

*In addition to the screens shown, these types can be supplied with several other screen phosphors.

ELECTRICAL DATA

	SC-3377	SC-3511 SC-3551 SC-3802	
Heater Voltage	6.3	1.5	Volts
Heater Current	0.6 ± 10 %	0.14 ± 10 %	Amperes

DIRECT INTERELECTRODE CAPACITANCES (Approximate)

Cathode to All Other Electrodes	5 pf
Grid No. 1 to All Other Electrodes	6 pf
Between Deflecting Plates 1-2[1]	3 pf
Between Deflecting Plates 3-4[1]	2 pf
Deflecting Plate 1 to All Other Electrodes	6 pf
Deflecting Plate 2 to All Other Electrodes	6 pf
Deflecting Plate 3 to All Other Electrodes	4 pf
Deflecting Plate 4 to All Other Electrodes	4 pf

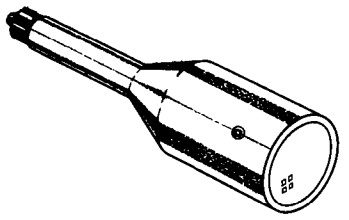
MECHANICAL DATA

Minimum Useful Screen Dimensions (Rounded Corners) (SC-3377, SC-3511, and SC-3551)	2⅞ x 2⅞ Inches
Minimum Useful Screen Diameter (SC-3802)	2⅝ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Neck Contacts (Anode No. 2 and Deflection Plates) (SC-3377 and SC-3511)	J1-25
Weight (Approx.)	1 ½ Pounds
Base (Small Shell Duodecal 12-Pin)	B12-43
Basing	Per Diagram
Base Alignment	
D1-D2 Trace Aligns with Pin No. 5 and Tube Axis	±10 Degrees
Positive Voltage on D1 Deflects Beam Approx. Toward Pin No. 5	
Positive Voltage on D3 Deflects Beam Approx. Toward Pin No. 2	
Bulb Contact Alignment	
J1-22 Contact Aligns with D1-D2 Trace	±10 Degrees
J1-22 Contact on Same Side as Pin No. 5	
Trace Alignment	
Angle Between D1-D2 and D3-D4 Traces	90 ± 1 Degrees

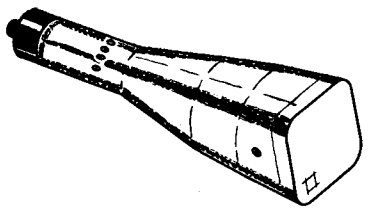
QUICK REFERENCE DATA

Oscilloscope Tube
Glass Type
Clear Faceplate
Electrostatic Focus
High Sensitivity
Electrostatic Deflection
Helical-Resistor Post
Deflection Acceleration
SC-3511, SC-3551 and SC-3802:
Very Low Heater Power

SC-3802



SC-3377
SC-3511
SC-3551



SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication
NOVEMBER, 1964

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Input		6.6 Watts	
Anode No. 3 Voltage		6600 Volts	dc
Anode No. 2 Voltage		2200 Volts	dc
Ratio of Anode No. 3 Voltage to Anode No. 2 Voltage[2]		5 : 1	
Anode No. 1 Voltage (Focusing Electrode)		1100 Volts	dc
Grid No. 1 Voltage			
Negative Bias Value		220 Volts	dc
Positive Bias Value		0 Volt	dc
Positive Peak Value		0 Volt	
	SC-3377	SC-3511 SC-3551 SC-3802	
Peak Heater-Cathode Voltage			
Heater Negative with Respect to Cathode	200	45 Volts	
Heater Positive with Respect to Cathode	200	0 Volts	
Peak Voltage Between Anode No. 2 and Any Deflecting Plate		600 Volts	
Post Deflection Accelerator Helix Resistance		600 Megohms	Max.
		200 Megohms	Min.

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage	3000 Volts	
Anode No. 2 Voltage[3]	1000 Volts	
Anode No. 1 Voltage for Focus	0 to 300 Volts	
Grid No. 1 Voltage Required for Cutoff[4]	−30 to −50 Volts	
Deflection Factors[1]		
Deflecting Plates 1-2	27 to 33 Volts dc/Inch	
Deflecting Plates 3-4	23 to 29 Volts dc/Inch	
Modulation at Ib3 = 10 μa[5]	30 Volts dc	Max.
Line Width "A" at Ib3 = 10 μa[5]	.45 mm	Max.
Deflection Factor Uniformity[5]	2 Percent	Max.
Pattern Distortion[6]	2 Percent	Max.
Undeflected Spot Position[7]	Within a 10 mm Square	
Useful Scan	2 ½ Inches	Max.

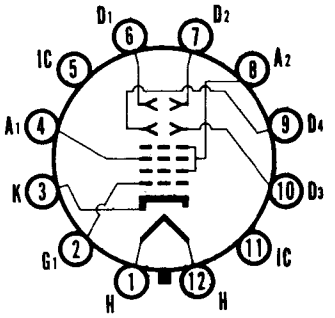
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.
Deflection Circuit Resistance[8]	1.0 Megohm	Max.

NOTES:

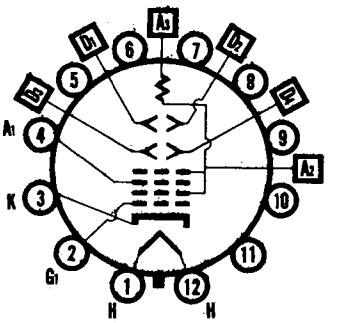
1. *Deflecting Plates D1 and D2 are nearer the screen, while deflecting plates D3 and D4 are nearer the base.*
2. *This tube is designed for optimum performance when operated at an Eb3/Eb2 ratio of 3.0. Operation at higher ratios of Eb3/Eb2 may result in changes of deflection uniformity and pattern distortion.*
3. *Under the typical operating conditions shown, the Anode No. 2 voltage should be variable from 940 to 1060 volts, to provide astigmatism adjustment. In order to maintain astigmatism control as cathode current is varied, it is recommended that the resistance in the Anode No. 2 circuit be limited to 12,500 ohms.*
4. *Visual extinction of undeflected focused spot.*
5. *Measured in accordance with MIL-E-1. Beam current (Ib3) is in addition to helix current in the Anode No. 3 circuit.*
6. *All portions of a raster pattern adjusted so its widest points just touch the sides of 2.295 x 2.295 inch square, will fall within the area bounded by the 2.295 x 2.295 inch square and an inscribed 2.205 x 2.205 inch square.*
7. *With the tube shielded and with the deflection plates connected to Anode No. 2. The limit square is centered on the tube face, with its sides parallel to the deflection axes.*
8. *It is recommended that the deflection electrode circuit resistances be approximately equal.*

BASING DIAGRAMS



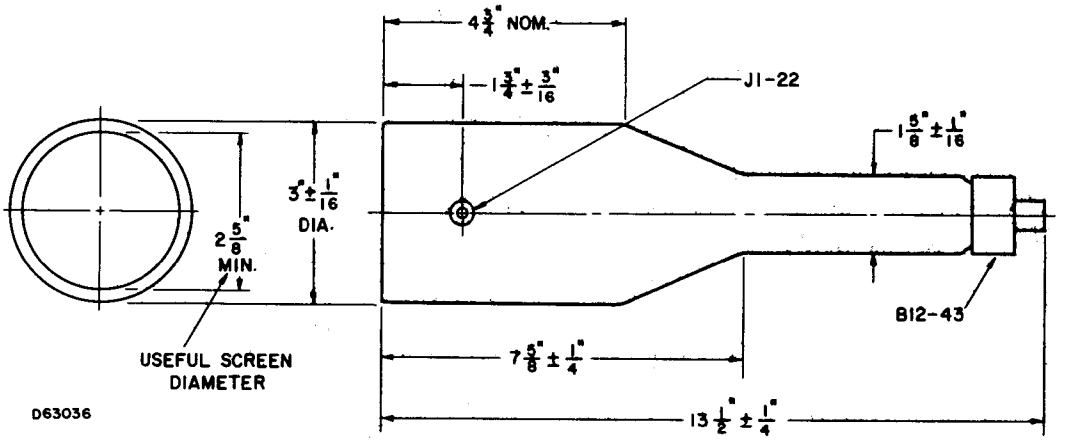
12-T

SC-3802
SC-3551

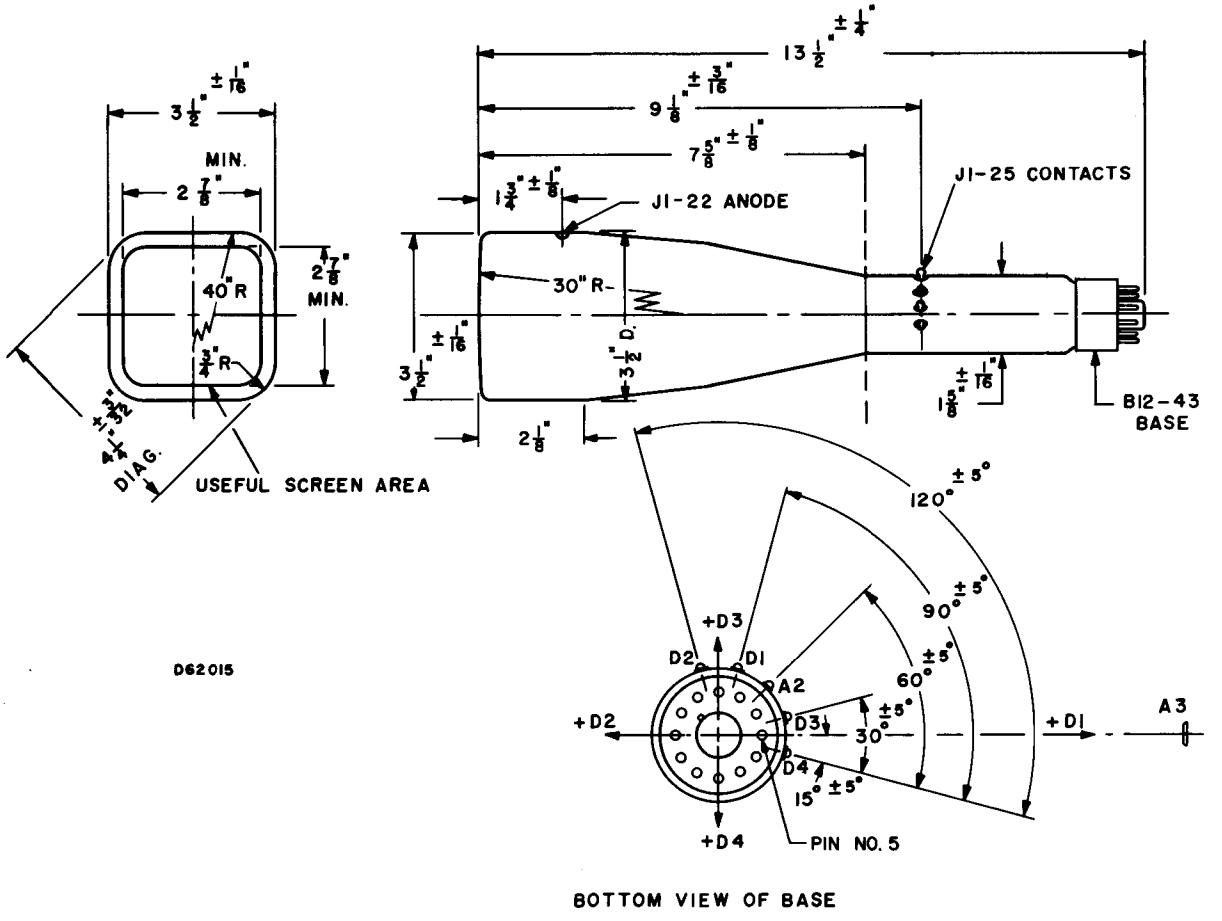


SC-3377
SC-3511

OUTLINE—SC-3802



OUTLINE—SC-3377
SC-3511
SC-3551 (See Diagram Note)



BOTTOM VIEW OF BASE

DIAGRAM NOTE:

SC-3551—deflection leads brought out through base.

DESCRIPTION

The Sylvania Type SC-3397 is a 4½" round faced, glass Cathode Ray Tube featuring electrostatic focusing and deflection. It is constructed in accordance with Mil-E-1.

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic
Phosphor*	P7
Fluorescence	Blue-Green
Phosphorescence	Green
Persistence	Long
Faceplate	Clear-Flat

**In addition to the P7 phosphor, the SC-3397 can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	1.2 ± 10 % Amperes

Direct Interelectrode Capacitances (Each Gun)

	Min.	Max.
Cathode to All	3.1	5.8 pf
Grid No. 1 to All	4.2	7.9 pf
D1 to D2	1.7	3.1 pf
D3 to D4	0.7	1.3 pf
D1 to All Except D2	2.7	6.1 pf
D2 to All Except D1	2.7	6.1 pf
D3 to All Except D4	2.1	4.0 pf
D4 to All Except D3	2.1	5.0 pf

MAXIMUM RATINGS (Absolute Maximum Values) (Each Gun)

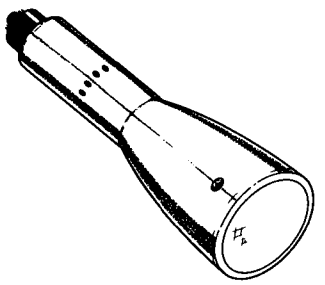
Anode No. 3 Voltage	6600 Volts	
Anode No. 2 Voltage[1]	2860 Volts	dc
Ratio of Anode No. 3 Voltage to Anode No. 2 Voltage	2.3:1 Max.	
Anode No. 1 Voltage	1100 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	220 Volts	dc
Positive Bias Value	0 Volt	dc
Positive Peak Value	2 Volts	
Grid No. 2 Voltage	2860 Volts	dc
Grid No. 3 Voltage	2860 Volts	dc
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	dc
Heater Positive with Respect to Cathode	200 Volts	dc
Peak Voltage Between Anode No. 2 and any Deflection Plate	550 Volts	
Post Accelerator Helix Resistance	200-600 Megohms	

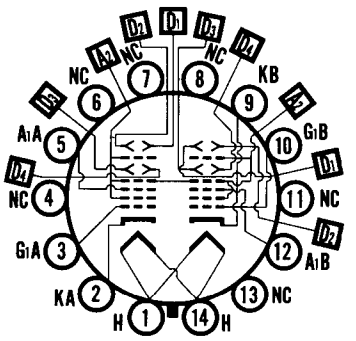
TYPICAL OPERATING CONDITIONS (Each Gun)

Anode No. 3 Voltage	4000 Volts	dc
Anode No. 2 Voltage	2000 Volts	dc
Anode No. 1 Voltage for Focus	400 to 600 Volts	dc
Grid No. 1 Voltage for Cutoff[2]	−45 to −75 Volts	dc
Grid No. 2 Voltage	2000 Volts	dc
Grid No. 3 Voltage	1850-2150 Volts	dc

QUICK REFERENCE DATA

Radar Indicator Tube
2 Independent Guns
4½" Direct Viewed
Round Glass Type
Electrostatic Focus
Electrostatic Deflection
Clear, Flat Faceplate





SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
PICTURE TUBE
OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
DECEMBER, 1963

File Under
SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

DEFLECTION FACTOR[3]

Deflecting Plates 1-2	54 to 66 Volts	dc/Inch
Deflecting Plates 3-4	40 to 50 Volts	dc/Inch
Modulation (Anode 3 Current = 25 μa)	45 Volts	Max.
Line Width (Anode 3 Current = 25 μa)	0.030 Inches	Max.
Pattern Distortion[4]	2 ½ Percent	Max.
Useful Scan (Deflection Plates 1-2 and 3-4)[5]	4 Inches	
Undeflected Spot Position	Note 6	

CIRCUIT VALUES (Each Gun)

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5 Megohms Max.

MECHANICAL GENERAL

Minimum Useful Screen Diameter	4 ½ Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Medium Shell Diheptal 12-Pin)	B12-37
Angle Between Traces D1-D2 and D3-D4	
Gun A	90 ± 1 Degree
Gun B	90 ± 1 Degree
Bulb Contact Alignment	
J1-21 Contact Aligns with D1-D2 Trace[7] (Gun A and Gun B)	±10 Degrees

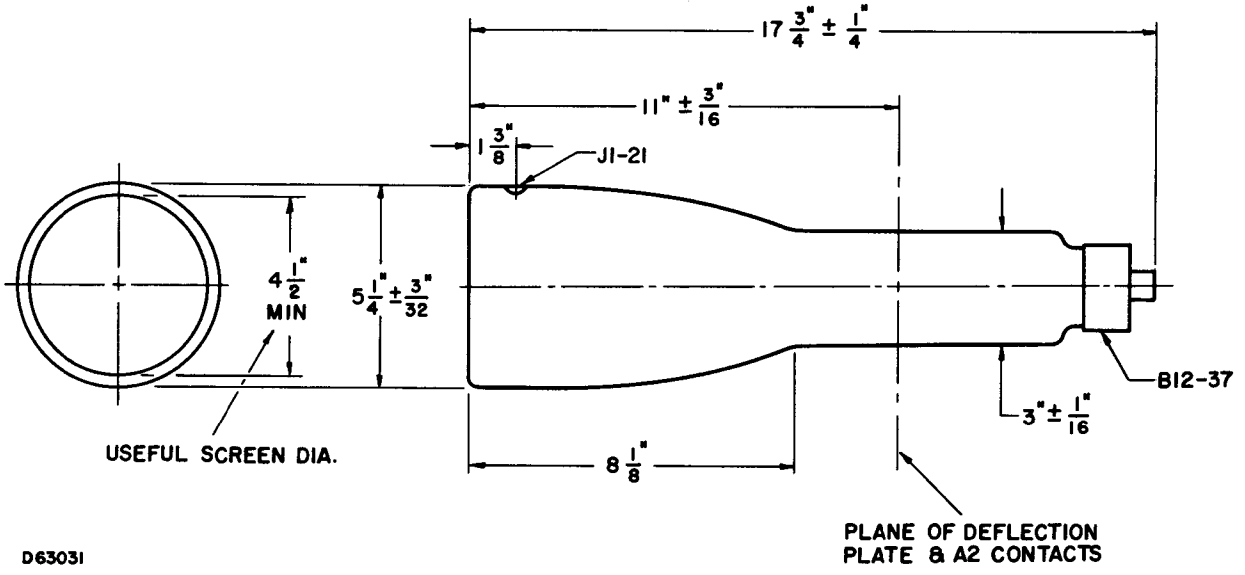
BASE ALIGNMENT

D1-D2 Traces (Gun A and Gun B) shall be Mutually Parallel to Diagonal through Tube Axis and Pin No. 5
D1-D2 Trace (Gun A) shall be Parallel to D1-D2 trace (Gun B) ± 1 Degree
D3-D4 (Gun A) shall be Aligned with D3-D4 Trace (Gun B) ± 3 Degrees
Positive Voltage on D1 (Gun A and Gun B) Deflects Beam Approx. Parallel to Diagonal through Tube Axis and Pin No. 5 toward the latter
Positive Voltage on D3 (Gun A and Gun B) Deflects Beam Approx. toward Pin No. 2

NOTES:

1. *The product of the Anode No. 2 Voltage and the Average Anode No. 2 Current should be limited to 6 watts.*
2. *Visual extinction of undeflected focused spot.*
3. *Deflection factor uniformity shall be not more than 2 %. Uniformity shall be measured in accordance with MIL-E-1, Section 4-12-11, for a scanned 3 inch square.*
4. *All edges of a raster pattern adjusted so its widest points just touch the sides of a 3.075 inch square will fall within the area bounded by the 3.075 inch square and an inscribed 2.925 inch square.*
5. *The useful scan shall be ±2 inches from the tube face center.*
6. *The undeflected spot positions shall fall between circles of radius of 3/16 and 13/16 inches from the tube face center. The spots of both sections of the cathode ray tube shall be symmetrically opposed around the tube axis.*
7. *J1-21 contact is on the same side and plane as Pin No. 5.*

OUTLINE


17 3/4" ± 1/4"
11" ± 3/16"
1 3/8"
J1-21
4 1/2" MIN
5 1/4" ± 3/32"
B12-37
3" ± 1/16"
8 1/8"
USEFUL SCREEN DIA.
PLANE OF DEFLECTION
PLATE & A2 CONTACTS
D63031

ADVANCE DATA

DESCRIPTION

The Sylvania SC-3399 is a 5 gun, electrostatically focused and deflected cathode-ray tube, 10 inches in diameter, for displaying simultaneously, 5 independently controlled traces. It features monoaccelerator design for maximum pattern linearity and deflection factor uniformity. All deflection plate leads are brought through the neck. An independent astigmatism electrode connection is provided, also brought through the neck, so that maximum resolution can be attained by the use of dynamic control of both focus and astigmatism voltages.

CHARACTERISTICS

GENERAL DATA[1]

Focusing Method	Electrostatic			
Deflection Method	Electrostatic			
Phosphor*	P1	P2	P7	P11
Fluorescence	Green	Blue-Green	Blue	Blue
Phosphorescence	—	Green	Yellow	—
Persistence	Medium	Long	Long	Short

*In addition to the types shown, the SC-3399 can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	1.5 ± 10 % Amperes
Direct Interelectrode Capacitances (Approx.)	Each Gun
Cathode to All	6.5 pf
Grid No. 1 to All	7.9 pf
D1 to D2	2.6 pf
D3 to D4	2.0 pf
D1 to All Other Electrodes	8.0 pf
D2 to All Other Electrodes	8.0 pf
D3 to All Other Electrodes	5.0 pf
D4 to All Other Electrodes	5.0 pf

MECHANICAL DATA

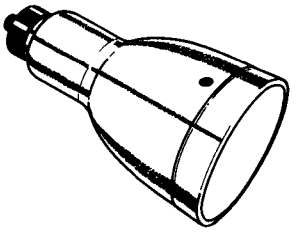
Overall Length	21 ¼ ± ¼ Inches
Minimum Useful Screen Diameter	9 Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Basing	See Diagram
Base and Contact Alignment	See Diagram
Positive Voltage on D1 Deflects the Beam Toward Base Key	±10 Degrees
Positive Voltage on D3 Deflects the Beam Approximately Toward Pin No. 23	
Bulb Contact (J1-22) Aligned Approximately with Base Key	
For Deflection Plate Lead Alignment with the Base and Bulb Contact—See Diagram	
Trace Alignment	
D1-D2 Trace Aligns with D3-D4 Trace (Each Gun)	90 ± 1 Degree
D1-D2 Traces of all Guns are Parallel	±1 Degree

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	5500 Volts	dc
Focus Electrode Voltage	3000 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	220 Volts	dc
Positive Bias Value	0 Volt	dc
Positive Peak Value	2 Volts	dc
Peak Heater to Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	
Peak Voltage Between Anode and Astigmatism Electrode or any Deflecting Plate	1000 Volts	

QUICK REFERENCE DATA

Five Independent Guns
10″ Direct Viewed
Oscilloscope Tube
Round Glass Type
Electrostatic Focus
Electrostatic Deflection
Monoaccelerator Design
All Deflection Plate Leads Brought Through the Neck Wall



For Basing Diagram See Page 3

SYLVANIA ELECTRONIC TUBES
A Division of Sylvania Electric Products Inc.
PICTURE TUBE OPERATIONS
SENECA FALLS, NEW YORK

Prepared and Released By The TECHNICAL PUBLICATIONS SECTION EMPORIUM, PENNSYLVANIA
JULY, 1963

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode Voltage	5000 Volts	dc
Astigmatism Electrode Voltage	5000 Volts	dc
Focus Electrode Voltage	850 to 1500 Volts	dc
Grid No. 1 Voltage[2]	−100 to −175 Volts	dc
Line Width "A"[3]	.020 Inch	Max.
Deflection Factors		
D1-D2	70 to 100 Volts Per Inch	
D3-D4	60 to 85 Volts Per Inch	
Deflection Factor Uniformity[4]	1 ½ Percent	Max.
Undeflected Spot Position	Within 1 Inch Square	
Useful Scan		
D1-D2	±4 ½ Inches	
D3-D4	±3 ½ Inches	
Interaction Factor[5]	6 x 10^{-5} In./Volts	Max.

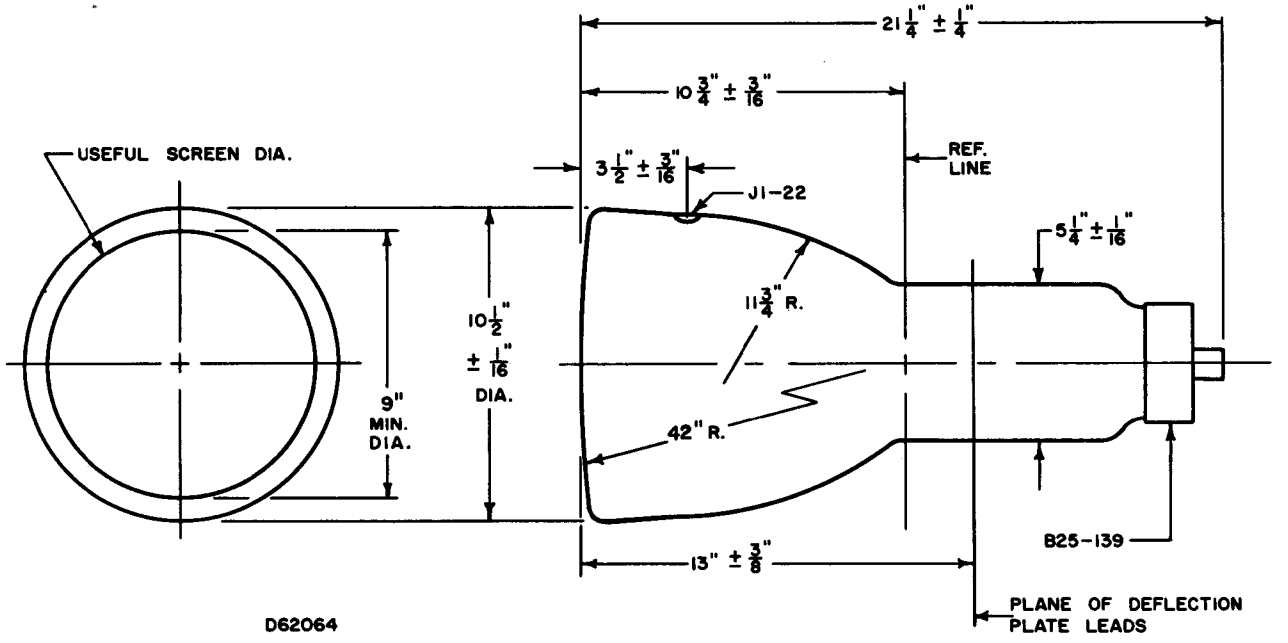
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.
Deflection Circuit Resistance	1.0 Megohms	Max.

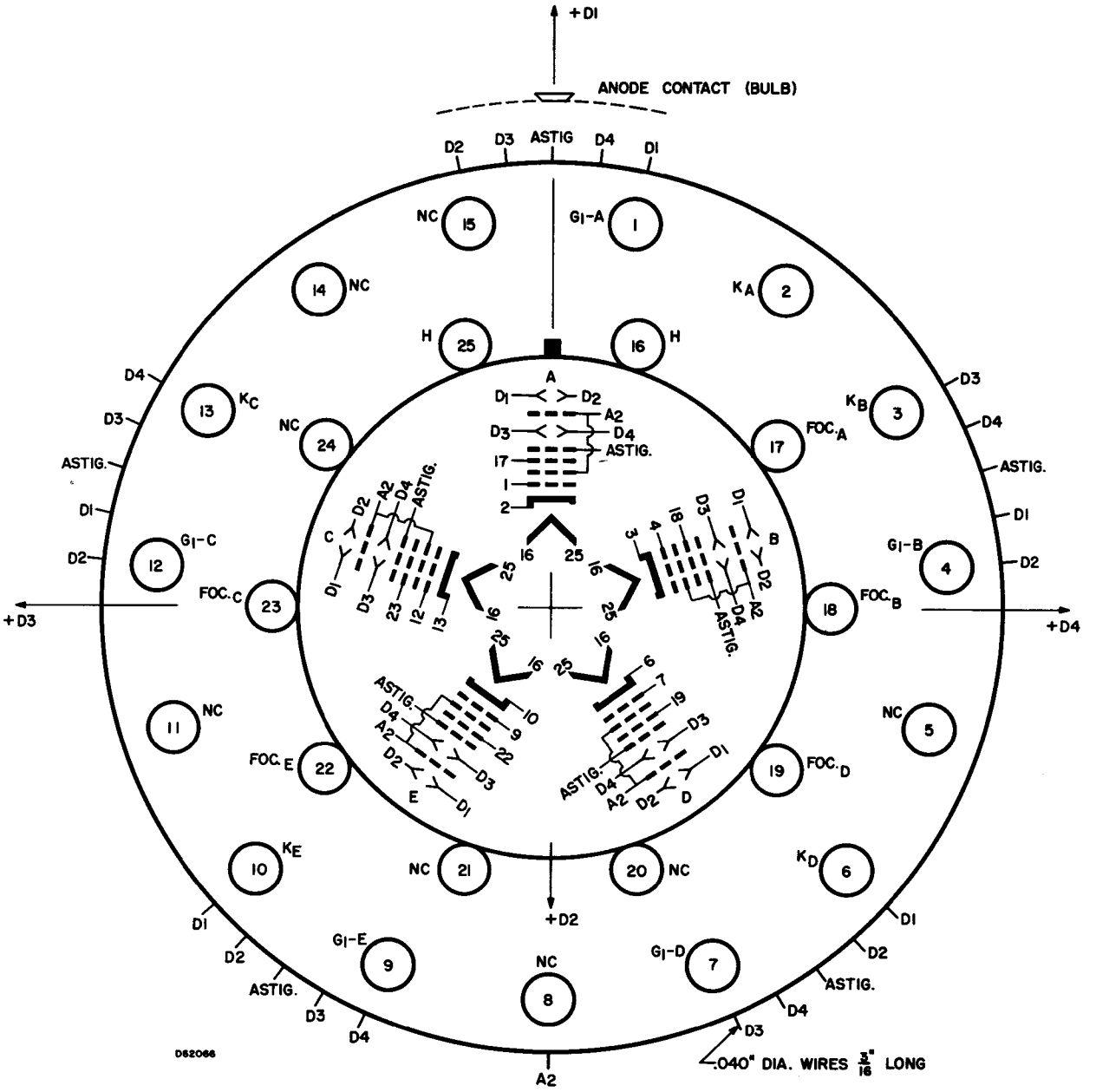
NOTES:

1. *Values are for each gun unless otherwise specified.*
2. *Visual extinction of undeflected focused spot.*
3. *Per MIL-E-1 and at a control grid voltage of 25 volts above spot cutoff.*
4. *The deflection factor (for both D1-D2 and D3-D4 plate pairs separately) for a deflection of 75 % of the minimum useful scan will not differ from the deflection factor at 25 % of the minimum useful scan by more than the indicated value.*
5. *The deflection of one beam when balanced dc voltages are applied to the deflection electrodes of either of the other two guns shall be less than the specified value.*

OUTLINE



BASING DIAGRAM



VIEW FROM BASE END OF TUBE

DESCRIPTION

Sylvania Type SC-3502 is a compact, 2" round cathode ray tube designed for portable oscilloscope applications. It features a high efficiency 1.5 V, 140 ma heater for battery economy and lightweight design; and an electron gun of high deflection sensitivity. This low heater power design requires only 1/16 of the power necessary to operate a conventional 6.3 V, 600 ma heater.

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic
Phosphor*	P1
Fluorescent Color	Green
Phosphorescent Color	None
Persistence	Medium

*In addition to the phosphor shown, the SC-3502 can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	1.5 Volts
Heater Current	0.140 ± 10 % Amperes
Direct Interelectrode Capacitances (Approx.) (Magnetic Shield Grounded)	
Grid No. 1 to All Other Electrodes	4.5 pf
D1 to D2	2.0 pf
D3 to D4	2.5 pf
D1 to All Other Electrodes	6.5 pf
D2 to All Other Electrodes	6.0 pf
D3 to All Other Electrodes	5.5 pf
D4 to All Other Electrodes	5.5 pf

MECHANICAL DATA

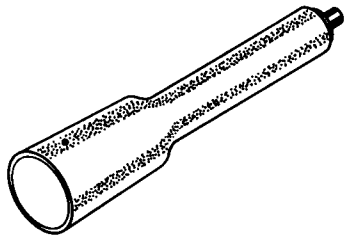
Overall Length	7 5/8 ± 3/16 Inches
Greatest Bulb Diameter	2 1/16 Inches
Minimum Useful Screen Diameter	1 3/4 Inches
Base Neo-eightar	B8-218
Basing	8KF
Base Alignment	
D1-D2 Trace Aligns with Pin No. 3 and Tube Axis	0 ± 10 Degrees
Positive Voltage on D1 Deflects Beam Approximately Toward Pin No. 3	
Positive Voltage on D3 Deflects Beam Approximately Toward Pin No. 5	
Trace Alignment	
Angle Between D3-D4 and D1-D2 Traces	90 ± 1 Degrees
Anode Contact	J1-21
Anode Contact is on same side as Pin No. 3	
Deflection Plates	
D1-D2 are nearest to the Screen	
D3-D4 are nearest to the Base	

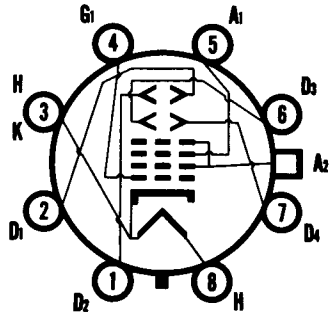
MAXIMUM RATINGS (Design Center Values)

Anode Voltage (A2)	3000 Volts	dc
Anode (A2) Input	6 Watts	
Anode No. 1 (Focusing Electrode) Voltage	1200 Volts	
Grid No. 1 (G1) Voltage		
Negative Bias Value	140 Volts	dc
Positive Bias Value	0 Volts	dc
Positive Peak Value	2 Volts	
Peak Voltage Between Anode No. 2 and Any Deflecting Plate	550 Volts	
Altitude	35,000 Feet	

QUICK REFERENCE DATA

Oscilloscope Tube
2" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Low Heater Power





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SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

JULY, 1965

PAGE 1 OF 2

File Under

SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

TUBE RATINGS

Focusing Electrode (A1) Current for Any Operating Conditions	−15 to ±10 μ Amp	
Spot Position, Undeflected	10 mm	Max.
A1 Voltage 20 % to 35 % of A2 Voltage		
G1 Voltage 3.5 % Max. of A2 Voltage		
Deflection Factors		
D1-D2	51 to 69 Volts DC/Inch/A2 Kilovolts	
D3-D4	29 to 39 Volts DC/Inch/A2 Kilovolts	

OPERATING CONDITIONS

	Typical	Typical	
Anode Voltage (A2)	1200	2000 Volts	
Focusing Electrode Volts (A1)	240 to 420	400 to 700 Volts	
G1 Voltage[2]	−24 to −42	−40 to −70 Volts	
Deflection Factor D1-D2	61 to 83	102 to 138 Volts	DC/In.
Deflection Factor D3-D4	34 to 47	58 to 78 Volts	DC/In.
Light Output[4]	3 FTL Min.		

MAXIMUM CIRCUIT VALUES

Grid No. 1 Resistance	1.5 Megohms
Resistance in Any Deflecting Electrode Circuit[3]	1.0 Megohms

NOTES:

1. *With tube shielded and deflecting electrodes connected to anode (A2).*
2. *Visual extinction of undeflected focused spot.*
3. *The resistance in each deflecting electrode circuit should be approximately equal.*
4. *Light Output shall be measured under the following conditions:*
   Eb2 = 1200 V
   Grid Drive = 20 Volts above spot cutoff
   Raster = 1" x 1" written with no retrace blanking at a vertical frequency of 60 cps and a horizontal frequency of 4500 cps.
   Light Meter = Weston Model 759 recalibrated with a ¾" active acceptance aperture.

OUTLINE

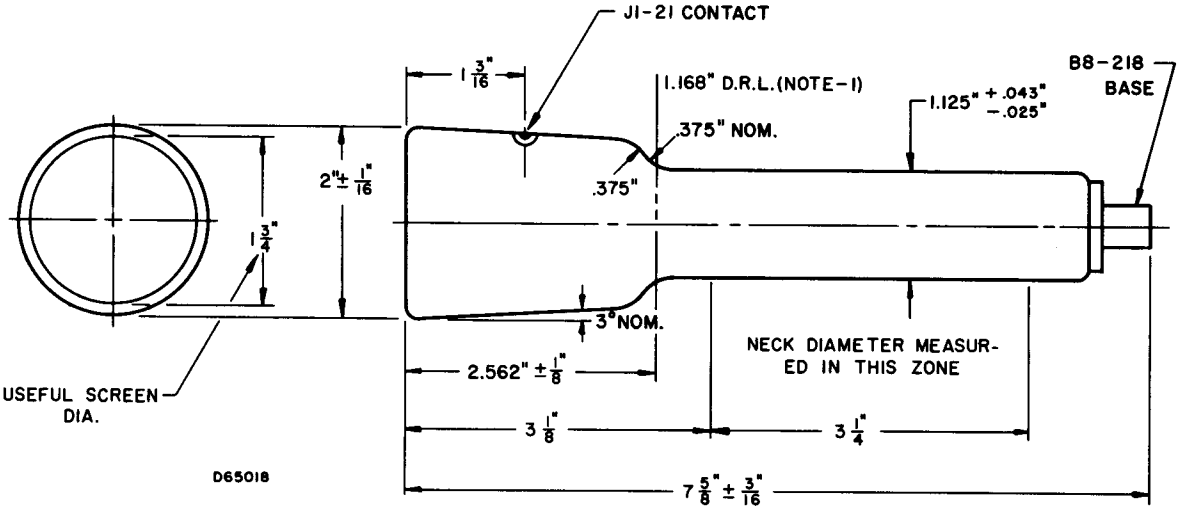


DIAGRAM NOTE:

1. *The leading edge of a 1.168" I.D. cylinder resting against the bulb cone will be 2.562" ± 1/8" from the face.*

DESCRIPTION

The Sylvania Types SC-3507, SC-3800 and SC-3876 are Cathode Ray Tubes with fiber optic strips inserted into the faceplate. They are intended for application of high resolution photographic recording. The fiber optics strip has an approximate active area 8 11/16 inches long by ½ inch wide. The electron-optical system and fine grain screen achieve a very fine trace width with conventional focusing and deflection units and a simple beam centering magnet.

CHARACTERISTICS

GENERAL DATA

	SC-3507 SC-3876	SC-3800	
Focusing Method	Magnetic	Electrostatic	
Deflection Method	Magnetic	Magnetic	
Deflection Angle (Approx.)	55	55	Degrees
Phosphor (Fine Grain Aluminized)	P11	P11	
Fluorescence	Blue	Blue	
Persistence	Short	Short	
Faceplate	Fiber Optics	Fiber Optics	

MECHANICAL DATA

Overall Length	See Drawing
Neck Diameter	1 7/16 Inches
Face Dimensions	3½ x 10 Inches
Bulb Contact	J1-21
Base	See Drawing

FIBER OPTICS DATA

Useful Screen Size	½ x 8 11/16 Inches
Fiber Size (Single Clad)	8-20 Microns
Numerical Aperture	0.8

RATINGS

MAXIMUM RATINGS (Absolute Values)

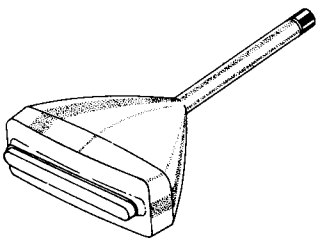
	SC-3507	SC-3800	SC-3876	
Anode Voltage	25,000	10,500	10,500	Volts
Focus Electrode Voltage	—	2500	—	Volts
Grid No. 2 Voltage	2500	770	2500	Volts
Grid No. 1 Voltage	0 to −150	0 to −150	0 to −150	Volts
Peak Heater Cathode Voltage				
Heater Negative with Respect to Cathode				
During Warm-up Period Not to Exceed 15 Secs.	450	400	400	Volts
After Equipment Warm-up	165	165	165	Volts
Heater Positive with Respect to Cathode	165	165	165	Volts

TYPICAL OPERATING CONDITIONS

Heater Voltage	6.3	6.3	6.3 Volts	
Heater Current	0.6 ± 10 %	0.6 ± 10 %	0.6 ± 10 % Amp	
Anode Voltage[4]	20,000	10,000	10,000 Volts	
Focus Voltage	—	1500-2500	— Volts	
Focus Electrode Current at Ib = 5 μa	—	50	— μa	Max.
Grid No. 2 Voltage	2000	500	2000 Volts	
Grid No. 1 Voltage for Cutoff[1]	−33 to −77	−33 to −77	−33 to −77 Volts	
Focusing Coil Current (Approx.)[2]	100	—	80 Ma	
Line Width[3]	0.002	0.005	0.004 Inch	Max.

QUICK REFERENCE DATA

Fiber Optics Tubes
High Resolution
Active Area 8½" x ½"
Very Fine Trace
Focusing
SC-3507 and SC-3876—Magnetic
SC-3800—Electrostatic
Deflection—Magnetic



BASING

	SC-3507 SC-3876 Pin No.	SC-3800 Pin No.
Heater	1	1
Grid No. 1	2	2
Focus	—	6
Grid No. 2	10	10
Cathode	11	11
Heater	12	12

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

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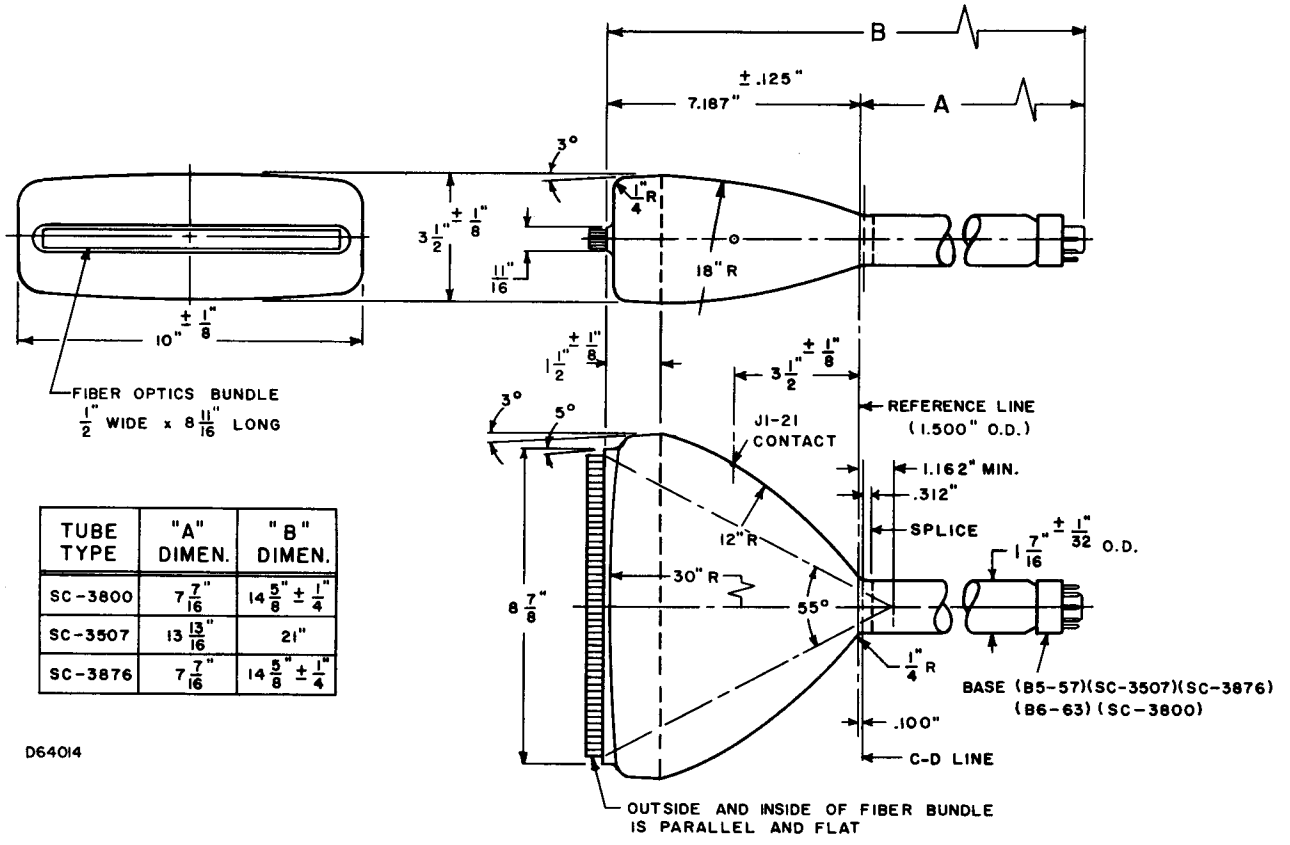
File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

CIRCUIT VALUES	SC-3507	SC-3800	SC-3876
Grid No. 1 Circuit Resistance	1.5	1.5	1.5 Megohms Max.

NOTES:

1. *Visual extinction of undeflected focused spot.*
2. *For JEDEC focusing coil 106 or equivalent, 2½ inches from reference line.*
3. *Line width measured at 5 μa by the shrinking raster method. Variable strength (0-10 gauss) beam centering magnet must be used for optimum line width.*
4. *SC-3507 must be operated with A2 or screen grounded and cathode at −20 KV. SC-3800 and SC-3876 must be operated only with anode grounded and cathode at −10 KV.*

OUTLINE



TUBE TYPE	"A" DIMEN.	"B" DIMEN.
SC-3800	7 7/16"	14 5/8" ± 1/4"
SC-3507	13 13/16"	21"
SC-3876	7 7/16"	14 5/8" ± 1/4"

D64014

DESCRIPTION

The Sylvania SC-3525 is a 2-gun, electrostatically focused and deflected cathode-ray tube for displaying simultaneously two independently controlled traces. It features linear post deflection acceleration for maximum pattern linearity and deflection factor uniformity. All deflection plate leads are brought through the neck. The screen is aluminized for high brightness. Potted, flying leads are used in place of a conventional base to minimize overall length.

CHARACTERISTICS

GENERAL DATA[1]

Focusing Method	Electrostatic
Deflection Method	Electrostatic

Types*	SC-3525 P1	SC-3525 P2	SC-3525 P7	SC-3525 P11
Fluorescence	Green	Blue-Green	Blue	Blue
Phosphorescence	—	Green	Yellow	—
Persistence	Medium	Long	Long	Short

**In addition to the types shown, the SC-3525- can be supplied with several other screen phosphors.*

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (2 Guns in Parallel)	1.08 to 1.32 Amperes

Direct Interelectrode Capacitances (Approx.)**

	Each Gun
Cathode to All	5.5 pf
Grid No. 1 to All	6.5 pf
D1 to D2	2.0 pf
D3 to D4	2.0 pf
D1 to All Other Electrodes	7.0 pf
D2 to All Other Electrodes	7.0 pf
D3 to All Other Electrodes	7.0 pf
D4 to All Other Electrodes	7.0 pf

***Exclusive of the basing leads.*

MECHANICAL DATA

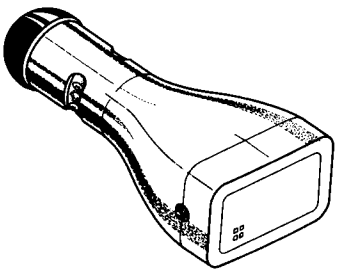
Overall Length	$11\frac{5}{8} \pm \frac{3}{8}$ Inches
Minimum Useful Screen Dimensions	$2\frac{1}{4} \times 4\frac{1}{8}$ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Basing	See Diagram
Base and Contact Alignment	See Diagram
Trace Alignment	
D1-D2 Trace Aligns with D3-D4 Trace (Each Gun)	90 ± 1 Degree
D1-D2 and D3-D4 Traces of the 2 Guns are Parallel	± 1 Degree

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Input	6 Watts	
Anode No. 3 Voltage	7260 Volts	dc
Anode No. 2 Voltage	3630 Volts	dc
Ratio to Anode No. 3 Voltage to Anode No. 2 Voltage	2.4:1	
Anode No. 1 (Focus Electrode) Voltage	1650 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	220 Volts	dc
Positive Bias Value	0 Volt	dc
Positive Peak Value	2 Volts	dc
Peak Heater to Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	
Peak Voltage Between Anode and Astigmatism Electrode, or Any Deflecting Plate	750 Volts	

QUICK REFERENCE DATA

Two Independent Guns
$5\frac{1}{4}$" x $3\frac{1}{4}$" Direct Viewed
Oscilloscope Tube
Aluminized Screen
Spiral Accelerator
Rectangular Glass Type
Electrostatic Focus
Electrostatic Deflection
Compact Size
All Deflection Plate and Acceleration Leads Brought Through the Neck Wall



FOR BASING
SEE PAGE 3

SYLVANIA
ELECTRONIC TUBES

A Division of
Sylvania Electric Products Inc.

PICTURE TUBE
OPERATIONS

SENECA FALLS, NEW YORK

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

DECEMBER, 1963

File Under
SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage	6000 Volts	dc
Anode No. 2 Voltage	2750 Volts	dc
Focus Electrode Voltage	730-540 Volts	dc
Grid No. 1 Voltage[2]	−66 to −110 Volts	dc
Line Width "A"[3]	0.018 Inches	Max.
Deflection Factors		
D1-D2	154-193 Volts Per Inch	
D3-D4	117-152 Volts Per Inch	
Deflection Factor Uniformity[4]	3 Percent	Max.
Undeflected Spot Positions[5]	Within 5/8 Inch Square	
Useful Scan[6]		
D1-D2	±1.12 Inches	
D3-D4	±2.06 Inches	
Interaction Factor[7]	5 x 10-5 In./Volts	Max.
Pattern Distortion[8]		
Maximum Ib3 at Cutoff	40 μadc	

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.
Deflection Circuit Resistance	1.0 Megohm	Max.

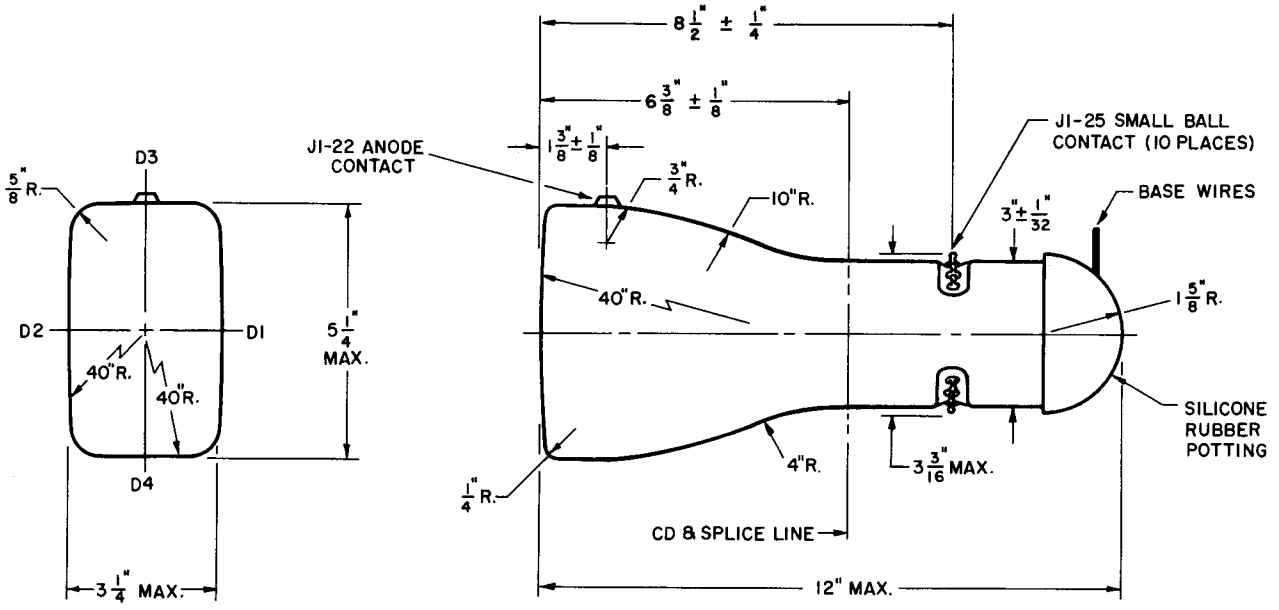
NOTES:

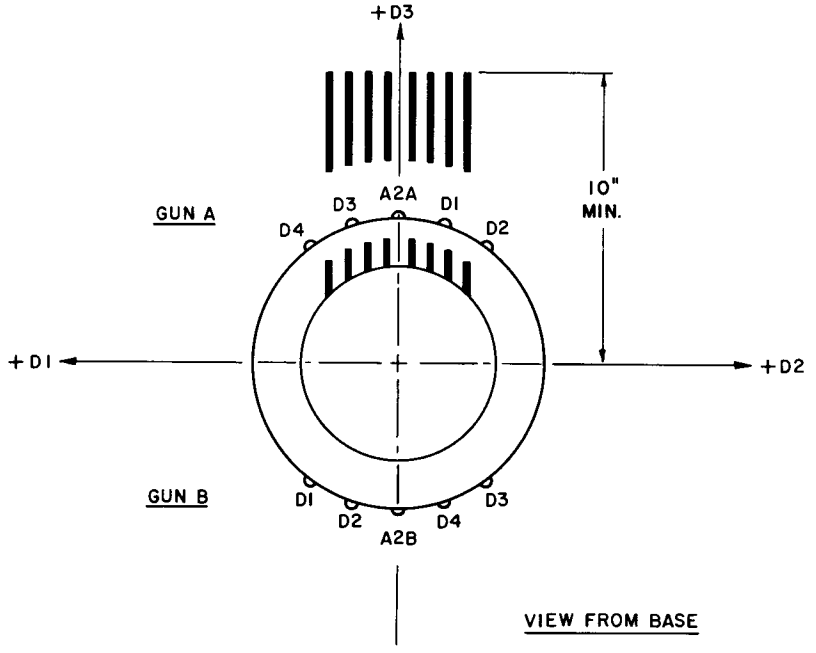
1. *Values are for each gun unless otherwise specified.*
2. *Visual extinction of undeflected focused spot.*
3. *Per MIL-E-1 and at Ib3 of 25μa. (This current shall be in addition to the value of Ib3 read at cutoff.)*
4. *The deflection factor (for both D1-D2 and D3-D4 plate pairs separately) for a deflection of 75 % of the minimum useful scan will not differ from the deflection factor at 25 % of the minimum useful scan by more than the indicated value.*
5. *The shielded, undeflected focused spots will fall within a 5/8" square, the center of which coincides with geometric center of the tube face and the sides of which are parallel to the deflection axes.*
6. *Useful scan shall be measured from the center of the square as specified in Note 5 for spot centering.*
7. *The deflection of one beam when balanced dc voltages are applied to the deflection electrodes of the other gun shall be less than the specified value.*
8. *All portions of a raster pattern adjusted so its widest points just touch the sides of a 4.05 x 2.05 inch rectangle will fall within the area bounded by the 4.05 x 2.05 rectangle and an inscribed 3.95 x 1.95 rectangle.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE





VIEW FROM BASE

D63037

BASE WIRE COLOR CODE
From
LEFT to RIGHT

BLACK	H
BROWN	H
YELLOW	K-A
GREEN	GI-A
ORANGE	AI-A
RED	AI-B
BLUE	GI-B
WHITE	K-B

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engineering data service

SYLVANIA

SC-3557

DESCRIPTION

The Sylvania SC-3557 is an ultra compact, magnetically deflected and low voltage electrostatically focused cathode ray tube. The screen, a special blend of phosphors, is aluminized, permitting its use in very high ambient light applications such as cockpit displays in high altitude fighter aircraft. Typical resolution is 150 lines per inch.

CHARACTERISTICS

GENERAL DATA

Focus Method	Electrostatic
Deflection Method	Magnetic
Phosphor, Aluminized	Modified P20
Face Plate	Gray, Non Browning

MECHANICAL DATA

Overall Length	5⅞ Inches
Neck Diameter	0.870
Face Diameter	3 Inches
Bulb Contact	Potted Anode Connector
Base	E9-37
Basing	9HT
Weight (Approx.)	8 Ozs.

MAXIMUM RATINGS (Absolute Maximum Values)

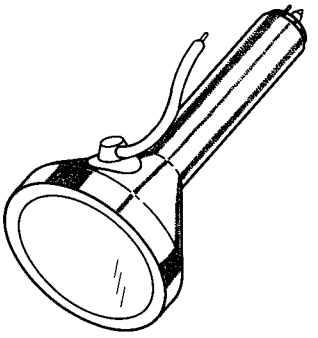
Anode Voltage	17,500 Volts
Focus Electrode Voltage	1100 Volts
Grid No. 2 Voltage	770 Volts
Grid No. 1 Voltage	0 to −150 Volts

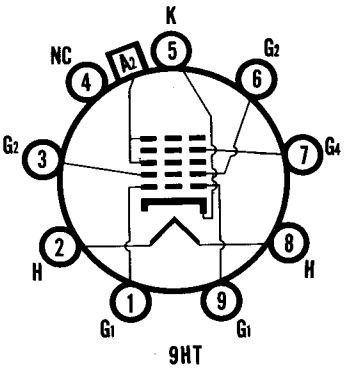
TYPICAL OPERATING CONDITIONS

Heater Voltage	6.3 Volts
Anode Voltage	15 KV
Focus Voltage	−100 to +300 Volts
Grid No. 2 Voltage	500 Volts
Grid No. 1 Voltage for Cutoff	−33 to −77 Volts
Line Width @ 100 μa	0.008 Inches Max.
Light Output @ 100 μa (full screen raster)	600 FTL Min.

QUICK REFERENCE DATA

3" Round Glass Type
Compact Design
High Brightness
Aluminized Screen with Special Phosphor Blend
Magnetic Deflection
Low Voltage Electrostatic Focus
Small (.840") Neck Diameter





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SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

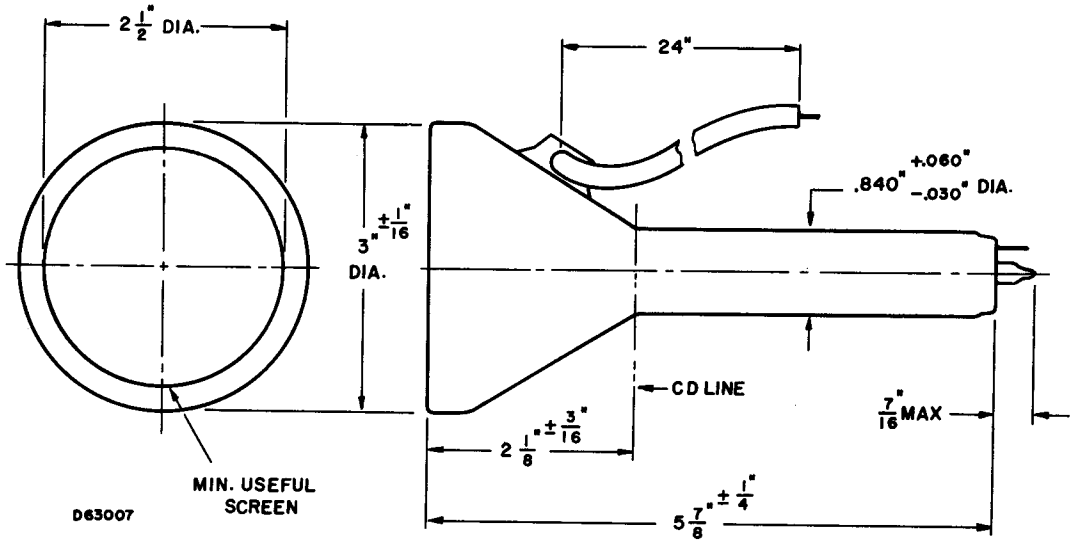
A Technical Publication

APRIL, 1964

File Under

SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

OUTLINE


2 1/2" DIA.
24"
.840" +.060" -.030" DIA.
3" ± 1/16" DIA.
CD LINE
7/16" MAX
2 1/8" ± 3/16"
MIN. USEFUL SCREEN
D63007
5 7/8" ± 1/4"

ADVANCE DATA

DESCRIPTION

The Sylvania SC-3561 is a 3 gun, electrostatically focused and deflected cathode-ray tube, for displaying simultaneously, 3 independently controlled traces. It features mono-accelerator design for maximum pattern linearity and deflection factor uniformity. All deflection plate leads are brought through the neck. In addition to high vertical deflection sensitivity, an independent astigmatism electrode connection is provided, also brought through the neck, so that maximum resolution can be attained by the use of dynamic control of both focus and astigmatism voltages.

CHARACTERISTICS

GENERAL DATA[1]

Focusing Method	Electrostatic			
Deflection Method	Electrostatic			
Phospor*	P1	P2	P7	P11
Fluorescence	Green	Blue-Green	Blue	Blue
Phosphorescence	—	Green	Yellow	—
Persistence	Medium	Long	Long	Short

*In addition to the types shown, the SC-3561P- can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (3 Guns in Parallel)	1.62 to 1.98 Amperes
Direct Interelectrode Capacitances (Approx.)	Each Gun
Cathode to All	5.5 pf
Grid No. 1 to All*	6.5 pf
D1 to D2	2.5 pf
D3 to D4	1.5 pf
D1 to All Other Electrodes	7.5 pf
D2 to All Other Electrodes	7.5 pf
D3 to All Other Electrodes	4.5 pf
D4 to All Other Electrodes	4.5 pf
*Value for B Gun Only	10 pf

MECHANICAL DATA

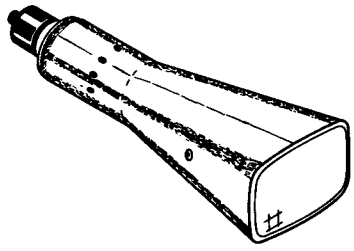
Overall Length	18 ½ ± ⅜ Inches
Minimum Useful Screen Diameter	3 ¼ x 5 ¼ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Basing	See Diagram
Base and Contact Alignment	See Diagram
Trace Alignment	
D1-D2 Trace Aligns with D3-D4 Trace (Each Gun)	90 ± 1 Degree
D1-D2 Traces of the 3 Guns are Parallel	± 1 Degree

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	5500 Volts	dc
Focus Electrode Voltage	3000 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	220 Volts	dc
Positive Bias Value	0 Volt	dc
Positive Peak Value	2 Volts	dc
Peak Heater to Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	
Peak Voltage Between Anode and Astigmatism Electrode, or Any Deflecting Plate	750 Volts	

QUICK REFERENCE DATA

Three Independent Guns
6 1/32" x 4 1/32" Direct Viewed
Oscilloscope Tube
Round Glass Type
Electrostatic Focus
Electrostatic Deflection
Monaccelerator Design
All Deflection Plate Leads Brought Through the Neck Wall



For Basing Diagram See Page 3

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JULY, 1963

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TYPICAL OPERATING CONDITIONS

Anode Voltage	5000 Volts	dc
Astigmatism Electrode Voltage	5000 Volts	dc
Focus Electrode Voltage	1500-2500 Volts	dc
Grid No. 1 Voltage[2]	−50 to −90 Volts	dc
Line Width "A"[3]	.016 Inch	Max.
Deflection Factors		
D1-D2	120-150 Volts Per Inch	
D3-D4	65 to 85 Volts Per Inch	
Deflection Factor Uniformity[4]	1 ½ Percent	Max.
Undeflected Spot Positions[5]	Within ½ Inch Square	
Useful Scan[6]		
D1-D2	Full Screen	
D3-D4	±1 ½ Inches	
Interaction Factor[7]	6×10^{-5} In./Volts	Max.
Pattern Distortion[8]		

CIRCUIT VALUES

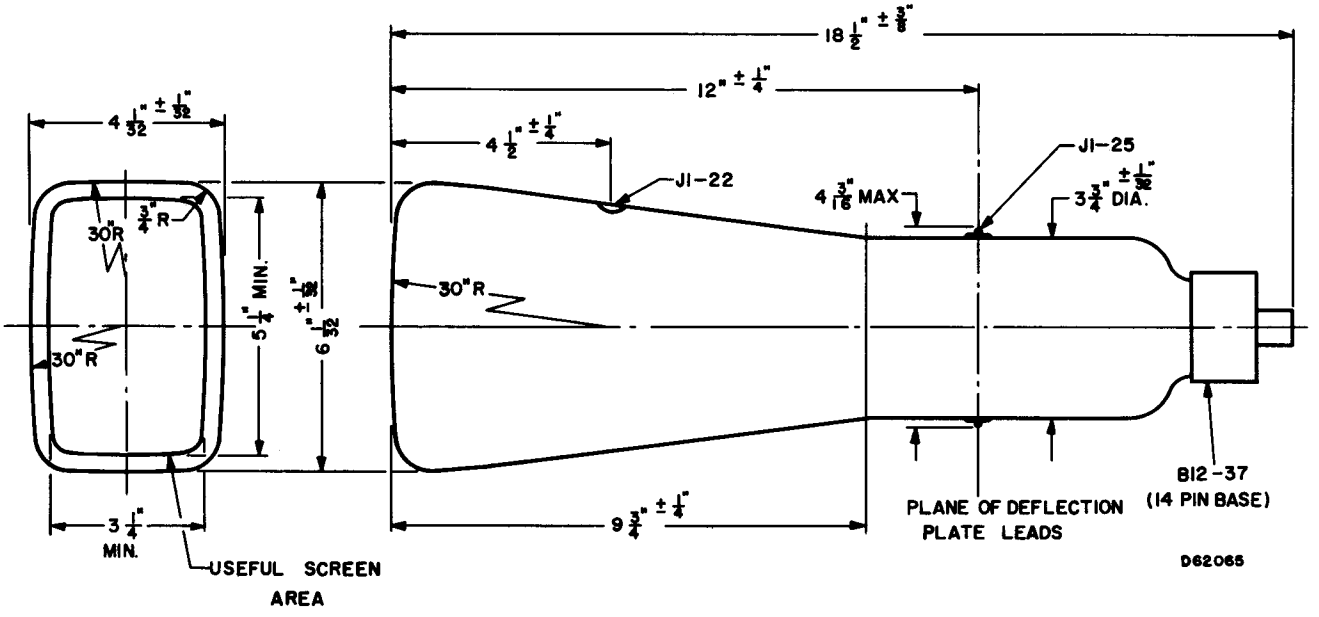
Grid No. 1 Circuit Resistance	1.5 Megohms	Max.
Deflection Circuit Resistance	1.0 Megohms	Max.

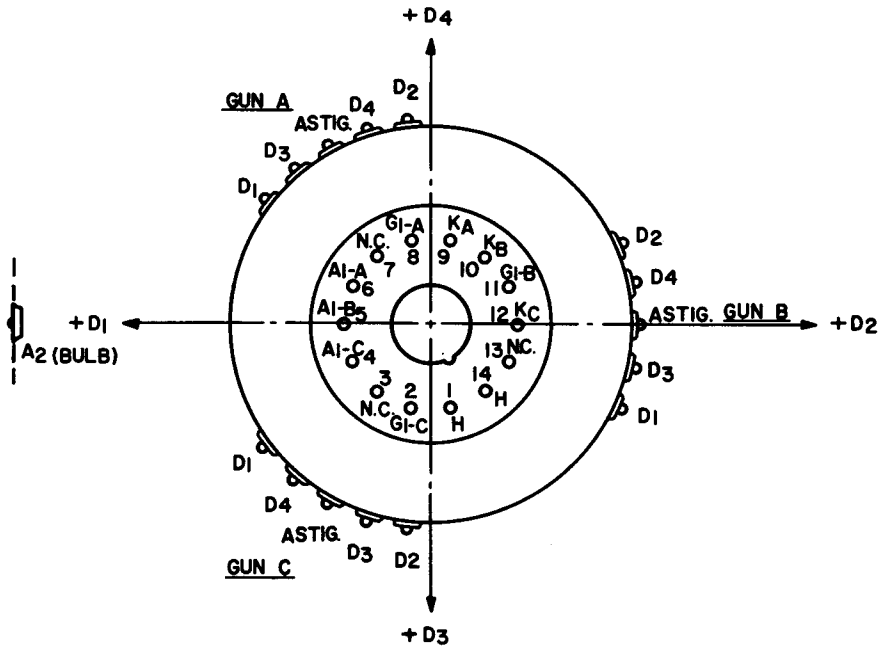
NOTES:

1. *Values are for each gun unless otherwise specified.*
2. *Visual extinction of undeflected focused spot.*
3. *Per MIL-E-1 and at a control grid voltage of 15 volts above spot cutoff.*
4. *The deflection factor (for both D1-D2 and D3-D4 plate pairs separately) for a deflection of 75 % of the minimum useful scan will not differ from the deflection factor at 25 % of the minimum useful scan be more than the indicated value.*
5. *Guns will be on parallel axes. Spot centering as follows:*
   One gun on horizontal center line 5/8" to left
   One gun ¾" above horizontal center line 5/8" to right
   One gun ¾" below horizontal center line 5/8" to right
6. *Useful scan shall be measured from the center of the square as specified in Note 5 for spot centering.*
7. *The deflection of one beam when balanced dc voltages are applied to the deflection electrodes of either of the other two guns shall be less than the specified value.*
8. *The total horizontal movement of the left or right end of a 5" horizontal trace, produced by any of the three guns, when deflected vertically ¾ inches above or below its normal position, shall not exceed .050 inches.*

   The total vertical movement of the upper or lower end of a 1 ½ inch vertical trace produced by any of the three guns, when any one or all beams are deflected horizontally for the full 5 inches of sweep, shall be less than .075 inches.

OUTLINE





VIEW FROM BASE END OF TUBE

DESCRIPTION

The SC-3814 is an electrostatically focused and deflected cathode ray tube designed for zoned display applications. The tube features provision for six simultaneous independently controlled zoned traces, and uses a 10″ x 12″ rectangular glass bulb with large radius of curvature faceplate. Deflection plate leads are brought out through the neck wall to reduce inter-electrode capacitance and a monoaccelerator design is employed to provide maximum pattern linearity and deflection factor uniformity.

The tube is encapsulated in an integral mu metal shield for protection against stray magnetic and electric fields and breakdown at high altitudes. Color coded leads are brought out of the encapsulation to make connection to associated circuitry.

CHARACTERISTICS

GENERAL DATA

Heater Voltage	6.3 Volts
Heater Current	1.8 Amp
Overall Length (Approx.)	21 ½ Inches
Phosphor*	P7

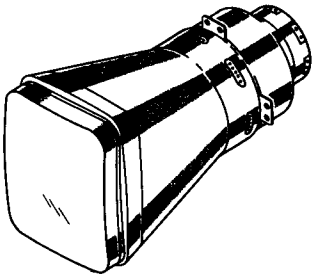
*The SC-3814 can be supplied with several other screen phosphors.

TYPICAL OPERATING CONDITIONS

Anode Voltage	4000 Volts dc
E_{A1} for Focus	900-1300 Volts dc
Grid No. 1 Voltage for Cutoff	−70 to −120 Volts dc
Deflection Factors	
1D2	80-100 Volts dc Per Inch
3D4	38-52 Volts dc Per Inch
Useful Scan	
D1-D2 (Horizontal)	9 Inches
3D4 (Vertical)	2 ½ Inches
(Major axis of the bulb is vertical)	
Parallelism of all Horizontal Traces	0.55 ° Max.

QUICK REFERENCE DATA

Six Independent Guns
Zoned Displays
10 x 12 Inch Direct Viewed
Electrostatic Focus
Electrostatic Deflection
Monoaccelerator Design
Encapsulated in mu Metal Shield
Color Coded Leads are Brought Out Through the Encapsulation



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Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

APRIL, 1964

File Under

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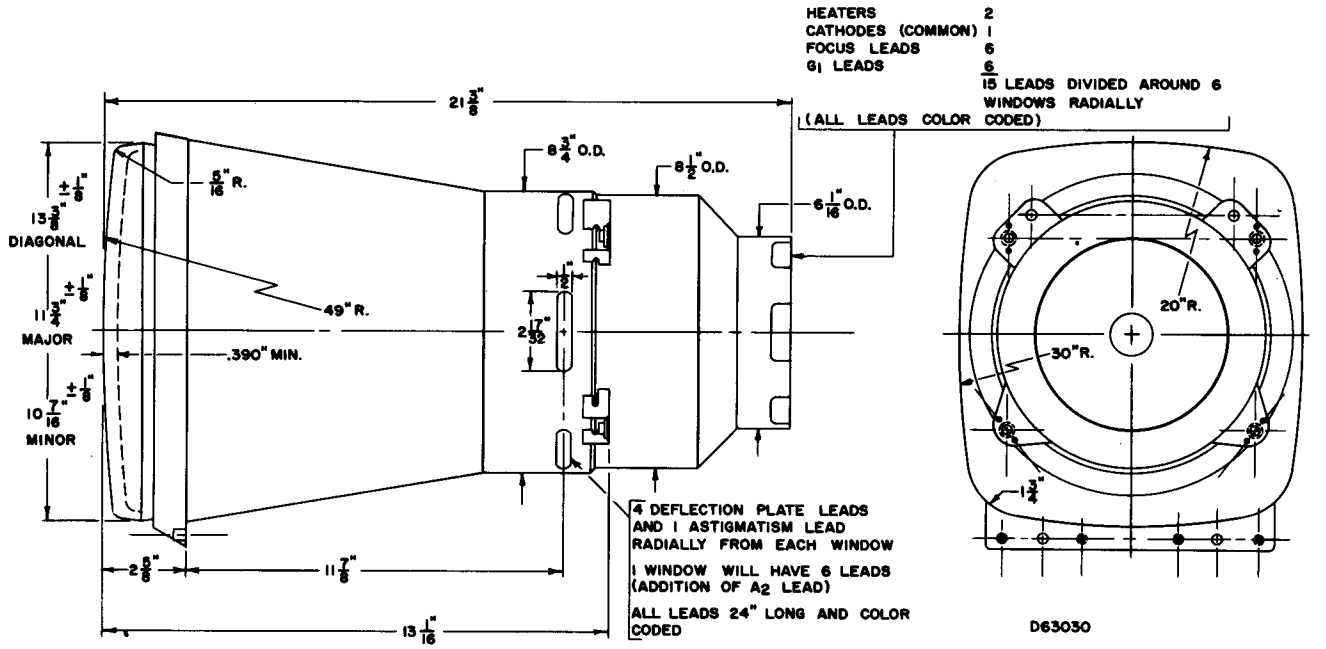
OUTLINE

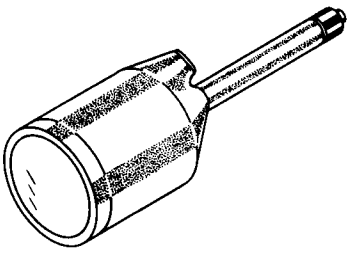

HEATERS 2
CATHODES (COMMON) 1
FOCUS LEADS 6
G1 LEADS 6
15 LEADS DIVIDED AROUND 6 WINDOWS RADIALLY
(ALL LEADS COLOR CODED)
21 3/8"
8 3/4" O.D.
8 1/2" O.D.
6 1/16" O.D.
5/16" R.
13 3/8" DIAGONAL
11 3/4" MAJOR
10 7/16" MINOR
49" R.
.390" MIN.
2 17/32"
2 5/8"
11 7/8"
13 1/16"
4 DEFLECTION PLATE LEADS AND 1 ASTIGMATISM LEAD RADIALLY FROM EACH WINDOW
1 WINDOW WILL HAVE 6 LEADS (ADDITION OF A2 LEAD)
ALL LEADS 24" LONG AND COLOR CODED
20"R.
30"R.
1 3/4"
D63030

DESCRIPTION

The Sylvania SC-3821 is a 7″ round rear window cathode ray tube intended for either simultaneously photographing the electron image or for optical projection of overlay information for comparator applications. It also features character writing deflection plates of high sensitivity for producing alpha-numeric symbols positioned with the main deflection yoke. The high resolution electron gun is designed for use with a single pole ion trap to eliminate ion blemishes. The optical viewing window has an approximate useful diameter of 1 15/16 inches and is of opthalmic quality.

QUICK REFERENCE DATA

Cathode Ray Tube
Rear Viewing Window
Electrostatic Focus
Magnetic Deflection
Ion Trap Design



CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Phosphor*	P14
Fluorescence	Blue
Phosphorescence	Orange
Persistence	Medium

*In addition to the type shown, the SC-3821 can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 ± 10 % Volts
Heater Current	540 to 660 Ma
Direct Interelectrode Capacitances (Approx.)	
K to all	5 pf
g1 to all	6 pf

MECHANICAL DATA

Overall Length (Approx.)	17 11/16 Inches
Faceplate Diameter	7 Inches
Minimum Useful Screen Diameter	6 1/8 Inches
Anode Terminal	J1-22

RATINGS

RATINGS (Absolute Maximum Values)

Anode Voltage	13,200 Volts dc
Focus Electrode Voltage	−550 to 1100 Volts dc
Grid No. 2 Voltage	770 Volts dc
Grid No. 1 Voltage	0 to −200 Volts dc

TYPICAL OPERATING CONDITIONS

Anode Voltage	10,000 Volts dc	
Focus Electrode Voltage	0 to +300 Volts dc	
Grid No. 2 Voltage	300 Volts dc	
Grid No. 1 Voltage for Cutoff	−30 to −75 Volts dc	
Line Width at Ib = 25 μa	0.010 Inch	Max.

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.

BASING

Pin 1 — Heater
Pin 2 — Grid No. 1
Pin 6 — Focus
Pin 10 — Grid No. 2
Pin 11 — Cathode
Pin 12 — Heater

SYLVANIA ELECTRIC PRODUCTS INC.

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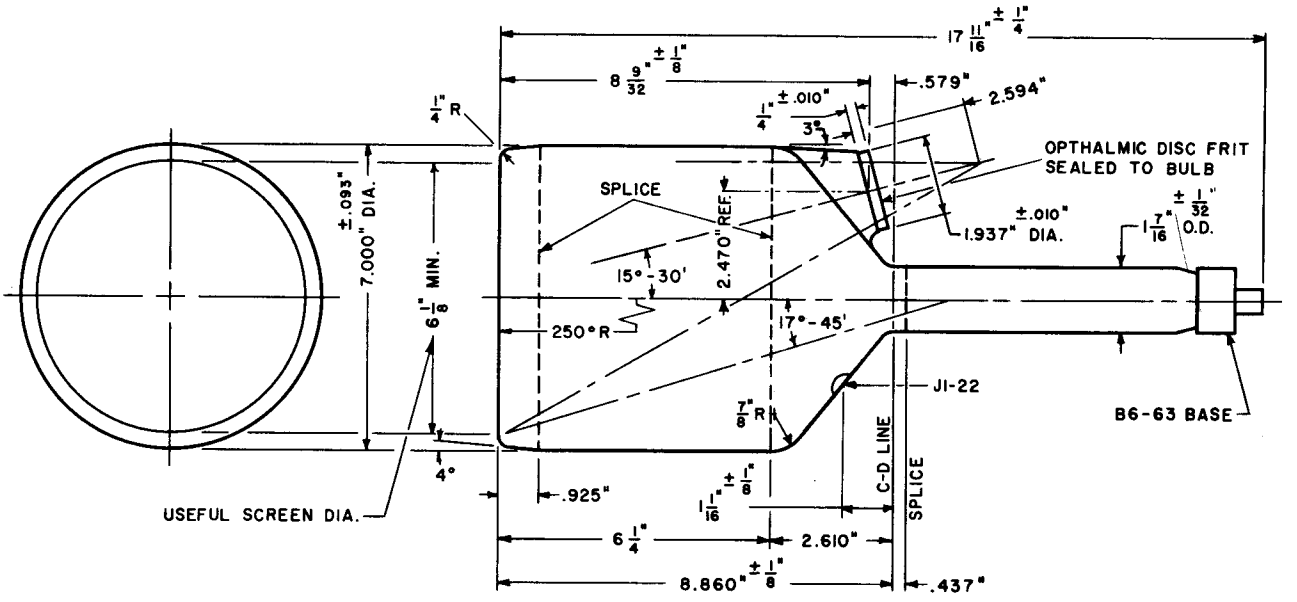
OUTLINE



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SYLVANIA

engineering data service

SYLVANIA

SC-3850

DESCRIPTION

Sylvania Type SC-3850 is a 5-inch diameter cathode ray tube designed for high resolution photographic recording using a fiber optics faceplate. An integral encapsulated high voltage connector is utilized to minimize corona at high altitude.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angle (Approx.)	50 Degrees
Type*	SC-3850
Phosphor	Fine Grain P11
Fluorescence	Blue
Persistence	Short
Faceplate	Fiber Optic Insert See Dwg.

*In addition to the type shown, the SC-3850 can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 10 % Ampere	
Direct Interelectrode Capacitances (Approx.)		
Grid No. 1 to All Other Electrodes	10 pf	
Cathode to All Other Electrodes	5.5 pf	
External Conductive Coating to Anode	500 pf	Max.
	100 pf	Min.

MECHANICAL DATA

Minimum Useful Screen Area	4 x ¼ Inches
Overall Length	16¾ Inches
Bulb	C40 Exp. 14 or Equivalent
Anode Terminal	16", HV Cable, Corona Protected
Base	Small Shell Duodecal 5-Pin B5-57
Basing	12N

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	15,000 Volts	dc
Anode Current (Eg1 = 0 Volt)	3.0 μa	dc
Grid No. 2 Voltage	2500 Volts	dc
Grid No. 2 Current (Eg1 = 0 Volt)	2000 μa	dc
Grid No. 1 Voltage		
Negative Bias Value	150 Volts	dc
Positive Bias Value	0 Volt	dc
Positive Peak Value	0 Volt	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 Seconds	450 Volts	
After Equipment Warm-up	165 Volts	
Heater Positive with Respect to Cathode	165 Volts	

TYPICAL OPERATING CONDITIONS

Anode Voltage	10,000 Volts	dc
Grid No. 2 Voltage	2000 Volts	dc
Grid No. 1 Voltage Required for Cutoff	−33 to −77 Volts	dc
Focusing Coil Current (Approx.)	100 Ma	
Line Width	0.0008 Inch	

CIRCUIT VALUES

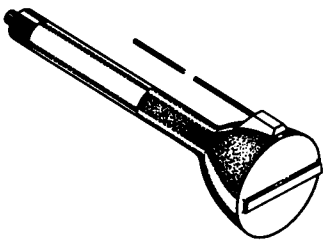
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

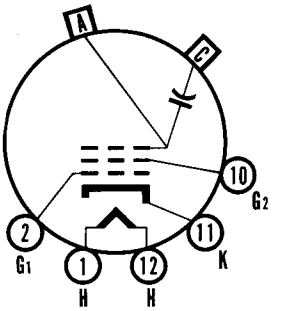
FIBER OPTICS SPECIFICATIONS

Size of Fiber Optics Insert	4½" x ½" x 3/16"
Fiber Size	5 Microns
Numerical Aperture	0.84

QUICK REFERENCE DATA

5" Fiber Optics Tube
Magnetic Focus
Magnetic Deflection
Integral H.V. Connector
For Very High Resolution Photographic Recording





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ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

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OUTLINE

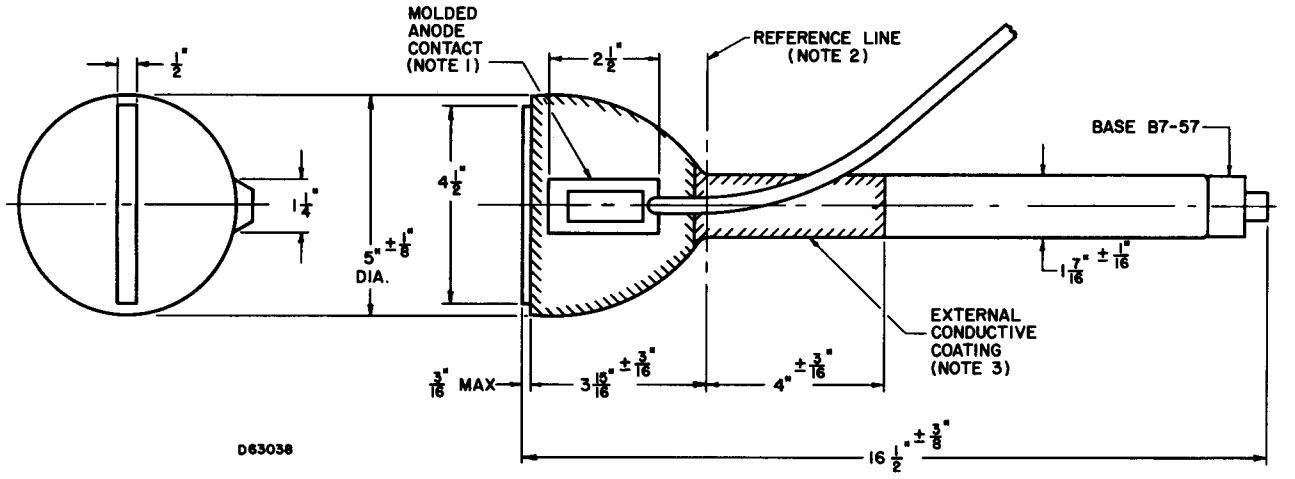


DIAGRAM NOTES:

1. *The plane through the tube axis and vacant pin position No. 3 may vary from the plane through the axis and centerline of molded anode contact by an angular tolerance (measured about the tube axis) of ±30°. Molded anode contact is on same side as vacant pin No. 3.*
2. *Reference line is determined by the plane C-C' of reference line gauge (JEDEC No. G112), when gauge is seated on the glass cone.*
3. *External conductive coating must be grounded.*

DESCRIPTION

Sylvania Type SC-3863 is an electrostatic charge printing tube designed for use in high speed printing equipment. It is a cathode ray tube which has as a target for the beam, an array of fine, closely spaced, wires extending through the bulb wall. Deflection and modulation of the beam striking the wires will produce charge patterns on a dielectric in contact with the outer surface of the tube.

The fine focus beam of the SC-3863, the small wire size and close spacing in the array, and the low capacitance between wire elements, permit high resolution along with extremely rapid printing. The SC-3863 can be used for single line scanning, and the .160" height of the array permits two-dimensional scanning for other types of operation. The useful printing width of the array is 2¾ inches.

CHARACTERISTICS

ELECTRICAL DATA

Focusing Method	Magnetic
Deflection Method	Magnetic
Horizontal Deflection Angle (Approx.)	24 Degrees
Heater Current at 6.3 Volts	600 ± 30 Ma
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 pf
Grid No. 1 to All Other Electrodes	8 pf

MECHANICAL DATA

Printing Head	
0.001" Diameter Conductive Elements Spaced Approximately 0.004" on Centers in Both Directions.	
Minimum Useful Printing Array Width	2.750 Inches
Minimum Useful Printing Array Height	0.160 Inches
Array Thickness (Approx.)	0.050 Inches
Overall Length	18 ± 3/8 Inches
Width	3 1/4 ± 1/32 Inches
Height	1 3/4 ± 1/32 Inches
Neck Length	13 5/8 ± 1/4 Inches
Neck Diameter	1 7/16 ± 1/16 Inches
Bulb Contact	C1-3
Base	B5-57
Basing	12D
Weight (Approx.)	1 Pound

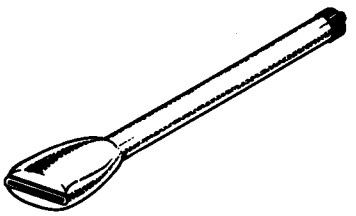
MAXIMUM RATINGS (Absolute Maximum Values)

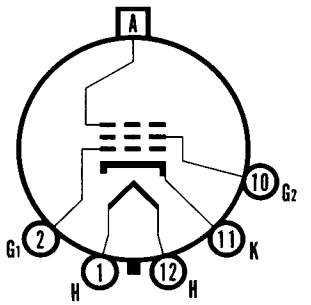
Unless Otherwise Specified, All Voltages are Positive with Respect to Cathode.

Maximum Anode Voltage	25,000 Volts	
Maximum Grid No. 2 Voltage	700 Volts	
Grid No. 1 Voltage		
Maximum Negative Value	155 Volts	dc
Maximum Negative Peak Value	200 Volts	
Maximum Positive Value	0 Volt	dc
Maximum Heater Voltage	6.9 Volts	
Minimum Heater Voltage	5.7 Volts	
Maximum Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	

QUICK REFERENCE DATA

Electrostatic Charge Printing Tube
Magnetic Deflection
Magnetic Focus
High Speed Printing
High Resolution
Printing Dimensions
.16" x 2.75" Minimum





12-D

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

APRIL, 1964

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Unless Otherwise Specified, All Voltages are Positive with Respect to Cathode.

Anode Voltage	20,000 Volts	dc
Grid No. 2 Voltage	300 Volts	dc
Grid No. 1 Voltage for Cutoff	−40 to −77 Volts	dc
Focusing Coil Current[1]	70 ± 10 Ma	dc

NOTE:

1. *For JEDEC Focus Coil No. 122 or equivalent, with the combined Grid No. 1 bias voltage and video-signal voltage adjusted to produce 100 μa anode current. Distance from tube face to center of air gap on focus coil is 7 3/8 inches.*

OUTLINE

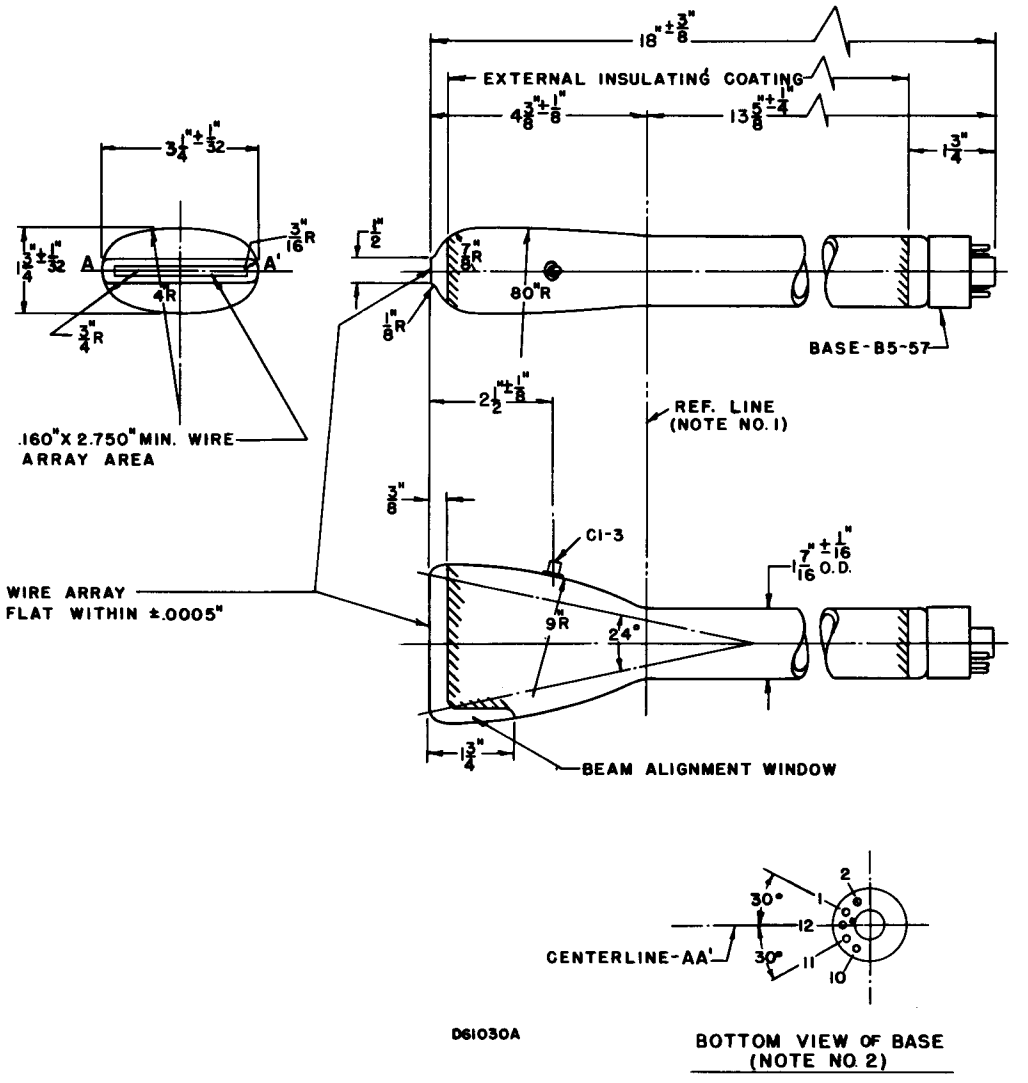


DIAGRAM NOTES:

1. *Reference line determined by plane where JEDEC Gauge No. 112 (a cylinder 1.500" + .003" − .000" I.D. and 2" long) will stop against body of bulb.*
2. *Base Pin No. 12 aligns with horizontal centerline (A-A') within 30° and is on the side opposite the anode contact, (C1-3).*

DESCRIPTION

The Sylvania SC-3875 is a 19" round rear window cathode ray tube intended for either simultaneously photographing the electron image or for optical projection of overlay information for comparator applications. It also features character writing deflection plates of high sensitivity for producing alpha-numeric symbols positioned with the main deflection yoke. The high resolution electron gun is designed for use with a single pole ion trap to eliminate ion blemishes. The optical viewing window has an approximate useful diameter of 2½ inches and is of opthalmic quality.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Character Writing	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	50 Degrees
Phosphor*	P14
Fluorescence	Blue
Phosphorescence	Yellow-Orange
Persistence	Medium to Long
Faceplate	Gray Filter Glass
Light Transmittance (Approx.)	75 Percent

*In addition to the type shown, the SC-3875 can be supplied with several other phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10 % Ampere
Direct Interelectrode Capacitances (Approx.)	
Cathode to All Other Electrodes	5 pf
Grid No. 1 to All Other Electrodes	6.5 pf
D1 to D2	1.6 pf
D3 to D4	1.6 pf
Any One Plate to All	4.5 pf
Angle Between 1D2 and 3D4	90 + 1 Degrees

MECHANICAL DATA

Minimum Useful Screen Diameter	17 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Neck Contacts (5)	0.040" Diam. Wire
Base (Short Small Shell Duodecal 6-Pin)	B6-203
Basing	See Diagram

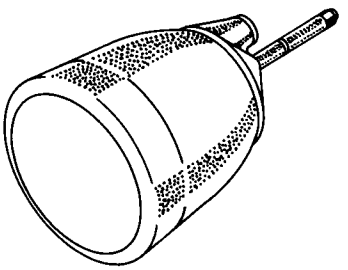
RATINGS

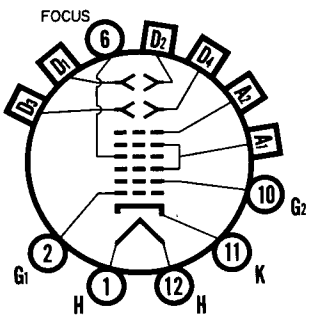
MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage[1]	18,000 Volts
Grid No. 4 (Focusing Electrode) Voltage	−500 to +1100 Volts
Grid No. 2 Voltage	700 Volts
Grid No. 1 Voltage	
Negative Bias Value	180 Volts
Negative Peak Value	220 Volts
Positive Bias Value	0 Volt
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period Not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts
Peak Voltage Between Anode and Any Deflection Plate	550 Volts

QUICK REFERENCE DATA

19" Cathode Ray Tube
Rear Viewing Window
Electrostatic Focus
Magnetic Deflection
Electrostatic Character Writing
Single Ion Trap





SC-3875

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

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PAGE 1 OF 2

File Under

SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS (Grid Drive Service)

Anode Voltage[1]	15,000 Volts	dc
Grid No. 4 Voltage for Focus	0 to +400 Volts	dc
Grid No. 2 Voltage	500 Volts	dc
Grid No. 1 Voltage Required for Cutoff[2]	−35 to −72 Volts	dc
Deflection Factors (Approx.)[3]		
D1-D2	170 Volts	dc/In.
D3-D4	185 Volts	dc/In.
Line Width at 20 FTL	0.025 In.	Max.
Spot Position	Within 30 mm Diam. Circle	

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms Max.
Deflection Circuit Resistance	5 Megohms Max.

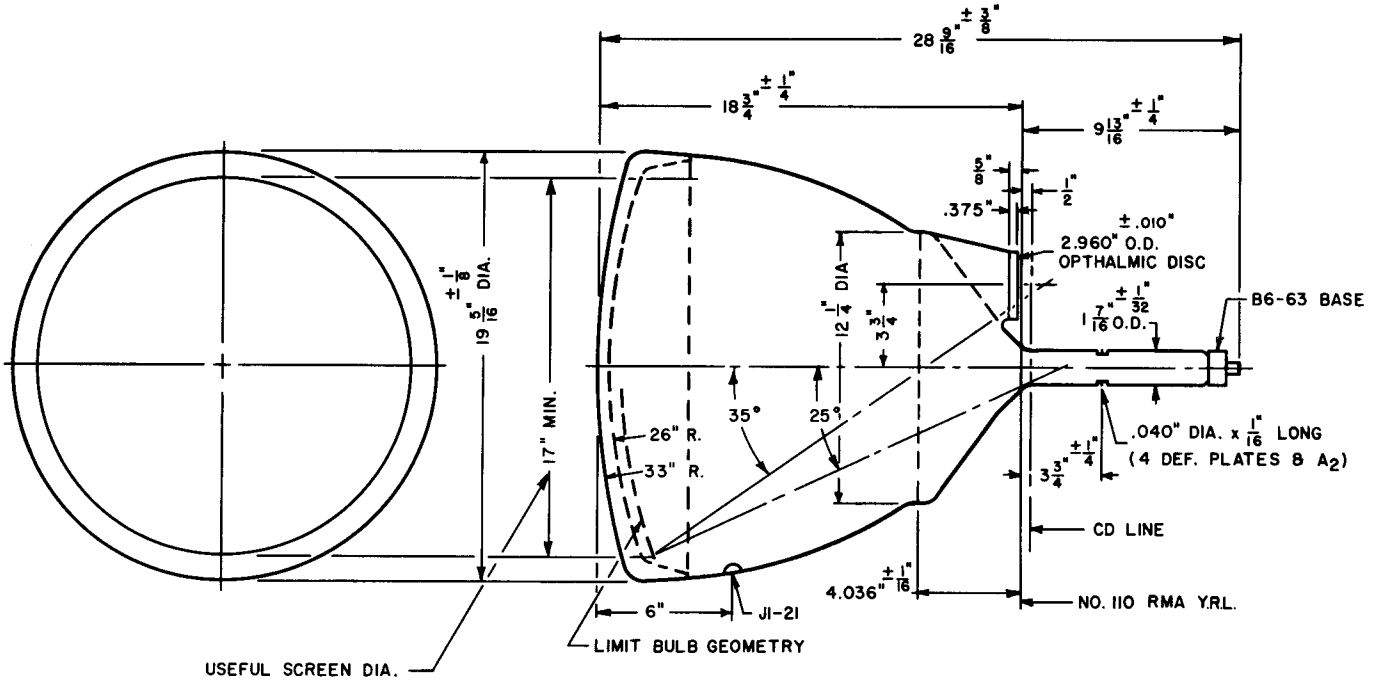
NOTES:

1. *Connect both bulb and neck anode contacts to anode supply.*
2. *Visual extinction of focused raster. Extinction of the stationary spot will require that these values be about 5 volts more negative.*
3. *Useful electrostatic deflection is limited to ±1″ on each axis.*
4. *20 FTL measured in 10″ x 10″ raster scanned with T.V. standards.*

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE



D64020

SYLVANIA SC-3890

DESCRIPTION

The Sylvania Type SC-3890 is a 10-inch diameter Cathode Ray Tube designed for high resolution photographic recording. Its electron-optical system and fine grain screen achieve very fine trace width with conventional focusing and deflection units and a simple beam-centering magnet. The tube has a flat, clear, non-browning optical glass faceplate for optimum photographic quality.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angle (Approx.)	50 Degrees
Phosphor	P11
Fluorescence	Blue
Phosphorescence	Blue
Persistence	Short
Faceplate	Flat, Non Browning Optical Glass

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10 % Ampere
Direct Interelectrode Capacitance (Approx.)	
Cathode to All Other Electrodes	5 pf
Grid No. 1 to All Other Electrodes	6 pf

MECHANICAL DATA

Minimum Useful Screen Diameter	9 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 6-Pin)	B5-57
Basing	12N
Bulb Contact Aligns with Vacant Pin Position No. 3	±10 Degrees

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	25,000 Volts dc
Grid No. 2 Voltage	2500 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	150 Volts dc
Positive Bias Value[1]	0 Volt
Positive Peak Value	0 Volt
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	200 Volts dc
Heater Positive with Respect to Cathode	200 Volts dc

TYPICAL OPERATING CONDITIONS

Anode Voltage	20,000 Volts dc
Grid No. 2 Voltage	2000 Volts dc
Grid No. 1 Voltage for Cutoff[2]	−33 to −77 Volts dc
Line Width at Ib = 5 μa	0.002 Inch

CIRCUIT VALUES

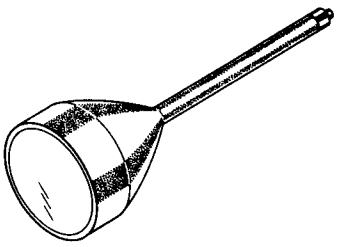
Grid No. 1 Circuit Resistance	1.5 Megohms Max.

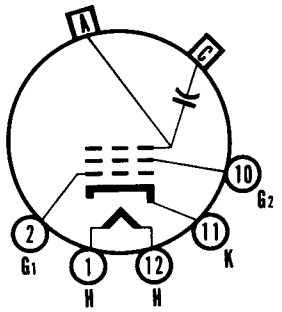
NOTES:

1. *At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts. To prevent burning, minimum beam current densities should be employed.*
2. *Visual extinction of undeflected focused spot.*

QUICK REFERENCE DATA

High Resolution Tube
0.002" Line Width
10-Inch, Flat, Optical Glass Faceplate
Clear Non-Browning Faceplate
Extremely Fine Grain Screen
Magnetic Deflection
Magnetic Focus
No Ion Trap





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SYLVANIA ELECTRIC PRODUCTS INC.

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ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

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JUNE, 1964

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's Maximum Rated Anode Voltage or 16,000 volts, whichever is less.

OUTLINE

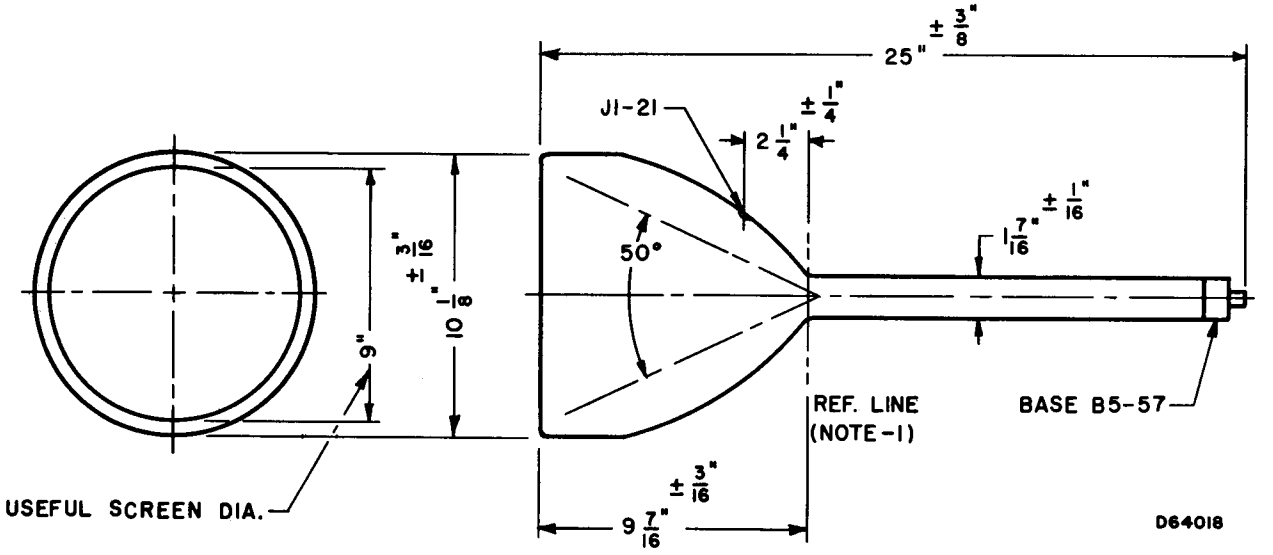


DIAGRAM NOTE:

1. *Reference Line is the point where a 1.500" + 0.003" – 0.000" diameter ring gauge 2" long will stop against the bulb.*

ADVANCE DATA

DESCRIPTION

The Sylvania SC-3892P1 is a 5 gun, electrostatically focused and deflected cathode-ray tube, 16 inches in diameter, for displaying simultaneously, 5 independently controlled traces. It features monoaccelerator design for maximum pattern linearity and deflection factor uniformity. The tube is potted in a mu-metal shield with all tube connections being color coded flying leads.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic

In addition to P1, the SC-3892 can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (600 ma per Gun)	3.0 ± 10 % Amperes
Direct Interelectrode Capacitances (Approx.)	Each Gun
Cathode to All	To Be Determined
Grid No. 1 to All	To Be Determined
D1 to D2	To Be Determined
D3 to D4	To Be Determined
D1 to All Other Electrodes	To Be Determined
D2 to All Other Electrodes	To Be Determined
D3 to All Other Electrodes	To Be Determined
D4 to All Other Electrodes	To Be Determined

MECHANICAL DATA

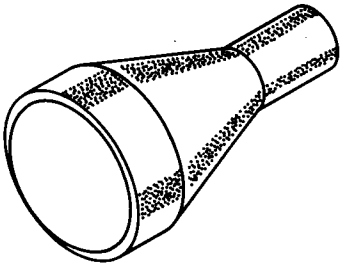
Overall Length	26½ ± ⅜ Inches
Minimum Useful Screen Diameter	15 Inches
Basing	Color Coded Leads
Trace Alignment	
D1-D2 Trace Aligns with D3-D4 Trace (Each Gun)	90 ± 1 Degree
D1-D2 Traces of All Guns are Parallel	±1 Degree

MAXIMUM RATINGS (Absolute Maximum Values)

Anode No. 2 Voltage	5500 Volts
Astigmatism Electrode Voltage	5500 Volts
Focus Electrode Voltage	3000 Volts
Grid No. 1 Voltage	
Negative Bias Value	220 Volts
Positive Bias Value	0 Volt
Positive Peak Value	2 Volts
Peak Heater to Cathode Voltage	
Heater Negative with Respect to Cathode	200 Volts
Heater Positive with Respect to Cathode	200 Volts
Peak Voltage Between Anode and Astigmatism Electrode or Any Deflecting Plate	1500 Volts

QUICK REFERENCE DATA

5 Gun Design
Electrostatic Focus
Electrostatic Deflection
16" Diameter
Monoaccelerator Design
Potted in Mu-Metal
Color Coded Leads



For Basing
Diagram See
Page 3

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Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication
SEPTEMBER, 1964

File Under

SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage	3000 Volts	dc
Astigmatism Electrode Voltage	2900-3100 Volts	dc
Focus Electrode Voltage	850 to −1500 Volts	dc
Grid No. 1 Voltage[2]	−50 to −100 Volts	dc
Line Width "A"[3]	0.035 Inches	Max.
Deflection Factors		
D1-D2	80 V/in.	Max.
D3-D4	80 V/in.	Max.
Deflection Factor Uniformity[4]	1½ Percent	Max.
Undeflected Spot Position (All Guns)	Within 1 Inch Square at Geometric Center of Face	
Useful Scan		
D1-D2	±7½ Inches	
D3-D4	±7½ Inches	
Interaction Factor[5]	6 x 10^{-5} In./Volts	Max.

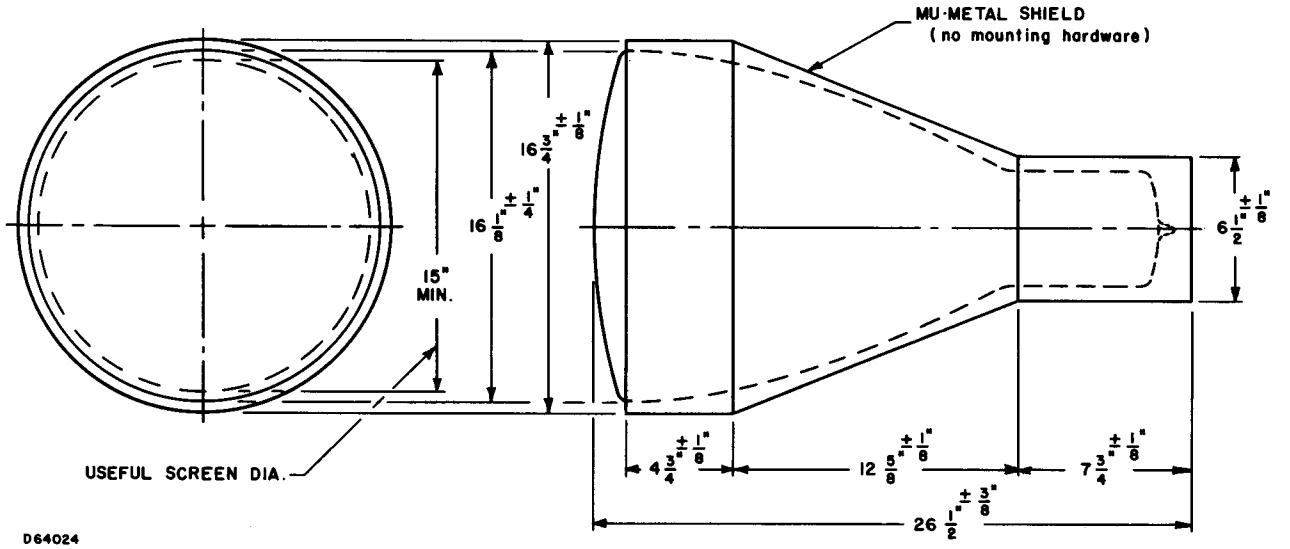
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.
Deflection Circuit Resistance	1.0 Megohm	Max.

NOTES:

1. *Values are for each gun unless otherwise specified.*
2. *Visual extinction of undeflected focused spot.*
3. *Per MIL-E-1 and at a control grid voltage of 25 volts above spot cutoff.*
4. *The deflection factor (for both D1-D2 and D3-D4 plate pairs separately) for a deflection of 75 % of the minimum useful scan will not differ from the deflection factor at 25 % of the minimum useful scan by more than the indicated value.*
5. *The deflection on one beam when balanced dc voltages are applied to the deflection electrodes of either of the other two guns shall be less than the specified value.*

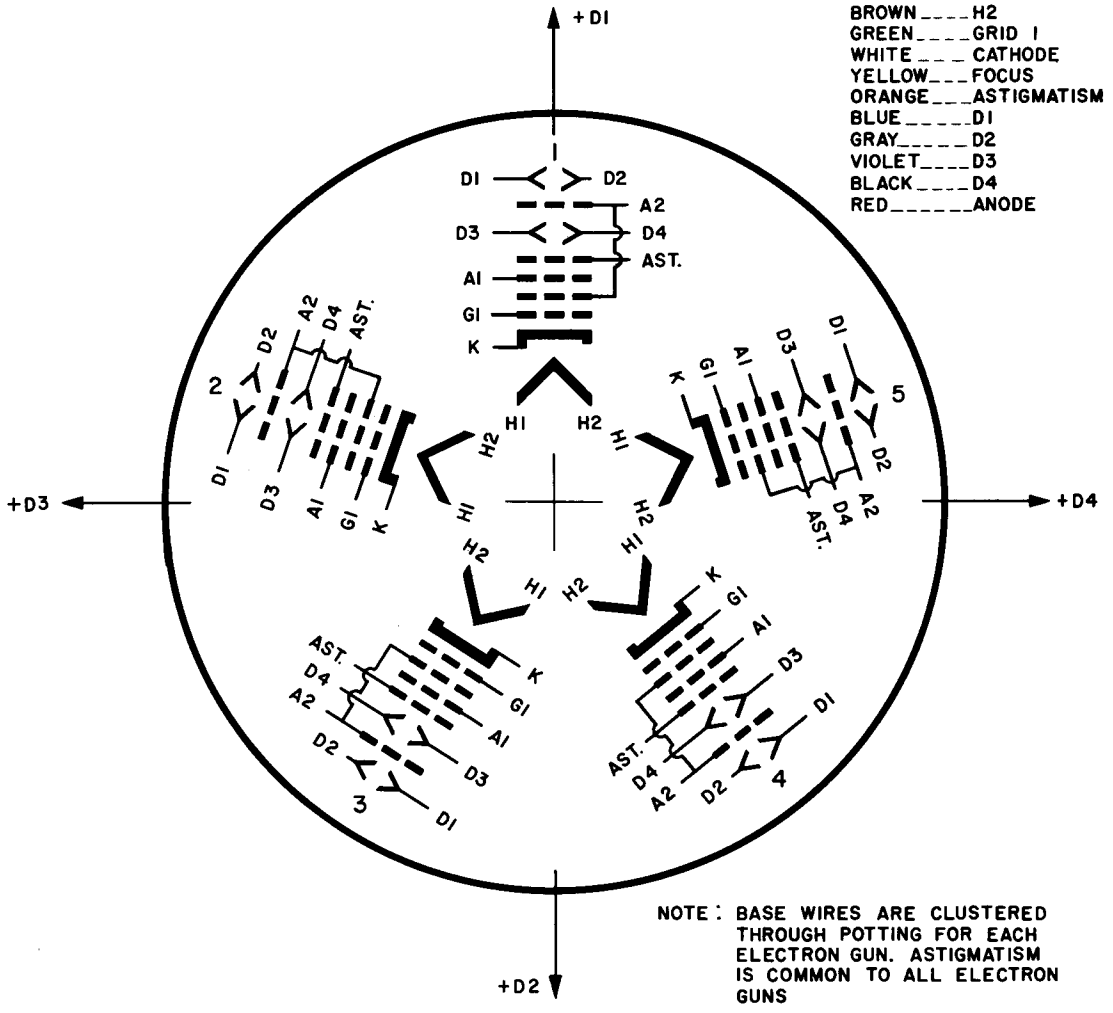
OUTLINE



BASING DIAGRAM

Color Coded Base Wires
(MIN. LENGTH 18 INCHES)

BROWN____H1
BROWN____H2
GREEN____GRID 1
WHITE____CATHODE
YELLOW___FOCUS
ORANGE___ASTIGMATISM
BLUE_____D1
GRAY_____D2
VIOLET____D3
BLACK____D4
RED______ANODE



NOTE: BASE WIRES ARE CLUSTERED THROUGH POTTING FOR EACH ELECTRON GUN. ASTIGMATISM IS COMMON TO ALL ELECTRON GUNS

D64028

VIEW FROM BASE END OF TUBE

TENTATIVE DATA

DESCRIPTION

The Sylvania SC3895 is a 19" round, console display tube for large screen visual readout of alphanumeric and vector information. It employs advanced designs for high resolution and brightness at very high writing rates. The SC3895 features an aluminized screen, post deflection acceleration, and deflection plate leads brought out through the neck for low deflection inductance and capacitance.

GENERAL DATA

Focusing Method	Electrostatic	
Deflecting Method	Electrostatic	
Phosphor* Spectral Energy Distribution of	P28	
Fluorescence	Yellow-Green	
Phosphorescence	Yellow-Green	
Persistence	Long	
Faceplate	Gray Filter Glass	
Transmittance (Approx.)	76	Percent

* In addition to the screen shown, the SC3895 can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Amperes
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	7.5	pf
Grid No. 1 to All Other Electrodes	14.0	pf
Between Deflecting Plates 1-2	6.4	pf
Between Deflecting Plates 3-4	2.5	pf
Deflecting Plate 1 to All Other Electrodes	13.7	pf
Deflecting Plate 2 to All Other Electrodes	13.7	pf
Deflecting Plate 3 to All Other Electrodes	5.7	pf
Deflecting Plate 4 to All Other Electrodes	5.7	pf
Grid No. 2 to All Other Electrodes	13.5	pf

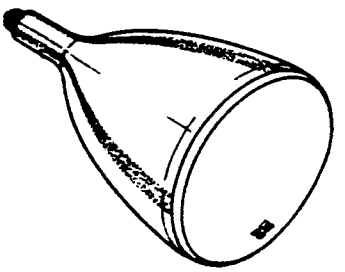
MECHANICAL DATA

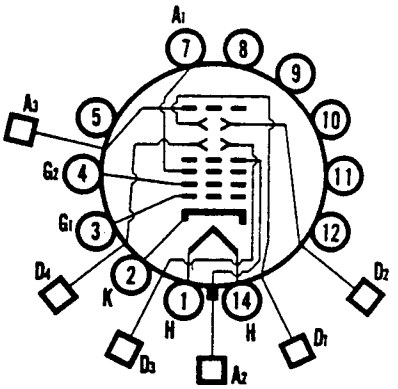
Minimum Useful Screen Diameter	18	Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Neck Contacts (Small Ball)	J1-25	
Base (Medium Shell Diheptal 14-Pin	B12-37	

These are tentative data only. Sylvania, by the publication thereof, is under no obligation as to future manufacture of the product herein described nor as to adherence to these data in case of such future manufacture.

QUICK REFERENCE DATA

Character Writing Tube
19" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Post Deflection Acceleration
Aluminized Screen





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Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

April 29, 1965

MECHANICAL DATA (Continued)

J1-21 Contact and Base Key Aligns with Trace D1-D2	±10	Degrees
D3-D4 Trace Aligns with Pin No. 11	±10	Degrees
Angle Between D1-D2 and D3-D4 Traces	90 ± 1	Degrees

RATINGS

MAXIMUM RATINGS (Absolute Maximum Ratings)

Anode Input	6	Watts
Anode No. 3 (Post Accelerator) Voltage	19,800	Volts dc
Anode No. 2 Voltage[1]	11,000	Volts dc
Anode No. 1 (Focusing Electrode) Voltage	8,000	Volts dc
Grid No. 1 Voltage		
Negative Bias Value	200	Volts dc
Positive Bias Value	0	Volt dc
Positive Peak Value	0	Volt
Grid No. 2 Voltage	800	Volts dc
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	180	Volts
Heater Positive with Respect to Cathode	180	Volts
Peak Voltage Between Anode No. 2 and Any Deflecting Plate	1500	Volts
Ratio Post Accelerator Voltage to Anode Voltage	2:1	

TYPICAL OPERATING CONDITIONS

Anode No. 3 (Post Accelerator) Voltage	18,000	Volts dc	
Anode No. 2 Voltage	10,000	Volts dc	
Grid No. 2 Voltage	500	Volts dc	
Anode No. 1 Voltage for Focus	4800 to 5200	Volts dc	
Grid No. 1 Voltage Required for Cutoff	-50 to -150	Volts dc	
Deflection Factors			
Deflecting Plates 1-2	90 to 140	Volts dc/Inch	
Deflecting Plates 3-4	90 to 140	Volts dc/Inch	
Modulation at 17.7 FTL[2]	50	Volts	Max.
Light Output Center[2]	17.7	FTL	Min.
Line Width[3-4]			
Center	0.025	Inch	
Corners	0.040	Inch	
Spot Position	1.5	Inch	
Spot Displacement	0.4	Inch	
Focus Correction[3-4]	0 to 1000	Volts	Max.
Astigmatism Correction[3-4]	0 to 350	Volts	Max.

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Megohms Max.
Resistance in Any Deflection Plate Circuit[1]	1.0	Megohms Max.

NOTES:

1. The deflection electrode circuit resistances shall be less than 30,000 ohms.

2. Using a Spectra Spot Brightness Meter or equivalent and writing at 850,000 inch/sec. with a repetition rate of 60 cycles. Minimum light output will be as specified.

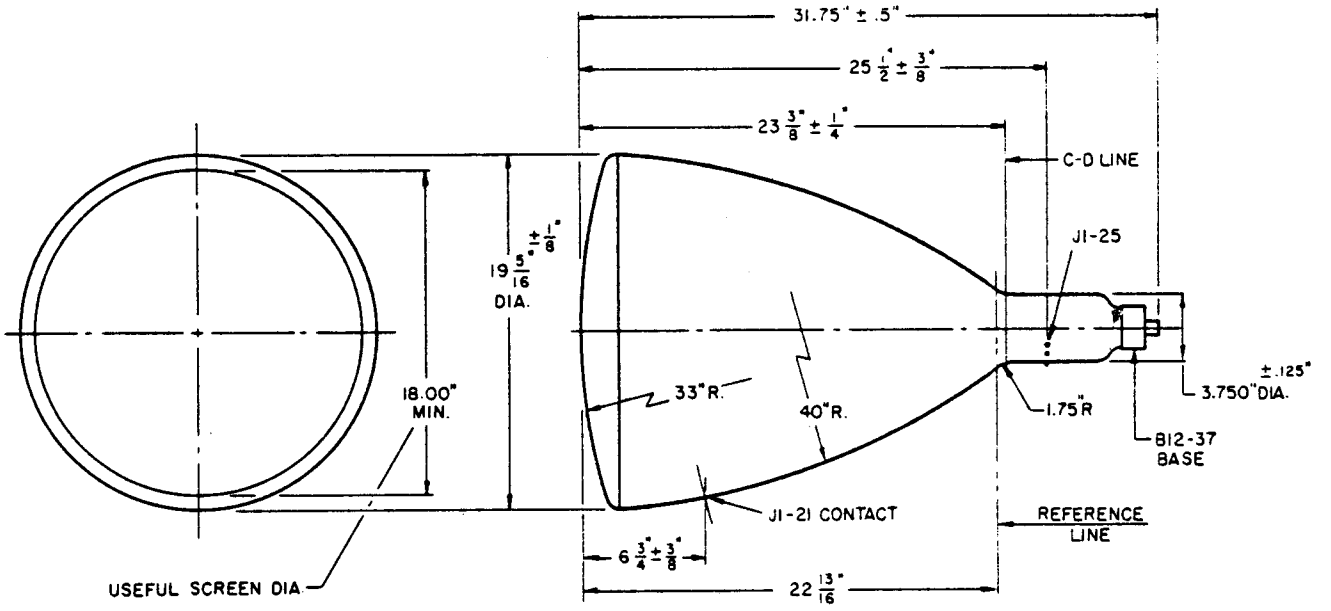
3. Line width within a 4-inch circle will be considered as center, the remaining area within a centered 12.6 inch square will be considered Line Width at corners. Line Width measurements will be taken per Note 2 using 5 FTL as the light output level.

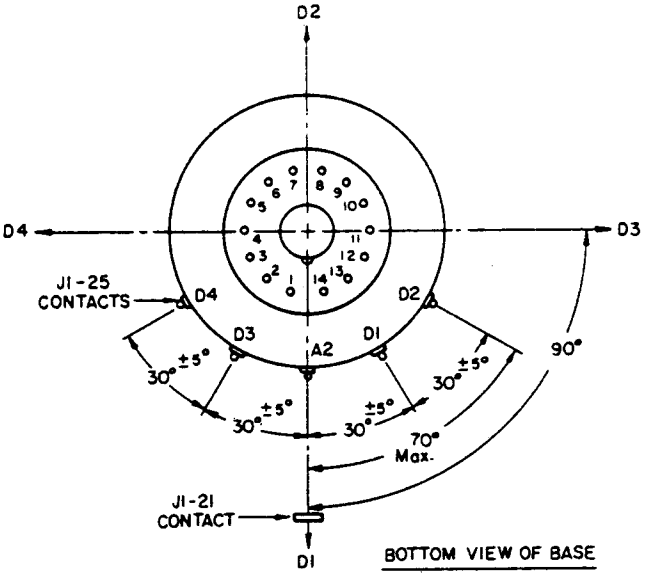
4. Line Width test made with dynamic focus ad astigmatism. Both focus and astigmatism may change from the center value to some value within the values specified.

X-RAY WARNING:

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at higher than the manufacturer's maximum anode voltage or 16,000 volts, whichever is less.

OUTLINE


31.75" ± .5"
25 1/2" ± 3/8"
23 3/8" ± 1/4"
C-D LINE
J1-25
19 5/16" ± 1/8" DIA.
18.00" MIN.
33"R.
40"R.
1.75"R
±.125"
3.750"DIA.
B12-37 BASE
J1-21 CONTACT
REFERENCE LINE
6 3/4" ± 3/8"
22 13/16"
USEFUL SCREEN DIA


D2
D4
D3
J1-25 CONTACTS
D4
D2
D3
D1
A2
30° ±5°
30° ±5°
30° ±5°
30° ±5°
90°
70° Max.
J1-21 CONTACT
D1
BOTTOM VIEW OF BASE
D65010

DESCRIPTION

Sylvania Type SC-4009 is an electrostatically focused and deflected cathode ray tube designed for modern oscilloscopes which feature a rectangular shape display. Its electron gun offers high deflection and pattern linearity.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic
Phosphor*	P31
Fluorescence	Green
Phosphorescence	Green
Persistence	Medium
Faceplate	Clear

*In addition to the phosphor shown the SC-4009 can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 10 % Ampere	
Direct Interelectrode Capacitances		
Cathode to All Other Electrodes	5.0 pf	Max.
Grid No. 1 to All Other Electrodes	6.9 pf	Max.
Between Deflecting Plates 1-2	4.5 pf	Max.
Between Deflecting Plates 3-4	1.6 pf	Max.
Deflecting Plate 1[1] to All Other Electrodes	9.3 pf	Max.
Deflecting Plate 2[1] to All Other Electrodes	9.3 pf	Max.
Deflecting Plate 3[1] to All Other Electrodes	6.3 pf	Max.
Deflecting Plate 4[1] to All Other Electrodes	6.3 pf	Max.

MECHANICAL DATA

Minimum Useful Screen Dimension	4 x 5 Inches
Base	B12-37, Medium Shell Diheptal 12-Pin
Basing	14G
Base Alignment	
D1-D2 Trace Aligns with Pin No. 5 and Major Tube Axis[4]	±10 Degrees
Angle Between D1-D2 and D3-D4 Traces	90 ± 0.8 Degrees
Angle Between D1-D2 Trace and Bulb Wall	±1.5 Degrees

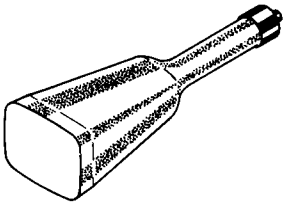
RATINGS

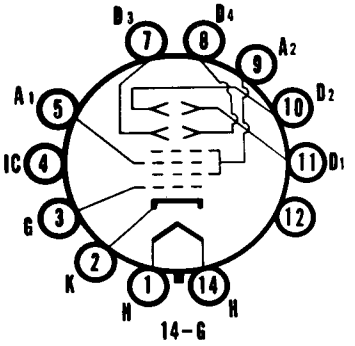
MAXIMUM RATINGS (Absolute Maximum Values)

Maximum Anode No. 2 Voltage[2]	4400 Volts dc
Anode No. 1 Voltage	1650 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	220 Volts dc
Positive Bias Value	0 Volt dc
Positive Peak Value	2 Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	200 Volts
Heater Positive with Respect to Cathode	200 Volts
Peak Voltage Between Anode No. 2 and any Deflecting Plate	1200 Volts

QUICK REFERENCE DATA

4½ x 5½ Face
Direct Viewed
Electrostatic Deflection
Oscilloscope Tube
Electrostatic Focus
Clear Faceplate





SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

JULY, 1965

File Under

SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

TYPICAL OPERATING CONDITIONS

Anode No. 2 Voltage	2500 Volts dc	
Anode No. 1 Voltage for Focus	0 to 300 Volts dc	
Grid No. 1 Voltage Required for Cutoff[3]	−34 to −56 Volts dc	
Deflection Factor[4]		
Deflecting Plates 1-2	40 to 50 Volts dc/In.	
Deflecting Plates 3-4	31.5 to 38.5 Volts dc/In.	
P1 Light Output[5]	15 Ft. L.	Min.
Modulation[5]	40 Volts dc	Max.
Line Width A[5]	0.030 Inch	Max.
Anode No. 2 Current[5]	400 μa dc	Max.
Deflection Factor Uniformity[6]	1 Percent	Max.
Pattern Distortion at 100 % of Useful Scan[7]	1 Percent	Max.
Spot Position[8]	Within a 5/16 Inch Radius Circle	
Useful Scan (Centered on Tube Face)	3 7/8 x 4 1/2 Inches	Min.

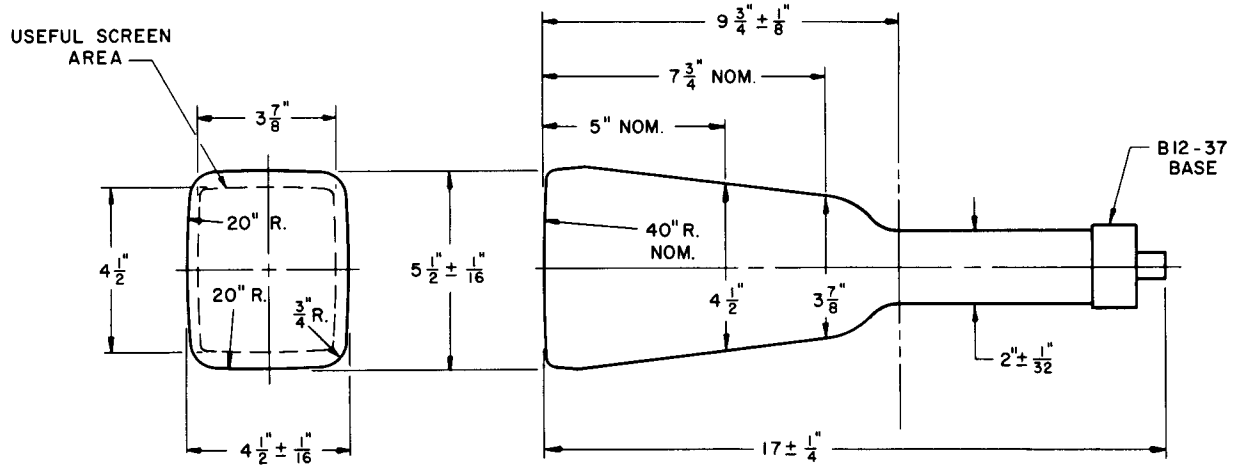
CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Megohms	Max.
Deflection Circuit Resistance[9]	1.0 Megohms	Max.

NOTES:

1. *Deflecting Plate 1 is Pin No. 11.*
   Deflecting Plate 2 is Pin No. 10.
   Deflecting Plate 3 is Pin No. 7.
   Deflecting Plate 4 is Pin No. 8.
2. *The product of Anode No. 2 voltage and average Anode No. 2 current should be limited to 6.0 watts.*
3. *Visual extinction of undeflected focused spot.*
4. *Positive voltage on D1 deflects beam approximately toward Pin No. 5.*
   Positive voltage on D3 deflects beam approximately toward Pin No. 2.
5. *Measured in accordance with MIL-E-1 specification on a P31 screen at a brightness of 15 Ft. L. on a raster size of 2 x 2 inches.*
6. *The deflection factors at 75 % of useful scan and at 25 % of useful scan shall not differ by more than the indicated value.*
7. *All edges of a raster pattern adjusted so its widest points just touch the sides of a 3.075 inch square, will fall within the area bounded by the 3.075 inch square and an inscribed 2.925 inch square.*
8. *Centered on the tube face with the tube shielded and with all deflection plates connected to Anode No. 2.*
9. *It is recommended that the deflecting electrode circuit resistances be approximately equal.*

OUTLINE



D65017

ADVANCE DATA

DESCRIPTION

The SC-4014 is a 7″ flat face, 2 gun cathode ray tube with electrostatic deflection and focus. It features linear post deflection acceleration for maximum pattern linearity and deflection factor uniformity. It is intended for applications where line widths less than 0.020 inches are required. The SC-4014 can be supplied with a variety of phosphors. The screen is aluminized for high brightness. This tube is potted in its mu-metal shield and is provided with color coded leads for all connections.

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Electrostatic
Faceplate	Clear

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current (2 Guns in Parallel)	0.60 ± 10 % Ampere

MECHANICAL DATA

Overall Tube Length	$20\frac{7}{8} \pm \frac{1}{4}$ Inches
Minimum Useful Screen Diameter	$6\frac{1}{8}$ Inches
Basing	Color Coded Leads
Angle Between D1-D2 and D3-D4 Traces of Each Gun	90 ± 1 Degree
Angle Between D1-D2 and D3-D4 Traces of the 2 Guns are Parallel	±1 Degree

MAXIMUM RATINGS (Absolute Maximum Values)

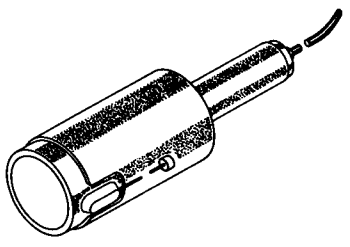
Anode No. 3 Voltage	15,000 Volts	dc
Anode No. 2 Voltage	4500 Volts	dc
Anode No. 1 (Focus Electrode) Voltage	1550 Volts	dc
Grid No. 1 Voltage		
Negative Bias Value	220 Volts	dc
Positive Bias Value	0 Volt	dc
Positive Peak Value	2 Volts	
Peak Voltage Anode No. 2 to Any Deflecting Plate	±550 Volts	
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	200 Volts	
Heater Positive with Respect to Cathode	200 Volts	
Modulation (Anode 3 Current = 25 μa)	36 Volts	Max.

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage	12,400 Volts	dc
Anode No. 2 Voltage	2900 Volts	dc
Grid No. 1 Voltage (For Spot Cutoff)	−35 to −65 Volts	dc
Anode No. 1 Voltage (For Focus)[1]	750-1050 Volts	dc
Deflection Factors		
D1-D2	116 to 134 Volts/in.	
D3-D4	116 to 134 Volts/in.	
Line Width "A"[2]	0.020 Inches	Max.
Useful Scan[3]		
D1-D2	$2\frac{5}{8}$ Inches	Min.
D3-D4	$2\frac{5}{8}$ Inches	Min.
Spot Position[4]	—	
Maximum Ib3 at Cutoff	60 μa	dc
Interaction Factor[5]	5×10^{-5} Inches/V	dc
Gun to Gun Tracking[6]	—	
Pattern Distortion[7]	—	

QUICK REFERENCE DATA

2 Gun Design
7″ Flat Face
Electrostatic Focus
Electrostatic Deflection
Linear Post Acceleration
Aluminized Screen
Potted in Mu-Metal
Color Coded Leads



For Basing
Diagram See
Page 3

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication
SEPTEMBER, 1964

File Under

SPECIAL AND GENERAL
PURPOSE CATHODE RAY TUBES

NOTES:

1. *Focus voltage at cutoff (Ib3 = 0) not to exceed maximum value specified.*
2. *Per MIL-E-1 and at Ib3 = 25 μa (this current shall be in addition to the value of Ib3 read at cutoff).*
3. *Measured from geometric center of the face.*
4. *The shielded undeflected focused spot of each gun shall fall within a 5/8 inch square whose sides are parallel to the deflection axes. The center of this square will lie on the geometric center of the face.*
5. *The deflection of one beam when balanced dc voltages are applied to the deflection electrodes of the other, shall not be greater than the specified value.*
6. *Display a spot with gun "A" and a 0.120 inch high by 0.130 inch wide rectangle with gun "B". After appropriate centering and scale factor corrections have been made, the guns shall track such that the spot of gun "A" will stay within the rectangle of gun "B" at all points within a rectangle 4.50 inches high by 3.75 inches wide centered on the tube face.*
7. *Guns "A" and "B". With a 4.50 inch high (+D3 is top) by 3.75 inch wide rectangular raster centered on the face of the tube, the raster edges shall not deviate from straight parallel lines by more than 0.080 inch total on the upper and lower edges, and 0.080 on the right and left edges.*

OUTLINE

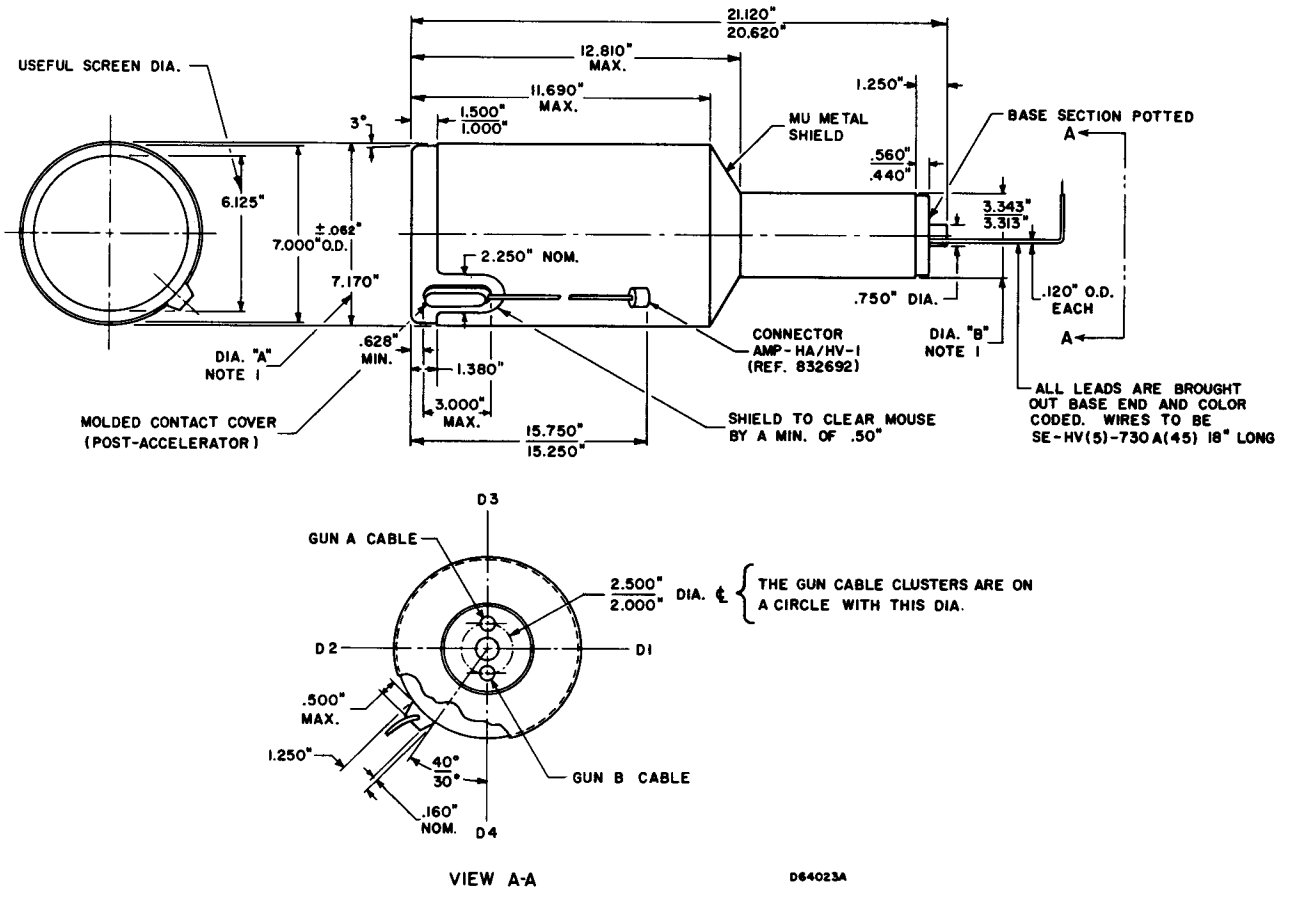
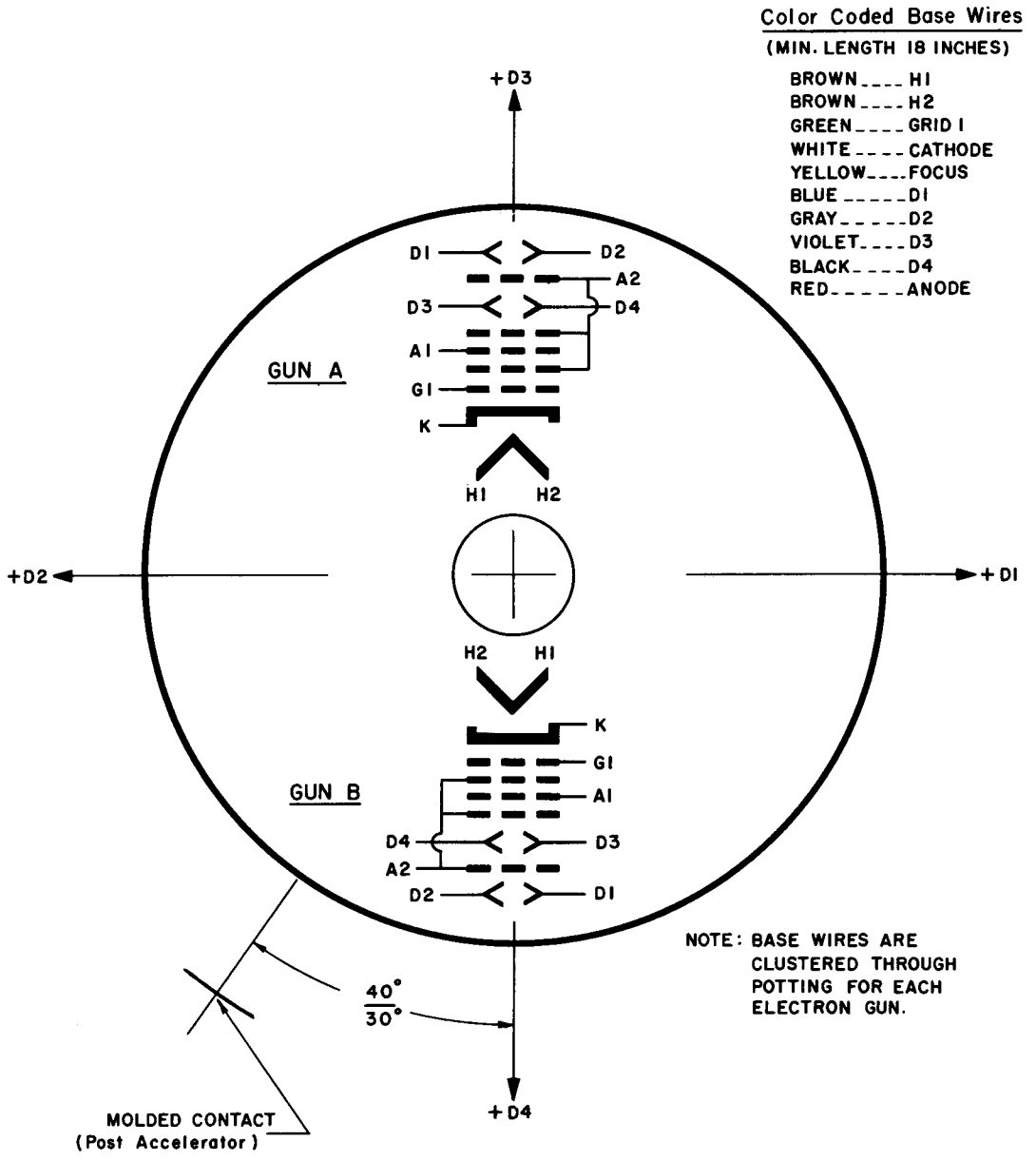


DIAGRAM NOTE:

1. *Diameter "A" to be concentric with Diameter "B" within 0.120 T.I.R.*

BASING DIAGRAM



VIEW FROM BASE END OF TUBE

TENTATIVE DATA

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Electrostatic
Phosphor*	P31
Fluorescence	Green
Phosphorescence	None
Persistence	Medium
Faceplate	Gray Filter Glass

* In addition to the phosphor shown, the SC4022 can be supplied with several other screen phosphors.

ELECTRICAL DATA

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Amperes
Direct Interelectrode Capacitances (Approx.)		
Cathode to All Other Electrodes	7.0	pf
Grid No. 1 to All Other Electrodes	8.5	pf
Between Deflecting Plates 1-2	4.0	pf
Between Deflecting Plates 3-4	3.5	pf
Deflecting Plate 1 to All Other Electrodes	13.0	pf
Deflecting Plate 2 to All Other Electrodes	13.0	pf
Deflecting Plate 3 to All Other Electrodes	8.5	pf
Deflecting Plate 4 to All Other Electrodes	8.5	pf

MECHANICAL DATA

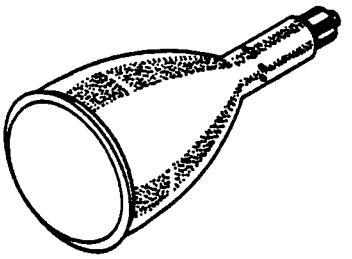
Minimum Useful Screen Diameter	9	Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-22	
Neck Contact (Small Ball)	J1-25	
Base (Medium Shell Diheptal 12-Pin)	B12-37	
Weight (Approx.)	12	Pounds
J1-22 Contact Aligns with Pins #1 & 14	±10	Degrees
Positive Voltage on D1 Deflects Beam Approx. toward Pin 5		
Positive Voltage on D3 Deflects Beam Approx. toward Pin 1 & 14		

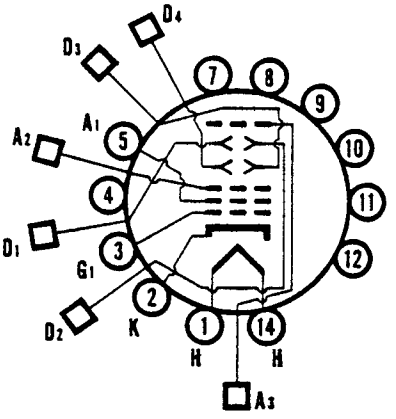
These are tentative data only. Sylvania, by the publication thereof, is under no obligation as to future manufacture of the product herein described nor as to adherence to these data in case of such future manufacture.

146 (10-58)

QUICK REFERENCE DATA

Oscilloscope Tube
10" Direct Viewed
Round Glass Type
Electrostatic Deflection
Electrostatic Focus
Post Deflection Acceleration
Aluminized Screen





SC-4022

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

April 28, 1965

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Input[1]	6	Watts
Anode No. 3 Voltage	15,000	Volts dc
Anode No. 2 Voltage	10,000	Volts dc
Anode No. 1 Voltage	3,300	Volts dc
Grid No. 1 Voltage		
Negative Bias Value	-200	Volts dc
Positive Bias Value	0	Volts dc
Positive Peak Value	2	Volts
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	180	Volts
Heater Positive with Respect to Cathode	180	Volts
Peak Voltage Between Anode No. 2 and any Deflecting Plate	1,500	Volts
Ratio Post Accelerator Voltage to Anode Voltage	2:5	

TYPICAL OPERATING CONDITIONS

Anode No. 3 Voltage	12,000	Volts dc
Anode No. 2 Voltage	8,000	Volts dc
Astigmatism Correction Voltage	0 - 200	Volts dc
Anode No. 1 Voltage for Focus	2000 - 2400	Volts dc
Grid No. 1 Voltage Required for Cutoff[2]	-70 to -100	Volts dc
Deflection Factor[3]		
Deflecting Plates 1-2	200 to 245	Volts dc/Inch
Deflecting Plates 3-4	180 to 210	Volts dc/Inch
Modulation[4]	27	Volts Max.
Line Width Center	.010	Inch
Line Width Corner[5]	.015	Inch
Focus Electrode Current[4]	-25 to +25	µa dc
Spot Position, Undeflected	Within 15	mm Square
Angle Between D1-D2 Trace and D3-D4 Trace	90 ± 1	Degree

CIRCUIT VALUES

Grid No. 1 Circuit Resistance	2.0	Megohms Max.
Resistance in Any Deflection Plate Circuit	1.0	Megohms Max.

NOTES:

1. Anode input equals the product of anode No. 2 voltage and average anode No. 2 current.

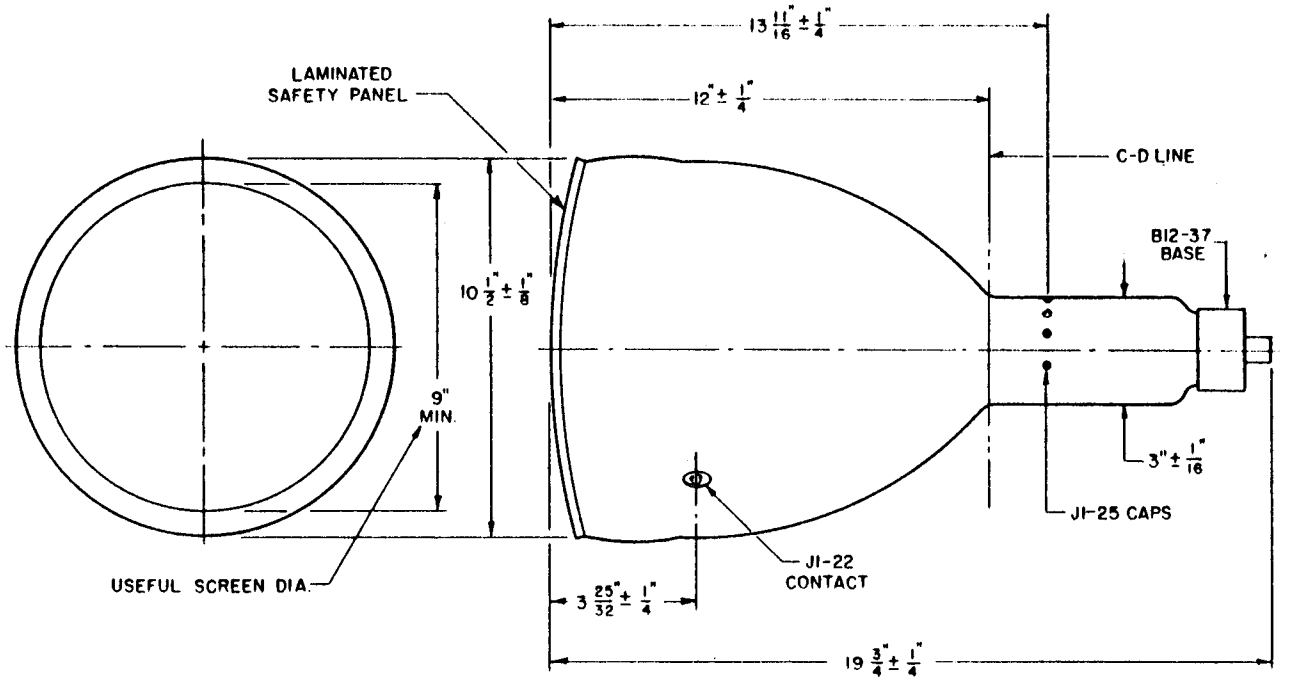
2. For visual extinction of undeflected focused spot.

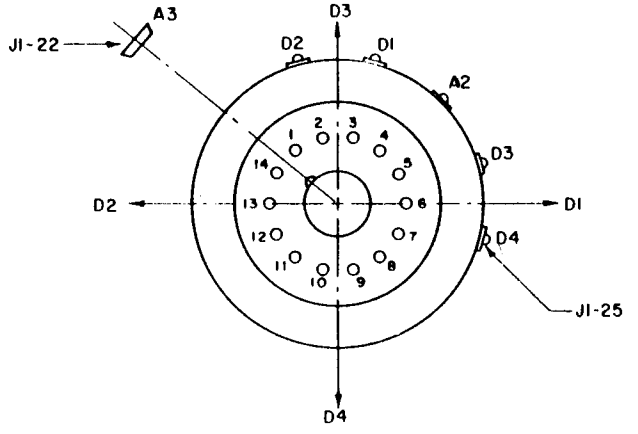
3. Deflection plates 1 and 2 are nearer the screen.

4. Measured on a 2 inch X 2 inch 75 line raster Light output equals 250 FT. L. using Meter. Foot Lamberts Meter Model 759.

5. 5½ inch square.

OUTLINE





BOTTOM VIEW OF BASE

D65016

SYLVANIA

engineering data service

electronic products

SYLVANIA SN4

1D21/SN4

STROBOTRON TYPE SN4 & 1D21/SN4
DESCRIPTION

The Types SN4 and 1D21 Strobotrons are internally-triggered, cold-cathode, inert-gas-filled electronic tubes which are capable of excellent service in condenser discharge circuits involving high peak currents at low average currents. One of their primary uses is as a source of stroboscopic light pulses of short duration. As a stroboscopic tube, the Strobotron provides a neon-red flashing light under whose illumination rotary and reciprocatory motion may be studied. The frequency of the flashes is easily controlled over relatively wide limits, the maximum pulse frequency being 60 pulses per second for the SN4 and 240 for the 1D21/SN4. For flexibility, two internal grids are incorporated, allowing adaptation to a wide variety of driving circuits. The intensity of the light is sufficient for visual observation.

The SYLVANIA Types SN4 and 1D21/SN4 Strobotrons are of equal value as electronic relays or controls wherever high peak currents but low average currents are desired. With these tubes, switching is possible without the interruption of service which results from deterioration of moving parts and contacts. Best results for high-current operation may be expected when the circuit constants are so proportioned as to give peak cathode currents of from 10 to 200 amperes at average levels of 50 milliamperes or less. Under favorable duty cycle conditions, peak currents as high as 300 or 400 amperes are possible.

AVERAGE CHARACTERISTICS AND RATINGS
MECHANICAL SPECIFICATIONS

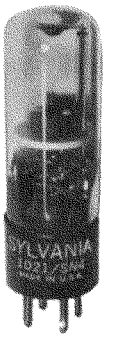
Envelope	T9
Base	Small 4 pin
Mounting Position	Any

ELECTRICAL RATINGS AND OPERATING CONDITIONS

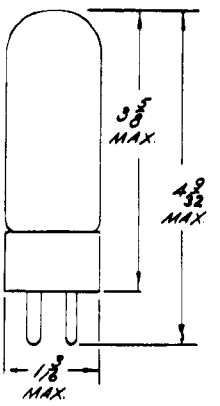
Anode Voltage	300 volts max.—Note 1
Peak Inverse Anode Voltage	50 volts max.
Average Cathode Current	50 ma. max.
Peak Cathode Current	5 amps. min.—Notes 2 & 3
Grid Firing Voltage	80-125 volts—Notes 4 & 5
Control Grid Bias Voltage	−50 to +50 volts
Shield Grid Bias Voltage	−50 to + 50 volts
Average Grid Current	15 ma. max.
Minimum Trigger Grid Current (Surge)	1 ma.
Control Grid Circuit Resistance	5 megohms max.
Pulse Frequency SN4	60 p.p.s. max.
Pulse Frequency 1D21/SN4	240 p.p.s. max.
Tube Voltage Drop	
Glow Discharge	75 volts approx.
Arc Discharge	20 volts approx
Ambient Temperature Range	−55 to + 90° C

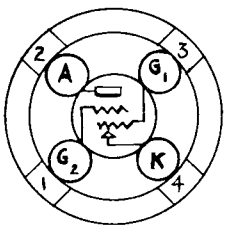
Note 1. Measured between shield grid and anode.
Note 2. Current required to initiate arc discharge.
Note 3. Maximum anode circuit capacitance, 50 μf.
Note 4. Applied to shield grid, zero bias on control grid.
Note 5. Average starting range. Holds only for tubes used in approved circuits under specified conditions. Circuit design should provide for a trigger pulse of at least 175 volts. Tube may be started by initiating glow discharge between grids or between either grid and cathode. Either grid may be used for control with proper bias on the remaining grid.

MECHANICAL DATA









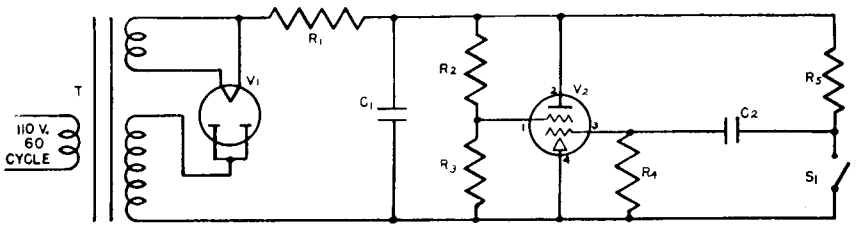
SYLVANIA ELECTRIC PRODUCTS INC. ELECTRONICS DIVISION
1740 Broadway, New York 19, New York

SN4
1D21/SN4

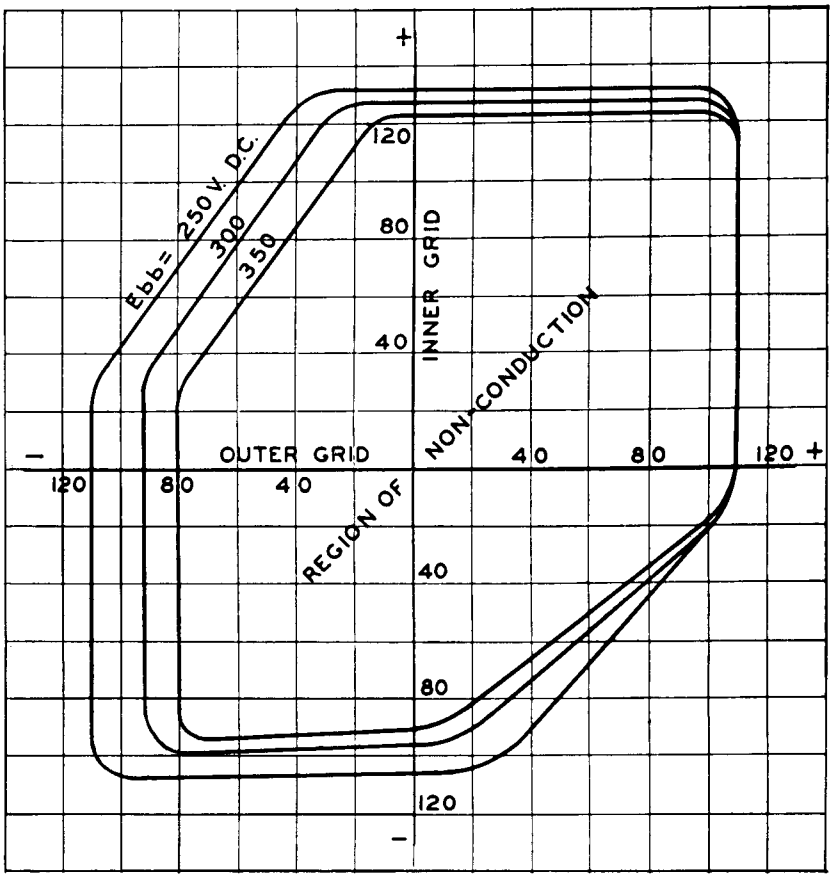
TYPICAL CIRCUIT

The circuit shown below is only one of many which may be used to operate the SN4 and 1D21/SN4. The switch S_1 is ordinarily operated either mechanically or electronically. In general, circuits are designed around specific applications. SYLVANIA engineers invite inquiries concerning your particular problems.

PATENTS—SYLVANIA Strobotron tubes are liscensed under Edgerton, Germeshausen & Grier patents 2,185,189 and 2,201,167.



T Power Transformer
C_1 2μf, 600 W.V.D.C.
C_2 0.03 μf. 600 W.V.D.C.
R_1 3000 ohms, 10 watts
R_2 1.0 megohm, 1 watt
R_3 0.1 megohm, 1 watt
R_4 1.0 megohm, 1 watt
R_5 0.1 megohm, 1 watt
S_1 Momentary Contact Switch
V_1 Low Voltage Rectifier
V_2 Type SN4 or 1D21



TYPICAL DYNAMIC CHARACTERISTICS

If the vector sum of the grid voltages lies within the region on non-conduction, the tube will not fire, but as soon as the voltage on either grid reaches a value outside of the critical limits portrayed in the curve above, the tube will fire. (Note: This graph is indicative of general behavior only.)

CHARACTERISTICS

GENERAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angles (Approx.)	Diagonal 70 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Short to Medium
Faceplate, Cover Plate	See Table I

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.3 ± 10 % Ampere
Emission Warm-Up Time (Approx.)	30 Sec.
Direct Interelectrode Capacitance (Max.)	
Cathode to All Other Electrodes	10 pf
Grid No. 1 to All Other Electrodes	10 pf
External Conductive Coating to Anode	200-350 pf

MECHANICAL DATA

Minimum Useful Screen Dimensions	4⅜ x 5¾ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base	E9-37
Basing	9HT
Bulb Contact has Radial Alignment about Tube Axis with Centerline Between Base Pins No. 1 and 9	±30 Degrees

RATINGS

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage	13,000 Volts dc
Grid No. 4 Voltage (Focusing Electrode)	−550 to +1100 Volts dc
Grid No. 2 Voltage	550 Volts dc
Grid No. 1 Voltage	
Negative Bias Value	155 Volts dc
Positive Bias Value	0 Volt dc
Positive Peak Value	2 Volts dc
Peak Heater-Cathode Voltage	±100 Volts

TYPICAL OPERATING CONDITIONS

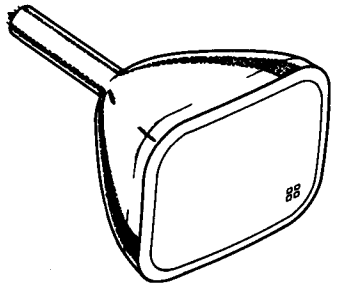
Anode Voltage	10,000 Volts	Max.
Grid No. 4 for Focus	−125 to +300 Volts dc	
Grid No. 2 Voltage	300 Volts dc	
Grid No. 1 Voltage		
Required for Spot Cutoff	−40 to −60 Volts dc	
Brightness at 100 μa Anode Current	60 Ft. L.	Min.

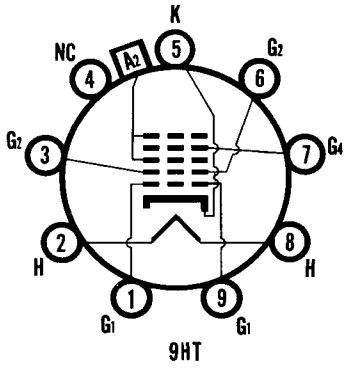
CIRCUIT VALUE

Grid No. 1 Circuit Resistance	1.5 Megohm Max.

QUICK REFERENCE DATA

Monitor Tube
Electrostatic Focus
Magnetic Deflection
4⅜ x 5¾ Rectangular Screen
Bonded Shield
Anti-Reflection Treated
ST-3183A, ST-3183B,
ST-3183C, ST-3183E





SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
SENECA FALLS, NEW YORK

A Technical Publication

APRIL, 1964

File Under
SPECIAL AND GENERAL PURPOSE CATHODE RAY TUBES

TABLE I

Approximate Face and Cover Transmittance by Type
All Covers Anti-reflection Coated

TYPE	FACE TRANS.	COVER TRANS.	COMBINED TRANS.
ST-3183	92 %	No Cover	92 %
ST-3183A	72 %	60 %	46 %
ST-3183B	92 %	32 %	30 %
ST-3183C	92 %	92 %	88 %
ST-3183D	72 %	No Cover	72 %
ST-3183E	92 %	14 %	15 %

OUTLINE

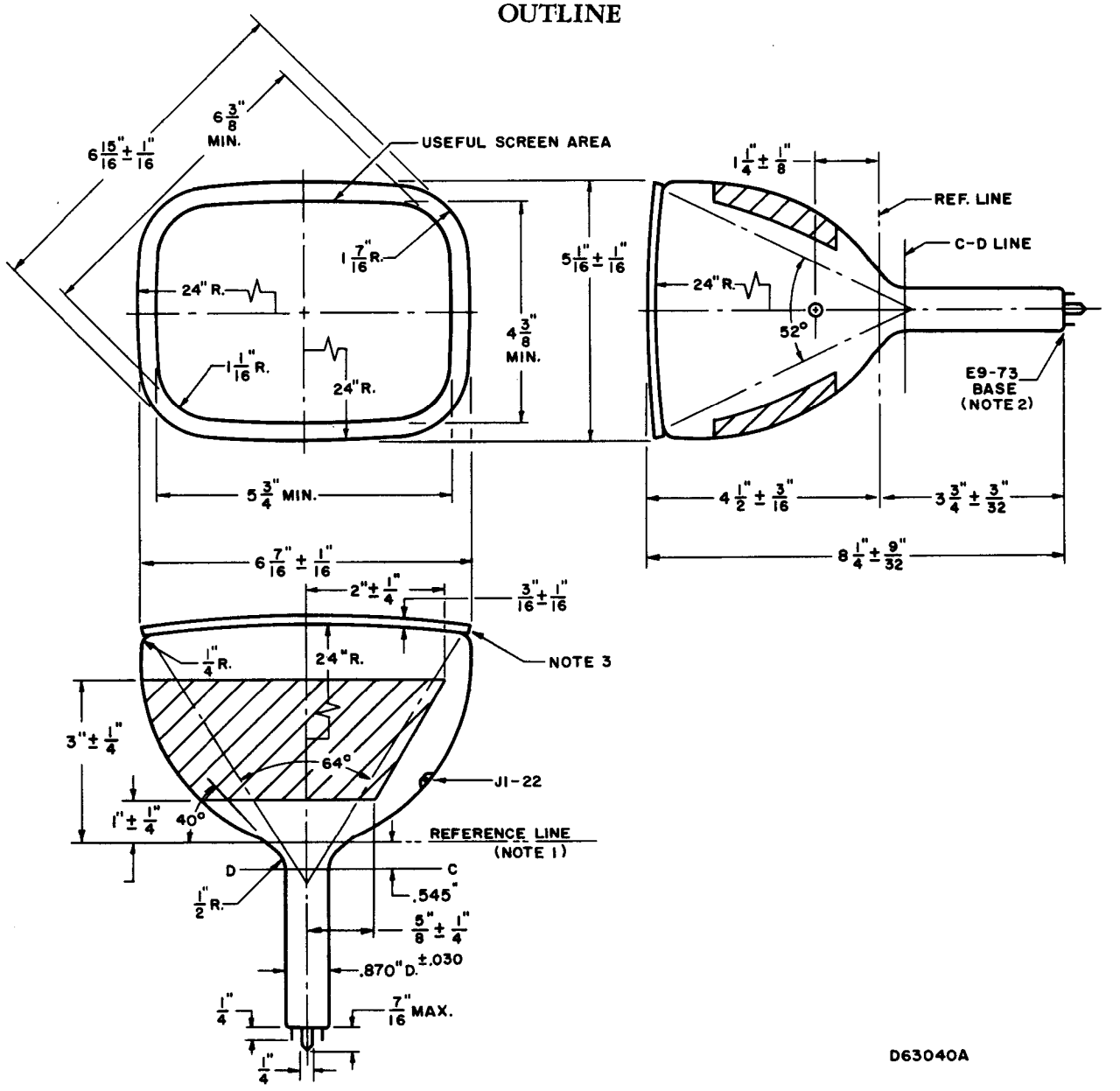


DIAGRAM NOTES:

1. *Reference line is determined by plane C-C' of JEDEC No G141 Reference Line Gauge, when the gauge is seated against the bulb.*
2. *Center plane between Pins 1 and 9 aligns with major axis of tube within 30° and is on same side as anode contact, J1-22.*
3. *Safety plate not to extend beyond mold match more than 1/8 inch.*

SYLVANIA SY1301 SY1301A

DESCRIPTION

The Sylvania Omegatron Type SY1301 is a mass spectrometer analyzer tube capable of resolving peaks of interest of simple hydrocarbons and fixed gases in the 2 to 50 mass to charge ratio range. By increasing magnetic field strength resolution is extended through mass 80. Useable in a pressure range from 10^{-5} to 10^{-10} torr, it can be incorporated into nearly any high vacuum system where a glass to glass or metal to glass seal can be made. The bulb is Nonex glass and is supplied with graded seals according to customer specifications. It operates at an ionizing current of only one microamp which minimizes gauge pumping and gas reactions. (See Note 5 for additional technical references.)
Type SY1301A is a calibrated unit, being otherwise identical with its counterpart Type SY1301.

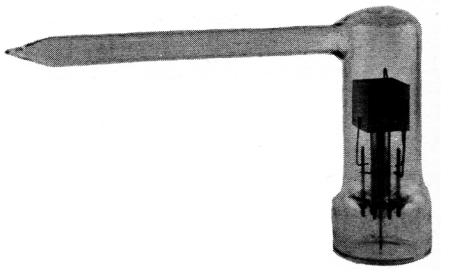
QUICK REFERENCE DATA

Omegatron
Mass Spectrometer
Small Size
High Sensitivity
Nonex Glass
Gold Plated Pins
Complete Systems Available

MECHANICAL DATA

Physical Dimensions	See Outline
Filament Emitter	Tungsten
Envelope	7720 Nonex Glass
Maximum Envelope Bake-Out Temperature	450°C
Base	8-Pin, T-9 with Center Lead[3]

Basing
Pin No. 1—Electron Beam Focusing Electrode
Pin No. 2—Filament Emitter
Pin No. 3—Trapping Voltage Cage
Pin No. 4—RF Electrode
Pin No. 5—Electron Collector Electrode
Pin No. 6—Ion Collector Shield (RF Ground)
Pin No. 7—Trapping Voltage Cage
Pin No. 8—Filament Emitter
Center Pin—Ion Collector Electrode



ELECTRICAL DATA

TYPICAL OPERATION[2] (M/e 44-2; Pressure Range 10^{-5} to 10^{-10} Torr)

Frequency of Applied RF	169 to 3720 Kc
Amplitude	1.7 to 3.0 v
Focus Electrode Voltage	−70 Vdc
Trapping Voltage[1]	−0.5 to −2.0 Vdc
Electron Collector Voltage	22.5 Vdc
Magnetic Flux Density	5000 Gauss
Electron Beam Current	1.0 μA
Emitter Voltage Range (Approx.)[4]	1.05 to 1.25 Vac
Ion Collector Current	10^{-10} to 10^{-15} A

NOTES:

1. *With the Omegatron in a properly aligned magnetic field, the trapping voltage is normally −1.0 volt but may be varied in increments of 0.1 volt within the range to obtain maximum sensitivity. For mass 2 trapping voltage is set at 1.9 volts.*
2. *Resolution can be extended through mass 80 by increasing magnetic field strength. The approximate relationship is*

$$\frac{M}{\Delta M} = \frac{edH^2}{2EM}$$

where:
e = *charge of the ion in esu.*
d = *distance from ion collector to electron beam in cm.*
H = *magnetic flux density in gauss.*
E = *high frequency field strength (distance between high frequency electrodes in cm).*
M = *mass of the ion in grams.*

SYLVANIA ELECTRIC PRODUCTS INC.

Electronic Components Group
ELECTRONIC TUBE DIVISION
EMPORIUM, PA.

A Technical Publication

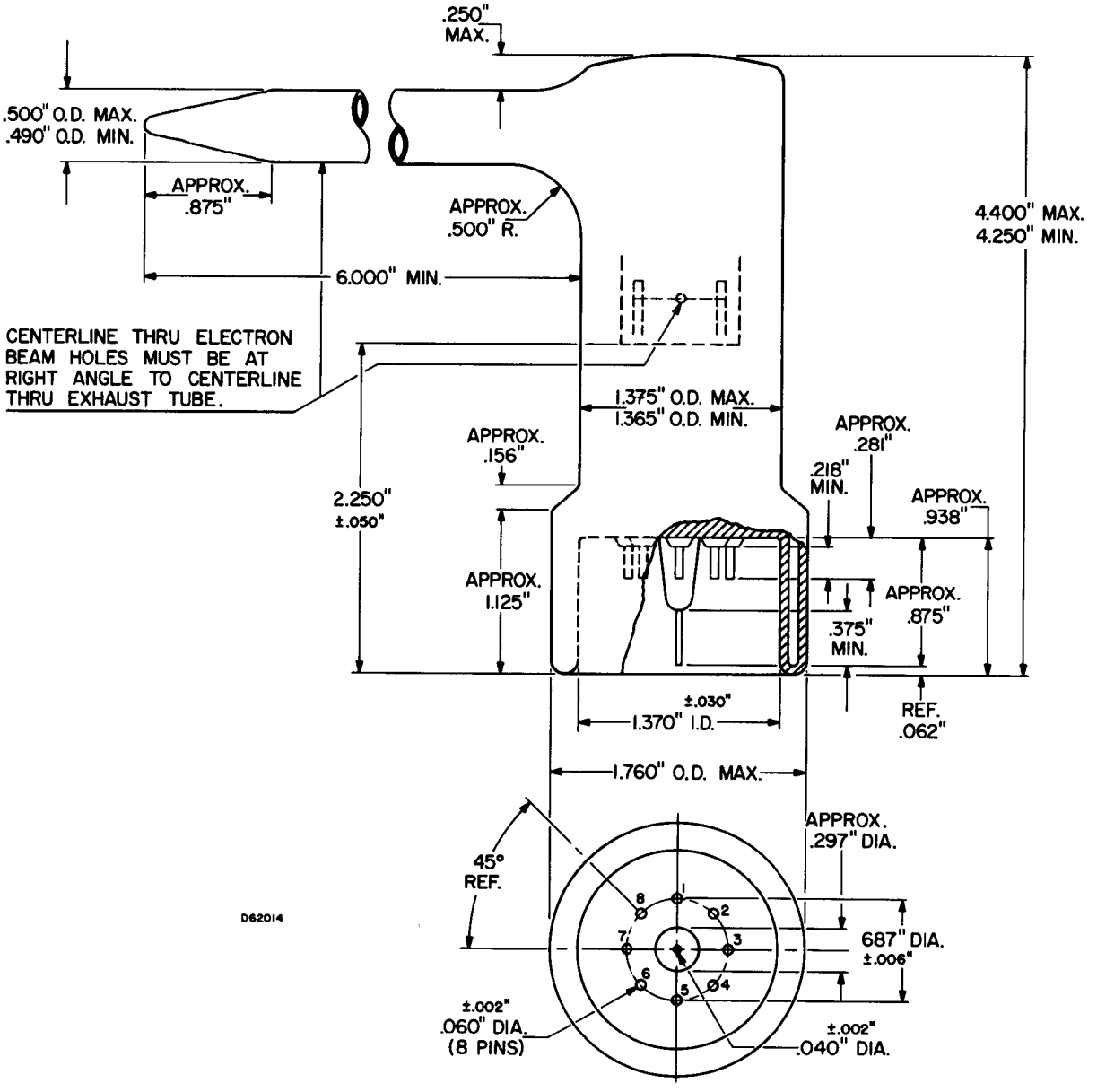
JUNE, 1964

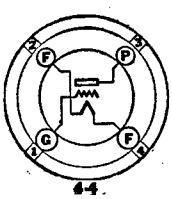
File Under
SPECIAL PURPOSE ELECTRONIC TUBES

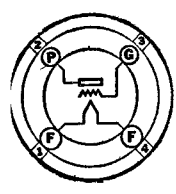
NOTES: (Continued)

3. *Base pins are coated with gold to assure low resistance connection with pin clips.*
4. *Following alignment of the Omegatron in the magnetic field, the emitter voltage is adjusted within the specified range to produce a beam current of 1.0 μA.*
5. *The following technical reference booklets are available from Sylvania upon request: (1) Omegatron Mass Spectrometer and (2) Operational Data—Sylvania Omegatron Type SY1301.*

OUTLINE



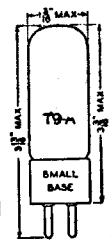




Sylvania

TYPE V99
TYPE X99

DETECTEUR AMPLIFICATEUR



CARACTERISTIQUES

Tension filament CA	3,0 à	3,3 volts
Courant filament	0,060 à	0,063 ampère
	V99	X99
Ampoule	T-8	T-9A
Culot (Type V99) Petit 4 broches ...	4-E	...
Culot (Type X99) Petit 4 broches ...	...	4-D
Position de montage	Verticale	Verticale

Capacités directes interélectrodes :

Grille à plaque	3,6 $\mu\mu$f
Entrée	2,5 $\mu\mu$f
Sortie	2,2 $\mu\mu$f

Conditions de fonctionnement et caractéristiques comme amplificateur :

Tension filament	3,0 à 3,3 volts
Tension plaque	90 volts max.
Tension grille	—4,5 volts
Courant plaque	2,2 ma.
Résistance interne	14.000 ohms
Conductance mutuelle	475 μmhos
Coefficient d'amplification	6,0

Conditions de fonctionnement en détecteur polarisé :

Tension plaque	90 volts max.
Tension grille	—10,5 volts (approx.)

Courant plaque ajusté à 0,2 ma. sans signal appliqué.

APPLICATION

Sylvania 99 est un tube d'utilisation générale pour remplacement dans de vieux récepteurs.

MECHANICAL DATA

Mounting Position	Any
Envelope	Pyrex Glass
Bulb	See Outline Drawing

ELECTRICAL DATA

Filament Voltage	3 to 7.5 V
Filament Current	3.5 to 5 A
Grid Voltage	+150 V
Grid Current	5 mA
Collector Voltage	−25 V

DESCRIPTION:

In the hot filament ionization gauge, such as the SYLVANIA type VG1A, the electrons emitted from a heated filament in the sensing tube are accelerated toward a positively charged cylindrical grid. Some electrons pass into the space between the grid and a negatively charged collector and collide with gas molecules from the vacuum system to produce positive ions. The positive ions are then collected on the negative collector. At a constant voltage and emission current, the number of positive ions formed is proportional to the pressure below 1×10^{-3} mm mercury and the strength of the ion current on the collector is indicated on a microammeter calibrated in units of pressure. Inasmuch as pressure indication is linear, the hot filament gauge is generally considered the most accurate continuous indication for pressures below 1×10^{-3} mm of mercury.

ADVANTAGES:

1. Hot filament gauges are highly sensitive, read to very low pressures and have a broad range.
2. Scalers are linear.
3. The sensing tubes can be easily degassed.

SENSITIVITY:

With all due precautions in degassing, voltage supply, leakage, etc., the sensitivity of the VG1A tube for air falls between 90 and 125 microamperes per micron Hg. A good average value for pressure below one micron is 100 microamperes per micron. Electrode potentials and grid currents other than standard may be used. Sensitivity is directly proportional to grid current but, for maximum tube life, grid currents should be kept low, particularly at pressures above 0.1 micron.

DEGASSING:

For lower pressure measurements (under 1×10^{-5} mm Hg) the tube must be degassed. A current of 7 amperes supplied through a special pair of leads for a few minutes degasses the spiral grid, and a flame touched to the hard-glass envelope outgasses the collector, which consists of a thin internal coating connected by a unique crack-resistant, glass-to-metal seal. The large diameter of the VG1A tubulation also helps reduce inaccuracies due to gas evolution.

INSTALLATION:

An open tubulation is required for installation, but a closed tube is supplied by Sylvania to protect the electrodes against contamination before installation. This tubulation can either be sealed directly to any Pyrex glass system or can be supplied on request with a glass-to-metal seal or ground joint for other types of connection. Normally, the tube is installed in a vertical position, but it can be operated in any position without sagging of the electrodes. The VG1A is also available with ¾ inch tubulation and/or long insulated leads terminating in a Jones plug.

QUICK REFERENCE DATA

A hot filament ionization gauge used to measure pressures down to 10^{-7}mm of mercury.



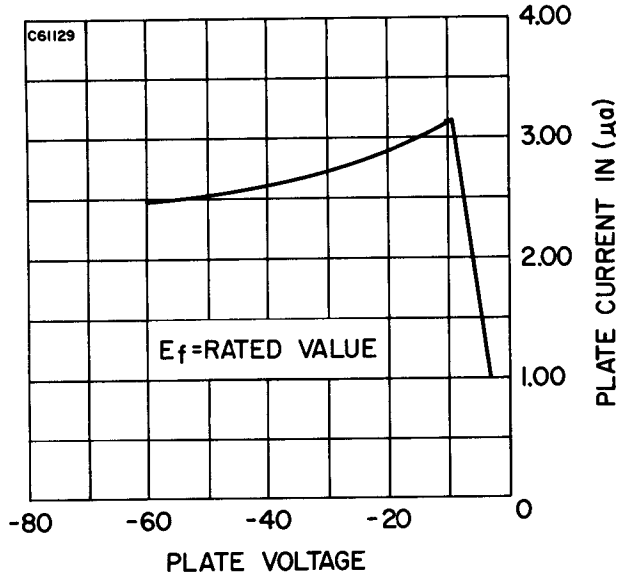
SYLVANIA
ELECTRONIC TUBES
A Division of
Sylvania Electric Products Inc.
RECEIVING TUBE
OPERATIONS
EMPORIUM, PA.

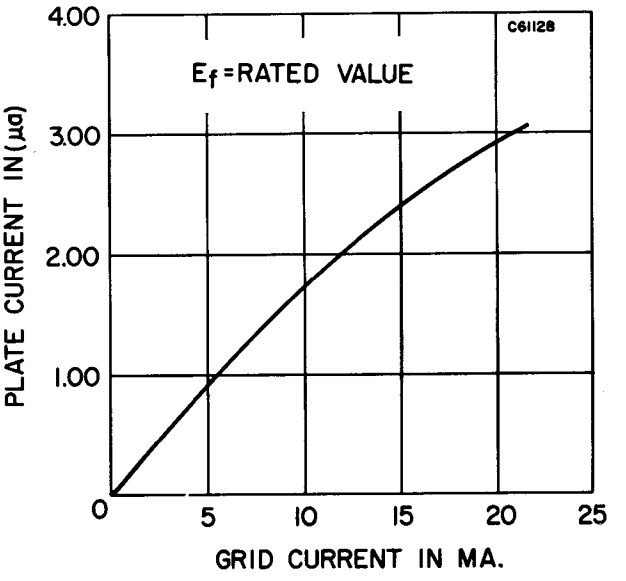
Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

DECEMBER, 1963

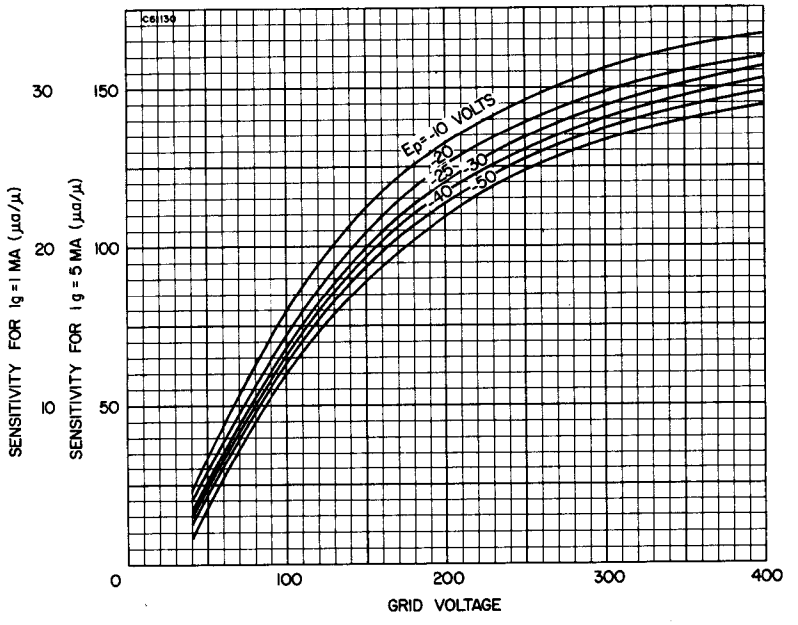
File Under
SPECIAL PURPOSE
ELECTRONIC TUBES

AVERAGE PLATE CHARACTERISTICS

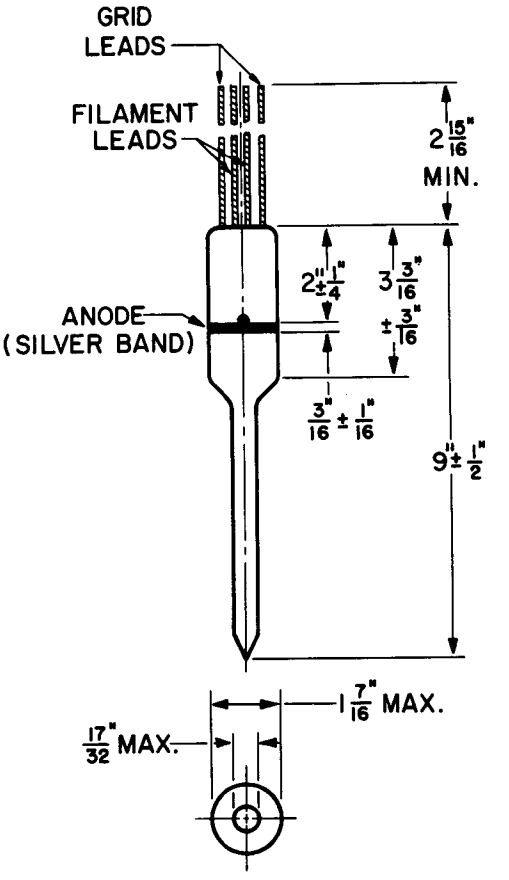


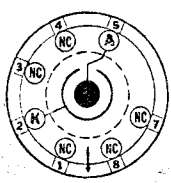


PRESSURE SENSITIVITY



OUTLINE



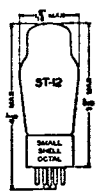


VR-4

Sylvania

TYPE VR90
TYPE VR150

REGULATEURS DE TENSION



CARACTERISTIQUES

Pas de tension de chauffage requise.

Ampoule	ST-12(G)
Culot : petit octal 7 broches	4-W
Position de montage	Toutes

Conditions de fonctionnement et caractéristiques :

	VR90	VR150
Tension amorçage minimum ...	125	180 volts min.
Tension fonctionnement	90	150 volts
Régulation type :		
Courant fonctionnement	10 (min.) 30 (max.)	5 (min.) ma. 30 (max.) ma.
Tension fonctionnement	90	150 volts (approx.)

APPLICATION

Les tubes Sylvania VR90 et VR150 sont des régulateurs de tension à remplissage gazeux et à cathode froide. Ils sont caractérisés par une chute de tension interne pratiquement constante qui peut être appliquée à une charge demandant une bonne régulation de tension.

Ces tubes sont montés dans l'ampoule ST-12 avec un culot standard octal 7 broches. L'électrode cylindrique extérieure est la cathode et est connectée à la broche n° 2. L'électrode intérieure est l'anode et est reliée à la broche n° 5.

Une résistance limitative de courant devra toujours être mise en série avec le tube et le secteur. La valeur du courant entraîné par la charge déterminera naturellement l'importance de la résistance, mais elle sera telle qu'elle ne permettra jamais le passage d'un courant de plus de 30 ma. à travers le tube lorsque la charge est déconnectée.

