

#214
9/15/39GENERAL DESCRIPTION

APPLICATION:

The Hytron Bantam 1B8GT is a filament type, triple-purpose diode-triode detector audio voltage amplifier and output Beam Pentode power amplifier in one envelope. The primary purpose for the combination is for the conservation of space in portable compact receivers.

The Hytron Bantam 1B8GT is a glass tube enclosed in a T9 bulb equipped with a small octal wafer base with metal sleeve. The sleeve is connected to the #1 base pin for the purpose of shielding. Electrically the 1B8GT consists of a 1H5GT and a 1T5GT mounted side by side, the filaments connected in parallel.

PHYSICAL CHARACTERISTICS: BULB T9-C Basing Designation SAW

RATINGS AND CHARACTERISTICS

Filament Voltage (D.C.)	1.4 volts
Filament Current	0.1 amp.

(Pentode Section - Class A, Amplifier)

Plate Voltage	90	67.5	62.5	45.0 volts
Screen Voltage	90	67.5	62.5	45.0 volts
Control Grid Voltage	-6.0	-4.5	-4.5	-3.0 volts
Plate Current	6.3	4.2	4.1	2.2 ma.
Screen Current	1.4	1.2	1.2	.8 ma.
Mutual Conductance	1150	900	850	750 umhos
Load Resistance	14000	16000	16000	20000 ohms
Power Output	210	100	90	30 mw
Total Harmonic Distortion	8.5	9.5	10.5	9.5 %

(Triode Section - Class A₁ Amplifier)

Plate Voltage	90	volts
Grid Bias	0**	volts
Plate Resistance	0.24	megohm
Transconductance	275	umhos
Plate Current	0.15	ma.

(DIODE UNIT)

** The diode is located at the negative end of the filament and is independent of the triode unit and pentode unit except for the common filament.

BASE PIN CONNECTIONS

Pin 1 - Shell	Pin 6 - Triode Plate
Pin 2 - Filament 4	Pin 7 - Filament -
Pin 3 - Pentode Plate	Pin 8 - Diode Plate
Pin 4 - Pentode Screen	Cap - Triode Grid
Pin 5 - Pentode Grid	



SYLVANIA

engineering data service

1N2

from JEDEC release
#2568, Aug. 31, 1959

ADVANCE DATA

MECHANICAL DATA

Bulb	T-12
Base ¹	B7-227, Short Medium Shell Octal, 7-Pin
Cap	G1-34
Outline	12-18
Basing ¹	3C
Cathode	Coated Filament
Mounting Position	Any

ELECTRICAL DATA

FILAMENT CHARACTERISTICS

Filament Voltage	1.25	Volts
Filament Current	200	Ma
Maximum Heater Voltage Range ²	1.05 - 1.45	Volts

DIRECT INTERELECTRODE CAPACITANCE

Plate to Filament and Internal Shield	1.4	μ f
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RATINGS (Design Maximum System)²Flyback Voltage Rectifier³

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

CHARACTERISTICS

Tube Drop for $I_b = 7$ Ma (approx.)	100	Volts
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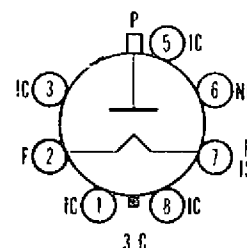
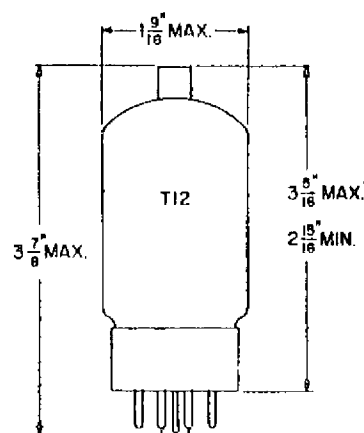
NOTES:

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. 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.

QUICK REFERENCE DATA

The Sylvania Type 1N2 is a filamentary half-wave diode intended for service as the high voltage rectifier in television receivers and other high voltage rectifier applications.



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

July 15, 1959
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SYLVANIA

IN2

Page 2

NOTES: (Continued)

2. 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 Broadcast Stations; Federal Communications Commission", the duty cycle of the voltage pulse must not exceed 15 per cent of one 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 Plate Voltage or 16,000 volts, whichever is less.

HYTRON CORPORATION

TENTATIVE SPECIFICATIONS

BANTAM TYPE 1P5GT

GENERAL DESCRIPTION

APPLICATION:

The Hytron Bantam 1P5GT is a filament type pentode amplifier designed for service as a high frequency amplifier in receivers operating from a low voltage battery filament supply.

It may also be employed as a I F amplifier or audio frequency voltage amplifier and in such use is capable of comparatively high gain.

The Hytron Bantam Type 1P5GT is a glass tube equipped with a small octal base and metal shell ring. It may be used interchangeably with Type 1P5G and affords simple shielding where necessary by using the standard slipover shield. Because of its small physical dimensions and unique electrical design, the Bantam Tube in many cases will require no additional shielding other than provided through Bantam construction.

PHYSICAL CHARACTERISTICS: BULB T 9C

RATINGS AND CHARACTERISTICS

Filament:

Voltage	1.4	volts
Current	.05	ampere

OPERATING CONDITIONS

Plate Voltage	90	volts
Screen Voltage	90	volts
Grid Voltage*	0	volts
Plate Current	2.3	ma.
Screen Current	.7	ma.
Plate Resistance (Approx.)	.8	megohm
Mutual Conductance	800	micromhos
Amplification Factor (Approx.)	640	
Mutual Conductance at $E_c = -12$ V. (App.)	10	micromhos

*Negative filament return.

Direct Interelectrode Capacitances:

G_1-P (With tube shield)	.007	uuf. Max.
$G_1-(F + G_2 + G_3)$	2.2	uuf.
$P-(F+G_2+G_3)$	9.0	uuf.

PIN CONNECTIONS

Pin 1 - Shell	Pin 5 - Open
Pin 2 - Fil +	Pin 7 - Fil -
Pin 3 - Plate	Pin 8 - Open
Pin 4 - Screen	Top Cap - Grid

RMA TYPE 2C26

Tentative Technical Data

Special Triode Oscillator

GENERAL CHARACTERISTICS

Electrical

Coated Unipotential Cathode

Heater Voltage 6.3 volts

Heater Current 1.1 amps.

Plate Dissipation 10 max. watts

Average Characteristics E_b 400 V.

E_c -15 V., E_f 6.3 V.

Plate Current 16 ma.

Amplification Factor 16.3

Transconductance 2200 micromhos

Average Direct Inter-electrode Capacitances

Grid-to-Plate 2.6 mmf.

Grid-to-Cathode 2.6 mmf.

Plate-to-Cathode 1.0 mmf.

Frequency for Maximum Rating 300 MC

Mechanical

Type of cooling: Convection

Base (see diagram) . . . Intermediate shell

Octal 8-pin phenolic

Top Caps Special skirted miniature

Bulb T-9

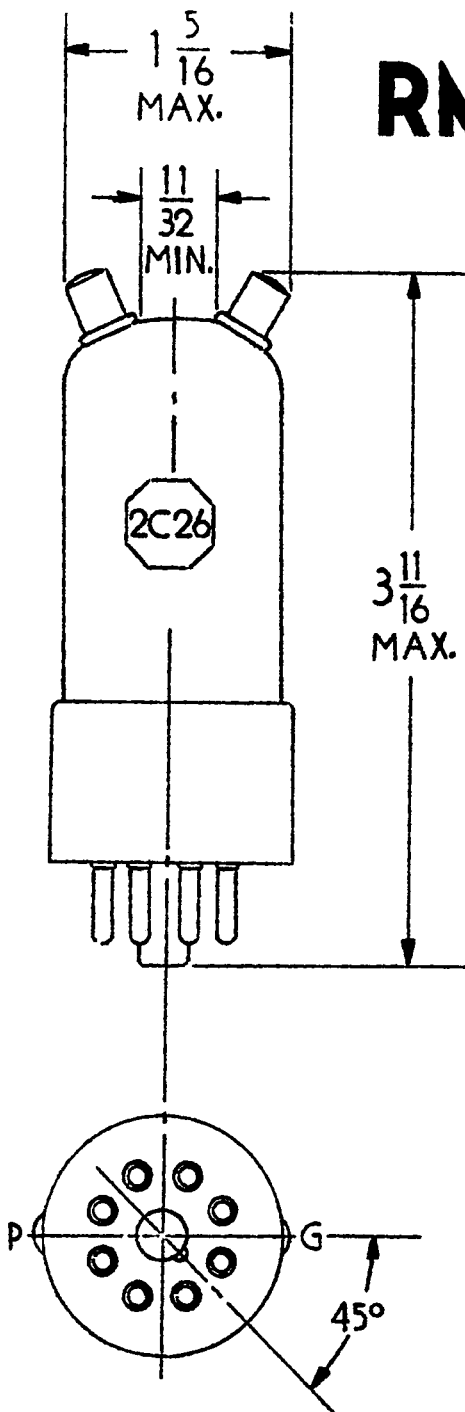
Maximum overall dimensions . . (see outline)

Length 3-11/16 inches

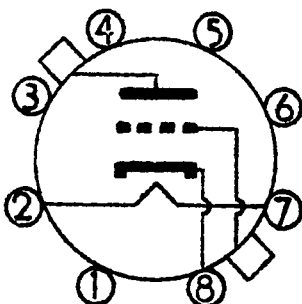
Seated Height 3-1/8 inches

Diameter 1-5/16 inches

Net Weight 1-1/2 ounces

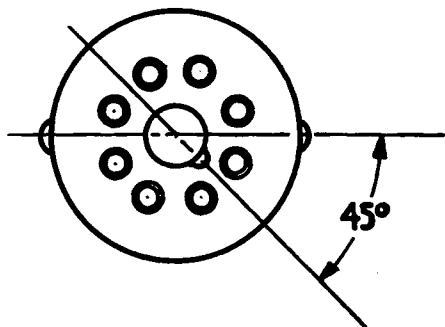
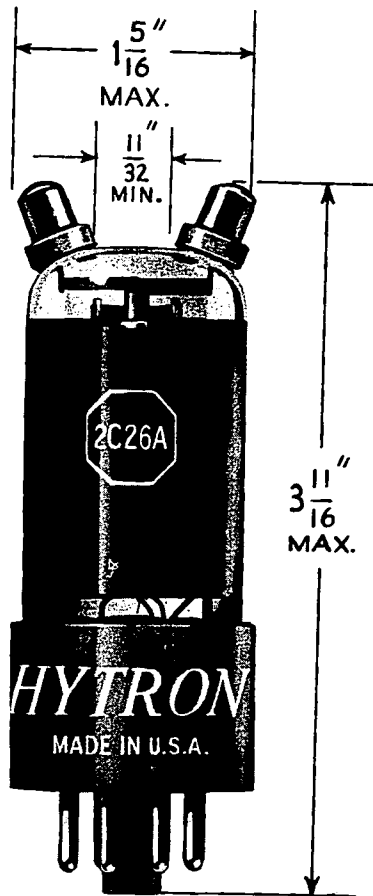


Basing Connections

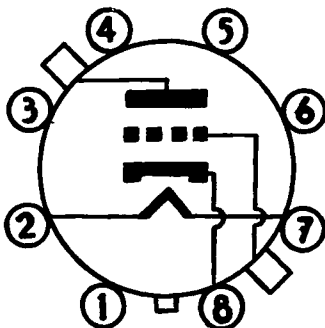


Bottom View

HYTRON TYPE 2C26A



Basing Connections
Bottom View



ULTRA-HIGH-FREQUENCY TRIODE PULSE OSCILLATOR

The Hytron type 2C26A is a special triode designed for use as a grid pulse or plate pulse oscillator at frequencies up to 300 megacycles. The cathode for the 2C26A is designed and processed to provide the extremely high peak plate currents required in pulse operation. The top cap design for the type 2C26A is such as to permit operation of the tube at maximum ratings without external voltage breakdown at the higher altitudes.

Electrical

Coated Unipotential Cathode

Heater Voltage.....	6.3 volts
Heater Current.....	1.1 amps.
Plate Dissipation.....	10 max. watts
Grid Dissipation.....	2.5 max. watts
Plate Potential(plate pulsed)...	3500 max. peak volts
Plate Potential(grid pulsed).....	2500 max. dc volts
Grid Bias.....	-700 max. dc volts

Average Characteristics for...Eb:400V;Eo:-15V;Eh:6.3V	
Plate Current.....	16 ma.
Amplification Factor.....	16.3
Transconductance.....	2250 micromhos

Average Direct Inter-electrode Capacitances

Grid-to-Plate.....	2.8 mmf.
Grid-to-Cathode.....	2.6 mmf.
Plate-to-Cathode.....	1.1 mmf.

Frequency for Maximum Rating..... 300 MC

Mechanical

Type of cooling.....	Convection
Base (see diagram).....	Intermediate shell
	Octal 8-pin phenolic
Top Caps.....	Special skirted miniature with insulating bushing
Bulb.....	T-9
Maximum overall dimensions.....	(see outline)
Length.....	3-11/16 inches
Seated Height.....	3-1/8 inches
Diameter.....	1-5/16 inches
Net Weight.....	1-1/2 ounces

NOTE: The 2C26A is interchangeable with and replaces the 2C26

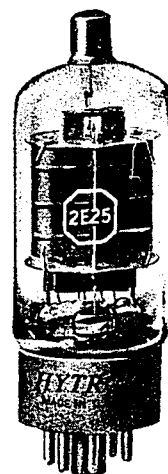
2E25

**CLASS C R-F BEAM TETRODE,
FREQUENCY MULTIPLIER,
A-F AMPLIFIER & MODULATOR**

2E25
15-WATT
BEAM TETRODE
INSTANT HEATING
FILAMENT

GENERAL CHARACTERISTICS

Filament	thoriated tungsten
Voltage a-c or d-c	6.0 ± 5% volts
Current	1.0 ampere
Transconductance	2500 μ hos
Ave amp factor (G_1 to G_2)	6
<i>Direct interelectrode capacitances</i>	
Grid to plate (maximum)	0.15 μ f
Input	8.5 μ f
Output	6.0 μ f
Maximum overall length	4-3/16 inches
Maximum diameter	1-7/16 inches
Bulb	ST-11
Cap	small metal
Base	7-pin medium short-shell octal low-loss phenolic
Mounting position - filament plane must be vertical	

**A-F POWER AMPLIFIER AND MODULATOR - CLASS A₁***Maximum Ratings, Design-Center Values.*

D-c plate potential	400	max	volts
D-c screen grid potential	250	max	volts
D-c plate input power*	10.5	max	watts
D-c screen grid input power	2.5	max	watts
Plate dissipation*	10.5	max	watts

Typical Operation - Average Characteristics

A-c filament potential ϕ	6.0	6.0	volts
D-c plate potential	300	250	volts
D-c screen grid potential	250	250	volts
D-c control grid potential ϕ_g	(a) -25	(b) -22.5	volts
	(c) ---	---	
Peak a-f control grid potential	600	500	ohms
Zero signal d-c plate current	25	22.5	volts
Max signal d-c plate current	34.5	38.5	ma
Zero signal d-c screen grid current	37	40	ma
Max signal d-c screen grid current	3	4	ma
Load resistance	8.4	9.6	ma
Total harmonic distortion	7000	5000	ohms
Max signal plate power output	11	7	percent
	6	4.75	watts

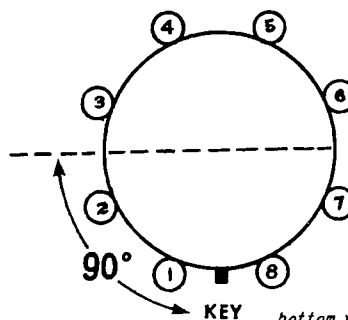
A-F POWER AMPLIFIER AND MODULATOR - CLASS AB₂*Maximum Ratings, Absolute Values.*

D-c plate potential	450	max	volts
D-c screen grid potential	250	max	volts
Peak positive a-f control grid potential	60	max	volts
Max signal d-c plate current ψ	75	max	ma
Max signal plate input power ψ	33	max	watts
Max signal screen grid input power ψ	5	max	watts
Plate dissipation ψ	15	max	watts

Typical Operation - Average Characteristics

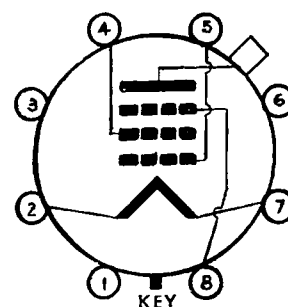
Unless otherwise specified the values are for two tubes

A-c filament potential ϕ	6.0	volts
D-c plate potential	450	volts
D-c screen grid potential	250	volts
D-c control grid potential ϕ_g	(a) -30	volts
Peak a-f control grid to control grid potential	142	volts
Zero signal d-c plate current	44	ma
Max signal d-c plate current	150	ma
Zero signal d-c screen grid current	10	ma
Max signal d-c screen grid current	40	ma
Max signal d-c control grid current	3	ma
Effective load resistance (plate to plate)	6000	ohms
Max signal control grid driving power	0.42	watts
Max signal plate power output	40	watts

FILAMENT PLANE

KEY
bottom view of socket
TERMINAL CONNECTIONS

Pin	Connection
1	None
2	Filament
3	None
4	Screen Grid

BASE PIN LAYOUT

Pin	Connection
5	Control Grid
6	None
7	Filament
8	Beam Plates $\diamond$

Cap — Plate

**R. F. POWER AMPLIFIER AND OSCILLATOR
CLASS C TELEGRAPHY AND FREQUENCY MODULATION**
Key-down conditions per tube without amplitude modulation

Maximum Ratings, Absolute Values.

D-c plate potential	450	max	volts
D-c screen grid potential	250	max	volts
D-c control grid potential	-125	max	volts
D-c plate current	75	max	ma
D-c control grid current	4.5	max	ma
Peak positive r-f control grid potential	60	max	volts
D-c plate input power	33.5	max	watts
D-c screen grid input power	4	max	watts
Plate dissipation	15	max	watts

Typical Operation - Average Characteristics

D-c plate potential	450	450	volts
D-c screen grid potential	250	250	volts
D-c control grid potential	(a) -45	(b) -70	volts
	(c) 15000	23000	ohms
Peak r-f control grid potential	480	750	ohms
D-c plate current	90	120	volts
D-c screen grid current	75	75	ma
D-c control grid current	15	15	ma
Control grid driving power (approx.)	3	3	ma
Plate power output Δ (approx.)	0.27	0.36	watts
	20	22	watts

HYTRON 2E25

PLATE AND SCREEN-GRID AMPLITUDE MODULATED R. F. POWER AMPLIFIER—CLASS C TELEPHONY

Carrier conditions for use with a max modulation percentage of 100

Maximum Ratings, Absolute Values

D-c plate potential	400	max	volts
D-c screen grid potential	225	max	volts
D-c control grid potential	-125	max	volts
D-c plate current	75	max	ma
D-c control grid current	4.5	max	ma
Peak positive r-f control grid potential	60	max	volts
D-c plate input power +	24	max	watts
D-c screen grid input power +	2.7	max	watts
Plate dissipation +	10	max	watts

Typical Operation - Average Characteristics

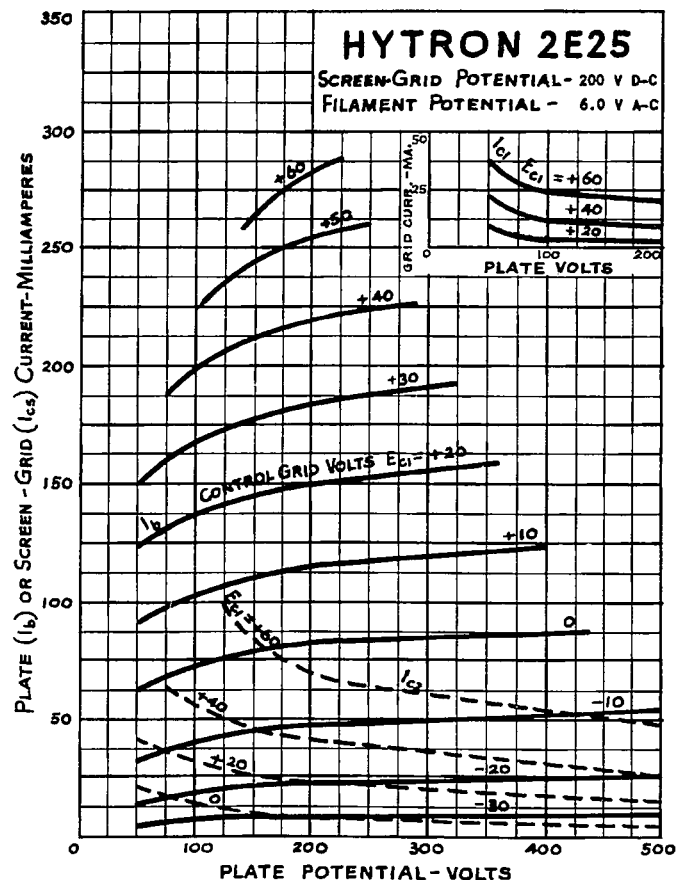
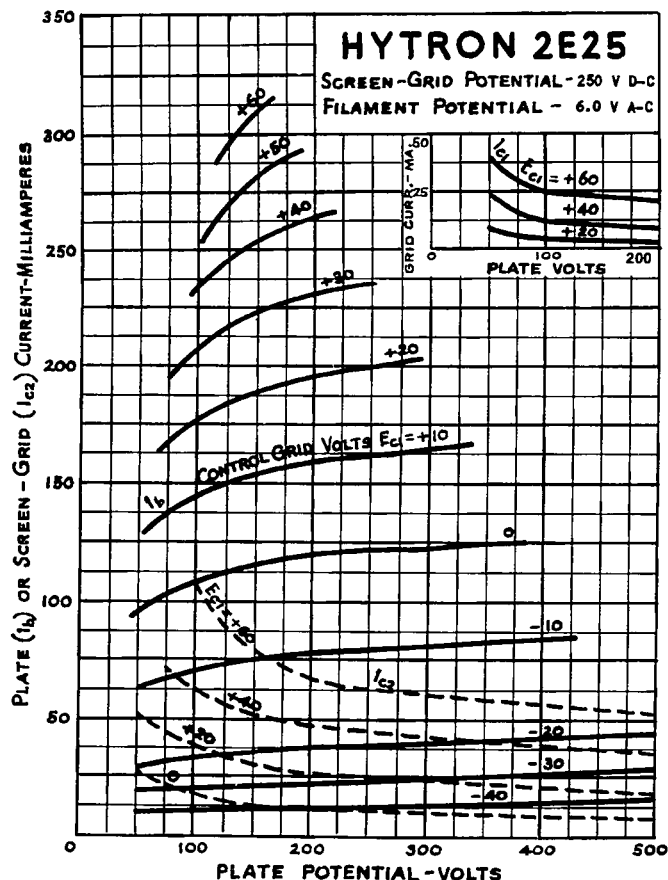
D-c plate potential	400	volts
D-c screen grid potential	225	volts
D-c control grid potential #	(a) -70	volts
	(b) 23000	ohms
	(c) 1000	ohms
Peak r-f control grid potential	110	volts
D-c plate current	60	ma
D-c screen grid current	8.5	ma
Screen grid dropping resistor	20000	ohms
D-c control grid current	3	ma
Control grid driving power (approx.)	0.33	watts
Plate power output Δ (approx.)	15	watts

NOTES

The plate supply must be switched off before or simultaneously with the filament in all applications. When the 2E25 is driven by a tube having an oxide-coated filament, provision must be made so that the tube (s) is not operated with plate and screen potential applied but without a bias voltage during the time interval required for the driver to come up to operating temperature. When the filament is heated from a transformer with a nominal 6.3-volt output, the filament connections may be made with small wire to introduce the necessary drop of 0.3 volts.

Tube conservation: When the standby period is generally less than 15 minutes, additional tube life can be obtained by reducing the filament potential to 80% of the nominal operating voltage during standby. For longer standby periods, the filament should be turned off.

- * Class A₁ dissipation rating based upon tubes having average plate current. In the case of tubes whose plate current is the maximum acceptable under the Hytron testing specification, dissipation will be 15 watts, with somewhat higher power output capability.
- φ When d-c is used on the filament, the bias should be reduced approximately 3½ volts, and the grid return made to negative leg of filament.
- # Obtained from (a) fixed supply (b) control grid resistor (c) cathode resistor, or by combination of methods.
- ψ Averaged over any a-f cycle of sine wave form.
- + When modulated 100% with a sine wave, the average power increases by 50%. With a complex wave form, such as is produced by speech or music, the average power increases approximately 20% to 25%.
- ◇ The beam plates should be connected to center tap of filament transformers, if a-c operated, or to negative side of filament, if d-c operated.
- Δ "Plate power output" includes circuit losses and r-f radiation losses, as well as useful power delivered to the load.



PREPARED BY COMMERCIAL ENGINEERING DEPT.
HYTRON RADIO & ELECTRONICS CORP.
MAIN OFFICE: SALEM, MASSACHUSETTS

February 1, 1949
Bulletin #E-110 issued Mar. 15, 1948
Supersedes issue of July 1, 1946
March 15, 1948



Engineering NEWS RELEASE

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E-137

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May 21, 1951

HYTRON TYPE 2E25A
Class C R-F Beam Tetrode
Frequency Multiplier
A-F Amplifier & Modulator

The 2E25A is a quick-heating, 15-watt beam tetrode for use in r-f and a-f.

The 2E25A is a quick-heating, 15-watt beam tetrode for use in r-f and a-f service. Its versatility permits its use in all stages -- r-f and a-f of an entire transmitter. In portable and mobile application, its quick heating filament can be turned off during standby periods. Thus, a tremendous saving in battery drain (over that possible with cathode-type tubes) can be gained when transmitting time is a small percentage of total time. The 2E25A requires no neutralization of frequencies up to 100 megacycles, and can be used at full ratings at that frequency. While the 2E25A is primarily adapted to mobile equipment, all ratings are for continuous commercial service (CCS).

from RTMA release #985, June 15, 1951

For further information write Commercial Engineering Department, Hytron Radio & Electronics Corp.,
Salem, Mass., or telephone Salem 2260

RTMA

HYTRON RADIO AND ELECTRONICS CORPORATION

GENERAL CHARACTERISTICS

Filament	oxide	coated
Voltage a-c or d-c	6.0 $\pm$ 5%	volts
Current	0.7	ampere
Transconductance	2500	umhos
Ave amp factor (G_1 to G_2)	6	
Direct interelectrode capacitances		
Grid to plate (maximum)	0.15	umf
Input	8.6	umf
Output	6.6	umf
Maximum overall length	4-3/16	inches
Maximum diameter	1-7/16	inches
Bulb		ST-11
Cap		small metal
Base	7-pin medium short-shell octal low-loss phenolic	
Mounting position	filament plane must be vertical	

A-F POWER AMPLIFIER AND MODULATOR - CLASS A₁Maximum Ratings, Design-Center Values

D-C plate potential	400	MAX.	volts
D-C screen grid potential	250	MAX.	volts
D-C plate input power*	10.5	MAX.	watts
D-C screen grid input power	2.5	MAX.	watts
Plate dissipation*	10.5	MAX.	watts

Typical Operation - Average Characteristics

A-C filament potential ϕ	6.0	6.0	volts
D-C plate potential	300	250	volts
D-C screen grid potential	250	250	volts
D-C control grid potential ϕ_c	(a) -25 (b) --- (c) 600	-22.5 --- 500	volts ohms
Peak a-f control grid potential	25	22.5	volts
Zero signal d-c plate current	34.5	38.5	ma
Max. signal d-c plate current	37	40	ma
Zero signal d-c screen grid current	3	4	ma
Max. signal d-c screen grid current	8.4	9.6	ma
Load resistance	7000	5000	ohms
Total harmonic distortion	11	7	percent
Max. signal plate power output	6	4.75	watts

A-F POWER AMPLIFIER AND MODULATOR - CLASS AB₂Maximum Ratings, Absolute Values

D-C plate potential	450	MAX.	volts
D-C screen grid potential	250	MAX.	volts
Peak positive a-f control grid potential	60	MAX.	volts
Max. signal d-c plate current μ	75	MAX.	ma
Max. signal plate input power μ	33	MAX.	watts
Max. signal screen grid input power μ	5	MAX.	watts
Plate dissipation μ	15	MAX.	watts

Typical Operation - Average Characteristics

Unless otherwise specified, the values are for two tubes.

A-C filament potential ϕ	6.0	volts
D-C plate potential	450	volts
D-C screen grid potential	250	volts
D-C control grid potential ϕ_c	(a) -30	volts
Peak a-f control grid to control grid potential	142	volts
Zero signal d-c plate current	44	ma
Max. signal d-c plate current	150	ma
Zero signal d-c screen grid current	10	ma
Max. signal d-c screen grid current	40	ma
Max. signal d-c control grid current	3	ma
Effective load resistance (plate to plate)	6000	ohms
Max. signal control grid driving power	0.42	watts
Max. signal plate power output	40	watts

May 21, 1951

**R. F. POWER AMPLIFIER AND OSCILLATOR
CLASS C TELEGRAPHY AND FREQUENCY MODULATION**
Key-down conditions per tube without amplitude modulation

Maximum Ratings, Absolute Values

D-C plate potential	450	max.	volts
D-C screen grid potential	250	max.	volts
D-C control grid potential	-125	max.	volts
D-C plate current	75	max.	ma
D-C control grid current	4.5	max.	ma
Peak positive r-f control grid potential	60	max.	volts
D-C plate input power	33.5	max.	watts
D-C screen grid input power	4	max.	watts
Plate dissipation	15	max.	watts

Typical Operation - Average Characteristics

D-C plate potential	450	450	volts
D-C screen grid potential	250	250	volts
	(a) -45	-70	volts
D-C control grid potential	(b) 15000	23000	ohms
	(c) 480	750	ohms
Peak r-f control grid potential	90	120	volts
D-C plate current	75	75	ma
D-C screen grid current	15	15	ma
D-C control grid current	3	3	ma
Control grid driving power (approx.)	.27	0.36	watts
Plate power output Δ (approx.)	20	22	watts

**PLATE AND SCREEN - GRID AMPLITUDE MODULATED
R. F. POWER AMPLIFIER - CLASS C TELEGRAPHY**

Carrier conditions for use with a max. modulation percentage of 100.

Maximum Ratings, Absolute Values

D-C plate potential	400	max.	volts
D-C screen grid potential	225	max.	volts
D-C control grid potential	-125	max.	volts
D-C plate current	75	max.	ma
D-C control grid current	4.5	max.	ma
Peak positive r-f control grid potential	60	max.	volts
D-C plate input power	24	max.	watts
D-C screen grid input power	2.7	max.	watts
Plate dissipation	10	max.	watts

Typical Operation - Average Characteristics

D-C plate potential	400	volts
D-C screen grid potential	225	volts
	(a) -70	volts
D-C control grid potential f	(b) 23000	ohms
	(c) 1000	ohms

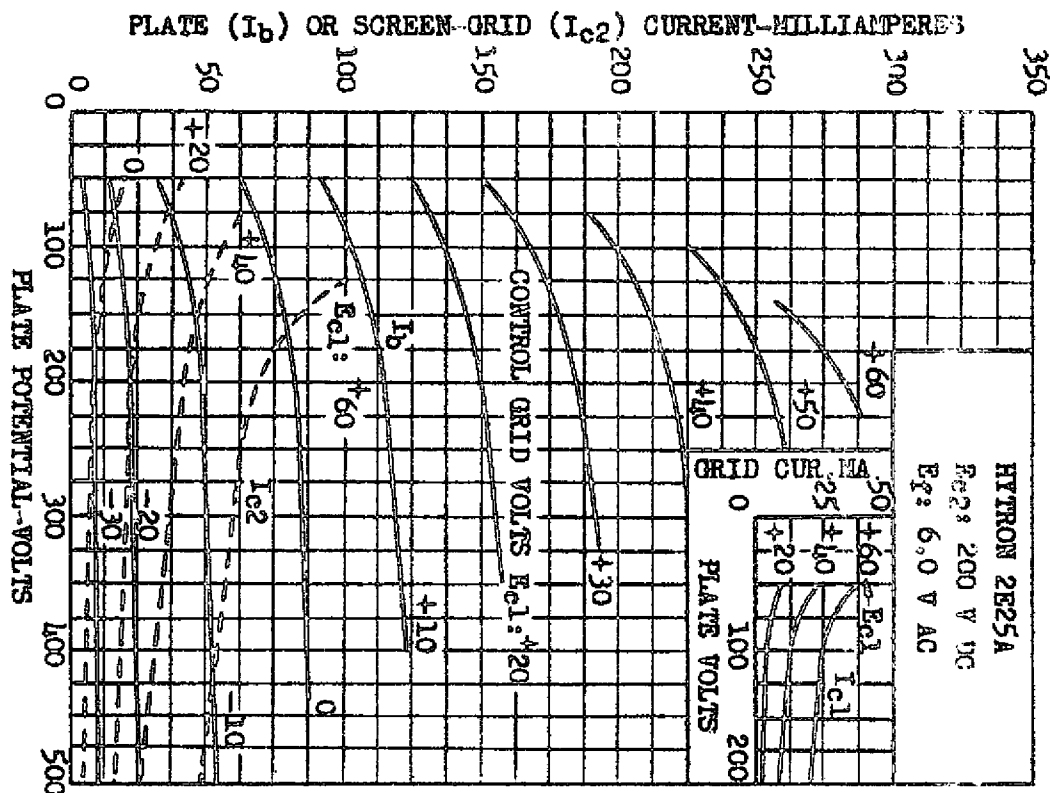
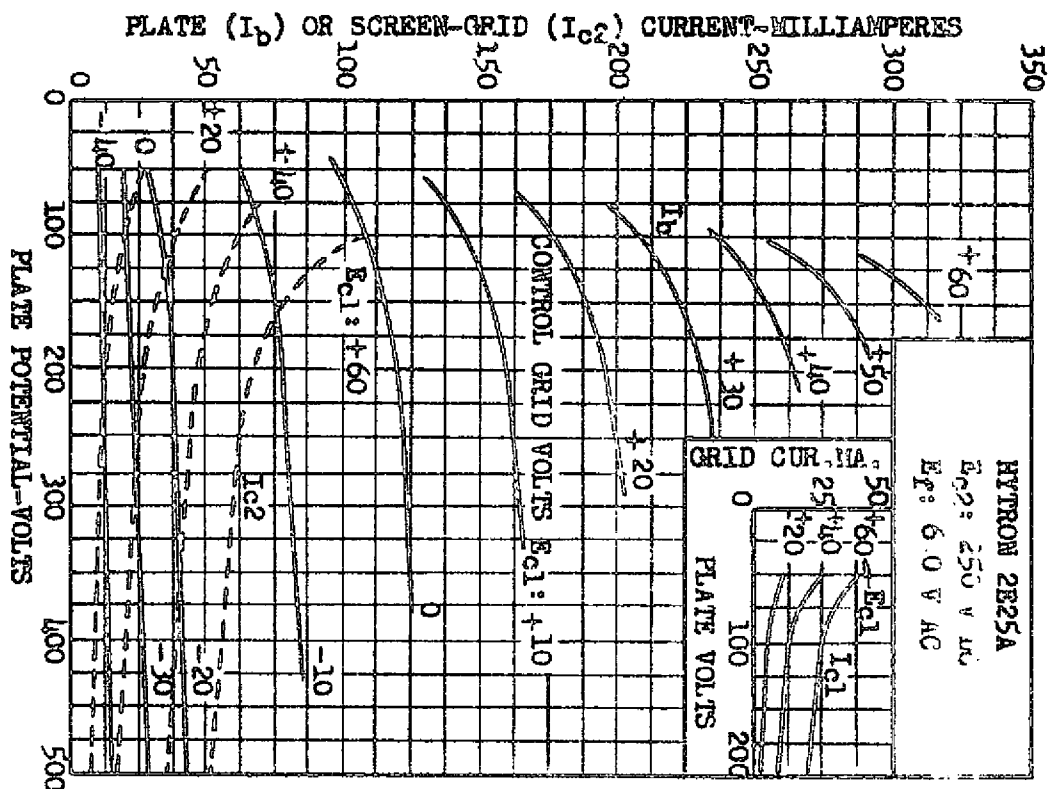
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Peak r-f control grid potential	110	volts
D-C plate current	60	ma
D-C screen grid current	8.5	ma
Screen grid dropping resistor	20000	ohms
D-C control grid current	3	ma
Control grid driving power (approx.)	0.33	watts
Plate power output Δ (approx.)	15	watts

May 21, 1951



May 21, 1951

NOTES

The plate supply must be switched off before or simultaneously with the filament in all applications. When the filament is heated from a transformer with a nominal 6.3-volt output, the filament connections may be made with small wire to introduce the necessary drop of 0.3 volts.

Tube conservation: When the standby period is generally less than 15 minutes, additional tube life can be obtained by reducing the filament potential of 80% of the nominal operating voltage during standby. For longer standby periods, the filament should be turned off.

• • • • •

*Class A₁ dissipation rating based upon tubes having average plate current. In the case of tubes whose plate current is the maximum acceptable under the Hytron testing specification, dissipation will be 15 watts, with somewhat higher power output capability.

†When d-c is used on the filament, the bias should be reduced approximately 3.2/2 volts, and the grid return made to negative leg of filament.

‡Obtained from (a) fixed supply (b) control grid resistor (c) cathode resistor, or by combination of methods.

§Averaged over any a-f cycle of sine wave form.

+When modulated 100% with a sine wave, the average power increases by 50%. With a complex wave form, such as is produced by speech or music, the average power increases approximately 20% to 25%.

◊The beam plates should be connected to center tap of filament transformers, if a-c operated, or to negative side of filament, if d-c operated.

Δ"Plate power output" includes circuit losses and x-f radiation losses, as well as useful power delivered to the load.



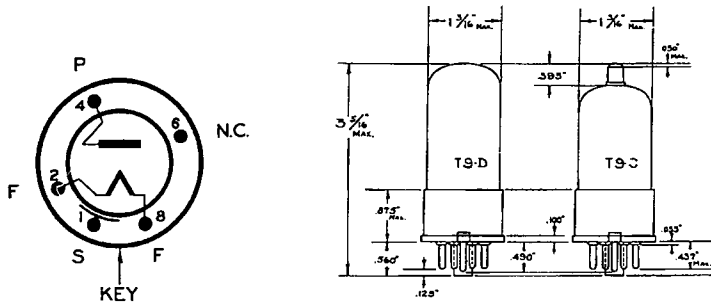
TYPE 2W3GT

HYTRON BANTAM

GENERAL DESCRIPTION

Application: The Hytron 2W3GT is a filament type half-wave rectifier designed for application where the total "B" drain is not high.

Physical Characteristics: Bulb T-9D



Bottom View

RATINGS AND CHARACTERISTICS

Filament:

Voltage	2.5 Volts A.C.
Current	1.5 Amperes

HALF-WAVE OPERATION

A.C. Plate Voltage (RMS)	350 Volts Max.
D.C. Load Current	55 Ma. Max.

April 30, 1948

TYPE 3B4**
Miniature Instant-Heating Beam Pentode

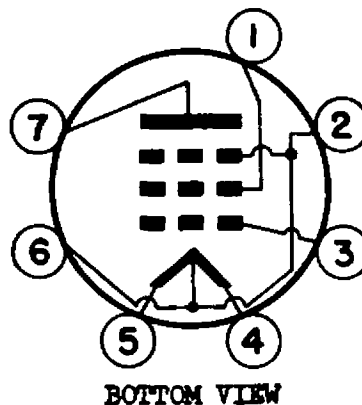
The Hytron type 3B4 is a filamentary-type radio-frequency beam-power amplifier for use in very-high-frequency portable-mobile equipment as a Class C oscillator, frequency multiplier, and r-f amplifier in those applications where it is desired to eliminate filament drain during standby periods. It utilizes a 1.25/2.5 volt filament which is essentially instantaneous in heating. The 3B4 may be used at full ratings to 100 megacycles.

GENERAL CHARACTERISTICS

Filament *			oxide coated
Potential a-c or d-c	1.25 or 2.5 $\pm$ 15%		volts
Current	330 or 165		milliamperes
Transconductance for $I_b=19\text{mA}$	1700		umhos
Amplification factor			
G_1 to G_2	4.1		
Direct interelectrode capacitances			
(without external shield)			
Grid to plate (maximum)	0.16		uuf
Input	4.6		uuf
Output	7.6		uuf
Maximum overall length	2-1/8		inches
Effective bulb length (hold-down height)	1 1/2 $\pm$ 3/32		inches
Maximum diameter	3/4		inches
Bulb	T-5 1/2		
Base			miniature button 7-pin
Mounting position			any

TERMINAL CONNECTIONS

- Pin 1. Screen grid
Pin 2. Filament center tap, beam plates and internal shielding.
Pin 3. Control grid
Pin 4. Filament
Pin 5. Filament
Pin 6. Same as pin 2
Pin 7. Plate



In v-h-f circuits it may be desirable to by-pass the filament center taps or ground them to a common point to provide lowest effective cathode inductance.

7CY

**HD30

April 30, 1948

R.F. POWER AMPLIFIER AND OSCILLATOR
CLASS C TELEGRAPHY AND FREQUENCY MODULATION

Key down conditions per tube without amplitude modulation

Maximum Ratings, Absolute Values

D-c plate potential	150 max	volts
D-c screen grid potential	135 max	volts
D-c control grid potential	-75 max	volts
Control grid resistor	100,000 max	ohms
D-c plate current	25 max	ma
D-c control grid current	1.5 max	ma
D-c plate input power	3.75 max	watts
D-c screen grid input power	1.1 max	watts
Plate dissipation	3 max	watts

Typical Operation and Average Characteristics, Class C Oscillation and Amplifier 100 mc.

Filament potential	2.5	2.5	volts
D-c plate potential	90	150	volts
D-c screen grid potential	90	135	volts
(a) -18		-38	volts
D-c control grid potential#(b) 45,000		70,000	ohms
Peak r-f control grid potential	35	63	volts
D-c plate current	15	25	ma
D-c screen grid current	4.8	6.2	ma
D-c control grid current	0.4	0.55	ma
Total grid driving power(approx.)	0.03	0.07	watts
Useful power output (approx.)	0.45	1.25	watts

- * When the filament sections are series connected, the low section of the filament should be shunted by a resistor to by-pass the cathode current of the upper section of the filament (equal to one half of the sum of plate and screen currents).

Note: When the 3B4 is operated from usual dry cells (carbon-zinc) a filament dropping resistor is necessary to prevent over voltage when new batteries are used.

- # Obtained from (a) fixed supply, (b) control grid resistor, (c) cathode resistor, or by combination of methods.

HYTRON CORPORATION

TENTATIVE SPECIFICATIONS

BANTAM TYPE
3C5GTGENERAL DESCRIPTION

APPLICATION:

Hytron "Bantam" type 3C5GT is a filament type power amplifier pentode designed for service in the output stage of receivers of the portable type. The tube is designed with the full filament connected between pins #2 and #7. A tap is provided and brought out to pin #8.

The Hytron "Bantam" 3C5GT is identical in many respects with type 1C5GT with the exception, the two strand filament is series connected to facilitate the use of a 50 ma. series filament string.

The Hytron "Bantam" 3C5GT is a glass tube equipped with a small octal base and metal shell ring.

PHYSICAL CHARACTERISTICS: BULB T-9D Basing ^{7A9} ~~EN~~ see note

RATINGS AND CHARACTERISTICS

	Series Connection	Parallel Connection
Filament	2.8	1.4 volts
Filament Current	0.050	0.10 amp.

Note: Filaments in series between pins #2 and #7.
Filaments in parallel between pin #2 and pin #8, with pins #2 and #7 tied together. When filaments are used in series connection, approximately 1.4 volts less bias is required as the increased filament voltage adds to the effective control grid bias.

SERIES FILAMENT OPERATION

Plate Voltage	90	90	90 volts
Screen Voltage	90	90	90 volts
Grid Bias	-7.5	-8.0#	-9.0 volts
Plate Current	8.5	7.5	6.0 ma.
Screen Current	1.8	1.6	1.4 ma.
Load Resistance	6000	8000	10000 ohms
Power Output	240	260	260 m.w.
Mutual Conductance	1600	1550	1450 umhos

PARALLEL FILAMENT OPERATION

Plate Voltage	85	90	volts
Screen Voltage	85	90	volts
Grid Bias	-7	-9#	volts
Mutual Conductance	1500	1550	umhos
Plate Current	7	6	ma.
Screen Current	1.6	1.4	ma.
Load Resistance	9000	8000	ohms
Power Output	200	240	mw.

Recommended operation.

E-6 6-39

RADIO MANUFACTURERS ASSOCIATION



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

R.M.A. DATA BUREAU
90 West Street
New York, N. Y.

RMA TYPE
3C30

Release No. 532

October 25, 1946

Sponsor: Hytron Corp.

HI MU TRIODE

Physical Specifications

Cathode	Thoriated Tungsten
Base	Medium 4-pin bayonet, low-loss phenolic
Bulb	ST-16
Maximum overall length	5-3/4"
Cap	Small
Maximum diameter	2-1/16"
Basing connections:	
Pin 1 - filament	Pin 3 - control grid
2 - control grid	4 - filament
	Cap - Plate

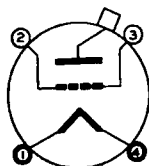
Maximum Ratings - Absolute Maximum Values

Filament potential	5.6 $\pm$ 5%	volts	
Filament current	2.5	amperes	
Plate potential	850	volts	dc
Negative grid bias	-100	volts	dc
Plate current	75	ma	dc
Control grid current	30	ma	dc
Plate dissipation	25	watts	

Average Characteristics

Filament potential	5.6	volts	ac
Plate potential	600	volts	
Control grid potential	$\pm$ 15	volts	
Plate current	41	ma	dc
Amplification factor	85		
Positive grid current	7	ma	dc
Capacitance-grid to plate	5.8	uuf	
Capacitance-grid to filament	5.4	uuf	
Capacitance-plate to filament	1.3	uuf	

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HYTRON Engineering NEWS RELEASE

☐ CHIEF ENGINEER
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E-102
Page 1 of 2 pages
RMA Release # 408
May 25, 1945
CONFIDENTIAL
Hytron Type 3D21
(Development Type D21)
Original Issued: 5-1-45
Supersedes: E-1002 for D21,
dated 4-5-44

The type 3D21 tube has been developed primarily as a high-vacuum blocking oscillator and a pulse modulator. Satisfactory pulse operation is assured by many tests including the following performed on every 3D21 tube: pulse grid, screen, and plate characteristics, high voltage pulse operation and high voltage plate current cut-off. The type 3D21 is of such a construction as to utilize high-production receiving-tube manufacturing techniques, thereby relieving production and material shortages existent with hard glass transmitting tubes. The 3D21 is small in diameter and light in weight and it uses a regular octal socket.

The 3D21 is recommended as a modulator for either one or two type 2C26A oscillators or other applications requiring as high as 20kw power in the pulse. The 3D21 is also suitable for use as a deflection amplifier.

TENTATIVE DATA Average Static Characteristics

Heater potential	6.3 or 12.6 volts AC or DC
Heater Current	1.70 or 0.85 amperes
Grid Bias	-30 volts DC
Screen Potential	300 volts DC
Plate Potential	600 volts DC
Screen Current	2.5 ma DC approx.
Plate Current	30 ma DC approx.
Transconductance	5500 micromhos

Recommended Pulse Operation Conditions and Maximum Ratings

Heater Potential	6.3 or 12.6 volts (±10%) Note 1
Maximum Plate Dissipation	15 watts
Maximum Screen Dissipation	3 watts
Maximum Grid Dissipation	0.5 watt
Maximum Plate Supply Potential	3500 volts DC Note 2 & 3
Maximum Peak Plate Potential Including Transient	5000 volts
Maximum Screen Supply Potential	850 volts DC Note 3
Maximum Negative Grid Potential Including Transient	-500 volts peak
Maximum Positive Peak Grid Potential	220 volts
Maximum Heater Cathode Potential	150 volts
Maximum Pulse Length	10 microseconds Note 4

For further information write Commercial Engineering Department, Hytron Radio & Electronics Corp.,
Salem, Mass., or telephone Salem 2260

RMA

HYTRON RADIO AND ELECTRONICS CORPORATION

CONFIDENTIAL

Issued: 5-1-45

Hytron Type 3D21
(Development Type D21)

For 3500 volt operation

$E_{c2} = 800$ volts, $R_L = 450$ ohms, $E_{c1} = -150$ volts
 E_{aig} (peak above ground) = 150 to 200 volts

$P_o = 21kw$ approx.

For 2500 volt operation

$E_{c2} = 800$ volts, $R_L = 305$ ohms, $E_{c1} = -150$ volts
 E_{aig} (peak above ground) = 150 to 200 volts

$P_o = 14kw$ approx.

For 1500 volt operation

$E_{c2} = 800$ volts, $R_L = 160$ ohms, $E_{c1} = -150$ volts
 E_{aig} (peak above ground) = 150 to 200 volts

$P_o = 7kw$ approx.

Physical Characteristics

Base	8-pin low loss medium shell oval
Envelope	ST-14
Top Cap	Skirted miniature
Max. Height	4-15/16 inch
Seated Height	4-1/8 inch approx.
Max. Diameter	1-13/16 inch
Weight	1-3/4 ounce approx.

Pinning Connections

Pin #1	Heater center tap
Pin #2	Heater
Pin #3	NC
Pin #4	Screen grid
Pin #5	NC
Pin #6	Control grid
Pin #7	Heater
Pin #8	Cathode and beam plates
Top cap	Plate

Note 1. Cathode must be preheated for minimum of 30 seconds before applying grid pulse.

Note 2. With a screen potential not exceeding 400 volts DC and when no instantaneous plate voltage due to transient is present (essentially resistive plate load), a maximum plate potential of 4500 volts DC may be used.

Note 3. Series resistance must be inserted in the power supply to limit the DC short circuit current to less than 0.5 ampere.

Note 4. Total pulse length in any 240 microsecond period not to exceed 12 microseconds.

HYTRON CERAMIC-BASE TUBES

The attached characteristics for the Hytron "GT" "Bantams" are applicable to ceramic-base "GTX" "Bantam" tubes.

These ceramic-based "Bantams" for high-frequency circuits are designated by the suffix letter "X" after "GT".

The tubes have the same physical dimensions as the Hytron "GT" series and identical static characteristics. However, because of the low-loss base, the Hytron "X" "Bantams" have improved dynamic characteristics, particularly at the higher frequencies.

Furthermore, the ceramic-base "Bantams" are specially selected and subjected to rigid tests.

These tubes are supplied with metal shields that contact the metal base ring or shell. This ring is connected to the #1 or ground pin. Therefore, the Hytron ceramic-base "Bantams" are interchangeable with metal tubes.

TYPE 6A8GT



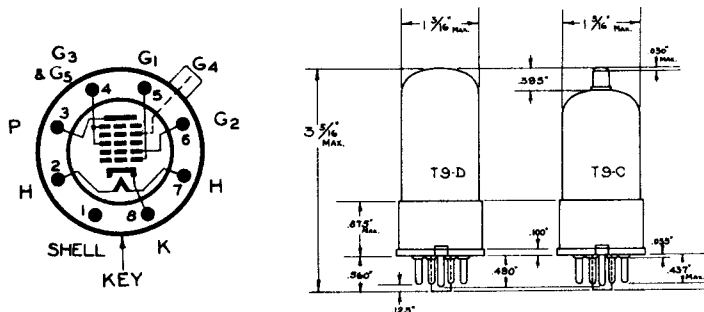
HYTRON BANTAM

GENERAL DESCRIPTION

Application: The Hytron 6A8GT is a cathode type pentagrid converter designed for use as a combined oscillator and mixer tube in superheterodyne circuits. The tube construction is such that independent control of these functions is available.

The 6A8GT is a glass tube equipped with a small octal base and may be used interchangeably with the 6A8G glass tube,

Physical Characteristics: Bulb T-9C



Bottom View

RATING AND CHARACTERISTICS

Heater:

Voltage 6.3 Volts AC or DC
Current 0.3 Ampere

Note: Voltage between heater and cathode should be kept at a minimum if direct connection is not possible.

MAXIMUM RATINGS

Plate Voltage	250	Volts
Screen Voltage (Grids No. 3 and No. 5)	100	Volts
Anode Grid Voltage (Grid No. 2)	200	Volts
*Anode Grid Voltage Supply	250	Volts
Control Grid Voltage (Grid No. 4)	-3	Volts Min.
Total Cathode Current	14	Milliamperes

*A 20,000 ohm voltage dropping resistor must be used for supply voltages above 200 volts.

CONVERTER OPERATION

Plate Voltage	100	250	Volts
Screen Voltage	50	100	Volts
Anode Grid Voltage	100	250*	Volts
Control Grid Voltage	-1.5	-3	Volts Min.
Plate Current	1.2	3.3	Milliamperes
Screen Current	1.5	3.2	Milliamperes
Anode Grid Current	1.6	4.0	Milliamperes
Oscillator Grid Current (Grid No. 1)	0.25	0.5	Milliamperes
Oscillator Grid Resistor	50,000	50,000	Ohms
Conversion Conductance	350	500	Micromhos
Control Grid Voltage			
Conversion Conductance = 2 Micromhos	-20	-45	Volts Approx.

*Anode Grid Supply Voltage - requires 20,000 ohm voltage dropping resistor.

Direct Interelectrode Capacitances:

Grid No. 4 to Plate	.20	μf.
Grid No. 4 to Grid No. 2	.19	μf.
Grid No. 4 to Grid No. 1	.13	μf.
Grid No. 1 to Grid No. 2	1.0	μf.
Grid No. 4 to all other electrodes (R F Input)	7.5	μf.
Grid No. 2 to all other electrodes (Osc. Output)	5.0	μf.
Plate to all other electrodes (Mixer Output)	7.5	μf.
Grid No. 1 to all other electrodes (Osc. Input)	6.2	μf.
*With shield can.		

Note: For characteristic curves refer to the type 6A8G

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TYPE 6J5GT

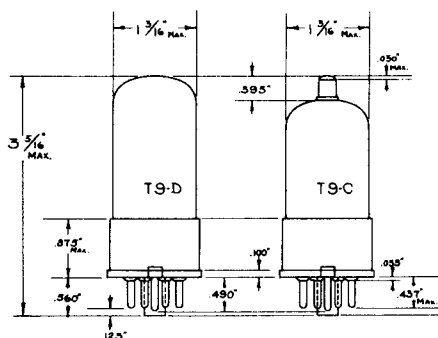
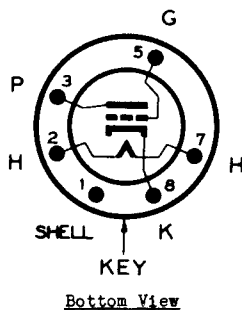


HYTRON BANTAM

GENERAL DESCRIPTION

Application: The Hytron 6J5GT is a cathode type general purpose amplifier triode designed for use in resistance coupled amplifiers or in super-heterodyne circuits as an oscillator. The high mutual conductance and low output capacitance make the tube especially suited for high frequency oscillator service. The 6J5GT is a glass tube equipped with a small octal base. In general, the application and operation of this tube parallels that of the 6C5G.

Physical Characteristics: Bulb T-9D

RATING AND CHARACTERISTICS

Heater:

Voltage	6.3	Volts AC or DC
Current	0.3	Ampere

Note: Voltage between heater and cathode should be kept at a minimum if direct connection is not possible.

Operating Conditions: (Class A Amplifier)

Plate Voltage	250	Volts Max.
Grid Voltage	-8	Volts
Plate Current	9.0	Milliamperes
Plate Resistance	7700	Ohms Approx.
Mutual Conductance	2600	Micromhos Approx.
Amplification Factor	20	

Direct Interelectrode Capacitances:

Grid to Plate	2.7	μ f.
Input	3.8	μ f.
Output	3.0	μ f.

TYPE 6J7GT



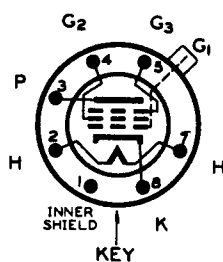
HYTRON BANTAM

GENERAL DESCRIPTION

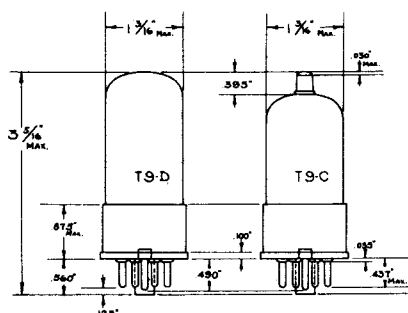
Application: The Hytron 6J7-GT is a cathode type pentode designed primarily for service as a biased detector and in such use is capable of comparatively high gain. It may also be employed as a high gain amplifier of radio or audio frequency signals. An internal shield is connected to the No. 1 base pin.

The Hytron 6J7GT is a glass tube equipped with a small octal base and may be used interchangeably with the Hytron 6J7G glass tube.

Physical Characteristics: Bulb T-9C



Bottom View

RATING AND CHARACTERISTICS**Heater:**

Voltage
Current

6.3 Volts AC or DC
0.3 Ampere

Note: Voltage between heater and cathode should be kept at a minimum if direct connection is not possible.

AMPLIFIER OPERATION (CLASS A)

Plate Voltage	100	250	Max.	Volts
Screen Voltage	100	**100		Volts
***Grid Voltage	-3	-3		Volts
Suppressor	Connected to cathode at socket.			
Plate Current	2.0	2.0		Milliamperes
Screen Current	0.5	0.5		Milliamperes
Plate Resistance	1.0	1.5	Min.	Megohm
Amplification Factor	1185	1500	Min.	
Mutual Conductance	1185	1225		Micromhos
*Grid Voltage	-7	-7	Approx.	Volts

* Voltage for Cathode Current Cut-Off.

** Screen Voltage = 125 Max. Volts.

*** Grid Circuit Resistance must not exceed 1.0 Megohm.

BIASED DETECTOR OPERATION

*Plate Supply Voltage	250	250	250	250	Volts
Screen Voltage	50	33	100	100	Volts
Grid Voltage	-2	-1.7	-3.9	-4.3	Volts
Cathode Resistor	3000	8000	4000	10,000	Ohms
Suppressor	Connected to Cathode at Socket.				
Cathode Current (Zero Signal)	0.65	0.21	0.97	0.43	Milliamperes
Plate Resistor	0.25	0.50	0.25	0.50	Megohm
Blocking Condenser	0.03	0.03	0.03	0.03	μf.
Grid Resistor of Following Tube	0.25	0.25	0.25	0.25	Megohm
**RMS RF Signal	1.18	1.21	1.38	1.37	Volts

* Effective plate voltage will be this value minus the voltage drop in the plate resistor.

** 20% Modulation. Output voltage for each set of conditions 17 peak audio volts at grid of following tube.

Direct Interelectrode Capacitances:

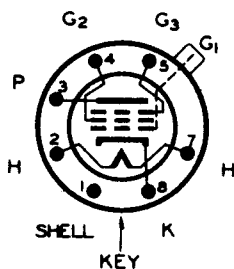
°Grid No. 1 to Plate	0.005	μf. Max.
Grid No. 1 to all other electrodes	4.3	μf.
Plate to all other electrodes	9.0	μf.
°With shield can.		

Note: For characteristic curves refer to the type 6J7G

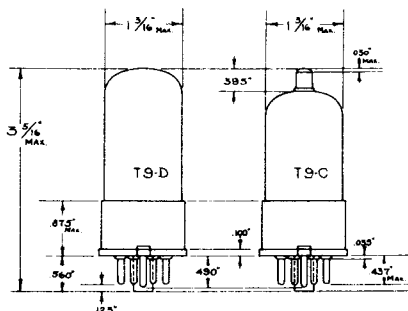
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HYTRON BANTAM

Physical Characteristics: Bulb T-9C



Bottom View



AMPLIFIER OPERATION (CLASS A)

Plate Voltage	90	180	250	250 Max.	Volts
Screen Voltage	30	75	100	175 Max.	Volts
Grid Voltage	-3	-3	-3	-3 Min.	Volts
Suppressor			Connected to Cathode	at Socket	
Plate Current	5.4	4.0	7.0	10.5	Milliamperes
Screen Current	1.3	1.0	1.7	2.6	Milliamperes
Plate Resistance	0.315	1.0	0.8	0.6	Megohm
Amplification Factor	400	1100	1160	990	
Mutual Conductance	1275	1100	1450	1650	Micromhos
*Grid Voltage	-38.5	-32.5	-42.5	-52.5	Volts

* Mutual Conductance = 2 Micromhos.

Plate Voltage	250	Max.	Volts
Screen Voltage	100		Volts
Grid Voltage	-10	Approx.	Volts
Suppressor	Connected to Cathode at Socket.		
Values shown are optimum. Grid voltage is minimum for 7 volts peak oscillator voltage.			

Direct Interelectrode Capacitances:

Grid No. 1 to Plate	0.005	μf. Max.
Grid No. 1 to all other electrodes	4.1	μf.
Plate to all other electrodes	9.3	μf.

°With shield can.

Note: For characteristic curves refer to the type 6K7G

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TYPE 6K8GT



HYTRON BANTAM

GENERAL DESCRIPTION

Application: The Hytron 6K8GT is a cathode type triode-hexode converter tube designed for the purpose of eliminating the faults found in pentagrid type converter tubes. The Hytron 6K8GT, through unique geometric and electrical design, either totally overcomes or greatly reduces in severity:

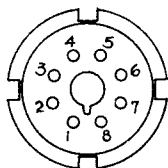
1. Interlock between oscillator and signal circuits.
2. Load transconductance in the oscillator section.
3. Change in transconductance of the oscillator section with signal grid bias.
4. Loading of the RF input circuit under ordinary operating conditions due to transit time effect.
5. Loading of the input circuit due to space charge coupling.

In addition to the above advantages, further enhancement of performance is possible due to the following improvements over typical pentagrid converter tubes:

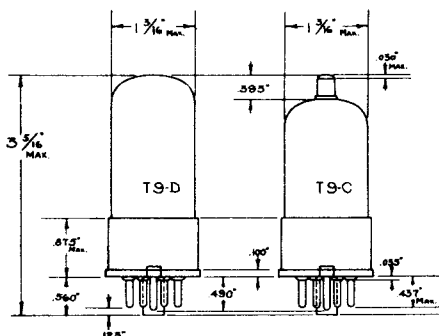
1. Lower interelectrode capacities in all important circuits.
2. Less feed-back required for satisfactory oscillator operation.
3. Higher output impedance.
4. Oscillator plate voltage may be the same as the screen voltage.
5. In 100 volt operation, the screen may be operated at the same voltage as the plate.
6. A negligible amount of voltage at oscillator frequency appears on the signal grid.

The Hytron 6K8GT is a glass tube equipped with a small octal base and may be used interchangeably with the Hytron 6K8G glass tube.

Physical Characteristics: Bulb T-9C
Base Connections



Bottom View

RATING AND CHARACTERISTICS

Heater:	Voltage	6.3	Coated Unipotential Cathode
	Current	0.3	a-c or d-c volts
Direct Interelectrode Capacitances: (Approx.)*			amp.
Hexode Grid No. 3 to Hexode Plate		0.03	unf
Hexode Grid No. 3 to Triode Plate		0.01	unf
Hexode Grid No. 3 to Triode Grid & Hexode Grid No. 1		0.1	unf
Triode Grid & Hexode Grid No. 1 to Triode Plate		1.1	unf
Triode Grid & Hexode Grid No. 1 to Hexode Plate		0.06	unf
Hexode Grid No. 3 to All Other Electrodes - RF Input		6.5	unf
Triode Plate to All Other Electrodes (except Triode Grid and Hexode Grid No. 1) - Osc. Output		3.2	unf
Triode Grid & Hexode Grid No. 1 to All Other Electrodes (except Triode Plate) - Osc. Input		6.0	unf
Hexode Plate to All Other Electrodes - Mixer Output		3.5	unf
Maximum Overall Length			3-5/16"
Maximum Diameter			1-5/16"
Bulb			Glass T-9
Cap			Miniature
Base			Bantam Octal 8-Pin
Mounting position			Vertical, base down
Pin 1 - Shell		Pin 6 - Triode Plate	
Pin 2 - Heater		Pin 7 - Heater	
Pin 3 - Hexode Plate		Pin 8 - Cathode	
Pin 4 - Hexode Grid #2 & #4		Cap - Hexode Grid #3	
Pin 5 - Hexode Grid #1 & Triode Grid			

CONVERTER SERVICE

Hexode Plate Voltage	250 max.	volts
Hexode Screen (Grids #2 & #3) Voltage	100 max.	volts
Hexode Control-Grid (Grid #3) Voltage	-3 min.	volts
Triode Plate Voltage	200 max.	volts
Total Cathode Current	16 max.	ma.
Typical Operation:		
Heater Voltage	6.3	volts
Hexode Plate Voltage	100	volts
Hexode Screen Voltage	100	volts
Hexode Control-Grid Voltage	-3	volts
Triode Plate Voltage	100	volts
Triode Grid Resistor	50000	ohms
Hexode Plate Resistance	0.4	megohm
Conversion Transconductance	325	umhos
Hexode Control-Grid Bias for		
Conver. Transcond. - 2 umhos	-30	volts
Hexode Plate Current	2.3	ma.
Hexode Screen Current	6.2	ma.
Triode Plate Current	3.8	ma.
Triode Grid & Hexode Grid #1 Current	0.15	ma.

Note: The Transconductance of the oscillator portion (not oscillating) of the 6K8GT is approximately 3000 umhos when the triode plate voltage is 100 volts, and the triode grid voltage is 0 volts.

* With shell connected to cathode.

o In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.

Note: For characteristic curves refer to type 6K8G.

B-3 9-36

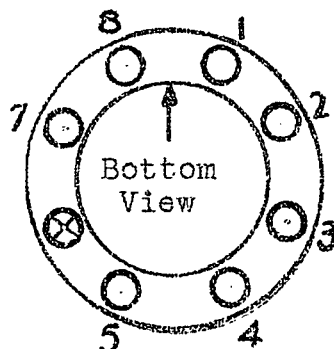


GENERAL DESCRIPTIONAPPLICATION:

The Hytron Bantam 6AC6GT is a cathode type power amplifier twin triode, internally connected in such manner that dynamic coupling is accomplished between the input triode and the output triode. Because of its many unique design features, the 6AC6GT affords high plate efficiency at low relative distortion and is essentially free of many of the defects generally attending the use of pentodes in similar applications. The dynamic coupled feature facilitates ease of application because of the simplicity of circuit components and the tube's small dimensions.

The Hytron Bantam 6AC6GT is a glass tube equipped with a seven pin intermediate bakelite octal base.

PHYSICAL CHARACTERISTICS: Bulb T-9D

Base Pin Connections

Pin 1 - No connection
Pin 2 - Heater
Pin 3 - Output Plate
Pin 4 - Input Plate
Pin 5 - Input Grid
Pin 7 - Heater
Pin 8 - Output Cathode

RATINGS AND CHARACTERISTICS

Heater Voltage (AC or DC)	6.3 volts
Heater Current	1.1 amps.
Maximum Overall Length	3-5/16"
Maximum Seated Height	2-3/4"
Maximum Diameter	1-5/16"
Base	7-pin intermediate bakelite octal
Basing	7W-0-0

STATIC CHARACTERISTICS

Input Plate	180 volts max.
Output Plate	180 volts max.
Grid Bias	0 volts
Input Plate Current	7.0 ma.
Output Plate Current	45.0 ma.
Plate Resistance	18000 ohms
Mutual Conductance	3000 umhos
Amplification Factor	54

TYPICAL OPERATING CONDITIONS

(Single Tube)

Output Plate Supply Voltage	180 volts
Input Plate Supply Voltage	180 volts
Output Plate Dissipation	10 watts max.
External Grid Bias#	0 volts*
Input Plate Current (zero signal)	7.0 ma.
Input Plate Current (rated signal)	13.0 ma.
Output Plate Current (zero signal)	45.0 ma.
Output Plate Current (rated signal)	47.0 ma.
Load Resistance	3500 ohms
Input Signal (for rated P.O.)	18 volts (RMS)
Power Output**	3.6 watts
Total Harmonic Distortion	9%

(Two Tubes Push-Pull)

Output Plate Supply Voltage	180 volts
Input Plate Supply Voltage	180 volts
External Grid Bias#	0 volts*
Output Plate Current (zero signal)	90 ma.
Output Plate Current (rated signal)	102 ma.
Input Plate Current (zero signal)	14 ma.
Input Plate Current (rated signal)	25 ma.
Load Resistance (Plate to Plate)	5000 ohms
Power Output	9 watts
Total Harmonic Distortion	10%
Input Signal (for rated P.O.) grid to grid	46 volts (RMS)

* The bias voltage for the input triode is developed through internal connection and results from the voltage drop occasioned between the grid of the output triode and ground. The input impedance of the output triode grid is essentially the controlling factor. The bias voltage of the output triode is of such nature that the grid of the output triode operates in the positive region.

** A power output of 4.3 watts may be obtained if the signal flow to the input triode is increased to the point of grid current flow. Distortion is approximately 16% under these conditions.

DC series resistance in grid return should not exceed .5 megohm

Note: The Hytron Corporation assumes no liability for the use of the dynamic coupled circuit or applications of tubes designed for use in same.



TYPE 6F5GT

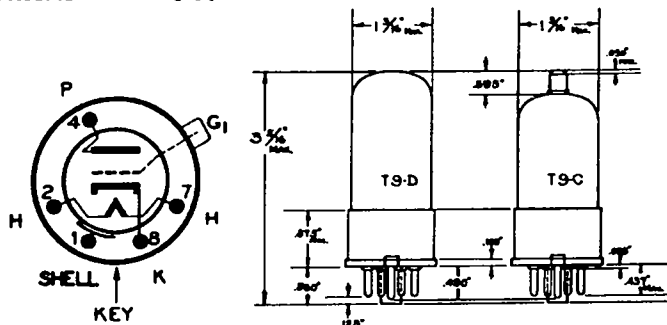
HYTRON BANTAM

GENERAL DESCRIPTION

Application: The Hytron 6F5GT is a cathode type high- μ triode designed primarily for service in high gain resistance coupled circuits.

The Hytron 6F5GT is a glass tube equipped with a small octal base and may be used interchangeably with the Hytron 6F5G glass tube where conditions permit larger size.

Physical Characteristics: Bulb T-9C



RATING AND CHARACTERISTICS

Heater:
Voltage 6.3 Volts AC or DC
Current 0.3 Amperes

Note: Voltage between heater and cathode should be kept at a minimum if direct connection is not possible.

AMPLIFIER OPERATION (CLASS A RESISTANCE COUPLED)

*Plate Supply Voltage	250	250 Volts
Grid Voltage	-1.3	-1.3 Volts
Plate Current	0.2 to 0.4	0.2 to 0.4 Milliamperes
Plate Resistor	0.25 to 1.0	0.25 to 1.0 Megohm
Grid Resistor of Following Tube	0.25	0.5 Megohm
Output Voltage(5% 2nd Harmonic)	11 to 20	14.5 to 25.5 RMS Volts
Voltage Amplification	52 to 58	51 to 60

*Effective plate voltage will be this value minus the voltage drop in the plate resistor. Voltage at plate should not exceed 250 volts.

AMPLIFIER OPERATION (CLASS A TRANSFORMER COUPLED)

Plate Voltage	250 Volts Max.
Grid Voltage	-2 Volts
Plate Current	0.2 Milliamperes
Plate Resistance	66,000 Ohms
Amplification Factor	100
Mutual Conductance	1,500 Micromhos

Direct Interelectrode Capacitances:

Grid No. 1 to Plate	2.0 puf
Grid No. 1 to cathode	6.0 puf
Plate to cathode	12.0 puf

Note: For characteristic curves refer to the type 6F5G.

B-1 3-38



JETEC DATA
JOINT ELECTRON TUBE ENGINEERING COUNCIL
COMMITTEE ON RECEIVING TUBES

Rel. 134B
J5-6F5GT
June 17, 1952

JETEC TYPE 6F5GT

TRIODE

MECHANICAL DATA

Coated unipotential cathode
Outline drawing. 9-17 or 9-47 Bulb. T-9
Base B6-81 or B7-7 intermediate shell octal
 or B7-84 or B7-59 short intermediate shell octal
Top cap. C1-2 skirted miniature
Maximum diameter 1-9/32"
Maximum overall length 3-5/16"
Maximum seated height. 2-3/4"
Pin connections. Basing 5M
 *Pin 1 - No connection Pin 5 - No connection
 Pin 2 - Heater Pin 7 - Heater
 Pin 3 - No connection Pin 8 - Cathode
 Pin 4 - Plate Top Cap- Grid

*Pin #1 omitted on Base Nos. B6-81 and B6-84

Mounting position. any

ELECTRICAL DATA

Ratings

Heater voltage (ac or dc)	6.3	volts
Maximum heater-cathode voltage	90	volts
Maximum plate voltage.	300	volts

Typical Operating Conditions and Characteristics, Class A1 Amplifier

Heater voltage	6.3	6.3	volts
Heater current	300	300	ma
Plate voltage.	100	250	volts
Grid voltage	-1.0	-2.0	volts
Plate resistance (approx.)	85,000	66,000	ohms
Transconductance	1150	1500	μmhos
Plate current.	0.4	0.9	ma
Amplification factor	100	100	

Refer to "Interpretation of Receiving Tube Ratings"

TYPE 6K5GT

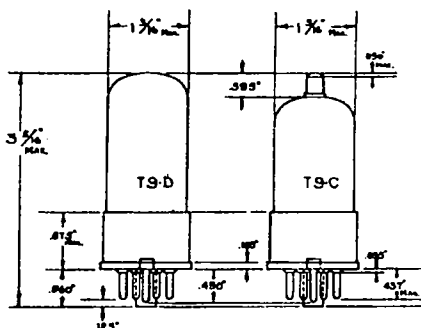
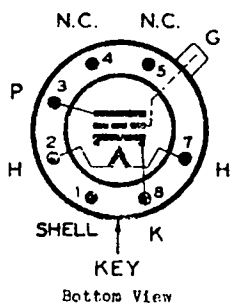


HYTRON BANTAM

GENERAL DESCRIPTION

Application: The Hytron 6K5GT is a cathode type high mu triode designed for use in high gain resistance coupled circuits. This tube has a lower amplification factor than previous similarly designed triodes thus enabling the use of a large signal input both under 250 volt and 100 volt operating conditions. The value of grid bias can be less critical than with a tube having a higher amplification factor. The 6K5GT is a glass tube equipped with a small octal base and has characteristics similar to the triode section of the Hytron 6Q7GT.

Physical Characteristics: Bulb T-9C



RATING AND CHARACTERISTICS

Heater:

Voltage 6.3 Volts AC or DC
Current 0.3 Ampere

Note: Voltage between heater and cathode should be kept at a minimum if direct connection is not possible.

Operating Conditions: (Class A Amplifier)

Plate Voltage	100	250 Max. Volts
Grid Voltage*	-1.5	-3 Volts
Plate Current*	0.35	1.1 Milliamperes
Plate Resistance	78,000	50,000 Ohms Approx.
Mutual Conductance	900	1,400 Micromhos Approx.
Amplification Factor	70	70

*These are rating values only and not operating points with coupling resistors.

Direct Interelectrode Capacitances:

Grid to Plate	2.0	μf.
Input	2.4	μf.
Output	3.6	μf.



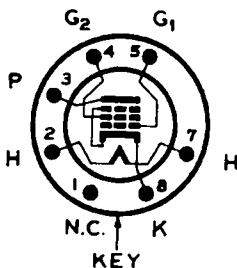
TYPE 6K6GT

HYTRON BANTAM

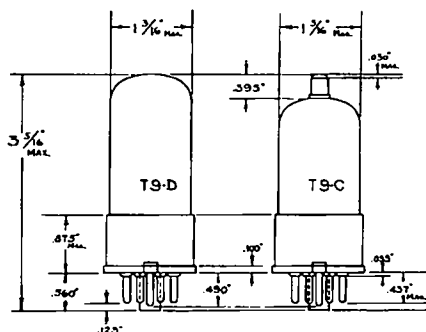
GENERAL DESCRIPTION

Application: The Hytron 6K6GT is a cathode type power amplifier pentode which may be employed either singly or in push-pull arrangements. The 6K6GT is a glass tube equipped with a small octal base and has ratings and characteristics identical to those of the type 41.

Physical Characteristics: Bulb T-9D



Bottom View



RATING AND CHARACTERISTICS

Heater:

Voltage	6.3	Volts
Current	0.4	Ampere

Note: Voltage between heater and cathode should be kept at a minimum if direct connection is not possible.

OPERATING CONDITIONS AND CHARACTERISTICS

Plate Voltage	125	167.5	180	250 ^{oo}	Volts
** Grid Voltage	-10	-12.5	-13.5	-18.0*	Volts
Screen Voltage	125	167.5	180	250 ^{oo}	Volts
Plate Current	11	17	18.5	32	Milliamperes
Screen Current	2	3	3	5.5	Milliamperes
Plate Resistance (Approx.)	100,000	85,000	81,000	68,000	Ohms
Mutual Conductance	1525	1800	1850	2200	Micromhos
Amplification Factor (Approx.)	150	150	150	150	
Load Resistance	11,000	9,500	9,000	7,600	Ohms
Power Output ^o	0.65	1.25	1.5	3.4	Watts

^oTotal harmonic distortion of 10%.

^{oo} Maximum

* A bias of -16.5 volts and a load of 7000 ohms will give a power output of 3.2 watts with a 7% total harmonic distortion.

** Transformer or impedance-coupled input systems are recommended. If resistance coupling is used the D.C. resistance in the grid return must be limited to 1 megohm for self-biased conditions and .1 megohm for fixed-bias conditions provided that the heater voltage does not exceed rated value by more than 10% under all operating conditions.

from RMA release #134, April 11, 1938

Note: For characteristic curves refer to the type 41.

Typical operating conditions and characteristics, class A1 amplifier (single tube)

Plate voltage.	100	250	315	volts
Grid #2 voltage.	100	250	250	volts
Grid #1 voltage.	-7	-18	-21	volts
Peak A-F grid #1 voltage	7	18	21	volts
Zero-signal plate current.	9	32	25.5	ma
Maximum-signal plate current	9.5	33	28	ma
Zero-signal grid #2 current.	1.6	5.5	4.0	ma
Maximum-signal grid #2 current	3	10	9	ma
Plate resistance (approx.)	104,000	90,000	110,000	ohms
Transconductance	1500	2300	2100	μmhos
Load resistance.	12,000	7600	9000	ohms
Maximum-signal power output.	0.35	3.4	4.5	watts
Total harmonic distortion (approx.)	11	11	15	%

Typical operating conditions and characteristics, class A1 push-pull amplifier**

	<u>Fixed bias</u>	<u>Cathode bias</u>	
Plate voltage.	285	285	volts
Grid #2 voltage.	285	285	volts
Grid #1 voltage.	-25.5	---	volts
Cathode resistor	---	400	ohms
Peak A-F grid #1 to grid #1 voltage.	51	51	volts
Zero-signal plate current.	55	55	ma
Maximum-signal plate current	72	61	ma
Zero-signal grid #2 current.	9	9	ma
Maximum-signal grid #2 current	17	13	ma
Plate-to-plate load resistance	12,000	12,000	ohms
Maximum-signal power output.	10.5	9.8	watts
Total harmonic distortion.	6	4	%

**Unless otherwise specified, values are for two tubes.

Ratings § Vertical Deflection Amplifier §§, Triode connected

Maximum D.C. plate voltage	315	volts
Maximum peak positive voltage (absolute maximum)	1200	volts
Maximum plate dissipation #.	7	watts
Maximum peak negative grid voltage	250	volts
Maximum average cathode current.	25	ma
Maximum peak cathode current	75	ma
Maximum grid circuit resistance (cathode bias)	2.2	megohms

Average characteristics - Triode connected

Plate voltage.	250	volts
Grid voltage	-18	volts
Plate current.	37.5	ma
Transconductance	2700	μmhos
Amplification factor	6.8	
Plate resistance (approx.)	2500	ohms
Grid voltage (approx.) for Ib = 0.5 ma.	-48	volts

Continued on page 3

§All values are evaluated on design center system except where absolute maximum is stated.

§§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.

#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.

Refer to "Interpretation of Receiving Tube Ratings"

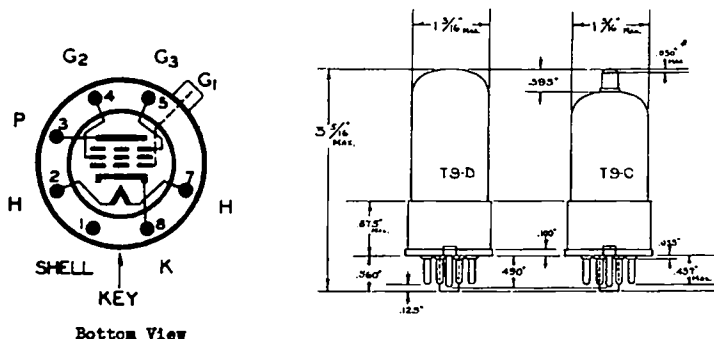


GENERAL DESCRIPTION

Application: The Hytron 6K7-GT is a cathode type super-control pentode primarily designed for amplifier service in radio or intermediate frequency circuits. It may also be used as a mixer tube in superheterodyne circuits. An internal shield is connected to cathode within the tube.

The Hytron 6K7GT is a glass tube equipped with a small octal base and may be used interchangeably with the Hytron 6K7G glass tube.

Physical Characteristics: Bulb T-9C



RATING AND CHARACTERISTICS

Heater:
Voltage 6.3 Volts AC or DC
Current 0.3 Ampere

Note: Voltage between heater and cathode should be kept at a minimum if direct connection is not possible.

AMPLIFIER OPERATION (CLASS A)

Plate Voltage	90	180	250	250 Max.	Volts
Screen Voltage	90	75	100	125 Max.	Volts
Grid Voltage	-3	-3	-3	-3 Min.	Volts
Suppressor				Connected to Cathode at Socket	
Plate Current	5.4	4.0	7.0	10.5	Milliamperes
Screen Current	1.3	1.0	1.7	2.6	Milliamperes
Plate Resistance	0.315	1.0	0.8	0.6	Megohm
Amplification Factor	400	1100	1160	990	
Mutual Conductance	1275	1100	1450	1650	Micromhos
*Grid Voltage	-38.5	-32.5	-42.5	-52.5	Volts

* Mutual Conductance = 2 Micromhos.

MIXER OPERATION (VARIABLE BIAS)

Plate Voltage	250	Max.	Volts
Screen Voltage	100		Volts
Grid Voltage	-10	Approx.	Volts
Suppressor		Connected to Cathode at Socket.	

Values shown are optimum. Grid voltage is minimum for 7 volts peak oscillator voltage.

Direct Interelectrode Capacitances:

°Grid No. 1 to Plate	0.007	μf. Max.
Grid No. 1 to all other electrodes	4.5	μf.
Plate to all other electrodes	11.0	μf.

°With shield can.

from RMA release #134, April 11, 1938

Note: For characteristic curves refer to the type 6K7G



JETEC DATA
JOINT ELECTRON TUBE ENGINEERING COUNCIL
COMMITTEE ON RECEIVING TUBES

134A
J5-6K7GT
October 4, 1948

JETEC TYPE 6K7GT

PENTODE

E. I. A.

REGISTRATION

FILE

MECHANICAL DATA

Coated unipotential cathode

Outline drawing. 9-18 Bulb T-9

Base B7-27 small wafer octal 7-pin, metal sleeve

Cap. C1-3 skirted miniature

Maximum diameter 1-5/16"

Maximum overall length 3-5/16"

Maximum seated height. 2-3/4"

Pin connections. Basing 7-R

Pin 1 - Base sleeve

Pin 2 - Heater

Pin 3 - Plate

Pin 4 - Grid #2

Pin 5 - Grid #3

Pin 7 - Heater

Pin 8 - Cathode, shield

Cap - Grid #1

Mounting position. any

ELECTRICAL DATA

Direct Interelectrode Capacitances*

Grid to plate: g1 to p (max.)	0.005	μmf
Input: g1 to (h+k+g2+g3+b.s.+i.s.)	4.6	μmf
Output: p to (h+k+g2+g3+b.s.+i.s.)	12	μmf

*Pin 1 and external shield #308 connected to pin 8

Ratings

Heater voltage (ac or dc)	6.3	volts
Maximum plate voltage	300	volts
Maximum grid #2 supply voltage	300	volts
Maximum grid #2 voltage.	See J5-C4	
Maximum heater-cathode voltage	90	volts
Maximum plate dissipation.	2.75	watts
Maximum grid #2 dissipation.	0.35	watts
Maximum positive d-c grid #1 voltage	0	volts

Typical Operating Conditions and Characteristics

Heater voltage (ac or dc)	6.3	6.3	6.3	volts
Heater current	300	300	300	ma
Plate voltage.	100	250	250	volts
Grid #3 voltage.	Pin #5 connected to pin #8 at socket			
Grid #2 voltage.	100	100	125	volts
Grid #1 voltage.	-1	-3	-3	volts
Plate resistance (approx.)	0.15	0.8	0.6	megohm
Transconductance	1650	1450	1650	μmhos
Plate current.	9.5	7.0	10.5	ma
Grid #2 current.	2.7	1.7	2.6	ma
Grid #1 voltage for gm = 2 μmhos (approx.)	-38.5	-42.5	-52.5	volts

Refer to "Interpretation of Receiving Tube Ratings"

TYPE 6Q7GT



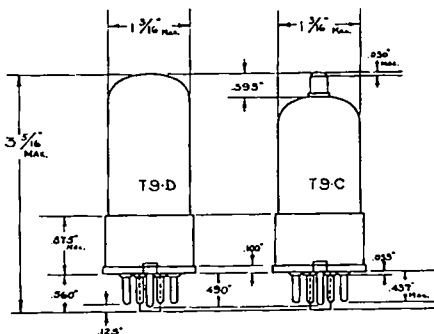
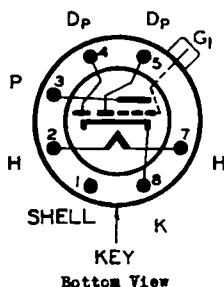
HYTRON BANTAM

GENERAL DESCRIPTION

Application: The Hytron 6Q7GT is a cathode type duplex tube consisting of a high- μ triode and two diodes in a single envelope. The combined functions of detection, automatic volume control, and audio amplification can be performed by this tube in properly designed circuits.

The Hytron 6Q7GT is a glass tube equipped with a small octal base and may be used interchangeably with the Hytron 6Q7G glass tube.

Physical Characteristics: Bulb T-9C



RATING AND CHARACTERISTICS

Heater:
Voltage 6.3 Volts AC or DC
Current .3 Ampere

Note: Voltage between heater and cathode should be kept at a minimum if direct connection is not possible.

AMPLIFIER OPERATION (CLASS A RESISTANCE COUPLED)

*Plate Supply Voltage	100	135	180	250	Volts
Grid Voltage	-1.5	-1.6	-1.75	-1.9	Volts
Plate Current	.11 to .07	.18 to .11	.26 to .16	.44 to .26	Milliamperes
Cathode Resistor	13500 to 21400	8700 to 14500	6700 to 11000	4300 to 7300	Ohms
Plate Resistor	.25 to .5	.25 to .5	.25 to .5	.25 to .5	Megohm
Grid Resistor	.5	.5	.5	.5	Megohm
°°Voltage Amplification	33 to 36	39 to 41	42 to 44	43 to 45	

*Effective plate voltage will be this value minus the voltage drop in the plate resistor. Voltage at plate should not exceed 250 volts.

°Grid resistor for the following tube.

°°Approximate.

AMPLIFIER OPERATION (CLASS A TRANSFORMER COUPLED)

Plate Voltage	100	250 Max.	Volts
Grid Voltage	-1.5	-3.0	Volts
Plate Current	.35	1.1	Milliamperes
Plate Resistance	87500	58000	Ohms
Amplification Factor	70	70	
Mutual Conductance	800	1200	Micromhos

DIODE OPERATION

The two diode plates are mounted about the common cathode sleeve but are otherwise isolated from each other and the triode unit. These diodes may be operated singly as half-wave rectifiers, tied together as a single half-wave rectifier, or operated in a full-wave arrangement. The full-wave circuit will provide about half the voltage obtainable from the half-wave circuit.

Automatic volume control may be effected by applying the D.C. voltage developed in the diode load to the control elements of preceding amplifier tubes. This D.C. voltage may be obtained from the same diode circuit as used for detection or from one of the diode plates operating separately as a bias rectifier.

from RMA release #134, April 11, 1938

Note: For characteristic curves refer to the type 6Q7G

JOINT ELECTRON DEVICE ENGINEERING COUNCIL



2260 SALMON TOWER
11 WEST FORTY-SECOND STREET
NEW YORK 36, N. Y.
TELEPHONE: LONGACRE 5-0717

Announcement of Electron Device Type Reregistration

Release No. 134D (Tentative)*

March 29, 1960

The Joint Electron Device Engineering Council announced the registration of the following electron device designation

6Q7GT

on April 11, 1938, Release No. 134, under the sponsorship of CBS Electronics, Danvers, Massachusetts.

The Radio Corporation of America, Harrison, New Jersey, now proposes reregistration based on the following data:

<u>ITEM</u>	<u>AS REGISTERED</u>	<u>AS PROPOSED</u>
<u>Direct Interelectrode</u> <u>Capacitances*</u>		
Triode grid to #2 diode plate (max.)	none	0.001 μf
Triode grid to #1 diode plate (max.)	none	0.001 μf
#2 diode plate to H + K + pin 1	none	1.7 μf
#1 diode plate to H + K + pin 1	none	2.2 μf

* Without external shield.

*Unless valid objection to this reregistration is lodged with the EIA Standards Laboratory prior to April 29, 1960, this reregistration will be made and this information will be considered
"FINAL" WITHOUT FURTHER NOTICE!

TYPE 6R7GT



RMA Release # 190

HYTRON BANTAM

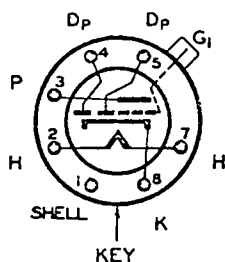
June 6, 1939

GENERAL DESCRIPTION

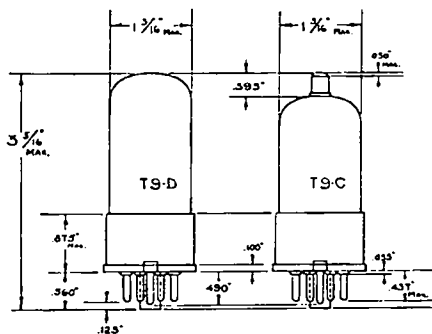
Application: The Hytron 6R7GT is a cathode type duplex tube consisting of a medium mu triode and two diodes in a single glass envelope. The combined functions of detection, automatic volume control, and audio amplification can be performed by this tube in properly designed receiver circuits.

The 6R7GT is a glass tube equipped with a small octal base and may be used interchangeably with the Hytron 6R7G glass tube.

Physical Characteristics: Bulb T-9C



Bottom View



RATING AND CHARACTERISTICS

Heater:
Voltage 6.3 Volts AC or DC
Current 0.3 Ampere

Note: Voltage between heater and cathode should be kept at a minimum if direct connection is not possible.

CLASS A AMPLIFIER OPERATION

Plate Voltage	250 Max.	Volts
Grid Voltage	-9	Volts
Plate Current	9.5	Milliamperes
Plate Resistance	8500	Ohms
Mutual Conductance	1900	Micromhos
Amplification Factor	16	

Note: For operation of diode units refer to the type 85.

Made in USSR

RADIO TUBE

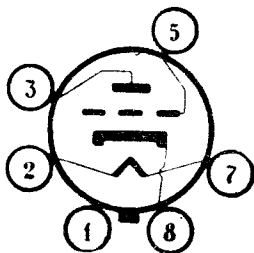
type 6C2C 6J5GT

Indirect heater triode in glass design with average coefficient of amplification intended for amplification of low frequency voltage.

Heater voltage	6.3 V
Heater current	275—325 mA
Anode current	5.5—12.5 mA
Grid voltage	—8 V
Steepness	2.0—3.2 mA/V
Coefficient of amplification	18—23
Maximum allowable anode voltage	330 V
Maximum allowable heater voltage oscillation	5.7—6.9 V
Maximum allowable cathode-heater voltage	100 V
Maximum allowable first grid voltage	0 V
Maximum allowable cathode current	20 mA
Maximum allowable anode dissipation	2.75 W

Maximum allowable values should not be reached simultaneously on 2 and more electrodes under operating conditions and should not be exceeded.
Maximum electrode dissipation is allowed for a short time.

Basing of tube
type 6C2C



View from the side
of pins.

Pin Nos.	Electrode names
1	Absent
2	Heater
3	Anode
4	Absent
5	Grid
6	Absent
7	Heater
8	Cathode

April 30, 1940

HYTRON CORPORATION

TENTATIVE SPECIFICATIONS

BANTAM TYPE 6SE7GT

GENERAL DESCRIPTIONAPPLICATION:

The Hytron Bantam 6SE7GT is a single ended cathode type pentode of sharp cutoff characteristics and is designed primarily for service as a high gain amplifier of radio or audio frequency signals. Because of its extremely high value of transconductance at relatively low cathode current and low plate resistance, the tube lends itself to use in applications requiring high gains with low thermal activity. It may be also employed as a bias detector, radio frequency oscillator or as a mixer tube in properly designed superheterodyne circuits.

The Hytron Bantam 6SE7GT is a glass tube equipped with an octal wafer base and metal shell. Through its unique geometric design the control grid of the tube is brought out completely isolated and shielded from all other elements to the #4 base pin. The metal base shell and metal inter-pin base shield are both brought out to the #1 pin to facilitate external shielding of the stem leads and base pins.

PHYSICAL CHARACTERISTICS: BULB T-9DRATINGS AND CHARACTERISTICS

Heater Voltage (A.C. or D.C.)	6.3	volts
Heater Current	0.3	ampere
Direct Interelectrode Capacitances: ^o		
Grid to Plate	.0035 max.	uuf
Input	6.0	uuf
Output	7.5	uuf
Maximum Overall Length		3-5/16"
Maximum Seated Height		2-3/4"
Maximum Diameter		1-5/16"
Base	Composite wafer-metal shell octal 8-pin	
Basing		8N-1-5

AMPLIFIER - CLASS AOperating Conditions and Characteristics:

Heater Voltage*	6.3	6.3	volts
Plate Voltage	100	250 max.	volts
Screen Voltage	100 max.	100 max.	volts
Grid Voltage	-1.0	-1.5	volts
Suppressor	Connected to cathode at socket		
Plate Current	5.5	4.5	ma.
Screen Current	2.4	1.5	ma.
Amplification Factor	750	3750	approx.
Plate Resistance	.25	1.1	megohms approx.
Transconductance	3100	3400	micromhos
Grid Volta (Gm = 5 umhos)	-4.5	-6.0	volts approx.

PIN CONNECTIONS

Pin 1 - Shell	Pin 5 - Cathode & internal shield
Pin 2 - Heater	Pin 6 - Screen grid
Pin 3 - Suppressor grid	Pin 7 - Heater
Pin 4 - Control grid	Pin 8 - Plate

^o With shell connected to cathode.

* In circuits where the cathode is not directly returned to ground, the potential difference between the heater and cathode should be kept as low as possible.

GENERAL DESCRIPTION

APPLICATION:

The Hytron Bantam 6W6GT is a cathode type high-mu beam-power amplifier intended for use in the output stage of automobile receivers having low voltage power supplies. Designed along lines similar to the original beam-power type 6L6G, this tube provides high power output with high sensitivity and high efficiency.

PHYSICAL CHARACTERISTICS: BULB T-9D

RATINGS AND CHARACTERISTICS

Heater:
Voltage 6.5 volts AC or DC
Current 1.25 amps.
Note: Voltage between heater and cathode should be kept at a minimum if direct connection is not possible.

AMPLIFIER OPERATION - SINGLE TUBE

CLASS A	
Plate Voltage	135 volts max.
Screen Voltage	135 volts max.
Grid Voltage#	-9.5 volts
Plate Current (Zero Signal)	56.0 ma.
Plate Current (Max. Signal)	61.0 ma.
Screen Current (Zero Signal)	2.8 ma.
Screen Current (Max. Signal)	12.0 ma.
Signal Input Volts	6.7 volts RMS
Mutual Conductance	9000 umhos.
Amplification Factor	215
Load Resistance	2000 ohms
Harmonic Distortion:	
Second	2 1/2%
Third	3%
Total	11%
Maximum Power Output	3.3 watts

BASING CONNECTIONS

Pin 1 - Shell	Pin 5 - Grid
Pin 2 - Heater	Pin 6 - Open
Pin 3 - Plate	Pin 7 - Heater
Pin 4 - Screen	Pin 8 - Cathode

The type of input coupling used should not introduce too much resistance in the grid circuits. Transformer or impedance coupling devices are recommended. When the grid circuit has a resistance not higher than 0.1 megohm fixed bias may be used; for higher values, self-bias is required. With self-bias, the grid circuit may have a resistance not to exceed 0.5 megohm. Where self-bias is used, the cathode resistor must be shunted by a suitable by-pass filter condenser to prevent degeneration at low audio frequencies.

JETEC DATA
JOINT ELECTRON TUBE ENGINEERING COUNCIL
COMMITTEE ON RECEIVING TUBES

JETEC Type 6W6GT
Release 191B

JETEC TYPE 6W6GT

BEAM PENTODE

MECHANICAL DATA

Coated unipotential cathode		
Outline drawing.	9-11 or 9-41	Bulb. T-9
Base	B6-81 or B7-7.	intermediate shell octal
	or .B6-84 or B7-59	short intermediate shell octal
Maximum diameter		1-9/32"
Maximum overall length		3-5/16"
Maximum seated height.		2-3/4 "
Pin connections.		Basing 7AC
*Pin 1 - No connection		Pin 5 - Grid #1
Pin 2 - Heater		Pin 7 - Heater
Pin 3 - Plate		Pin 8 - Cathode, grid #3
Pin 4 - Grid #2		

*Pin #1 omitted on Base Nos. B6-81 and B6-84.

Mounting position. Any

ELECTRICAL DATA

Direct Interelectrode Capacitances (Approx.)

Grid to plate: (g1 to p).	0.8	μpf
Input: g1 to (h+k+g2+g3).	15.0	μpf
Output: p to (h+k+g2+g3).	9.0	μpf

Heater Characteristics

Heater voltage	6.3	volts
Heater current	1.2	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

Ratings - Class A₁ Amplifier

Maximum plate voltage.	300	volts
Maximum grid #2 voltage.	150	volts
Maximum plate dissipation.	10	watts
Maximum grid #2 dissipation.	1.25	watts
Maximum grid #1 circuit resistance		
Fixed bias	0.1	megohm
Cathode bias	0.5	megohm

Continued on page 2

JETEC Comm. JTC-5
January 16, 1956

Typical Operating Conditions and Characteristics, Class A₁ Amplifier (single Tube)

Plate voltage.	110	200	volts
Grid #2 voltage.	110	125	volts
Grid #1 voltage.	-7.5	---	volts
Cathode bias resistor.	---	180	ohms
Peak AF grid #1 voltage.	7.5	8.5	volts
Zero-signal plate current.	49	46	ma
Maximum-signal plate current.	50	47	ma
Zero-signal grid #2 current.	4.0	2.2	ma
Maximum-signal grid #2 current.	10.0	8.5	ma
Plate resistance (approx.)	13,000	28,000	ohms
Transconductance	8000	8000	μmhos
Maximum-signal power output.	2.1	3.8	watts
Load resistance.	2000	4000	ohms
Total harmonic distortion (approx.)	10	10	%

Ratings § Vertical Deflection Amplifier §§ Triode Connected

Maximum DC plate voltage	300	volts
Maximum peak positive voltage (absolute maximum)	1200	volts
Maximum plate dissipation #.	7.5	watts
Maximum peak negative grid voltage	250	volts
Maximum average cathode current.	60	ma
Maximum peak cathode current	180	ma
Maximum grid circuit resistance (cathode bias)	2.2	megohms

Ratings § Vertical Deflection Amplifier §§ Pentode Connected

Maximum DC plate voltage	300	volts
Maximum peak positive plate voltage (absolute maximum)	1500	volts
Maximum DC grid #2 voltage	150	volts
Maximum plate dissipation #.	7.0	watts
Maximum grid #2 dissipation.	1.0	watt
Maximum peak negative grid #1 voltage.	250	volts
Maximum average cathode current.	60	ma
Maximum peak cathode current	180	ma
Maximum grid #1 circuit resistance (cathode bias).	2.2	megohms

Average Characteristics - Triode Connected

Plate voltage.	225	volts
Grid voltage	-30	volts
Plate current.	22	ma
Transconductance	3800	μmhos
Amplification factor	6.2	
Plate resistance (approx.)	1600	ohms
Grid voltage (approx.) for I _b = 0.5 ma	-42	volts

§All values are evaluated on design center system except where absolute maximum is stated.

§§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.

#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.

Refer to "Interpretation of Receiving Tube Ratings"

JETEC Comm. JTC-5
January 16, 1956

TYPE 6X5GT

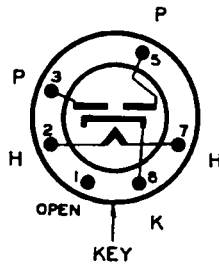


HYTRON BANTAM

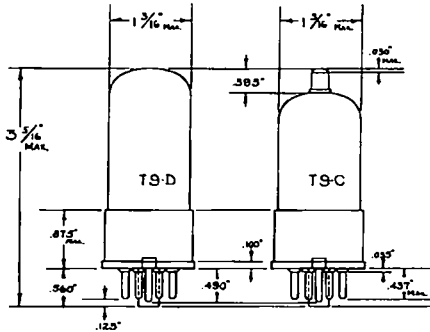
GENERAL DESCRIPTION

Application: The Hytron 6X5GT is a cathode type rectifier designed particularly for use in automobile receivers. The 6X5GT is a glass tube with a small octal base and may be used interchangeably with the Hytron 6X5G glass tube.

Physical Characteristics: Bulb T-9D



Bottom View



RATING AND CHARACTERISTICS

Heater:

Voltage
Current

6.3 Volts AC or DC
0.6 Ampere

Note: Voltage between heater and cathode should not exceed 500 volts DC.

FULL-WAVE OPERATION

AC Plate Voltage (RMS per plate)
Load Current

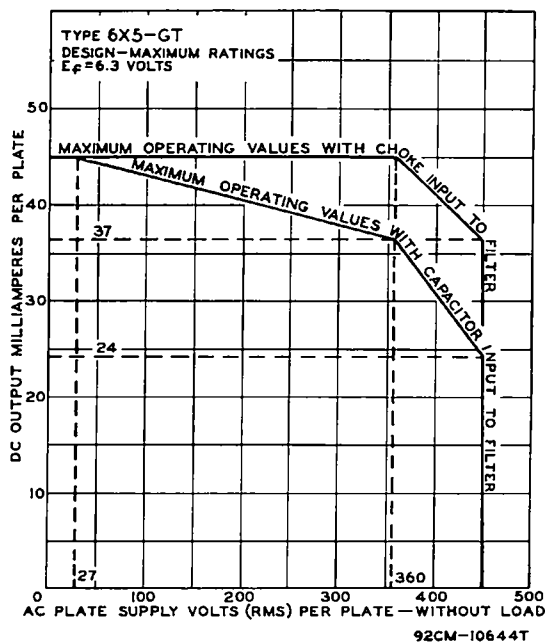
350 Volts Max.
75 Milliamperes Max.

from RMA release #134, April 11, 1938

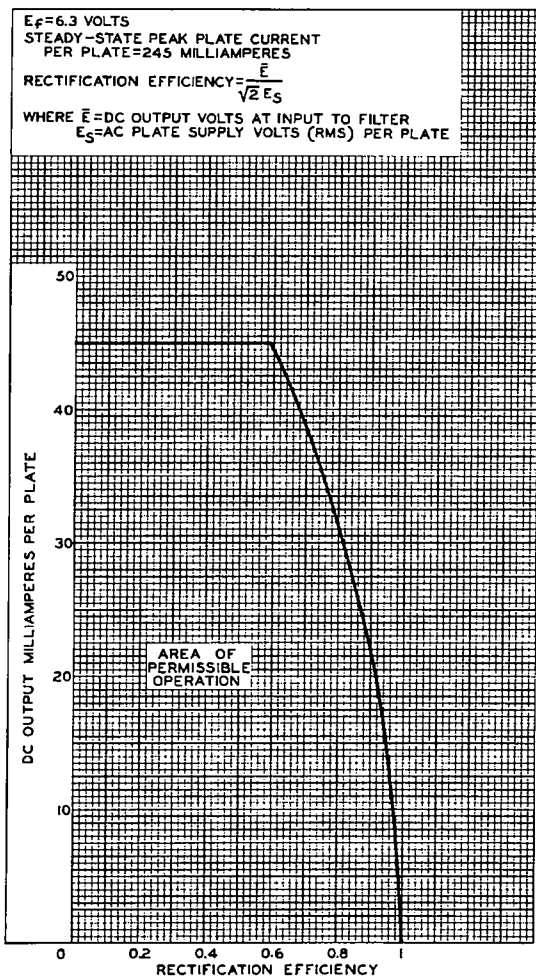
Type 6X5GT

<u>ITEM</u>	<u>AS REGISTERED</u>	<u>AS PROPOSED</u>	
Reference is made to RMA Data Sheet for Type 6X5GT/6X5G dated Oct. 10, 1940	On Basis of Design-Center Rating System	On Basis of Design-Maximum Rating System	
<u>Under Ratings</u>			
Heater Voltage (ac or dc)	6.3	6.3 ± 10% *	volts
Heater Current at 6.3 volts	0.6	0.6	amp
Maximum DC Heater to Cathode Potential	450	delete	volts
Heater-Cathode Voltage: Heater negative with respect to cathode:			
DC	-	450 max.	volts
Total DC and Peak	-	450 max.	volts
Heater positive with respect to cathode:			
DC	-	100 max.	volts
Total DC and Peak	-	200 max.	volts
Maximum Peak Inverse Plate Voltage	1250	1250	volts
Maximum Steady-State Peak Plate Current per Plate	210	245 See Rating Chart II	ma
Maximum Transient Peak Plate Current per Plate	-	1.1 See Rating Chart III	amp
Maximum DC Output Current per Plate	-	See Rating Chart I	
Maximum A.C. Plate Voltage per Plate (RMS):			
Capacitor Input	325	See Rating Chart I	volts
Choke Input	450	See Rating Chart I	volts
<u>Vibrator Operation (Min. duty cycle of 75%):</u>			
Maximum DC Output Volt- age at Filter Input	-	350	volts
Maximum DC Output Cur- rent per Plate	-	45	ma

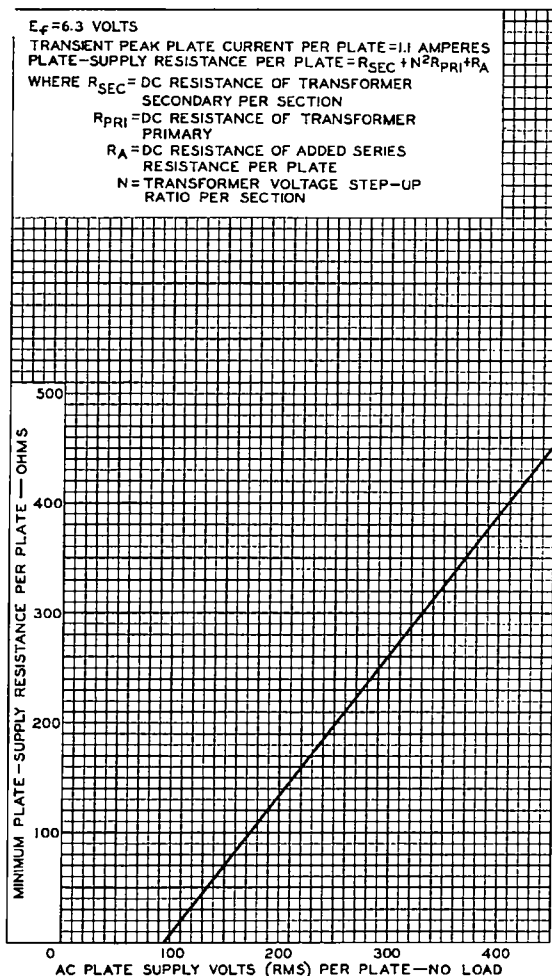
* When the heater is operated in automotive service from a 6-volt battery source, the permissible range in heater voltage is from 5.0 to 8.0 volts



Type 6X5-GT: Rating Chart I.



Type 6X5-GT: Rating Chart II.



Type 6X5-GT: Rating Chart III.

HYTRON Engineering NEWS RELEASE

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☐ ASST. ENGINEER
☐ PURCHASING AGENT
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E-159
Page 1 of 3 pages

Original issue, July 28, 1950.

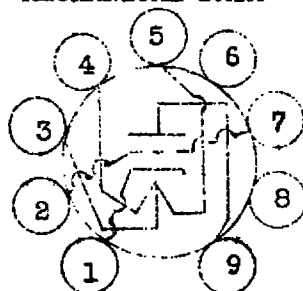
HYTRON TYPE 12A4 Medium-Mu Triode

The Hytron type 12A4 is a medium-mu triode having high perveance intended for use in television receivers and other applications where high peak currents must be developed with a low voltage power supply. It may also be used in circuits requiring a tube of high transconductance.

The high perveance is such as to make the 12A4 suitable for use as a vertical deflection amplifier in television receivers using large deflection angles and having low plate supply potentials. The tube is designed to withstand relatively high peak positive plate potentials of short duration. The 12A4 has characteristics similar to one section of the 12BH7 or 6SN7GT except that the power sensitivity and output are considerably greater. Approximately 15% more output at a given plate voltage supply may be obtained as a vertical deflection amplifier compared to the above types. It may be used in 300 mA series heater circuits or from a 6.3 volt source with the heaters connected in parallel.

MECHANICAL DATA

Coated unipotential cathode
Outline drawing
Base
Maximum diameter
Maximum overall length
Maximum seated height
Mounting position
Pin connections



TERMINAL CONNECTIONS

Bulb T-6-1/2
E9-1 small button 9-pin
7/8"
2-5/8"
2-3/8"
any
JETEC Basing 9-AG

Pin 1: Cathode
Pin 2: Grid
Pin 3: Heater center tap
Pin 4: Heater
Pin 5: Heater

Pin 6: No connection
Pin 7: Grid
Pin 8: No connection
Pin 9: Plate

For further information write Commercial Engineering Department, Hytron Radio & Electronics Corp.,
Salem, Mass., or telephone Salem 2260

HYTRON RADIO AND ELECTRONICS CORPORATION

July 29, 1950.

ELECTRICAL DATA

Direct interelectrode capacitances *

Grid to plate (g to p)	4.9	uuf
Input (g to k+h)	6.7	uuf
Output (p to k+h)	3.8	uuf

Ratings, Class A-1 Amplifier, Design Center Maximum (Note A)

(Except as noted below)		
Heater potential (a-c or d-c) **	12.6	volts
Maximum d-c plate potential	450	volts
Maximum negative d-c grid potential	-50	volts
Maximum peak heater-cathode potential	180	volts
Maximum cathode current	40	mA
Maximum plate dissipation (Note B)	6.5	watts
Maximum grid circuit resistance (cathode bias) (Note B)	2.5	megohms
Maximum grid circuit resistance (fixed bias) (Note B)	1.2	megohms

Typical Operating Conditions and Characteristics, Class A-1 Amplifier

Heater potential **	12.6	volts
Heater current **	300	mA
Plate potential	250	volts
Grid potential	-9.0	volts
Amplification factor	20	
Transconductance	7800	umho
Plate current	21	mA
Grid voltage (approx.) for Ib: 50 uA at Eb: 500	-33	volts

Ratings, Vertical Deflection Amplifier /, design Center Maximum (Note A)
(except as noted below)

Maximum d-c plate potential	450	volts
Maximum peak positive pulse plate potential (Note B)(Note C)	1000	volts
Maximum d-c negative grid potential	-50	volts
Maximum peak negative pulse grid potential (Note B)	-100	volts
Maximum d-c cathode current	30	mA
Maximum plate dissipation (Note B)	6.5	watts
Maximum peak heater-cathode potential	180	volts
Maximum grid circuit resistance (cathode bias) (Note B)	2.5	megohms
Maximum grid circuit resistance (fixed bias) (Note B)	1.2	megohm

Typical Operating Conditions and Characteristics, vertical deflection circuit /

Heater potential **	12.6	volts
D-C plate potential	250	volts
Cathode bias resistor (variable)	560	ohms
Grid input potential		
Peak to peak saw-tooth component (approx.)	25	volts
Negative peaking component (approx.)	30	volts
D-c plate current	15	mA
Plate output voltage		
Peak positive pulse component	450	volts
Peak to peak saw-tooth component	220	volts
Peak to peak saw-tooth current in yoke (50 millihenry inductance 360		mA

July 28, 1950.

- * Measured with external shield #315
- ** Value given is for series connection. For parallel connection, values are: heater potential, 6.3 volts; heater current, 600 mA.
- / 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 cycles of the voltage pulse must not exceed 15% of one scanning cycle is 2.5 milliseconds.

Note A: This is the conventional system of receiving tube ratings.

Note B: These ratings are on the absolute maximum system ! Absolute maximum ratings are the limiting values above which the serviceability of the tube may be impaired from the viewpoint of life and satisfactory performance. Therefore, in order not to exceed these absolute ratings, the equipment designer has the responsibility of determining an average design value for each rating below the absolute value of that rating by an amount such that the absolute values will never be exceeded under any usual condition of line voltage variation, manufacturing variations (including components) in the equipment itself, or adjustments of controls.

Note C: The peaking resistor incorporated in the oscillator discharge circuit should be chosen so that this rating is not exceeded under any condition.

TYPE 25A6GT



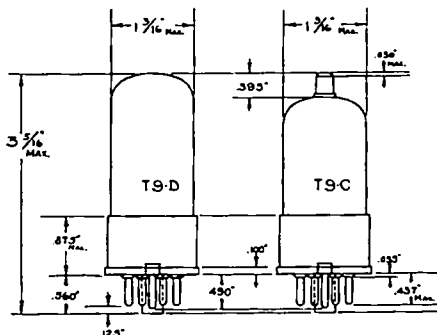
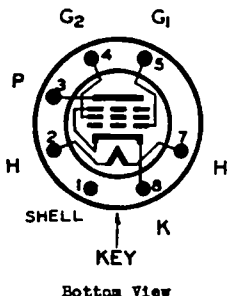
HYTRON BANTAM

GENERAL DESCRIPTION

Application: The Hytron 25A6GT is a cathode type power pentode suitable for use in the output stage of radio receivers. It is especially adapted to universal AC-DC receivers or receivers operating directly from DC power lines. The power output is relatively large for the low voltages available in such receivers.

The 25A6GT is a glass tube equipped with a small octal base and may be used interchangeably with the Hytron 25A6G glass tube.

Physical Characteristics: Bulb T-9D



RATING AND CHARACTERISTICS

Heater:
Voltage 25.0 Volts AC or DC
Current 0.3 Ampere

Note: Voltage between negative end of heater and cathode should not exceed 90 volts DC.

AMPLIFIER OPERATION-SINGLE TUBE (CLASS A)

Plate Voltage	95	135	180	Max.	Volts
Screen Voltage	95	135	135	Max.	Volts
Grid Voltage	-15	-20	-20		Volts
Plate Current	20	27	38		Milliamperes
Screen Current	4	8	7.5		Milliamperes
Plate Resistance	45,000	35,000	40,000		Ohms Approx.
Amplification Factor	90	85	100		Approx.
Mutual Conductance	2,000	2,450	2,500		Micromhos
Load Resistance	4,500	4,000	5,000		Ohms
Power Output	0.9	2	2.75		Watts
Total Harmonic Distortion	11	9	10		Per Cent
*Self-Biasing Resistor	625	420	420		Ohms

*Single tube.

Transformer or impedance coupled input systems are recommended. If resistance coupling is used the DC resistance in the grid return must be limited to 0.25 megohm for self-biased conditions and 0.1 megohm for fixed-biased conditions provided that the heater voltage does not exceed rated value by more than 10% under all operating conditions.

from RMA release #134, April 11, 1938

Note: For characteristic curves refer to the type 25A6G

HYTRON CORPORATION

SALEM, MASS.



TYPE 25A7GT



HYTRON BANTAM

GENERAL DESCRIPTION

Application: The Hytron 25A7GT is a cathode type dual-purpose high vacuum rectifier, power amplifier pentode. The tube construction is such that the services of a half-wave rectifier and audio output tube are combined within one tube. The primary purpose for the combination is for the conservation of space in compact receivers and at the same time to reduce the heat generated by the filaments of the tubes within the receiver.

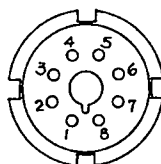
The Hytron 25A7GT is a glass tube equipped with a small octal base and may be used interchangeably with the 25A7G glass tube.

Heater: Two separate, Coated Uni-potential Cathodes. One cathode for rectifier and one for Pentode section. Half of total filament in each cathode sleeve. Filament sections series connected within the bulb.

Voltage
Current

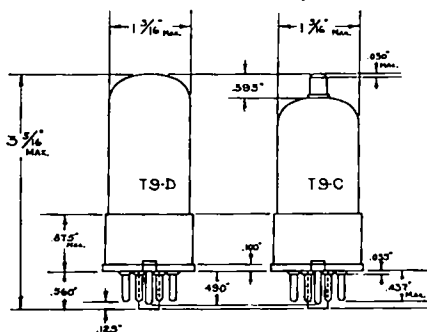
25.0 a.c. or d.c. volts
0.3 amp.

Physical Characteristics: Bulb T-9D
Base Connections



Bottom View

1. Rectifier Cathode
2. Heater
3. Pentode Plate
4. Pentode Screen (#2 Grid)



5. Pentode Control Grid (#1 grid)
6. Rectifier Plate
7. Heater
8. Pentode Cathode and (#3 grid)

Basing of

RECTIFIER SECTION

Operating Conditions
and Characteristics:

(Half-wave high vacuum rectifier.)

Heater: (rectifier section) internal connection
A. C. plate voltage (RMS)
D. C. output current

12.5 volts
125.0 volts max
75.0 mls "

* The D.C. potential difference between the cathode and filament must never exceed 175 volts Under no conditions of operation should the normal operating heater voltage of the tube be less than 22 V. or more than 28.0 V.

PENTODE SECTION

Amplifier (Class A)

Operating Conditions
and Characteristics:

Heater (pentode section) internal connection	12.5 volts
Plate	100.0 volts
Screen	100.0 volts
Grid	-15.0 volts
Amplification Factor	90.0
Plate Resistance	50,000 ohms
Mutual Conductance	1,800 umhos
Plate Current	20.5 ma.
Screen Current	4.0 ma.
Load Resistance	4,500 ohms
Total Harmonic Distortion	9.0 %
Power Output	.800 watts

* Heater to cathode bias should not exceed 125 volts D.C. as measured between the negative heater terminal and the cathode.

The total resistance introduced into the grid circuit by the input coupling device and filter network should not exceed 0.5 megohm with resistor or self-bias and should not exceed 1.0 megohm with grid or fixed bias.

When operating the 25A7GT pentode section in self-bias, the self-biasing resistor is 625 ohms. The 625 ohm bias resistor must be shunted by a suitable filter network to avoid degeneration at low audio frequencies. The recommended minimum by-pass filter condenser is 5.0 mfd.

When operating the tube in fixed bias the cathode is direct-connected to the negative return of the filter circuit at ground potential.

For characteristic curves, refer to type 25A7G.

B-1 3-38



TYPE 25Y4GT

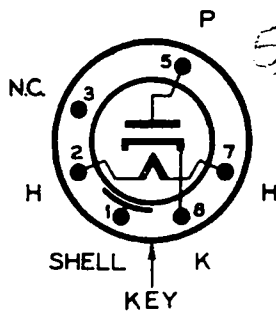


HYTRON BANTAM

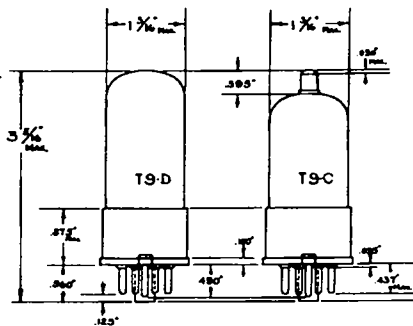
GENERAL DESCRIPTION

Application: The Hytron 25Y4GT is a cathode type half-wave rectifier designed for operation in transformerless receivers having the filaments connected in series. The base is of the small octal type.

Physical Characteristics: Bulb T-9D



Bottom View



RATING AND CHARACTERISTICS

Heater:

Voltage
Current

25.0 Volts AC or DC
0.15 Ampere

RECTIFIER OPERATION (HALF-WAVE)

A.C. Plate Voltage (RMS)
Load Current
Peak Plate Current

125 Volts Max.
75 Ma. Max.
250 Ma. Max.

Average Tube Voltage Drop

18 Volts at 125 Ma. Load Current

from RMA release #190, June 6, 1939

TYPE 25Z4GT

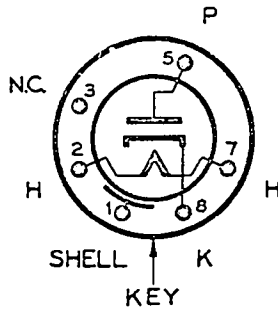


RMA Release # 190
HYTRON BANTAM
June 6, 1939

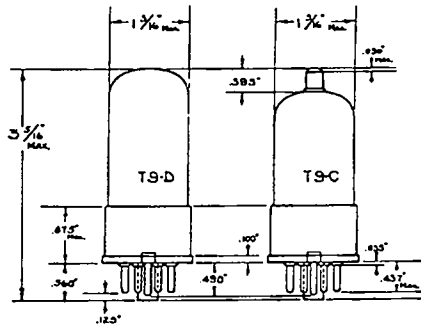
GENERAL DESCRIPTION

Application: The Hytron 25Z4GT is a cathode type half-wave rectifier designed for operation in transformerless receivers having the filaments connected in series. The base is of the small octal type.

Physical Characteristics: Bulb T-9D



Bottom View



RATING AND CHARACTERISTICS

Heater:

Voltage
Current

25.0 Volts AC or DC
0.3 Ampere

RECTIFIER OPERATION (HALF-WAVE)

A.C. Plate Voltage (RMS)	125	Volts Max.
Load Current	125	Ma. Max.
Peak Plate Current	750	Ma. Max.

Average Tube Voltage Drop

12 Volts at 125 Ma. Load Current



TYPE 25Z6GT



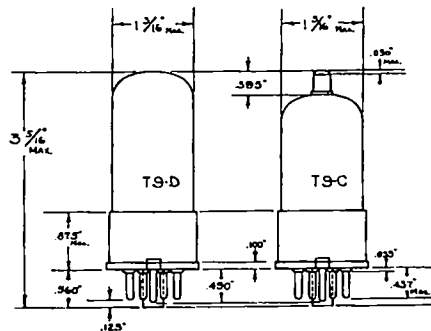
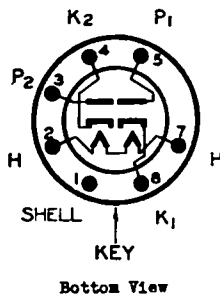
HYTRON BANTAM

GENERAL DESCRIPTION

Application: The Hytron 25Z6GT is a cathode type full-wave high vacuum rectifier. It is especially designed for use in receivers which do not employ a transformer and may be operated in half-wave or voltage doubler circuits.

The 25Z6GT is a glass tube equipped with a small octal base and may be used interchangeably with the Hytron 25Z6G glass tube.

Physical Characteristics: Bulb T-9 D



RATING AND CHARACTERISTICS

Heater:
Voltage
Current

25.0 Volts AC or DC
0.3 Ampere

RECTIFIER OPERATION (HALF-WAVE)

Plate Voltage (RMS per plate)	125	Volts Max.
Load Current (Per plate)	85	Milliamperes Max.
Peak Current (Per plate)	500	Milliamperes Max.

Note: Separate or parallel operation of the two sections is permissible in half-wave operation.

VOLTAGE DOUBLER OPERATION

Plate Voltage (RMS per plate)	125	Volts Max.
Load Current	85	Milliamperes Max.
Peak Current	500	Milliamperes Max.

from RMA release #134, April 11, 1938

Note: For characteristic curves refer to the type 25Z6G



TYPE 45Z5GT

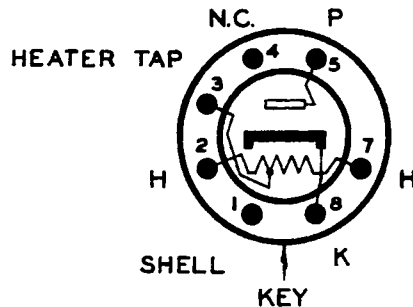
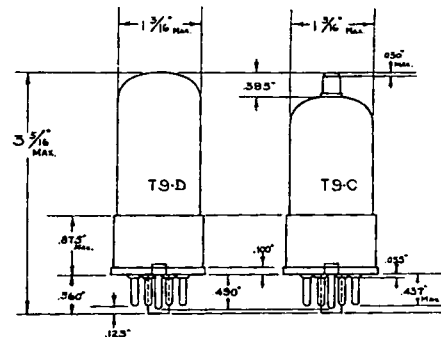


HYTRON BANTAM

GENERAL DESCRIPTION

Application: The Hytron 45Z5GT is a cathode-type half-wave rectifier designed for service in AC-DC receivers. It features a 45 volt 150 milliampere heater having a tap brought out from the heater so that with proper external connections a single pilot lamp can be lighted to nominal brilliancy. It is recommended that the plate current of the rectifier be passed through the pilot lamp and the tapped section of the heater. This is accomplished by connecting the plate of the rectifier to the tap on the heater. The Hytron 45Z5GT is a glass tube with an octal base.

Physical Characteristics: T-9D

Bottom ViewRating and Characteristics

Heater:
Voltage 45.0 Volts AC or DC
Current .150 Ampere

Note: With 45 volts RMS between pins 2 and 7, the open circuit voltage between pins 2 and 3 is 7.5 volts RMS.

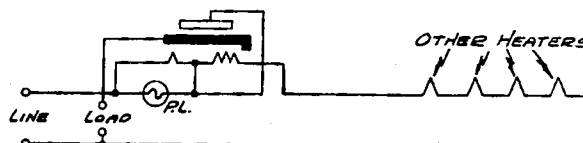
Maximum Conditions

AC Plate Voltage (RMS)	125 Volts Max.
DC Load Current with No. 40 or No. 40A Pilot Lamp	50 Ma. Max.
DC Load Current with No. 50 or No. 51 Pilot Lamp	60 Ma. Max.
DC Load Current without Tap Connected	100 Ma. Max.
<u>AVERAGE TUBE VOLTAGE DROP</u>	16 Volts at 200 ma.

Note: No. 40 and No. 40A lamps are .15 Amp. at 6.3 volts. No. 50 and No. 51 lamps are .20 Amp. at 7.5 volts.

RECOMMENDATIONS:

1. It is recommended that the pilot lamp and DC load current should be such that the potential between base pins 2 and 3 does not exceed 5.2 volts RMS at 117.0 volts line. This voltage should be measured with a thermal meter or a meter that will read RMS voltages. Rectifier type voltmeters, although calibrated in RMS volts, measure average volts and should not be used for this measurement.
2. It is recommended that the input filter condenser be limited to 40 μ fds.
3. Although it is possible to use DC load currents above 60 milliamperes in combination with high current pilot lamps such as the No. 44 and No. 46, this operation is not recommended because with pilot lamp failure excessive voltage appears between pins 2 and 3, causing heater burn out.
4. If the 45Z5GT is used without the tap connection, it is recommended that a 25 ohm protective resistor be used in series with the plate.
5. Voltages should not be applied to the socket when installing or removing tube.

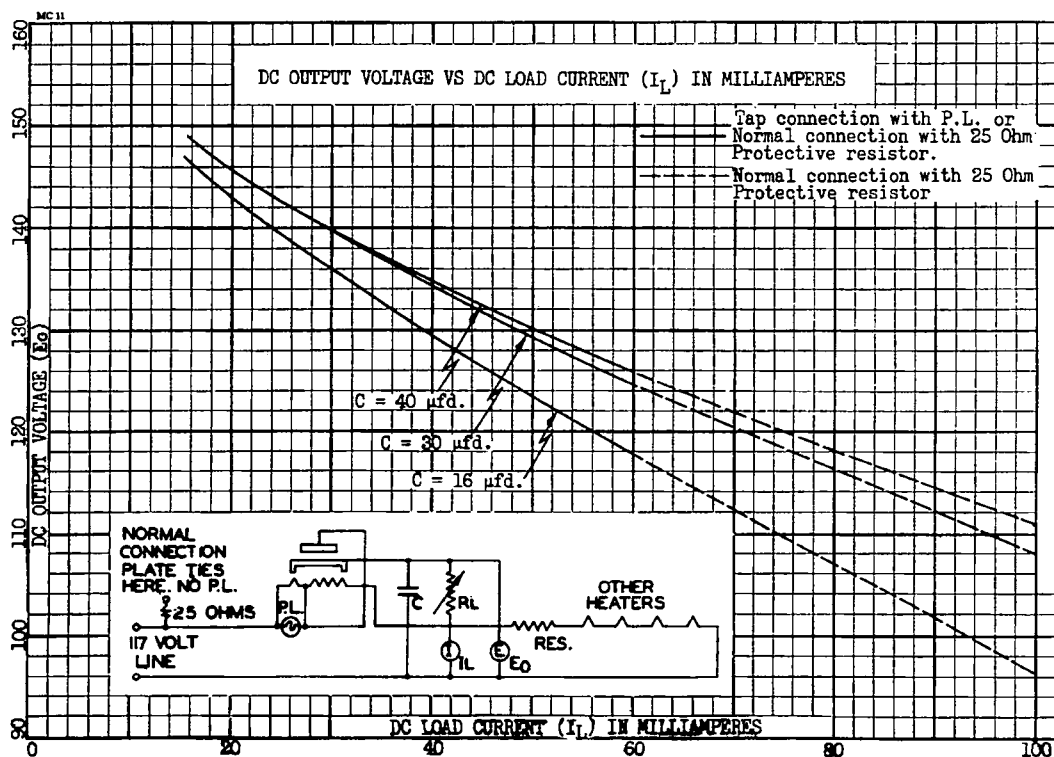
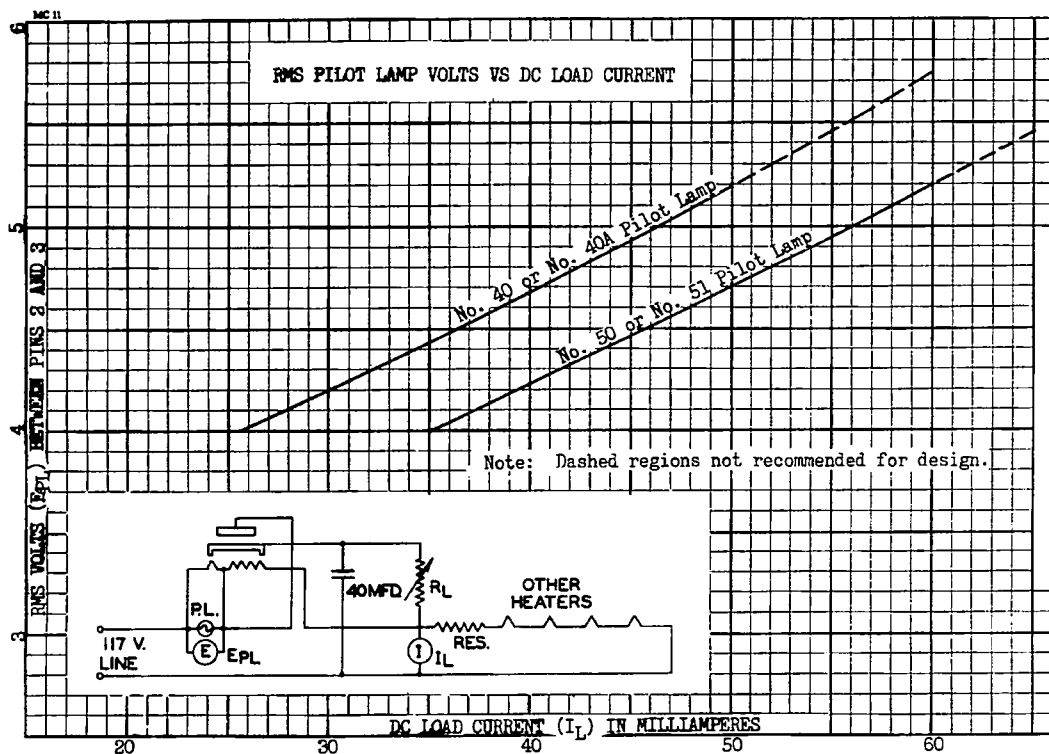
TYPICAL CONDITIONS

Note: Drop across resistance and all heaters should total 117.0 volts at .150 ampere. B-3 3-39

HYTRON CORPORATION

SALEM, MASS.





2 2 3

DATA CHANGE NOTICE - 45Z5GT

Due to a difficult situation arising from the revision of numbering on this type, it is found necessary to double-number this type with the following imprint: 40Z5/45Z5GT.

All tubes having been manufactured in the past bearing the above two type numbers have been identical in all electrical and physical respects and to avoid complications arising in the replacement field the use of double numbering has been resorted to.

The basing connections for type 40Z5/45Z5GT are identical with types 45Z5GT and 35Z5GT and for this reason, base pin connections and tube element drawings have not been supplied on this data correction sheet. Instead, an additional copy of standard 45Z5GT specifications have been attached.

HYTRON CORPORATION

Commercial Engineering Department



HYTRON

CORPORATION
RADIO TUBE MANUFACTURERS SINCE 1922
SALEM MASSACHUSETTS U.S.A.



SALES BULLETIN

No. 227

April 13th 1938

from RMA release #136,
April 18, 1938

COMMERCIAL RELEASE

Hytron 50Z6G

Hytron 50Z6G is a heavy duty high vacuum rectifier with two separate rectifier units using a common heater. It is similar to the 25Z6G in this respect.

Hytron 50Z6G is intended for use in medium size sets where it is feasible to use a series heater connection across the line.

High Vacuum Rectifier - Doubler

Heater Volts	50
Heater Amps.	0.3
Maximum Overall Length	4-5/8"
Maximum Diameter	1-13/16"
Bulb	ST-14
Base	7 Pin
Medium Shell	Octal
Pin 1 -	Not Connected
Pin 2 -	Heater
Pin 3 -	Plate #2
Pin 4 -	Cathode #2
Pin 5 -	Plate #1
Pin 7 -	Heater
Pin 8 -	Cathode #1

Half - Wave Rectifier Operation

A.C. Plate Voltage per plate (RMS)	250 Max. Volts
D.C. Output Current per plate	125 Max. M.A.

Full - Wave Rectifier Operation

A.C. Plate Voltage per plate (RMS)	250 Max. Volts
Peak Inverse Voltage	1000 Max. Volts
D.C. Output Current	250 Max. M.A.

Voltage - Doubler Operation

A.C. Plate Voltage per plate (RMS)	125 Max. Volts
Peak Plate Current	750 Max. M.A.
D.C. Output Current	150 Max. M.A.

REGISTRATION

FILE



865

**U. S. ARMY
SIGNAL CORPS.
TYPE VT-55**

Screen-Grid R-F Power Amplifier

865 is a screen-grid transmitting tube of the thoriated-tungsten filament type for use as an r-f power amplifier and frequency multiplier. The plate connection is brought out of the top of the bulb to maintain low grid-plate capacitance. ~~Neutralization~~ Neutralization to prevent feedback is generally unnecessary in adequately shielded circuits. The 865 can be operated at maximum ratings at frequencies as high as 15 megacycles. The maximum plate dissipation rating for class C telegraph service is 15 watts.

CHARACTERISTICS and RATINGS

FILAMENT VOLTAGE (A.C. or D.C.)	7.5	Volts
FILAMENT CURRENT	2.0	Amperes
AMPLIFICATION FACTOR (Approx.)	150	
TRANSCONDUCTANCE (For plate current of 18 ma.)	850	Micromhos
DIRECT INTERELECTRODE CAPACITANCES:		
Grid-Plate (with external shielding)	0.15 max.	μ f
Input	8.5	μ f
Output	8.0	μ f
BULB	ST-16	
CAP	Small Metal	
BASE	Medium 4-Pin Bayonet	

MAXIMUM CCS RATINGS and TYPICAL OPERATING CONDITIONS

CCS = Continuous Commercial Service

As R-F Power Amplifier - Class B Telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0

<i>CCS</i>			
D-C PLATE VOLTAGE	750 max.	Volts	
D-C SCREEN VOLTAGE	175 max.	Volts	
D-C PLATE CURRENT	30 max.	Milliamperes	
PLATE INPUT	22.5 max.	Watts	
SCREEN INPUT	3 max.	Watts	
PLATE DISSIPATION	15 max.	Watts	
TYPICAL OPERATION:			
D-C Plate Voltage	500	750	Volts
D-C Screen Voltage	125	125	Volts
D-C Grid Voltage #	-30	-30	Volts
D-C Plate Current	30	22	Milliamperes
D-C Grid Current (Approx.) *	5	3	Milliamperes
Driving Power (Approx.) #	2	1.5	Watts
Power Output (Approx.)	3	4.5	Watts

As Plate-Modulated R-F Power Amplifier - Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0

<i>CCS</i>			
D-C PLATE VOLTAGE	500 max.	Volts	
D-C SCREEN VOLTAGE	175 max.	Volts	
D-C GRID VOLTAGE	-250 max.	Volts	
D-C PLATE CURRENT	60 max.	Milliamperes	
D-C GRID CURRENT	15 max.	Milliamperes	
PLATE INPUT	30 max.	Watts	
SCREEN INPUT	2 max.	Watts	
PLATE DISSIPATION	40 max.	Watts	
TYPICAL OPERATION:			
D-C Plate Voltage	375	500	Volts
D-C Screen Voltage	125	125	Volts
D-C Grid Voltage	-120	-120	Volts
D-C Plate Current	50	40	Milliamperes
D-C Grid Current (Approx.) *	11	9	Milliamperes
Driving Power (Approx.) #	3	2.5	Watts
Power Output (Approx.)	8.5	10	Watts

#, *, °: See next page.

As R-F Amplifier and Oscillator - Class C Telegraphy

Key-down conditions per tube without modulation [#]

	CCS				
D-C PLATE VOLTAGE				750 max.	Volts
D-C SCREEN VOLTAGE				175 max.	Volts
D-C GRID VOLTAGE				-250 max.	Volts
D-C PLATE CURRENT				60 max.	Milliamperes
D-C GRID CURRENT				15 max.	Milliamperes
PLATE INPUT				45 max.	Watts
SCREEN INPUT				3 max.	Watts
PLATE DISSIPATION				15 max.	Watts
TYPICAL OPERATION:					
D-C Plate Voltage	375	500	625	750	Volts
D-C Screen Voltage	125	125	125	125	Volts
D-C Grid Voltage	-80	-80	-80	-80	Volts
D-C Plate Current	55	50	45	40	Milliamperes
D-C Grid Current (Approx.) *	11	9	6	5.5	Milliamperes
Driving Power (Approx.)	4.5	2.0	1.2	1.0	Watts
Power Output (Approx.)	8.5	10	14	16	Watts

* Subject to wide variations depending on the impedance of the load circuit. High-impedance load circuits require more grid current and driving power to obtain the desired output. Low-impedance circuits need less grid current and driving power, but plate-circuit efficiency is sacrificed. The driving stage should have a tank circuit of good regulation and should be capable of delivering considerably more than the required driving power.

o At crest of audio-frequency cycle with modulation factor of 1.0.

** Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

Grid voltages are given with respect to the mid-point of filament operated on a.c. If d.c. is used, each stated value of grid voltage should be decreased by one-half the filament voltage and the circuit returns made to the negative end of the filament.

INSTALLATION

The base of the 865 fits the standard 4-contact socket, which should be installed to hold the tube in a vertical position with the base down.

The bulb of the tube becomes hot during continuous operation so that free circulation of air around the tube should be provided.

The filament of the 865 is of the thoriated-tungsten type. The filament voltage should not be allowed to vary more than $\pm 5\%$ from the normal value; otherwise a loss of emission may result. It is recommended that, in intermittent service where the average number of daily transmissions is greater than 100, the filament be maintained at 80% of normal voltage during standby periods. If the number of transmissions is less than 100 per day, the filament power during standby may be either removed or maintained at 80% of normal voltage, whichever is preferred. However, in such applications as amateur service where the average number of daily transmissions is usually not greater than 100 and where the standby periods are usually no longer than the transmission periods, the filament voltage may be maintained at normal value during standby periods.

The plate of the 865 shows no color at the maximum plate-dissipation rating for each class of service.

The screen voltage may be obtained from a separate source, from a voltage divider across the plate supply, or through a voltage-dropping resistor in series with the plate supply, depending on the service in which the tube is used (see APPLICATION). When screen voltage is obtained from a separate source or from a voltage divider, plate voltage should be applied before or with the screen voltage. Otherwise, with voltage on the screen only, the screen current may rise high enough to cause excessive screen dissipation. When screen voltage regulation is not an important factor, the series resistance method for obtaining screen voltage is desirable because of its simplicity and because it limits the d-c power input to the screen. With this method, however, it is important that the high-voltage switch be opened before the r-f excitation is removed and before the filament circuit is opened; otherwise full plate voltage will be placed on the screen.

The screen current is a very sensitive indication of plate-circuit loading and it rises excessively (often to the point of damaging the tube) when the amplifier is operated without load. Therefore, care should be taken when tuning an 865 under no-load conditions in order to prevent exceeding the screen-input rating of the tube.

A protective device, such as a high-voltage fuse or a relay should be used to protect both the plate and screen against overloads. When a voltage divider of

poor regulation or a series resistor is used for obtaining the screen voltage, this device should be placed in the common positive high-voltage supply lead. It should remove the high-voltage supply when the d-c plate current reaches a value 50% greater than normal. When the screen voltage is obtained from a separate source or from a voltage divider of good regulation, a protective device should be placed in the screen-supply lead. It should remove the screen voltage when the screen current reaches a value 50% greater than normal.

Shielding of the r-f amplifier stage using the 865 is required for stable operation. The r-f impedance between the screen and filament must be kept low, usually by means of a suitable by-pass condenser. The capacitance of the condenser may be about 0.01 μ f.

When a new circuit is tried or when adjustments are made, it is advisable to reduce the plate voltage. This may be done conveniently by means of a protective resistance of about 5000 ohms in series with the high-voltage supply lead. The plate and screen voltages of this tube are high enough to be dangerous to the user. Care should be taken during the adjustment of circuits, especially when exposed circuit parts are at high d-c plate potential.

APPLICATION

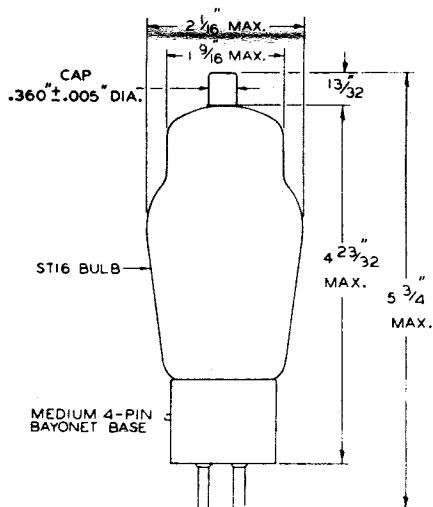
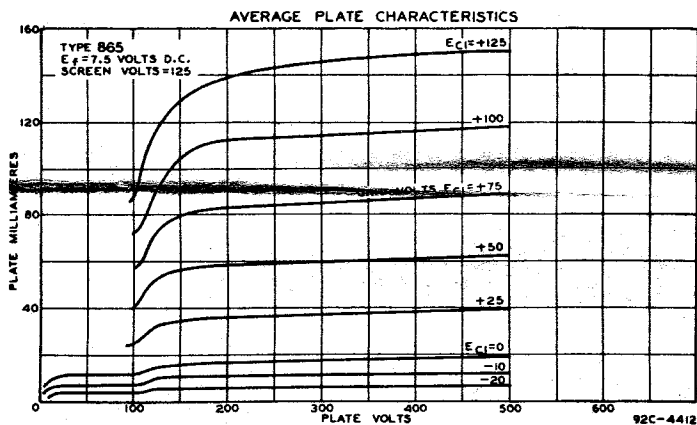
In class B r-f power amplifier service, the 865 is supplied with unmodulated d-c plate voltage. The grid is excited with r-f voltage modulated at audio frequency in a preceding stage. Screen voltage may be obtained from a separate source or from a voltage divider connected across the plate supply. Control-grid bias may be obtained from a battery, from a rectifier of good regulation, or from a cathode resistor, suitably by-passed for both audio and radio frequencies.

In plate-modulated class C r-f power amplifier service, the 865 can be modulated 100%. The screen voltage should be obtained preferably from a fixed source or from a voltage divider connected across the plate-voltage supply. If a series resistor is used to obtain the screen voltage, the resistor should be connected in series with the unmodulated plate-voltage supply. The screen voltage must be modulated simultaneously with the plate voltage so that the ratio of plate voltage to screen voltage remains constant. Modulation of a fixed screen-voltage supply can be accomplished either by connecting the screen to a separate winding on the modulation transformer or by connecting it through a blocking condenser to a tap on the modulation transformer or choke. With the latter method, an a-f choke of suitable impedance for low frequencies should be connected in series with the screen-supply lead. Control-grid bias should be obtained from a grid resistor, or from a combination of grid resistor and fixed supply, or grid resistor and cathode resistor. The cathode resistor should be by-passed for both audio and radio frequencies. The combination method of grid resistor and fixed supply has the advantage of not only protecting the tube from damage through loss of excitation but also of minimizing distortion by bias-supply compensation.

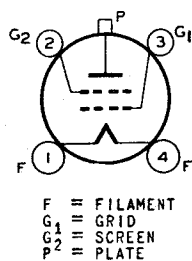
In class C r-f telegraph service, the 865 may be supplied with screen voltage from a fixed supply such as a voltage divider, or from a separate source. The regulation of the supply need be only good enough to prevent the screen voltage from rising higher than twice the maximum screen voltage rating under key-up conditions. The screen voltage should not be obtained from a series resistor. Control-grid bias may be obtained by any convenient method, excepting when a preceding stage is keyed; in this case, sufficient fixed bias should be used to maintain the plate current at a low value when the key is up.

The 865 can be operated at maximum ratings in all classes of service at frequencies as high as 15 megacycles. The tube may be operated at higher frequencies provided the maximum values of plate voltage and plate input are reduced as the frequency is raised (other maximum ratings are the same as shown under CHARACTERISTICS). The tabulation shows the highest percentage of maximum plate voltage and plate input that can be used up to 60 megacycles. Special attention must be given to shielding and r-f by-passing at these frequencies.

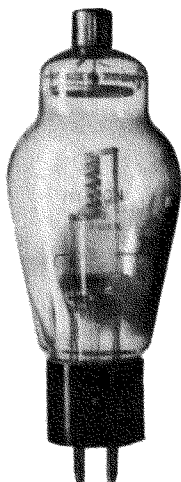
FREQUENCY	15	30	60	MC
MAX. PERMISSIBLE PERCENTAGE OF MAX. RATED PLATE VOLTAGE AND PLATE INPUT:				
Class B r-f	100	90	78	Per Cent
Class C plate-mod.	100	78	55	Per Cent
Class C telegraph	100	78	55	Per Cent



**Bottom View of
 Socket Connections**



Type 866



GENERAL CHARACTERISTICS

Filament Voltage (A.C.)	2.5	volts
Filament Current	5.0	amp.
Max. RMS A.C. Volts	2650	volts
Peak Inverse Voltage*	7500 max.	volts
Peak Plate Current	.500 max.	amp.
Average Plate Current	.250 max.	amp.
Tube Voltage Drop*	15	volts
Bulb	ST-19	
Cap	Medium metal	
Base	Med. 4-pin Bayonet	

HALF-WAVE MERCURY VAPOR RECTIFIER

Hytron 866 is a half-wave, mercury-vapor rectifier tube of the hot-cathode type. It is intended for use in high-voltage rectifying devices designed to supply d-c power of uniform voltage. In single-phase circuits, full-wave rectification is accomplished by using two 866's.

INSTALLATION

The base pins of the 866 fit the standard four-contact socket which should be installed to hold the tube in a vertical position with the base down. Only a socket making very good filament contact and capable of carrying 5 amperes continuously should be used with the 866.

The condensed-mercury temperature of the 866 should be maintained between 10°C (50°F.) and 60°C (140°F.). This temperature may be measured with a small thermometer contacting the bulb with a minimum amount of putty at a point near the base end of the bulb. Low condensed-mercury temperature produces conditions which make starting with rated peak plate current difficult. High condensed-mercury temperature decreases the arc drop and is favorable for long filament life, but reduces the maximum value of peak inverse voltage which the tube will stand.

* Approximate for supply frequency up to 150 cycles and for condensed-mercury temperature range of 10° to 60°C.

Product of HYTRONIC LABORATORIES Salem, Mass.

The coated filament is intended for a-c operation from a secondary winding of a power transformer. This filament source, provided with a center-tap in the transformer secondary or suitable center-tap resistor, should supply at the socket terminals the rated voltage of 2.5 volts under all operating conditions. The filament voltage, measured at the tube terminals, should not vary more than plus or minus 5% from the rated value. This tolerance should include the effects of regulation caused by transmitter-modulation load as well as the normal power-supply regulation. Less than the recommended filament voltage may cause a high voltage drop with consequent bombardment of the filament and eventual loss of emission. Higher than the rated voltage will greatly shorten the life of the filament.

The filament of the 866 should be allowed to come up to operating temperature before the plate voltage is applied. The temperature of the air surrounding the tube will vary the delay period required for preheating the filament. For average conditions, the delay should be approximately 30 seconds. If there is evidence of arc-back in the tube, the time delay should be increased. In radio transmitters during "standby" period, the filament should be kept at its rated voltage to avoid delay in "coming back". A protective relay having an obtainable delay period of one minute is desirable in the plate circuit to prevent automatically the application of plate voltage until the filament has reached operating temperature.

When a Hytron 866 is first placed in service, its filament should be operated at normal voltage for approximately 15 minutes without plate voltage in order to distribute the mercury properly. This procedure need not be repeated unless, during subsequent handling, the mercury is spattered on the filament and plate.

Shields and R.F. filters should be provided for the 866 if it is subjected to extraneous high-voltage and high-frequency fields when in operation. These fields tend to produce breakdown effects in mercury vapor and are detrimental to tube life and performance. External shielding is employed when the tube is in proximity to high-voltage field. R.F. filters are employed to prevent damage caused by radio-frequency currents which might otherwise be fed back into the rectifier tubes.

OPERATION

As a single-phase or multi-phase rectifier, Hytron 866 should be operated under conditions such that the maximum rated values under characteristics are not exceeded. Maximum Peak Inverse Voltage and Maximum Plate Current are the fundamental limitations in the operation of this tube.

Two or more 866's may be connected in parallel to give a corresponding increase in output current over a single tube. In this service a stabilizing resistor of approximately 50 ohms should be connected in series with each plate in order that a proportionate share of the total load current will be carried by each tube. In special cases where it is desirable to minimize the small power loss caused by the voltage drop through the stabilizing resistor, an inductance of approximately one-third henry may be connected in series with the plate lead of each tube in place of the stabilizing resistor. The inductance has the added advantage of limiting the peak current to each tube, is especially desirable when a condenser-input type of filter is used.

Filter circuits of either the condenser-input or the choke-input type may be employed. If the condenser-input type of filter is used, special consideration must be given to the instantaneous peak value of the a-c input voltage which is about 1.4 times the RMS value as measured with an a-c voltmeter. It is important, therefore, that the filter condensers (especially the

input condenser) have a sufficiently high breakdown rating to withstand this instantaneous peak value. With the condenser-input type of filter, the peak plate current of the tube is considerably higher than the load current. When choke input to the filter is used, the peak plate current is substantially reduced. This type of circuit is preferable from the standpoint of obtaining the maximum continuous d.c. output current from the 866 under the most favorable conditions.

Table 1 gives definite values of choke inductance (L) and condenser capacity (C) for choke-input-to-filter circuits which will keep the peak plate current below the recommended maximum, provided the average d.c. load current for any installation does not exceed the maximum load current figures given in the table. Values of (L) and (C) are based on a 60-cycle a.c. voltage supply. It is important that a good quality input choke be used so that its inductance will not drop below the required minimum value under full load-current conditions. The capacitance (C) given in the table is small enough to prevent excessive surges when power is first applied to the circuit and yet is large enough to give adequate filtering. If the inductance (L) is increased, it is permissible to increase the capacitance in the same proportion. In a two-section filter with two inductances of unequal value, the larger inductance should be placed next to the rectifier tubes. With such an arrangement, the maximum value of each capacitance should be determined on the basis of the value of the inductance preceding it. The first three circuits (figs. 1, 2 and 3) of Table 1 will have a ripple voltage of less than 5% when used with a two-section filter having a minimum of inductance and the corresponding maximum of capacitance. For most purposes, this is adequate filtering. Similarly, the next two circuits (figs. 4 and 5) will give a ripple voltage of less than 1%. The last set of conditions in the table applied to a single-phase, full-wave system using two tubes with condenser input to the filter. It will be noted that the maximum d.c. output voltage available at the filter is 25% higher than for the choke-input system (fig. 1), but the permissible d.c. load current is 50% less. Similarly, these same percentages will hold for the single-phase, full-wave system using four tubes. (fig. 2). For any of these circuits, better filtering may be obtained with inductance larger than the minimum given in the table. With the use of larger inductances, the corresponding capacitances may be increased by the same per cent as the inductances to give still better smoothing. The use of additional sections in the filter, of course, is another way of obtaining greater smoothing.

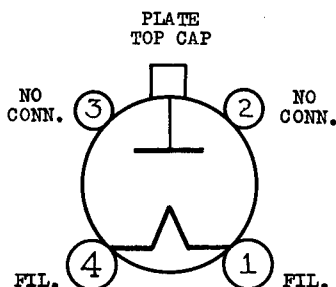
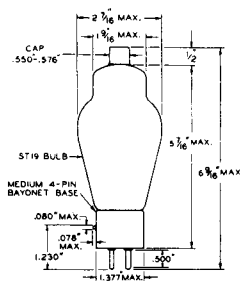


TABLE I

CIRCUIT	A-C INPUT VOLTS (RMS)	MAX. D-C OUTPUT VOLTS TO FILTER	CHOKE INPUT ONE-SECTION FILTER		MAX. D-C LOAD CURRENT AMPERES
			MIN. CHOKE (L) HENRYS	MAX. CON- DENSER (C) uf	
SINGLE-PHASE FULL-WAVE (2-tubes)	2650 max. per tube	2385	6.0	1.6	0.5
	2000 per tube	1800	4.9	1.8	0.5
	1500 per tube	1350	3.3	2.8	0.5
	1000 per tube	900	2.1	4.2	0.5
SINGLE-PHASE FULL-WAVE (4-tubes) Bridge Rect.	5300 max. total	4770	12.0	0.8	0.5
	4500 total	4050	10.0	1.0	0.5
	4000 total	3600	8.4	1.2	0.5
	3000 total	2700	6.8	1.5	0.5
THREE-PHASE HALF-WAVE (3-tubes)	3065 max. per leg	3585	2.2	1.8	0.75
	2500 per leg	2925	1.7	2.4	0.75
	2000 per leg	2340	1.0	3.0	0.75
	1500 per leg	1755	0.8	4.0	0.75
THREE-PHASE PARALLEL DOUBLE-Y (6-tubes)	3065 max. per leg	3585	1.5	0.7	1.5
	2500 per leg	2925	1.0	0.9	1.5
	2000 per leg	2340	1.0	1.1	1.5
	1500 per leg	1750	0.7	1.5	1.5
THREE-PHASE FULL-WAVE (6-tubes) Bridge Rect.	3065 max. per leg	7175	1.5	0.84	0.75
	2500 per leg	5850	1.2	0.9	0.75
	2000 per leg	4680	1.0	1.0	0.75
	1500 per leg	3510	0.8	1.3	0.75
SINGLE-PHASE FULL-WAVE (2-tubes) Cond. Input	2650 max. per tube	3000	-	-	0.25
	2000 per tube	2260	-	-	0.25
	1500 per tube	1700	-	-	0.25
	1000 per tube	1150	-	-	0.25

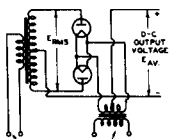


FIG. 1

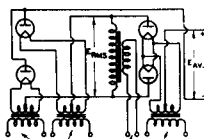


FIG. 2

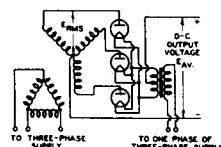


FIG. 3

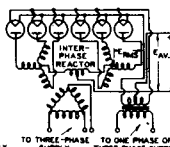


FIG. 4

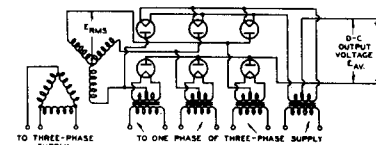


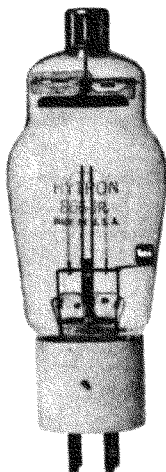
FIG. 5

FIGURE	CIRCUIT	E AVERAGE	E INVERSE	I AVERAGE
1	SINGLE-PHASE FULL-WAVE (2 TUBES)	0.318 E MAXIMUM 0.450 E RMS	3.14 E AVERAGE	0.836 I MAXIMUM
2	SINGLE-PHASE FULL-WAVE (4 TUBES)	0.838 E MAXIMUM 0.900 E RMS	1.57 E AVERAGE	0.836 I MAXIMUM
3	THREE-PHASE HALF-WAVE	0.827 E MAXIMUM 1.170 E RMS	2.09 E AVERAGE	0.827 I MAXIMUM
4	THREE-PHASE DOUBLE-Y PARALLEL	0.827 E MAXIMUM 1.170 E RMS	2.09 E AVERAGE	1.91 I MAXIMUM
5	THREE-PHASE FULL-WAVE	1.85 E MAXIMUM 2.345 E RMS	1.045 E AVERAGE	0.955 I MAXIMUM

CONDITIONS ASSUMED -

(1) SINE WAVE SUPPLY (2) BALANCED PHASE VOLTAGES (3) ZERO TUBE DROP
(4) PURE RESISTANCE LOAD (5) NO FILTER USED

Type 866 Jr.



GENERAL CHARACTERISTICS

Filament Voltage (A.C.)	2.5	volts
Filament Current	3.0	amp.
Max. RMS A.C. Volts	1250	volts
Peak Inverse Voltage*	1750 max.	volts
Peak Plate Current	.250 max.	amp.
Average Plate Current	.125 max.	amp.
Tube Voltage Drop*	15	volts
Bulb	ST-16	
Cap	Medium metal	
Base	Med. 4-pin Bayonet	

HALF-WAVE MERCURY VAPOR RECTIFIER

Hytron 866 Jr. is a half-wave, mercury-vapor rectifier tube of the hot-cathode type. It is intended for use in high-voltage rectifying devices designed to supply d-c power of uniform voltage. In single-phase circuits, full-wave rectification is accomplished by using two 866 Jr.'s.

INSTALLATION

The base pins of the 866 Jr. fit the standard four-contact socket which should be installed to hold the tube in a vertical position with the base down. Only a socket making very good filament contact and capable of carrying 3 amperes continuously should be used with the 866 Jr.

The condensed-mercury temperature of the 866 Jr. should be maintained between 100°C (50°F.) and 60°C (140°F.). This temperature may be measured with a small thermometer contacting the bulb with a minimum amount of putty at a point near the base end of the bulb. Low condensed-mercury temperature produces conditions which make starting with rated peak plate current difficult. High condensed-mercury temperature decreases the arc drop and is favorable for long filament life, but reduces the maximum value of peak inverse voltage which the tube will stand.

* Approximate for supply frequency up to 150 cycles and for condensed-mercury temperature range of 10° to 60°C.

Product of HYTRONIC LABORATORIES Salem, Mass.

2 The coated filament is intended for a-c operation from a secondary winding of a power transformer. This filament source, provided with a center-tap in the transformer secondary or suitable center-tap resistor, should supply at the socket terminals the rated voltage of 2.5 volts under all operating conditions. The filament voltage, measured at the tube terminals, should not vary more than plus or minus 5% from the rated value. This tolerance should include the effects of regulation caused by transmitter-modulation load as well as the normal power-supply regulation. Less than the recommended filament voltage may cause a high voltage drop with consequent bombardment of the filament and eventual loss of emission. Higher than the rated voltage will greatly shorten the life of the filament.

When operating type 866 Jr. from transformers designed for higher filament current rectifiers, the filament voltage should be adjusted to 2.5 volts. The current drain affected by two 866 Jr. rectifiers totals 6 amperes and is 4 amperes lower than larger mercury type rectifiers. Due to the lower current drain, the filament transformer will supply higher potential than is rated.

The filament of the 866 Jr. should be allowed to come up to operating temperature before the plate voltage is applied. The temperature of the air surrounding the tube will vary the delay period required for preheating the filament. For average conditions, the delay should be approximately 30 seconds. If there is evidence of arc-back in the tube, the time delay should be increased. In radio transmitters during "standby" period, the filament should be kept at its rated voltage to avoid delay in "coming back". A protective relay having an obtainable delay period of one minute is desirable in the plate circuit to prevent automatically the application of plate voltage until the filament has reached operating temperature.

When a Hytron 866 Jr. is first placed in service, its filament should be operated at normal voltage for approximately 15 minutes without plate voltage in order to distribute the mercury properly. This procedure need not be repeated unless, during subsequent handling, the mercury is spattered on the filament and plate.

Shields and R.F. filters should be provided for the 866 Jr. if it is subjected to extraneous high-voltage and high-frequency fields when in operation. These fields tend to produce breakdown effects in mercury vapor and are detrimental to tube life and performance. External shielding is employed when the tube is in proximity to high-voltage field. R.F. filters are employed to prevent damage caused by radio-frequency currents which might otherwise be fed back into the rectifier tubes.

OPERATION

As a single-phase or multi-phase rectifier, Hytron 866 Jr. should be operated under conditions such that the maximum rated values under characteristics are not exceeded. Maximum Peak Inverse Voltage and Maximum Plate Current are the fundamental limitations in the operation of this tube.

Two or more 866 Jr.'s may be connected in parallel to give a corresponding increase in output current over a single tube. In this service a stabilizing resistor of approximately 50 ohms should be connected in series with each plate in order that a proportionate share of the total load current will be carried by each tube. In special cases where it is desirable to minimize the small power loss caused by the voltage drop through the stabilizing resistor, an inductance of approximately one-third henry may be connected in series with the plate lead of each tube in place of the stabilizing resistor. The inductance has the added advantage of limiting the peak current to each tube, is especially desirable when a condenser-input type of filter is used.

Filter circuits of either the condenser-input or the choke-input type may be employed. If the condenser-input type of filter is used, special consideration must be given to the instantaneous peak value of the a-c input voltage which is about 1.4 times the RMS value as measured with an a-c voltmeter. It is important, therefore, that the filter condensers (especially the input condenser) have a sufficiently high breakdown rating to withstand this instantaneous peak value. With the condenser-input type of filter, the peak plate current of the tube is considerably higher than the load current. When choke input to the filter is used, the peak plate current is substantially reduced. This type of circuit is preferable from the standpoint of obtaining the maximum continuous d.c. output current from the 866 Jr. under the most favorable conditions. Table 1 gives definite values of choke inductance (L) and condenser capacity (C) for choke-input-to-filter circuits which will keep the peak plate current below the recommended maximum, provided the average d.c. load current for any installation does not exceed the maximum load current figures given in the table. Values of (L) and (C) are based on a 60-cycle a.c. voltage supply. It is important that a good quality input choke be used so that its inductance will not drop below the required minimum value under full load-current conditions. The capacitance (C) given in the table is small enough to prevent excessive surges when power is first applied to the circuit and yet is large enough to give adequate filtering. If the inductance (L) is increased, it is permissible to increase the capacitance in the same proportion. In a two-section filter with two inductances of unequal value, the larger inductance should be placed next to the rectifier tubes. With such an arrangement, the maximum value of each capacitance should be determined on the basis of the value of the inductance preceding it. The first three circuits (figs. 1, 2 and 3) of Table 1 will have a ripple voltage of less than 5% when used with a two-section filter having a minimum of inductance and the corresponding maximum of capacitance. For most purposes, this is adequate filtering. Similarly, the next two circuits (figs. 4 and 5) will give a ripple voltage of less than 1%. The last set of conditions in the table applied to a single-phase, full-wave system using two tubes with condenser input to the filter. It will be noted that the maximum d.c. output voltage available at the filter is 25% higher than for the choke-input system (fig. 1), but the permissible d.c. load current is 50% less. Similarly, these same percentages will hold for the single-phase, full-wave system using four tubes. (fig.2). For any of these circuits, better filtering may be obtained with inductance larger than the minimum given in the table. With the use of larger inductances, the corresponding capacitances may be increased by the same percent as the inductances to give still better smoothing. The use of additional sections in the filter, of course, is another way of obtaining greater smoothing.

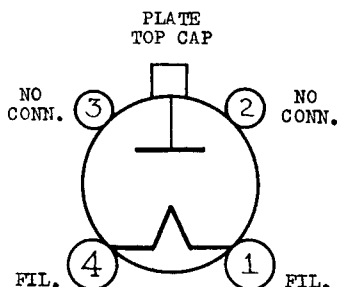
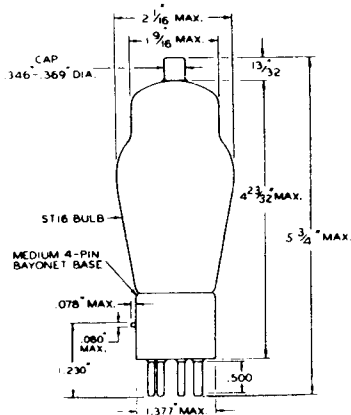


TABLE I

CIRCUIT	A-C INPUT VOLTS (RMS)	MAX. D-C OUTPUT VOLTS TO FILTER	CHOKES INPUT ONE-SECTION FILTER		MAX. D-C LOAD CURRENT AMPERES
			MIN. CHOKE (L) HENRYS	MAX. CON- DENSER (C) μF	
SINGLE-PHASE FULL-WAVE (2-tubes)	1250 max. per tube	1125	6.0	1.6	0.25
	1000 per tube	900	4.9	1.8	0.25
	750 per tube	675	3.3	2.8	0.25
	500 per tube	450	2.1	4.2	0.25
SINGLE-PHASE FULL-WAVE (4-tubes) Bridge Rect.	2500 max. total	2250	12.0	0.8	0.5
	2000 total	1800	10.0	1.0	0.5
	1500 total	1350	8.4	1.2	0.5
	1000 total	900	6.8	1.5	0.5
THREE-PHASE HALF-WAVE (3-tubes)	1450 max. per leg	1685	2.2	1.8	0.375
	1250 per leg	1450	1.7	2.4	0.375
	1000 per leg	1175	1.0	3.0	0.375
	750 per leg	875	0.8	4.0	0.375
THREE-PHASE PARALLEL DOUBLE-Y (6-tubes)	1450 max. per leg	1685	1.5	0.7	0.75
	1250 per leg	1450	1.0	0.9	0.75
	1000 per leg	1175	1.0	1.1	0.75
	750 per leg	875	0.7	1.5	0.75
THREE-PHASE FULL-WAVE (6-tubes) Bridge Rect.	1450 max. per leg	3385	1.5	0.84	0.375
	1250 per leg	2925	1.2	0.9	0.375
	1000 per leg	2350	1.0	1.0	0.375
	750 per leg	1750	0.8	1.3	0.375
SINGLE-PHASE FULL-WAVE (2-tubes) Cond. Input	1250 max. per tube	1400	-	-	0.2
	1000 per tube	1125	-	-	0.2
	750 per tube	850	-	-	0.2
	500 per tube	575	-	-	0.2

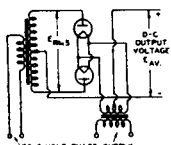


FIG. 1

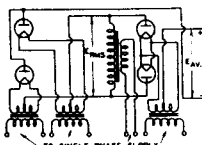


FIG. 2

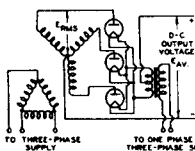


FIG. 3

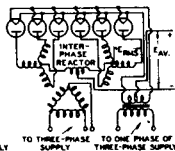


FIG. 4

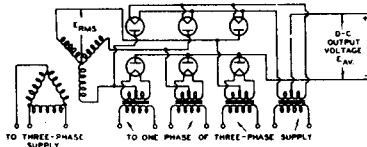


FIG. 5

FIGURE	CIRCUIT	E AVERAGE	E INVERSE	I AVERAGE
1	SINGLE-PHASE FULL-WAVE (2 TUBES)	0.318 E MAXIMUM 0.450 E RMS	3.14 E AVERAGE	0.636 I MAXIMUM
2	SINGLE-PHASE FULL-WAVE (4 TUBES)	0.636 E MAXIMUM 0.900 E RMS	1.57 E AVERAGE	0.636 I MAXIMUM
3	THREE-PHASE HALF-WAVE	0.837 E MAXIMUM 1.170 E RMS	2.09 E AVERAGE	0.827 I MAXIMUM
4	THREE-PHASE PARALLEL DOUBLE-Y	0.827 E MAXIMUM 1.170 E RMS	2.09 E AVERAGE	1.91 I MAXIMUM
5	THREE-PHASE FULL-WAVE	1.65 E MAXIMUM 2.34 E RMS	1.045 E AVERAGE	0.955 I MAXIMUM

CONDITIONS ASSUMED -
 (1) ONE WAVE SUPPLY (2) BALANCED PHASE VOLTAGES (3) ZERO TUBE DROP
 (4) PURE RESISTANCE LOAD (5) NO FILTER USED

5514
CLASS C R-F AMPLIFIER
CLASS B AUDIO AMPLIFIER
5514
65-WATT
HIGH-MU
TRIODE

The 5514 is a 65-watt, high-mu, all-purpose transmitting triode designed for highly efficient operation over a wide range of plate voltages in either audio or r-f applications. It has a low internal tube drop for maximum efficiency, dual base connections to the grid, zirconium-coated graphite plate, and lava-insulated plate cap. High amplification factor of the 5514 permits operation at plate voltages up to 1250 volts without exceeding maximum plate dissipation when no fixed bias is used and excitation is removed. At 1500 volts, a fixed bias of 4.5 volts is adequate for tube protection. The 5514 is interchangeable with many other triodes in its voltage range; substitution of the 5514 often permits higher input. Discontinued Hytron types HY30Z, HY40, HY40Z, HY51A, HY51B, and HY51Z are supplanted by the 5514.

OPERATION HINTS

So versatile is the 5514 that all its possible applications cannot be covered even in such comprehensive listings as are included in this data sheet. High amplification factor of the 5514 makes the bias problem simple. Maximum plate dissipation is high enough to permit zero-bias operation at up to 1250 plate volts, without fear of tube damage. For example, with grid excitation removed, zero bias, and 1250 plate volts, the static plate current ranges from 34 to 50 ma (dependent on normal variations in manufacture of the tubes), thus developing between 42.5 and 62.5 watts of plate dissipation.

Because of this feature, it is practical to construct a transmitter with no protective bias supply (operating bias obtained from a grid resistor in accordance with the data shown) and with 435 watts input for two tubes. Keying in low power stages for break-in operation is perfectly feasible under these conditions. To take advantage of this no-bias-supply feature, however, it is absolutely necessary that perfect neutralization and complete absence of parasitic oscillation be attained. If a cutoff bias (approximately plate potential divided by amplification factor) is used, the neutralization problem is much less critical.

The 5514 may also be used as a radio-frequency amplifier without any bias whatsoever. This class of operation is similar to the commonly used class B audio. It has the advantage of requiring extremely low driving power. The type of operation can be called class B r-f, but should not be confused with class B linear. Efficiency under class B r-f conditions is of the order of 60 to 70 per cent; as an example, the 5514 with 1000 plate volts delivers approximately 120 watts of class B r-f power output with about 3.5 watts drive. In class C, it would yield 132 watts with 8.7 watts drive. In either class of operation, it has been found that linearity of modulation is obtained without difficulty.

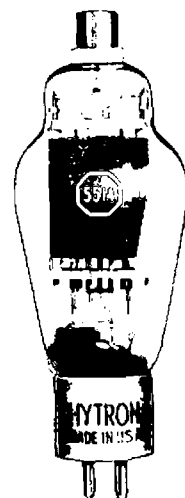
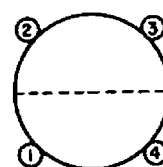
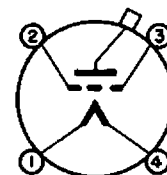
High output is delivered by the 5514 at low plate voltages, thus resulting in a low impedance output circuit. For this reason it is a simple matter to use the tube as a driver to match effectively the grid impedance of another 5514 in the following amplifier. Grid drive for triode power tubes is usually composed of a high current at a rather low voltage. This is particularly true of the 5514 with which the tendency to supply too much grid voltage must be avoided. A high current combined with a low voltage means a low impedance. Medium- and low-mu tubes generally require a high impedance plate load, therefore making it difficult to match their high-impedance outputs to a following low-impedance grid input. Using the 5514 in both driver and amplifier stages, however, simplifies the impedance matching problem. Since the 5514 can be operated with a low-impedance output, direct capacitive coupling to the following tube is effective and involves no special matching adjustments.

Close electrode spacings of the 5514 permit efficient operation at high frequencies, but the usual care must be exercised in transmitter design to avoid parasitic oscillations. High-frequency parasitics can be eliminated by tuned chokes in the plate leads. These chokes should be designed to have a high impedance at the parasitic frequency and a low impedance at the operating frequency.

It is advisable to have both grid leads of the 5514 tied together at the socket in all types of operation. This is particularly true at high frequencies, since the lead inductance in the grid circuit is thereby reduced.

GENERAL CHARACTERISTICS

Filament	thoriated tungsten
Potential	7.5 ± 5% volts
Current	3 amperes
Transconductance $E_b = 1000V$	
$E_c = 0, E_r = 7.5V$ a-c	5100 μ mhos
Amplification factor	145
Direct interelectrode capacitances	
Grid-to-plate	7.9 μ fd
Input	7.8 μ fd
Output	1.0 μ fd
Maximum over-all length	6-9/16 inches
Maximum diameter	2-7/16 inches
Bulb	ST - 19
Base	4-pin medium, low-loss phenolic
Cap	medium with ceramic insulation
Mounting position	filament plane must be vertical


Filament Plane

Terminal Layout

bottom view of socket
Terminal Connections

1—Filament	3—Grid
2—Grid	4—Filament
Cap—Plate	

RATINGS vs. FREQUENCY

Maximum ratings for full input apply to 60 megacycles. The 5514 may be operated at higher frequencies provided the maximum values of plate voltage and power input are reduced according to the tabulation below (other maximum ratings are the same as shown). Special attention should be given to adequate ventilation of the bulb at these higher frequencies.

Frequency	60	80	100	mc
Percentage of maximum ratings:				
Plate potential	100	75	60	per cent
Plate input	100	75	60	per cent

A-F POWER AMPLIFIER AND MODULATOR — CLASS B
Maximum Ratings, Absolute Values

D-c plate potential	1500 max volts	Max signal plate input power ψ	262.5 max watts
Peak positive a-f grid potential	125 max volts	Plate dissipation ψ	65 max watts
Max signal d-c plate current ψ	175 max ma		

Typical Operation — Average Characteristics

Unless otherwise specified, the values are for two tubes

D-c plate potential	400	500	600	600	750	750	850	850	1000	1000	1000	1250	1250	1250	1500	1500	1500	volts
D-c grid potential $\pm$ (a)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-4.5	-4.5	-4.5	volts
Peak a-f grid to grid potential	98	96	96	136	93	135	90	126	89	123	135	84	118	134	96	130	146	volts
Zero signal d-c plate current	24	30	36	36	46	46	54	54	64	64	64	84	84	84	50	50	50	ma
Max signal d-c plate current	200	200	200	300	200	300	200	300	200	300	350	200	300	350	200	300	350	ma
Max signal d-c grid current	60	60	60	110	60	90	54	90	54	80	88	50	72	84	46	76	88	ma
Load resistance (plate to plate)	4000	5500	6500	4800	8400	6000	8500	7000	11600	8000	6500	15000	10000	8400	17000	12600	10500	ohms
Max sig grid driving power	3	3	3	7.5	3	6	2.5	5.5	2.5	5	6	2	4.5	5.5	2	5	6.5	watts
Max sig plate power output	50	65	85	135	105	175	115	200	145	230	260	170	270	320	215	350	400	watts
Total harmonic distortion	3	2.5	2	6.5	2	4.5	2	4.5	2.5	2.5	2	4	3	2.5	2.5	2	2.5	per cent

HYTRON 5514

R-F POWER AMPLIFIER AND OSCILLATOR CLASS C TELEGRAPHY AND FREQUENCY MODULATION

Key down conditions per tube, without amplitude modulation

Maximum Ratings, Absolute Values

D-c plate potential	1500 max volts	Peak positive r-f control grid potential	125 max volts
D-c control grid bias	-200 max volts	D-c plate input power	262.5 max watts
D-c plate current	175 max ma	Plate dissipation	65 max watts
D-c control grid current	60 max ma		

Typical Operation — Average Characteristics

D-c plate potential	400	400	500	500	600	600	750	750	850	850	1000	1000	1250	1250	1500	1500	volts
(a)	-15	-24	-15	-36	-22.5	-36	-22.5	-36	-30	-60	-37	-60	-45	-84	-52	-106	volts
D-c grid potential ‡	400	400	600	600	600	600	600	600	800	1000	1000	1000	1200	1400	1400	1800	ohms
(b)	110	110	110	170	165	170	165	100	220	250	270	250	330	360	380	450	ohms
(c)	67	100	69	114	74.5	112	74.5	117	82	146	89	145	99	172	117	197	volts
Peak r-f grid potential	100	150	100	150	100	150	100	175	100	175	100	175	100	175	100	175	ma
D-c plate current	37	60	37	60	37	60	37	60	37	60	37	60	37	60	37	60	ma
D-c grid current	2.5	6	2.5	6.8	2.8	6.7	2.8	7	3	8.8	3.3	8.7	3.7	9.9	4.4	12	watts
Grid driving power (approx.)	30	43	37	54	43	65	55	92	64	110	75	132	93	165	112	200	watts
Plate power output (approx.) Δ																	

R-F POWER AMPLIFIER — CLASS C TELEPHONY

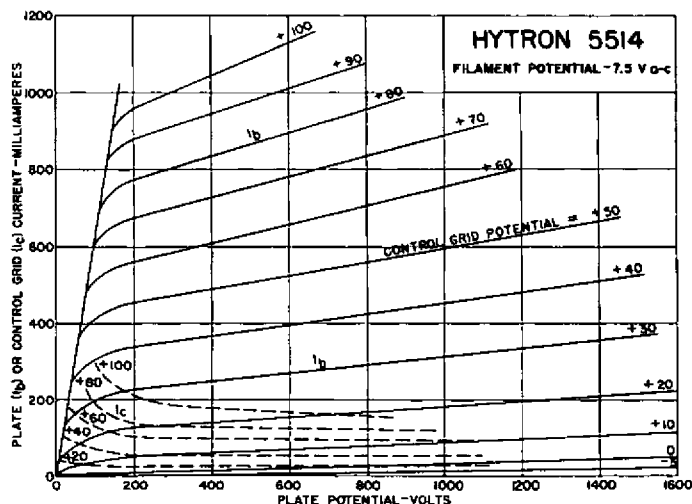
Carrier conditions for use with a maximum modulation percentage of 100

Maximum Ratings, Absolute Values

D-c plate potential	1250 max volts	Peak positive r-f grid potential	125 max volts
D-c control grid bias	-200 max volts	D-c plate input power +	175 max watts
D-c plate current	175 max ma	Plate dissipation +	43 max watts
D-c grid current	60 max ma		

Typical Operation — Average Characteristics

D-c plate potential	400	400	500	500	600	600	750	750	850	850	1000	1000	1250	1250	volts
(a)	-15	-24	-15	-36	-22.5	-36	-22.5	-36	-30	-60	-37	-60	-45	-84	volts
D-c grid potential ‡	400	400	600	600	600	600	600	600	800	1000	1000	1000	1200	1400	ohms
(b)	110	110	110	170	165	170	165	100	220	250	270	250	330	415	ohms
(c)	67	100	69	114	74.5	112	74.5	117	82	146	89	145	99	168	volts
Peak r-f grid potential	100	150	100	150	100	150	100	175	100	175	100	175	100	142	ma
D-c plate current	37	60	37	60	37	60	37	60	37	60	37	60	37	60	ma
D-c grid current	2.5	6	2.5	6.8	2.8	6.7	2.8	7	3	8.8	3.3	8.7	3.7	10	watts
Grid driving power (approx.)	30	43	37	54	43	65	55	92	64	110	75	132	93	135	watts
Plate power output (approx.) Δ															



‡ Obtained from (a) fixed supply (b) control grid resistor (c) cathode resistor, or by combination of methods.

ψ Averaged over any a-f cycle of sine wave form.

+ When modulated 100% with a sine wave, the average power increases by 50%. With a complex wave form, such as is produced by speech or music, the average power increases approximately 15% to 25%.

Δ "Plate power output" includes circuit losses and r-f radiation losses as well as useful power delivered to the load.

PREPARED BY COMMERCIAL ENGINEERING DEPT.

HYTRON RADIO & ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

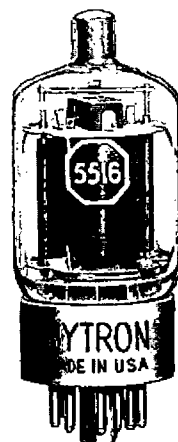
5516
**CLASS C R-F BEAM PENTODE
FREQUENCY MULTIPLIER
A-F AMPLIFIER & MODULATOR**
5516
**15-WATT
BEAM PENTODE
INSTANT-HEATING
FILAMENT**

The 5516 is an instant-heating filamentary-type 15-watt transmitting beam pentode. Designed for vhf mobile equipment, it is ideal as a class C frequency multiplier or as a class C amplifier requiring no neutralization in properly designed circuits operating up to 165 mc. Extremely low internal tube drop makes the 5516 highly efficient at the low plate potentials so desirable for portable and mobile applications. A tremendous saving in battery power (over that with cathode-type tubes) is made possible in such applications by the 5516's instant-heating filament. When used in conjunction with other instant-heating types (such as the 2E25 and 2E30), all electrode potentials may be applied simultaneously, thus permitting the instant-heating filament to be turned off during transmitting standby periods. Filament of the 5516 is rated at 6.0 volts—the potential preferred by RMA for mobile service. While the 5516 is primarily adapted to mobile equipment, all ratings are for continuous commercial service (CCS) and are equally suitable for fixed station use.

The 5516 has several constructional advantages. Zirconium-coated plate, gold-plated control grid, and carbonized screen grid enable maximum possible vhf ratings, despite compact size. A special, rugged filament suspension avoids short circuits and burn-outs in rigorous mobile applications. Three separate base-pin connections to the filament center tap provide for the lowest possible cathode lead inductance. The dishpan stem and compact structure give short, heavy leads with low inductance and capacitance.

General Characteristics

Filament*	center-tapped oxide-coated	
Potential a-c or d-c	6.0 ± 10%	volts
Current	0.7	amperes
Heating time (approx.)*	2	seconds
Transconductance (for $E_b = 450V$, $E_{c2} = 250V$, $E_{c1} = -19V$, $E_f = 6.0V$ a-c)	4000	μ mhos
Average amplification factor (G_1 to G_2)	9	
Direct interelectrode capacitances (no external shield)		
Grid to plate (max)	0.12	μ fd
Input	8.5	μ fd
Output	6.5	μ fd
Bulb	T-11	
Maximum overall length	3-21/32	inches
Maximum seated height	3-3/32	inches
Maximum diameter	1-7/16	inches
Base	short octal low-loss phenolic	
Cap	small metal	
Mounting position	filament plane must be vertical	


A-F Power Amplifier and Modulator — Class A₁
Maximum Ratings, Absolute Values

D-c plate potential	600 max	volts
D-c screen grid potential	250 max	volts
Control grid resistor	50000 max	ohms
D-c plate input power	15 max	watts
D-c screen grid input power	5 max	watts
Plate dissipation	15 max	watts

Typical Operation — Average Characteristics
Push-Pull Amplifier

Unless otherwise specified, the values are for two tubes:

A-c filament potential ϕ	6.0	6.0	6.0	6.0	volts
D-c plate potential	250	300	400	500	volts
D-c screen grid potential	250	250	250	250	volts
	(a) -15	-17.5	-18.5	-21	volts
D-c control grid bias ϕ %	(b) ...	...	...	...	ohms
	(c) 135	170	240	330	ohms
Peak a-f control grid to control grid potential	30	35	37	42	volts
Zero signal d-c plate current	104	96	75	60	ma
Max signal d-c plate current	116	114	100	92	ma
Zero signal d-c screen grid current	10	8	4	3	ma
Max signal d-c screen grid current	20	17	14	10	ma
Effective load resistance (plate to plate)	5000	5000	8000	11000	ohms
Max signal plate power output	9.5	11	15	21	watts
Total harmonic distortion	4.5	4	4	3.5	percent

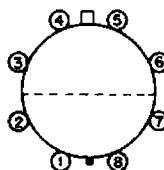
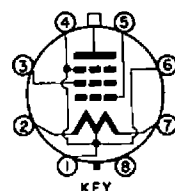
A-F Power Amplifier and Modulator — Class AB₁
Maximum Ratings, Absolute Values

D-c plate potential	600 max	volts
D-c screen grid potential	250 max	volts
Control grid resistor	50000 max	ohms
D-c screen grid input power	5 max	watts
Plate dissipation	15 max	watts

Typical Operation — Average Characteristics

Unless otherwise specified, the values are for two tubes:

A-c filament potential ϕ	6.0	6.0	6.0	6.0	volts
D-c plate potential	300	400	500	600	volts
D-c screen grid potential	250	250	250	250	volts
D-c control grid bias ϕ %	(a) -25	-25	-25	-25	volts
Peak a-f control grid to control grid potential	50	50	50	50	volts
Zero signal d-c plate current	32	32	34	36	ma
Max signal d-c plate current	90	90	90	90	ma
Zero signal d-c screen grid current	1	1	1	1	ma
Max signal d-c screen grid current	16	14	14	14	ma
Effective load resistance (plate to plate)	6500	9000	12000	16000	ohms
Max signal plate power output	15	20	28	38	watts
Total harmonic distortion	2.5	2.5	2.5	2.5	percent

Filament Plane

Terminal Layout

bottom view of socket
Terminal Connections

Pin	Connection	Pin	Connection
1	Fil. center tap and beam plates	5	Control grid
2	Filament	6	Same as pin 1
3	Screen grid	7	Filament
4	Same as pin 1	8	No connection
		Cap	Plate

A-F Power Amplifier and Modulator — Class AB₂
Maximum Ratings, Absolute Values

D-c plate potential	600 max	volts
D-c screen grid potential	250 max	volts
Peak positive a-f control grid potential	20 max	volts
Max signal d-c plate current ψ	70 max	ma
Max signal plate input power ψ	42 max	watts
Max signal screen grid input power ψ	5 max	watts
Plate dissipation ψ	15 max	watts

Typical Operation — Average Characteristics

Unless otherwise specified, the values are for two tubes:

A-c filament potential ϕ	6.0	6.0	6.0	6.0	volts
D-c plate potential	300	400	500	600	volts
D-c screen grid potential	250	250	250	250	volts
D-c control grid bias ϕ %	(a) -25	-25	-25	-25	volts
Peak a-f control grid to control grid potential	80	80	80	80	volts
Zero signal d-c plate current	30	32	34	36	ma
Max signal d-c plate current	140	140	140	140	ma
Zero signal d-c screen grid current	1	1	1	1	ma
Max signal d-c screen grid current	24	24	24	24	ma
Max signal d-c control grid current	4	4	4	4	ma
Effective load resistance (plate to plate)	4000	6000	8000	10500	ohms
Max signal control grid driving power	0.16	0.16	0.16	0.16	watts
Max signal plate power output	25	38	53	67	watts
Total harmonic distortion	4	3.5	3.5	3.5	percent

PREPARED BY COMMERCIAL ENGINEERING DEPT.

HYTRON RADIO & ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

HYTRON 5516

R-F Power Amplifier and Oscillator Class C Telephony and Frequency Modulation

Key-down conditions per tube without amplitude modulation.

Maximum Ratings, Absolute Values

D-c plate potential	600 max	volts
D-c screen grid potential	250 max	volts
D-c control grid bias	-150 max	volts
Control grid resistor	50000 max	ohms
D-c plate current	90 max	ma
D-c control grid current	6 max	ma
Peak positive r-f control grid potential	35 max	volts
D-c plate input power	45 max	watts
D-c screen grid input power	5 max	watts
Plate dissipation	15 max	watts

Typical Operation — Average Characteristics

Filament potential	6.0	6.0	6.0	volts
D-c plate potential	400	500	600	volts
D-c screen grid potential	250	250	250	volts
D-c control grid bias §	(a) -60	(b) -60	(c) -60	volts
Peak r-f control grid potential	85	85	85	volts
D-c plate current	75	90	75	ma
D-c screen grid current	15	15	15	ma
D-c control grid current	5	5	5	ma
Control grid driving power (approx)	0.5	0.5	0.5	watts
Plate power output (approx) Δ	21	32	32	watts

Measured performance at 156 mc

Filament potential	6.0	6.0	6.0	volts
D-c plate potential	400	450	450	volts
D-c screen grid potential	250	250	250	volts
D-c control grid bias §	(a) -40	(b) -40	(c) -40	volts
Peak r-f control grid potential	60	60	60	volts
D-c plate current	80	75	75	ma
D-c screen grid current	15	15	15	ma
D-c control grid current (approx)	2	2	2	ma
Control grid driving power (approx)	2	2	2	watts
Plate power output (approx) Δ	19	21	21	watts
Useful power output (approx) Δ	16	18	18	watts

Plate & Screen Grid Amplitude Modulated R. F. Power Amplifier — Class C Telephony

Carrier conditions for use with a max modulation percentage of 100

Maximum Ratings, Absolute Values

D-c plate potential	475 max	volts
D-c screen grid potential	250 max	volts
D-c control grid bias	-150 max	volts
D-c plate current	75 max	ma
D-c control grid current	6 max	ma
Peak positive r-f control grid potential	35 max	volts
D-c plate input power †	30 max	watts
D-c screen grid input power †	3.3 max	watts
Plate dissipation †	10 max	watts

Typical Operation — Average Characteristics

Filament potential	6.0	6.0	6.0	volts
D-c plate potential	300	400	475	volts
D-c screen grid potential	250	250	250	volts
D-c control grid bias §	(a) -90	(b) -90	(c) -90	volts
Peak r-f control grid potential	115	115	115	volts
D-c plate current	60	75	63	ma
D-c screen grid current	15	12.5	10	ma
Screen grid dropping resistor	3500	12000	22500	ohms
D-c control grid current	5	5	4	ma
Control grid driving power (approx)	0.6	0.6	0.5	watts
Plate power output (approx) Δ	12	20	22	watts

Measured performance at 156 mc

Filament potential	6.0	6.0	6.0	volts
D-c plate potential	300	350	350	volts
D-c screen grid potential	250	250	250	volts
D-c control grid bias §	(a) -45	(b) -45	(c) -45	volts
Peak r-f control grid potential	65	65	65	volts
D-c plate current	55	70	70	ma
D-c screen grid current	12.5	12.5	12.5	ma
Screen grid dropping resistor	4000	8000	8000	ohms
D-c control grid current (approx)	3	3	3	ma
Control grid driving power (approx)	3	3	3	watts
Plate power output (approx) Δ	14	14	14	watts
Useful power output (approx) Δ	8	12	12	watts

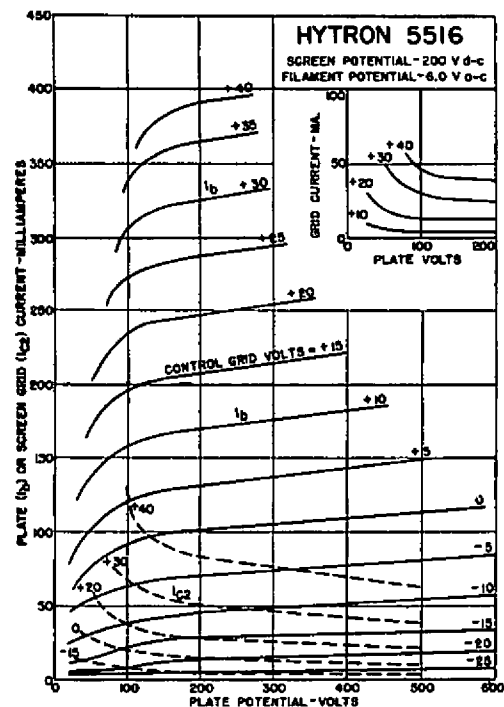
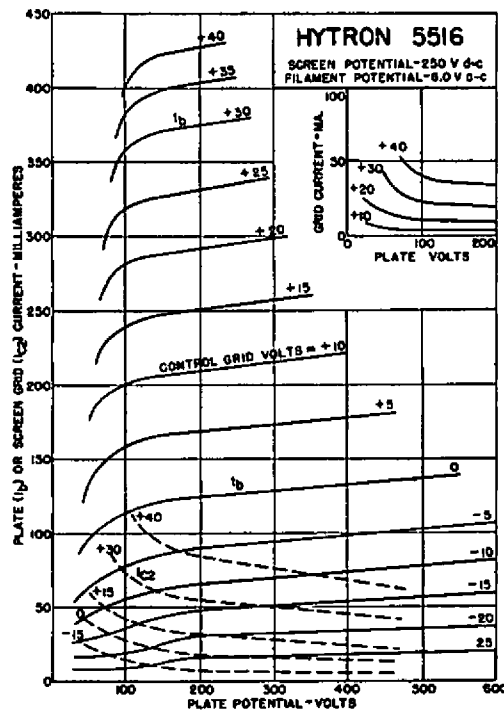
* The plate supply must be switched off before or simultaneously with the filament in all applications. When the 5516 is used as an r-f driver for a tube having a thoriated-tungsten filament, provision must be made so that the driven tube(s) is not operated with plate and screen potential applied but without a bias voltage during the time interval required for the 5516 to come up to operating temperature. When the filament is heated from a transformer with a nominal 6.3-volt output, the filament connections may be made with small wire to introduce the necessary drop of 0.3 volts.

Tube conservation: When the standby period is generally less than 15 minutes, additional tube life can be obtained by reducing the filament potential to 80% of the nominal operating voltage. For longer standby periods, the filament should be turned off.

Ratings vs. Frequency

Maximum ratings for full input apply to 80 megacycles. The 5516 may be operated at higher frequencies provided the maximum values of plate voltage and power input are reduced according to the tabulation below (other maximum ratings are the same as shown above). Special attention should be given to adequate ventilation of the bulb at these higher frequencies.

Frequency	80	135	165	mc
Percentage of maximum ratings:				
Plate potential	100	83	75	percent
Plate input	100	89	78	percent



§ When d-c is used on the filament, the bias should be reduced approximately 1-1/2 volts and the grid return made to the negative leg of the filament.

§ Obtained from (a) fixed supply, (b) control grid resistor, (c) cathode resistor, or by combination of methods.

ψ Averaged over any a-f cycle of sine wave form.

† When modulated 100% with a sine wave, the average power increases by 50%. With a complex wave form, such as is produced by speech or music, the average power increases approximately 15% to 25%.

Δ "Plate power output" includes circuit losses and r-f radiation losses as well as useful power delivered to the load.

* In vhf circuits all three filament center taps should be well bypassed to or grounded to a common point to provide lowest effective cathode inductance.



Engineering NEWS RELEASE

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Bulletin E-138
Page 1 of 3 pages

May 22, 1950.
Supersedes issue of March 25, 1949.

HYTRON TYPE 5812 INSTANT-HEATING R-F BEAM PENTODE

The 5812 is an instant-heating, 10-watt, miniature beam-pentode power tube for use in r-f and a-f service. Its versatility permits its use in all stages, r-f and a-f, of an entire low-power transmitter. The low plate voltage requirement makes it especially adaptable to portable and mobile applications. In this type of service its instant-heating filament can be turned off during transmitting standby periods. The 5812 provides significant power savings in portable and mobile receivers as an a-f output tube which is turned on only during active reception periods by a signal-actuated relay. Thus a tremendous saving in battery drain (over that possible with cathode-type tubes) can be gained when the transmitting or receiving time is a small percentage of the total time. The 5812 in properly designed circuits requires no neutralization at frequencies up to 165 megacycles and can be used at full ratings at that frequency.

The 5812 has been designed and constructed in accordance with transmitting tube practices, and the characteristics in both the negative and positive grid regions are carefully controlled by suitable tests on each tube. All ratings are for continuous commercial service (CCS).

GENERAL CHARACTERISTICS

Filament	center-tapped oxide-coated	
Potential, a-c or d-c	6.0±10%	volts
Current	0.65	ampere
Heating time (note 1)	2 approx.	seconds
Average amplification factor (G1 to G2)	5.5	
Direct interelectrode capacitances (measured without shield)		
Grid to plate (maximum)	0.2	uuf
Input	9.0	uuf
Output	7.4	uuf
Bulb	Miniature T-5- $\frac{1}{2}$	
Maximum over-all length	2-5/8	inches
Effective bulb length	2-3/32	inches
Bulb diameter	3/4	inch
Weight	0.5	ounce
Base	Miniature 7-pin button	
Mounting position	filament plane must be vertical	

For further information write Commercial Engineering Department, Hytron Radio & Electronics Corp.,
Salem, Mass., or telephone Salem 2260

May 22, 1950.

General characteristics cont'd.

Terminal Connections:

Pin 1:	Control grid	Pin 5:	Plate
Pin 2:	Beam plates *	Pin 6:	Screen grid
Pin 3:	Filament	Pin 7:	Filament c.t.
Pin 4:	Filament		

AVERAGE STATIC CHARACTERISTICS

Filament potential	6.0 d-c	volts
D-c plate potential	250	volts
D-c screen grid potential	250	volts
D-c control grid bias	-24.5	volts
D-c plate current	40	ma
D-c screen current	1.8	ma
Plate resistance	63,000	ohms
Transconductance	43,000 ~~0~~	umhos

R-F POWER AMPLIFIER AND OSCILLATOR
Class C Telegraph and Frequency Modulation
Key-Down Conditions Per Tube Without Amplitude Modulation

Maximum ratings - absolute values

D-c plate potential	300 max	volts
D-c screen grid potential	250 max	volts
D-c control grid bias	-150 max	volts
Control grid resistor	100,000 max	ohms
D-c plate current	60 max	ma
D-c control grid current	3 max	ma
Peak positive r-f control grid potential	30 max	volts
D-c plate input power	18 max	watts
D-c screen input power	2.5 max	watts
Plate dissipation	10 max	watts

Typical Operation and Average Characteristics (160 megacycles)

D-c plate potential	300	volts
D-c screen grid potential	200	volts
D-c control grid bias # (a)	-45	volts
(b)	60,000	ohms
Peak r-f control grid potential	---	volts
D-c plate current	55	ma
D-c screen grid current	3	ma
D-c control grid current	0.75	ma
Control grid driving power (approx.)	1.5	watts
Useful power output (approx.)	7	watts

May 22, 1950.

Note 1. The plate supply must be switched off before or simultaneously with the filament in all applications. When the 5812 is used as an r-f driver for a tube having a thoriated-tungsten filament, provision must be made so that the driven tube (s) is not operated with plate and screen potentials applied but without a bias voltage during the time interval required for the 5812 to come up to operating temperature.

* Beam plates should be connected directly to ground or filament center tap. In vhf circuit, the center tap should be by-passed to or grounded to a common point to provide lowest effective filament inductance.

Obtained from (a) fixed supply (b) control-grid resistor (c) cathode resistor or by a combination of these methods.

Tube conservation: When the standby period is generally less than 15 minutes, additional tube life can be obtained by reducing the filament potential to 80% of the nominal operating voltage. For longer standby periods, the filament should be turned off.



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Engineering Bulletin

Type HY25

25 - 1

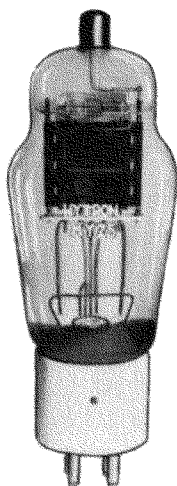
PHYSICAL DATA

Plate	Carbonized Nickel
Grid	Molybdenum-Nickel
Filament	Thoriated Tungsten
Insulation	Ceramic
Base	4 Pin UX Ceramic
Plate Lead	Metal Top Cap
Max. Overall Length	5 3/4"
Max. Diameter	2 1/16"
Bulb	ST-16
Net Weight	2 1/2 oz.

ELECTRICAL DATA

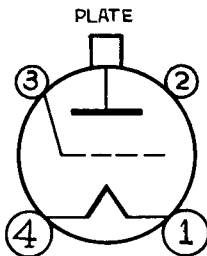
Filament Voltage	7.5	volts
Filament Current	2.25	amp.
D.C. Plate Voltage	800	volts max.
Plate Dissipation	25.	watts max.
Max. Plate Current	75.	ma.
Max. Grid Current	25.	ma.
Average Amp. Factor	55	
Mutual Conductance	3000	umhos

INTERELECTRODE CAPACITANCE

Grid to Plate	4.6 uuf
Grid to Filament	4.2 uuf
Plate to Filament	1.0 uuf

BASE PIN CONNECTIONS

- 1 - Filament
- 2 - No Connection
- 3 - Control Grid
- 4 - Filament



TOP VIEW

R.F. POWER AMPLIFIER, OSCILLATOR, CLASS "B" MODULATOR,
POWER-DOUBLER.

The Hytron HY25 is a three-electrode transmitting tube of the high mu type for use as a radio-frequency amplifier, oscillator, or Class "B" modulator and audio-frequency amplifier. Type HY25 due to its high value of transconductance operates at high efficiency as a Power Doubler requiring small values of driving power. The internal structure of the HY25 permits operation at maximum ratings at frequencies up to 60 megacycles. The maximum plate dissipation is 25 watts for Class "C" Telegraph and Class "B" Services.

Product of HYTRONIC LABORATORIES Salem, Mass.

HYTRON HY25

GENERAL DESCRIPTION

The Hytron HY25 is an exceptionally fine radio frequency amplifier and surprisingly high power outputs may be obtained at moderate plate voltages. Low inter-electrode capacity, high amplification factor, and high mutual conductance result in a combination which requires a very small amount of grid driving power and low bias. For Class "C" operation it is not necessary to use high bias to obtain good efficiency. Only 17 milliamperes of grid current is required for full excitation, and to obtain optimum bias, roughly 3000 ohms of grid leak is required for 750 volts on the plate. Under no conditions should the grid current exceed 25 milliamperes. The data under Class "C" Amplifier gives optimum operating conditions.

The Hytron HY25 is well suited for Class "B" audio operation. The high amplification factor coupled with the low plate impedance, provides that it will deliver large amounts of power with low distortion, and low bias and excitation requirements. With 500 plate volts it may be operated as a zero bias tube. The data under Class "B" Audio gives optimum operation conditions. These conditions limit the total distortion to less than 2%.

A.F. POWER AMPLIFIER AND MODULATOR CLASS "B"

D.C. Plate Voltage	800 max. volts
Maximum Signal D.C. Plate Current	75 max. ma.
Maximum Signal Plate Input	60 max. watts
Plate Dissipation	25 max. watts

Typical Operation:

(Unless otherwise specified, values are for 2 tubes)

DC Plate Voltage	500	650	800	volts
DC Grid Voltage#	0	-4.5	-9	volts
Static Plate Current	30	25	20	ma.
Peak A.F. grid to grid voltage	125	130	140	volts
Maximum Signal DC Plate Current	150	145	140	ma.
Load Resistance per Tube	1300	1800	2250	ohms
Effective Load Resistance Pl.-Pl.	5200	7200	9000	ohms
Max. Signal Driving Power (approx.)	2.4	2.4	2.7	watts
Max. Signal Power Output (approx.)	45	60	75	watts

R.F. POWER AMPLIFIER - CLASS "B" TELEPHONY

(Carrier conditions per tube for use with a max. modulation factor of 1.0)

DC Plate Voltage	750 max. volts
DC Plate Current	50 max. ma.
Plate Input	37.5 max. watts
Plate Dissipation	20 max. watts

Typical Operation:

DC Plate Voltage	500	750	volts
DC Grid Voltage#	-4.5	-9	volts
Peak R.F. Grid Voltage	35	40	volts
DC Plate Current	50	50	ma.
DC Grid Current (Approx.)**	6	5	ma.
Driving Power (Approx.)**o	1.4	1.5	watts
Power Output (Approx.)	7.5	12.5	watts

PLATE-MODULATED R.F. POWER AMPLIFIER - CLASS "C" TELEPHONY
(Carrier conditions per tube for use with a max. modulation factor of 1.0)

3

DC Plate Voltage	700 max. volts
DC Grid Voltage	-100 max. volts
DC Plate Current	75 max. ma.
DC Grid Current	25 max. ma.
Plate Input	53 max. watts
Plate Dissipation	25 max. watts

Typical Operation:

DC Plate Voltage	500	600	700	volts
DC Grid Voltage	-30	-37½	-45	volts
Peak R.F. Grid Voltage	250	250	250	volts
DC Plate Current	75	75	75	ma.
DC Grid Current (Approx.)**	17	17	17	ma.
Driving Power (Approx.)**	5.0	5.0	5.0	watts
Power Output (Approx.)	25	33	40	watts
Grid Leak Bias	1750	2200	2700	ohms

POWER AMPLIFIER AND OSCILLATOR - CLASS "C" TELEGRAPHY
(Key-down conditions per tube without modulation##)

DC Plate Voltage	750 max. volts
DC Grid Voltage	-200 max. volts
DC Plate Current	75 max. ma.
DC Grid Current	25 max. ma.
Plate Input	56 max. watts
Plate Dissipation	25 max. watts

Typical Operation:

DC Plate Voltage	500	650	750	volts
DC Grid Voltage	-22½	-30	-45	volts
Peak R.F. Grid Voltage	120	120	130	volts
DC Plate Current	75	75	70	ma.
DC Grid Current (Approx.)**	15	15	15	ma.
Driving Power (Approx.)** o	2.0	2.0	2.0	watts
Power Output (Approx.)	28	37	42	watts
Grid Leak Bias	1500	2000	3000	ohms

POWER DOUBLER

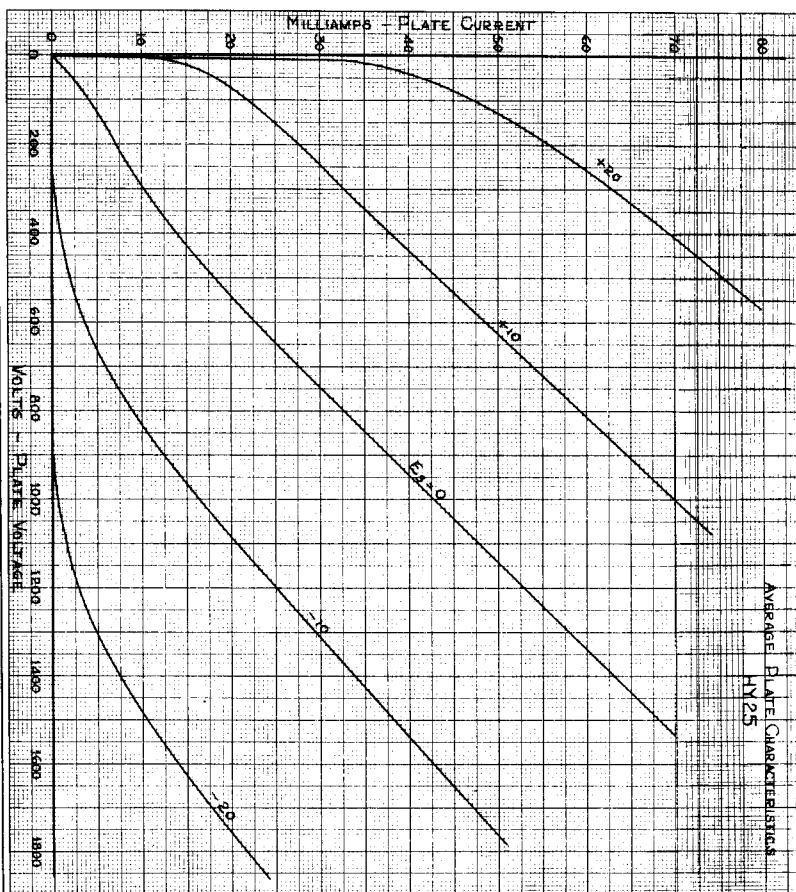
DC Plate Voltage	750 max. volts
DC Grid Voltage	-200 max. volts
DC Plate Current	75 max. ma.
DC Grid Current	25 max. ma.
Plate Input	56 max. watts
Plate Dissipation	25 max. watts

Typical Operation:

DC Plate Voltage	500	750	volts
DC Grid Voltage	-100	-135	volts
Peak R.F. Grid Voltage	150	175	volts
DC Plate Current	75	75	ma.
DC Grid Current (Approx.)**	20	20	ma.
Driving Power (Approx.)**	5.0	6.0	watts
Power Output (Approx.)	19	32	watts
Grid Leak Bias	5000	6750	ohms

- * Averaged over any audio-frequency cycle of sine-wave form.
 # Grid voltages are given with respect to the mid-point of filament operated on a.c. If d.c. is used, each stated value of grid voltage should be decreased by 3.75 volts and the circuit returns made to the negative end of the filament.
 o At crest of audio-frequency cycle with modulation factor of 1.0.
 ## Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.
 ** Subject to wide variations controlled by circuit constants and operating characteristics of associated input and output circuits.

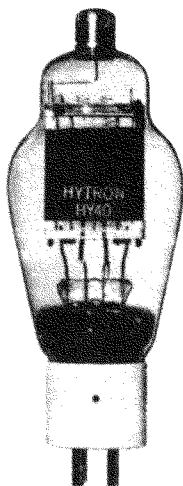
AVERAGE PLATE CHARACTERISTICS
WITH E_{c1} AS VARIABLE



DIVISION OF
HYTRON CORPORATION - SALEM, MASS., U.S.A.

Type HY40

40 - 1



PHYSICAL DATA

Plate	Processed Graphite
Grid	Molybdenum-Nickel
Filament	Thoriated Tungsten
Insulation	Processed Lava
Base	4 Pin UX Ceramic
Plate Lead	Large Metal Cap
Max. Overall Length	6 9/16"
Max. Diameter	2 7/16"
Bulb	ST-19
Net Weight	3 oz.

ELECTRICAL DATA

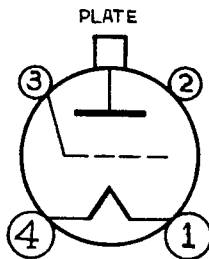
Filament Voltage	7.5	volts
Filament Current	2.25	amperes
D.C. Plate Voltage	1000.	volts max.
Plate Dissipation	40.	watts max.
Max. Plate Current	115.	ma.
Max. Grid Current	25.	ma.
Average Amp. Factor	25	
Mutual Conductance	3800	umhos

INTERELECTRODE CAPACITANCE

Grid to Plate	6.3 uuf
Grid to Filament	5.9 uuf
Plate to Filament	1.3 uuf

BASE PIN CONNECTIONS

- 1 - Filament
- 2 - No Connection
- 3 - Control Grid
- 4 - Filament



TOP VIEW

R.F. POWER AMPLIFIER, OSCILLATOR, CLASS "B" MODULATOR
GENERAL PURPOSE-HIGH EFFICIENCY TRIODE

The Hytron HY40 tube is a high efficiency triode of rugged construction. Because of its high value of transconductance it operates at high efficiency as an R.F. Amplifier requiring low driving power. The internal structure permits operation at maximum rating at frequencies up to 60 megacycles.

GENERAL DESCRIPTION

The construction of the HY40 is similar to that of higher priced tubes. A large sturdy graphite anode with plate lead at top of bulb isolates the plate from all stem wires. All insulating material is of specially processed lava.

The materials and workmanship in this product have been carefully prepared and are the result of lengthy research into the problems surrounding Amateur Radio. The quality and performance of this and other Hytron tubes is definitely assured by 17 years of successful manufacturing experience in the radio tube field.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONSA.F. Power Amplifier and Modulator Class "B"

D.C. Plate Voltage	1000 max. volts
Maximum Signal D.C. Plate Current*	115 max. ma.
Maximum Signal Plate Input*	115 max. watts
Plate Dissipation*	40 max. watts

* Averaged over any Audio Frequency Cycle.

Typical Operation Two Tubes:

(Unless otherwise specified, values are for 2 tubes)

D.C. Plate Voltage	800	1000	volts
D.C. Grid Voltage	-28	-37½	volts
Static Plate Current	20	20	ma.
Peak A.F. grid to grid voltage	175	190 approx.	volts
Maximum Signal D.C. Plate Current	270	270	ma.
Load Resistance per Tube	1450	1750	ohms
Effective Load Resis. Pl.-Pl.	5800	7000	ohms
Maximum Signal Driving Power	5	6 approx.	watts
Maximum Signal Power Output	140	175 approx.	watts

R.F. POWER AMPLIFIER - CLASS "B" TELEPHONY

(Carrier conditions per tube for use with a max. modulation factor of 1.0)

D.C. Plate Voltage	1000 max. volts
D.C. Plate Current	75 max. ma.
Plate Input	75 max. watts
Plate Dissipation	40 max. watts

Typical Operation:

D.C. Plate Voltage	800	1000	volts
D.C. Grid Voltage	-32	-40	volts
Peak R.F. Grid Voltage	60	60	volts
D.C. Plate Current	75	75	ma.
D.C. Grid Current**	7	6	approx. ma.
Driving Power Required**	8	5.5	approx. watts
Power Output	18	25	approx. watts

PLATE MODULATED R.F. POWER AMPLIFIER - CLASS "C" TELEPHONY
(Carrier conditions per tube for use with a max. modulation factor of 1.0)

D.C. Plate Voltage	850 max. volts
D.C. Grid Voltage	-200 max. volts
D.C. Plate Current	90 max. ma.
D.C. Grid Current	25 max. ma.
Plate Input	77 max. watts
Plate Dissipation	40 max. watts

Typical Operation:

D.C. Plate Voltage	600	850	volts
D.C. Grid Voltage#	-67½	-90	volts
Peak R.F. Grid Voltage	185	195	volts
D.C. Plate Current	90	90	ma.
D.C. Grid Current**	20	15	approx. ma.
Driving Power Required**	4.5	3.5	approx. watts
Power Output	35	52	approx. watts

R.F. POWER AMPLIFIER AND OSCILLATOR-CLASS "C" TELEGRAPHY
(Key down conditions per tube without modulation.)

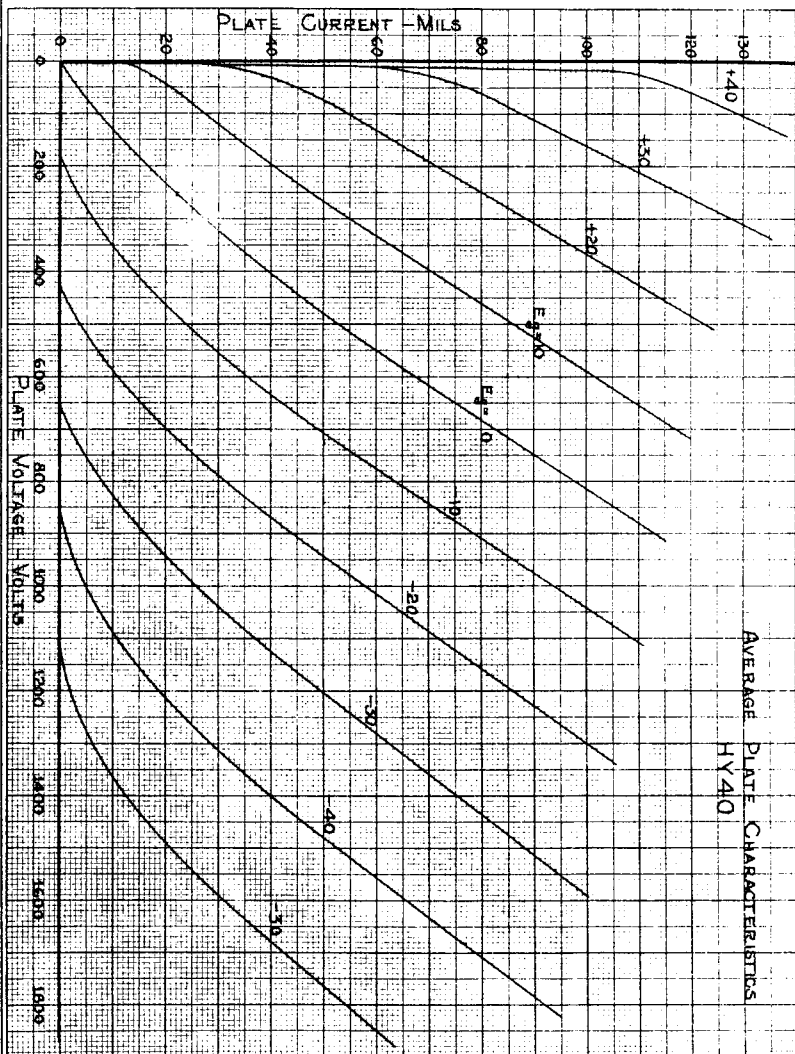
D.C. Plate Voltage	1000 max. volts
D.C. Grid Voltage	-150 max. volts
D.C. Plate Current	115 max. ma.
D.C. Grid Current	25 max. ma.
Plate Input	115 max. watts
Plate Dissipation	40 max. watts

Typical Operation:

D.C. Plate Voltage	600	800	1000	volts
D.C. Grid Voltage#	-50	-67½	-90	volts
Peak R.F. Grid Voltage	165	170	175	volts
D.C. Plate Current	115	115	115	ma.
D.C. Grid Current**	20	20	20	approx. ma.
Driving Power Required**	5	5	5	approx. watts
Power Output	48	67	86	approx. watts

** Subject to wide variations controlled by circuit constants and operating characteristics of associated input and output circuits.
Grid leak bias is not recommended. If used, care must be taken to maintain grid excitation while plate voltage is applied.

AVERAGE PLATE CHARACTERISTICS
WITH E_{c1} AS VARIABLE



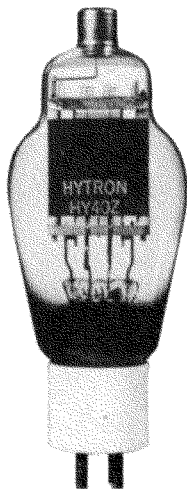
AVERAGE PLATE CHARACTERISTICS
HY40



DIVISION OF
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Type HY40Z

40 - 2



PHYSICAL DATA

Plate	Processed Graphite
Grid	Molybdenum-Nickel
Filament	Thoriated Tungsten
Insulation	Processed Lava
Base	4 Pin UX Ceramic
Plate Lead	Large Metal Cap
Max. Overall Length	6-9/16"
Max. Diameter	2-7/16"
Bulb	ST-19
Net Weight	3 oz.

ELECTRICAL DATA

Filament Voltage	7.5	volts
Filament Current	2.5	amperes
D.C. Plate Voltage	1000.	volts max.
Plate Dissipation	40.	watts max.
Max. Plate Current	115.	ma.
Max. Grid Current	30.	ma.
Average Amp. Factor	80	
Mutual Conductance	4200	umhos
Plate Resistance	19000	ohms

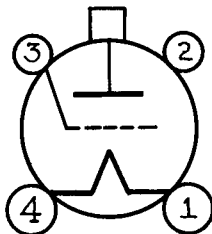
INTERELECTRODE CAPACITANCE

Grid to Plate	6.3 uuf
Grid to Filament	5.8 uuf
Plate to Filament	1.8 uuf

BASE PIN CONNECTIONS

- 1 - Filament
- 2 - No Connection
- 3 - Control Grid
- 4 - Filament

PLATE TOP CAP



TOP VIEW

ZERO-BIAS CLASS "B" MODULATOR, R. F. POWER AMPLIFIER, HIGH EFFICIENCY TRIODE

The Hytron HY40Z tube is a high efficiency triode of rugged construction. Because of its high value of transconductance it operates at high efficiency as an R. F. Amplifier requiring low driving power. The internal structure permits operation at maximum rating at frequencies up to 60 megacycles. As an audio power amplifier, two type HY40Z's may be operated at zero-bias up to full ratings.

GENERAL DESCRIPTION

The construction of the HY40Z is similar to that of higher priced tubes. A large, sturdy graphite anode with plate lead at top of bulb isolates the plate from all stem wires. All insulating material is of specially processed lava.

The materials and workmanship in this product have been carefully prepared and are the result of lengthy research into the problems surrounding Amateur Radio. The quality and performance of this and other Hytron tubes is definitely assured by 18 years of successful manufacturing experience in the radio tube field.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONSA.F. Power Amplifier and Modulator Class "B"

D.C. Plate Voltage	1000 max. volts
Maximum Signal D.C. Plate Current*	115 max. ma.
Maximum Signal Plate Input*	115 max. watts
Plate Dissipation*	40 max. watts

* Averaged over any Audio Frequency Cycle.

Typical Operation Two Tubes:

(Unless otherwise specified, values are for 2 tubes)

D.C. Plate Voltage	800	1000	volts
D.C. Grid Voltage	0	0	volts
Static Plate Current	36	48	ma.
Peak A.F. grid to grid voltage	150	175 approx.	volts
Maximum Signal D.C. Plate Current	280	280	ma.
Load Resistance per Tube	1375	1725	ohms
Effective Load Resis. Pl.-Pl.	5500	6900	ohms
Maximum Signal Driving Power	2.5	3 approx.	watts
Maximum Signal Power Output	140	180 approx.	watts

R. F. POWER AMPLIFIER - CLASS "B" TELEPHONY

(Carrier conditions per tube for use with a max. modulation factor of 1.0)

D.C. Plate Voltage	1000 max. volts
D.C. Plate Current	75 max. ma.
Plate Input	75 max. watts
Plate Dissipation	40 max. watts

Typical Operation:

D.C. Plate Voltage	800	1000	volts
D.C. Grid Voltage	-10	-12	volts
Peak R.F. Grid Voltage	40	50	volts
D.C. Plate Current	75	65	ma.
D.C. Grid Current**	12	10 approx.	ma.
Driving Power Required**	8	6 approx.	watts
Power Output	19	22 approx.	watts

PLATE MODULATED R. F. POWER AMPLIFIER - CLASS "C" TELEPHONY
(Carrier conditions per tube for use with a max. modulation
factor of 1.0)

D.C. Plate Voltage	850 max. volts
D.C. Grid Voltage	-90 max. volts
D.C. Plate Current	90 max. ma.
D.C. Grid Current	30 max. ma.
Plate Input	77 max. watts
Plate Dissipation	40 max. watts

Typical Operation:

D.C. Plate Voltage	600	850	volts
D.C. Grid Voltage	-25 $\frac{1}{2}$	-30	volts
Peak R.F. Grid Voltage	160	170	volts
D.C. Plate Current	115	90	ma.
D.C. Grid Current**	30	30 approx.	ma.
Driving Power Required**	7.0	7.0 approx.	watts
Power Output	45	52 approx.	watts
Grid Leak Bias Resistor#	750	900 approx.	ohms

R. F. POWER AMPLIFIER AND OSCILLATOR-CLASS "C" TELEGRAPHY
(Key down conditions per tube without modulation)

D.C. Plate Voltage	1000 max. volts
D.C. Grid Voltage	-150 max. volts
D.C. Plate Current	115 max. ma.
D.C. Grid Current	25 max. ma.
Plate Input	115 max. watts
Plate Dissipation	40 max. watts

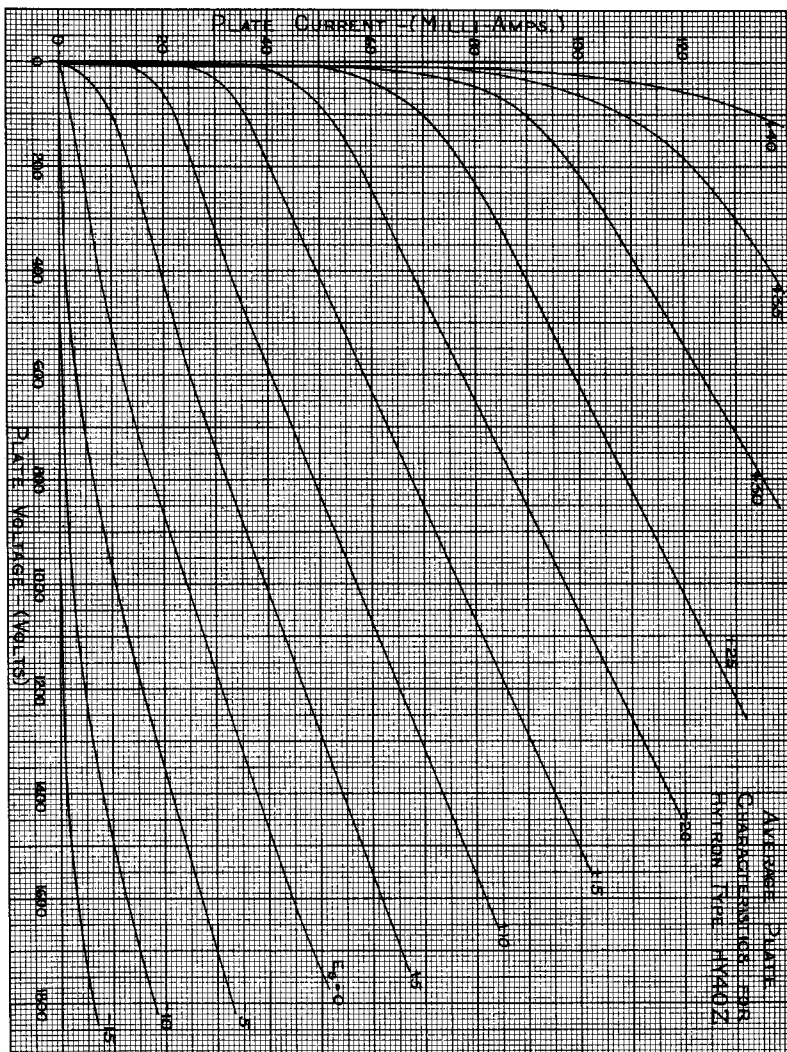
Typical Operation:

D.C. Plate Voltage	600	800	1000	volts
D.C. Grid Voltage	-22 $\frac{1}{2}$	-25 $\frac{1}{2}$	-27 $\frac{1}{2}$	volts
Peak R.F. Grid Voltage	165	170	175	volts
D.C. Plate Current	115	115	115	ma.
D.C. Grid Current**	25	25	25	approx. ma.
Driving Power Required**	5	5	5	approx. watts
Power Output	48	67	86	approx. watts
Grid Leak Bias Resistor#	800	925	1000	approx. ohms

**Subject to wide variations controlled by circuit constants and operating characteristics of associated input and output circuits.

#The HY40Z may be used as a power frequency-doubler. Efficient doubler operation requires grid bias voltages approximately four times that required for Class "C" Telephony operation. Accordingly, grid leak bias resistor values will be four times that specified under Class "C" Telephony conditions.

AVERAGE PLATE CHARACTERISTICS
WITH E_{c1} AS VARIABLE



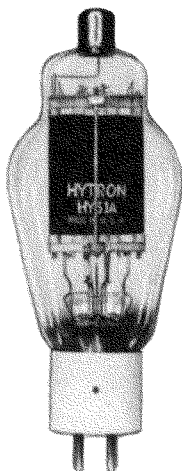
DIVISION OF
HYTRON CORPORATION
SALEM, MASS., U.S.A.



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Engineering Bulletin
51 - 1

Type HY51A - HY51B



PHYSICAL DATA

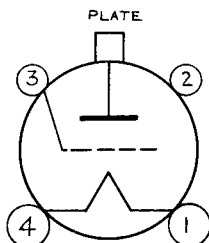
Plate	Processed Graphite
Grid	Molybdenum-Nickel
Filament	Thoriated Tungsten
Insulation	Processed Lava
Base	4 Pin UX Iso.
Plate Lead	Large Metal Cap
Max. Overall Length	6 9/16"
Max. Diameter	2 7/16"
Bulb	ST-19
Net Weight	3 1/4 oz.

INTERELECTRODE CAPACITANCE

Grid to Plate	7.5 uuf
Grid to Filament	6.0 uuf
Plate to Filament	2.0 uuf

ELECTRICAL DATA

	HY51A	HY51B
Filament Voltage	7.5 Volts	10.0 Volts
Filament Current	3.5 Amperes	2.25 Amperes
D.C. Plate Voltage	1000. Volts Max.	
Plate Dissipation	65. Watts Max.	
Max. Plate Current	155. ma.	
Max. Grid Current	25. ma.	
Average Amp. Factor	25	
Mutual Conductance	6500 umhos	



BASE PIN CONNECTIONS

- 1 - Filament
- 2 - No Connection
- 3 - Control Grid
- 4 - Filament

Product of HYTRONIC LABORATORIES Salem, Mass.

HY51A - HY51B

R.F. POWER AMPLIFIER, OSCILLATOR, CLASS "B" MODULATOR
GENERAL PURPOSE-HIGH EFFICIENCY TRIODE

The Hytron HY51A and HY51B tubes are high efficiency triodes of rugged construction. Because of their high values of transconductance they operate at high efficiency as R.F. Amplifiers requiring low driving power. Their internal structure permits operation at maximum rating at frequencies up to 60 megacycles.

GENERAL DESCRIPTION

The Types HY51A and HY51B differ only with respect to the filament Voltage and filament Current. The versatility of the two popular filament supply voltages makes the tubes adaptable to any triode use.

The construction of the HY51A and HY51B is similar to that of higher priced tubes. A large sturdy graphite anode with plate lead at top of bulb isolates the plate from all stem wires. All insulating material is of specially processed lava. The mechanical assembly is mounted on heavy four way supports as well as mica top snubbers in the dome of the bulb.

The materials and workmanship in this product have been carefully prepared and are the result of lengthy research into the problems surrounding Amateur Radio. The quality and performance of these and other Hytron tubes is definitely assured by 17 years of successful manufacturing experience in the radio tube field.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONSA.F. Power Amplifier and Modulator Class "B"

D.C. Plate Voltage	1000 max. volts
Maximum Signal D.C. Plate Current*	150 max. ma.
Maximum Signal Plate Input*	150 max. watts
Plate Dissipation*	65 max. watts

* Averaged over any Audio Frequency Cycle.

Typical Operation Two Tubes:

(Unless otherwise specified values are for 2 tubes.)

D.C. Plate Voltage	800	1000	volts
D.C. Grid Voltage	-27	-35	volts
Static Plate Current	20	20	ma.
Peak A.F. grid to grid voltage	175	190 approx.	volts
Maximum Signal D.C. Plate Current	300	300	ma.
Load Resistance per tube	1450	1750	ohms
Effective Load Resis. Pl.-Pl.	5800	7000	ohms
Maximum Signal Driving Power	5	6 approx.	watts
Maximum Signal Power Output	150	180 approx.	watts

R.F. POWER AMPLIFIER - CLASS "B" TELEPHONY
(Carrier conditions per tube for use with a max. modulation factor of 1.0)

D.C. Plate Voltage	1000 max. volts
D.C. Plate Current	100 max. ma.
Plate Input	100 max. watts
Plate Dissipation	60 max. watts

Typical Operation:

D.C. Plate Voltage	800	1000	volts
D.C. Grid Voltage	-27	-35	volts
Peak R.F. Grid Voltage	60	60	volts
D.C. Plate Current	100	90	ma.
D.C. Grid Current**	7	6	approx. ma.
Driving Power Required**	8	5.5	approx. watts
Power Output	25	30	approx. watts

R.F. POWER AMPLIFIER AND OSCILLATOR - CLASS "C" TELEGRAPHY
(Key down conditions per tube without modulation.)

D.C. Plate Voltage	1000 max. volts
D.C. Grid Voltage	-150 max. volts
D.C. Plate Current	155 max. ma.
D.C. Grid Current	25 max. ma.
Plate Input	155 max. watts
Plate Dissipation	65 max. watts

Typical Operation:

D.C. Plate Voltage	600	800	1000	volts
D.C. Grid Voltage	-45	-60	-75	volts
Peak R.F. Grid Voltage	165	170	175	volts
D.C. Plate Current	140	140	140	ma.
D.C. Grid Current**	20	20	20	approx. ma.
Driving Power Required**	5	5	5	approx. watts
Power Output	55	80	100	approx. watts

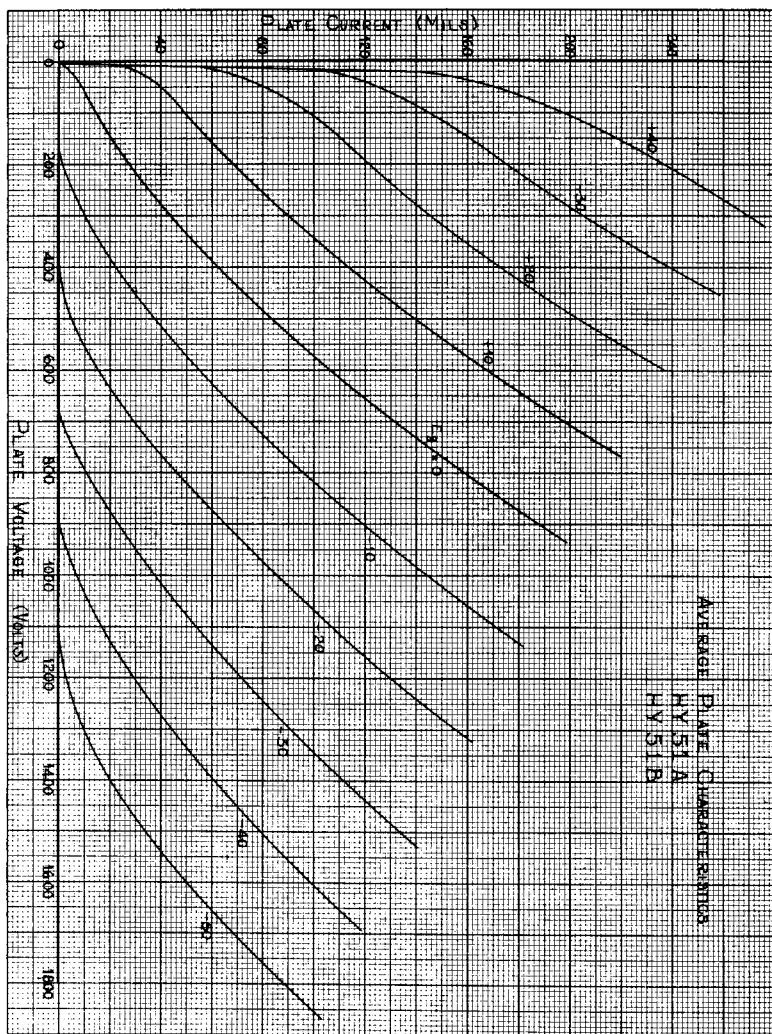
** Subject to wide variations controlled by circuit constants and operating characteristics of associated input and output circuits.

PLATE MODULATED R.F. POWER AMPLIFIER - CLASS "C" TELEPHONY
(Carrier conditions per tube for use with a max. modulation factor of 1.0)

D.C. Plate Voltage	800 max. volts
D.C. Grid Voltage	-200 max. volts
D.C. Plate Current	110 max. ma.
D.C. Grid Current	25 max. ma.
Plate Input	88 max. watts
Plate Dissipation	45 max. watts

Typical Operation:

D.C. Plate Voltage	600	800	volts
D.C. Grid Voltage	-55	-67.5	volts
Peak R.F. Grid Voltage	185	195	volts
D.C. Plate Current	100	100	volts
D.C. Grid Current**	20	15	approx. ma.
Driving Power Required**	4.5	3.5	approx. watts
Power Output	40	55	approx. watts



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Type HY60

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GENERAL CHARACTERISTICS

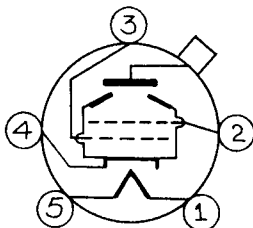
Heater Voltage (A.C. or D.C.)	6.3 volts
Heater Current	0.5 amp.
Mutual Conductance	4100 umhos
Average Amp. Factor	218
Bulb	ST-14
Max. Overall Length	5"
Max. Diameter	1-13/16"
Net Weight	2-1/4 oz.
Cap	Small Metal
Base	Med. 5 pin ceramic

INTERELECTRODE CAPACITANCE

Grid to Plate (ext. shield)	0.19 uuf
Input Electrodes	11.0 uuf
Output Electrodes	10.2 uuf

BASE PIN CONNECTIONS

- 1 - Heater
- 2 - Screen Grid
- 3 - Control Grid
- 4 - Cathode
- 5 - Heater



TOP VIEW

R.F. AMPLIFIER, OSCILLATOR CLASS AB₁
AUDIO AMPLIFIER, FREQUENCY DOUBLER.

Hytron HY60 is a heater-cathode type transmitting tube of Beam-Tetrode design incorporating efficient inter-electrode shielding and high insulation factor. The HY60 affords extremely high power-sensitivity as an audio-amplifier and very high plate efficiency as an R.F. oscillator, amplifier, or frequency doubler. Surprisingly high output is obtainable from a single HY60 as a crystal oscillator due to the small transfer of energy from plate to grid and high amplification factor. Because of its well suited characteristics, the HY60 operates as a Class "C" doubler at high efficiency and with relatively high power output. The small physical size, low filament consumption and high operating efficiency of the HY60 make the tube highly desirable for portable use. The internal structure of the HY60 permits operation at maximum ratings at frequencies up to 60 megacycles. The maximum plate dissipation of the HY60 is 15 watts.

HYTRON HY60

AS PUSH-PULL AUDIO AMPLIFIER CLASS "AB₁"

D.C. Plate Voltage	300 max. volts
D.C. Screen Voltage	300 max. volts
Plate and Screen Dissipation (total)*	12.5 max. watts

Typical Operation - Values are for 2 tubes:

D.C. Plate Voltage	250	300	volts
D.C. Screen Voltage	250	300	volts
D.C. Grid Voltage ^o	-15	-20	volts
Peak A.F. Grid to Grid Voltage	30	40	volts
Zero Signal Plate Current	70	78	ma.
Zero Signal Screen Current	5	5	ma.
Max. Signal Plate Current	79	90	ma.
Max. Signal Screen Current	12	13.5	ma.
Load Resistance per Tube	2500	2000	ohms
Effective Load Resistance Plate to Plate	10000	8000	ohms
Max. Signal Driving Power***	0.2	0.23	watts
Max. Signal Power Output	8.5	13	watts

AS RADIO FREQUENCY DOUBLER - MULTIPLIER

D.C. Plate Voltage	350 max. volts
D.C. Screen Voltage	200 max. volts
D.C. Grid Voltage	-150 max. volts
D.C. Plate Current	60 max. ma.
D.C. Grid Current	5 max. ma.
Plate Input	21 max. watts
Screen Input	2.0 max. watts
Plate Dissipation	15 max. watts

Typical Operation:

D.C. Plate Voltage	275	350	volts
D.C. Screen Voltage	200	200	volts
D.C. Grid Voltage	-100	-100	volts
Peak R.F. Grid Voltage	125	125	volts
D.C. Plate Current	44	50	ma.
D.C. Screen Current	3.7	3.0	ma.
D.C. Grid Current (Approx.)**	2.0	2.0	ma.
Screen Resistor	20000	50000	ohms
Grid Resistor	50000	50000	ohms
Driving Power (Approx.)**	0.3	0.3	watts
Power Output (Approx.)	6.0	8.0	watts

AS PLATE AND SCREEN MODULATED R.F. POWER AMPLIFIER
CLASS "C" TELEPHONY

(Carrier conditions per tube for use with a max. modulation factor of 1.0.)

D.C. Plate Voltage	325 max. volts
D.C. Screen Voltage (Grid #2)	225 max. volts
D.C. Grid Voltage (Grid #1)	-150 max. volts
D.C. Plate Current	60 max. ma.
D.C. Grid Current	5 max. ma.
Plate Input	20 max. watts
Screen Input	2.0 max. watts
Plate Dissipation	12 max. watts

Typical Operation:

D.C. Plate Voltage	250	325	volts
D.C. Screen Voltage	160	200	volts
D.C. Grid Voltage (Grid #1)	-45	-45	volts
Peak R.F. Grid Voltage	70	70	volts
D.C. Plate Current	35	45	ma.
D.C. Screen Current	6	8.5	ma.
D.C. Grid Current (Approx.):**	2.0	2.0	ma.
Screen Resistor##	15000	15000	ohms
Grid Resistor	22500	22500	ohms
Driving Power (Approx.):**	0.2	0.2	watts
Power Output (Approx.)	5.5	10	watts

AS R.F. AMPLIFIER AND OSCILLATOR CLASS "C" TELEGRAPHY
(Key down conditions per tube without modulation^{oo})

D.C. Plate Voltage	425 max.	volts
D.C. Screen Voltage (Grid #2)	200 max.	volts
D.C. Grid Voltage (Grid #1)	-150 max.	volts
D.C. Plate Current	60 max.	ma.
D.C. Grid Current	4 max.	ma.
Plate Input	26 max.	watts
Screen Input	2.5 max.	watts
Plate Dissipation	15 max.	watts

Typical Operation:

D.C. Plate Voltage	300	425	volts
D.C. Screen Voltage	200	200	volts
D.C. Grid Voltage (Grid #1)	-45	-62.5	volts
Peak R.F. Grid Voltage	70	70	volts
D.C. Plate Current	60	55	ma.
D.C. Screen Current	7.5	7.0	ma.
D.C. Grid Current (Approx.):**	2.5	2.5	ma.
Screen Resistor	13500	32000	ohms
Grid Resistor	18000	25000	ohms
Driving Power (Approx.):**	0.2	0.25	watts
Power Output (Approx.)	12.5	16	watts

* Averaged over any audio-frequency cycle of sine-wave form.

o The type of input coupling should not introduce too much resistance in the grid circuit. Transformer or impedance coupling devices are recommended. When the grid circuit has a resistance not higher than 50,000 ohms fixed bias may be used; for higher values, cathode bias is required. With cathode bias, the grid circuit may have a resistance not to exceed 0.5 megohm, provided the heater voltage does not exceed 10% higher than the rated value under operating conditions.

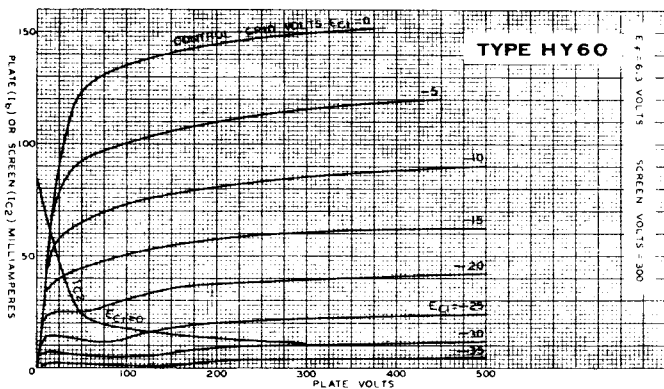
Connected to modulated plate voltage supply.

*** Driver stage should be capable of supplying grids of the class AB stage with the specified peak values at low distortion.

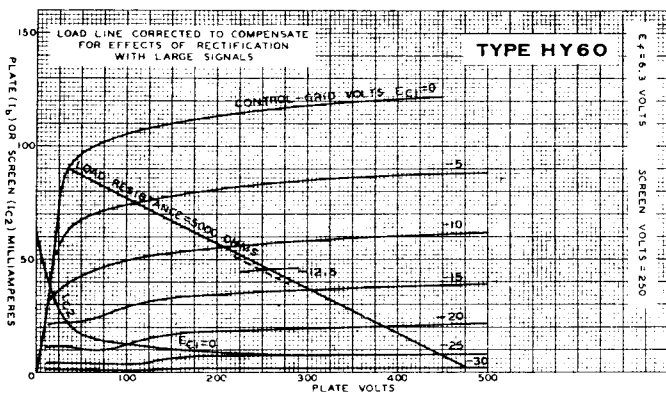
oo Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

** Subject to wide variations controlled by circuit constants and operating characteristics of associated input and output circuits.

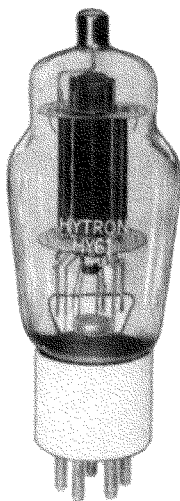
AVERAGE PLATE CHARACTERISTICS
WITH E_{c1} AS VARIABLE



AVERAGE PLATE CHARACTERISTICS
WITH E_{c1} AS VARIABLE



DIVISION OF
HYTRON CORPORATION - SALEM, MASS., U.S.A.



GENERAL CHARACTERISTICS

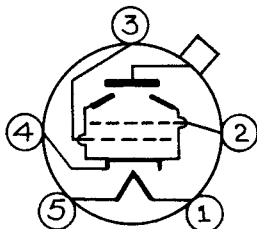
Heater Voltage (A.C. or D.C.)	6.3 volts
Heater Current	0.9 amp.
Mutual Conductance	6000 umhos
Average Amp. Factor	135.
Bulb	ST-16
Max. Overall Length	5-3/4"
Max. Diameter	2-1/16"
Net Weight	2-1/2 oz.
Cap	Small Metal
Base	Med. 5 pin Iso.

INTERELECTRODE CAPACITANCE

Grid to Plate (ext. shield)	0.2 uuf
Input Electrodes	11.0 uuf
Output Electrodes	7.0 uuf

BASE PIN CONNECTIONS

- 1 - Heater
- 2 - Screen Grid
- 3 - Control Grid
- 4 - Cathode
- 5 - Heater



TOP VIEW

R.F. AMPLIFIER, OSCILLATOR CLASS AB₂
AUDIO AMPLIFIER, FREQUENCY DOUBLER.

Hytron HY61 is a heater cathode type transmitting tube of Beam-Tetrode design incorporating efficient inter-electrode shielding and high insulation factor. The HY61 affords extremely high power-sensitivity as an audio-amplifier and very high plate efficiency as an R.F. oscillator, amplifier or frequency doubler. Surprisingly high output is obtainable from a single HY61 as a crystal oscillator due to the small transfer of energy from plate to grid and high amplification factor. Because of its well suited characteristics, the HY61 operates as a Class "C" doubler at high efficiency and with relatively high power output. The internal structure of the HY61 permits operation at maximum ratings at frequencies up to 60 megacycles. The maximum plate dissipation of the HY61 is 25 watts.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONSAs push-pull amplifier - Class AB₂# (fixed bias)

D.C. Plate Voltage	600 max. volts
D.C. Screen Voltage (Grid #2)	300 max. volts
Max. Signal D.C. Plate Current *	120 max. ma.
Max. Signal Plate Input *	60 max. watts
Screen Input *	3.5 max. watts
Plate Dissipation *	25 max. watts

Typical Operation:

(Unless otherwise specified, values are for two tubes)

Plate Voltage	400	500	600	volts
Screen Voltage	300	300	300	volts
D.C. Grid Voltage (Grid #1)	-25	-25	-30	volts
Peak A.F. grid to grid voltage	80	80	80	volts
Zero Signal D.C. Plate Current	100	100	60	ma.
Max. Signal D.C. Plate Current	230	230	200	ma.
Max. Signal D.C. Screen Current	10	10	10	ma.
Load Resistance per tube	950	1165	1665	ohms
Load Resistance Plate to Plate	3800	4660	6660	ohms
Max. Signal Driving Power ^o	0.35	0.6	0.4	watt
Max. Signal Power Output**	60	75	80	watts

As R.F. Power Amplifier - Class "B" Telephony

D.C. Plate Voltage	600 max. volts
D.C. Screen Voltage (Grid #2)	300 max. volts
D.C. Plate Current	80 max. ma.
Plate Input	37.5 max. watts
Screen Input	2.5 max. watts
Plate Dissipation	25 max. watts

Typical Operation:

D.C. Plate Voltage	400	500	600	volts
D.C. Screen Voltage	250	250	250	volts
D.C. Grid Voltage (Grid #1)	-25	-25	-25	volts
Peak R.F. Grid Voltage	30	30	20	volts
D.C. Plate Current	75	75	62.5	ma.
D.C. Screen Current	4	4	3	ma.
D.C. Grid Current (Approx.)	0	0	0	ma.
Driving Power (Approx.)***	0.25	0.25	0.2	watt
Power Output (Approx.)	9	12.5	12.5	watts

As Plate-Modulated R.F. Power Amplifier - Class "C" Telephony
(Carrier conditions per tube for use with a max. modulation factor of 1.0)

D.C. Plate Voltage	475 max. volts
D.C. Screen Voltage (Grid #2)	300 max. volts
D.C. Grid Voltage (Grid #1)	-200 max. volts
D.C. Plate Current	83 max. ma.
D.C. Grid Current	5 max. ma.
Plate Input	40 max. watts
Screen Input	2.5 max. watts
Plate Dissipation	16.5 max. watts

* Averaged over any audio-frequency cycle of sine-wave form.

Typical Operation:

D.C. Plate Voltage	325	400	475	volts
D.C. Screen Voltage	225	225	225	volts
D.C. Grid Voltage	-45	-50	-50	volts
Peak R.F. Grid Voltage	70	70	70	volts
D.C. Plate Current	80	80	83	ma.
D.C. Screen Current	9	9	9	ma.
D.C. Grid Current (Approx.)	3	2	2	ma.
Screen Resistor##	10000	16000	25000	ohms
Grid Resistor	5000	10000	10000	ohms
Cathode Resistor	300	300	300	ohms
Driving Power (Approx.)	0.2	0.13	0.13	watt
Power Output (Approx.)	15	19	24	watts

As R.F. Power Amplifier and Oscillator - Class "C" Telegraphy
(Key down conditions per tube without modulation^{oo})

D.C. Plate Voltage	600	max.	volts
D.C. Screen Voltage (Grid #2)	300	max.	volts
D.C. Grid Voltage (Grid #1)	-200	max.	volts
D.C. Plate Current	100	max.	ma.
D.C. Grid Current	5	max.	ma.
Plate Input	60	max.	watts
Screen Input	3.5	max.	watts
Plate Dissipation	25	max.	watts

Typical Operation:

D.C. Plate Voltage	400	500	600	volts
D.C. Screen Voltage	250	250	250	volts
D.C. Grid Voltage	-50	-50	-50	volts
Peak R.F. Grid Voltage	80	80	80	volts
D.C. Plate Current	95	95	100	ma.
D.C. Grid Current (Approx.)	2.5	2	3	ma.
D.C. Screen Current	9	9	9	ma.
Screen Resistor	17000	28000	39000	ohms
Grid Resistor	20000	25000	16700	ohms
Driving Power (Approx.)	0.18	0.14	0.22	watt
Power Output (Approx.)	25	30	37.5	watts

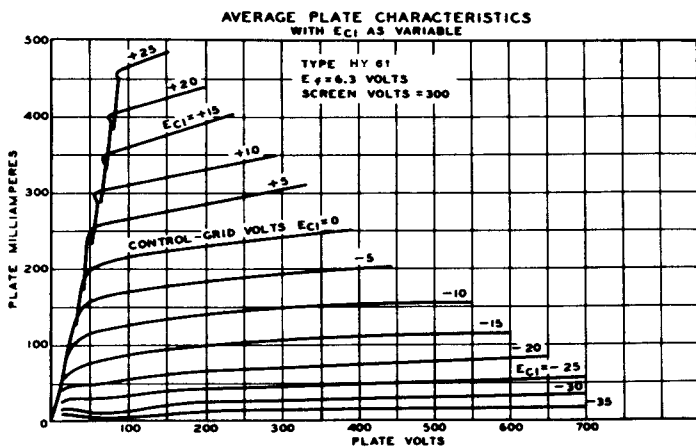
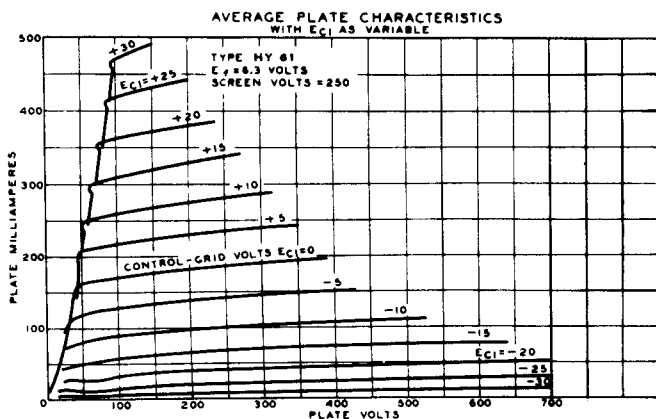
° Driver stage should be capable of supplying the grids of the Class AB stage with the specified peak values at low distortion. The effective resistance per grid circuit of the Class AB stage should be kept below 500 ohms and the effective impedance at the highest desired frequency should not exceed 700 ohms.

** With zero-impedance driver and perfect regulation, plate circuit distortion does not exceed 2%. In practice, plate-voltage regulation, screen-voltage regulation, and grid-bias regulation, should not be greater than 5%, 5%, and 3%, respectively.

*** At crest of audio-frequency cycle with modulation factor of 1.0.

Connected to modulated plate-voltage supply.

oo Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.



DIVISION OF
HYTRON CORPORATION - SALEM, MASS., U.S.A.

HY69



R-F OSCILLATOR-AMPLIFIER FREQUENCY MULTIPLIER, A-F AMPLIFIER AND MODULATOR

HY69
30-WATT
BEAM PENTODE
INSTANT-HEATING
FILAMENT

The HY69 is an instant-heating filamentary type 30-watt beam pentode for use in r-f and a-f service. Its versatility permits its use in all stages — r-f and a-f of an entire transmitter. In portable and mobile applications, its instant-heating filament can be turned off during standby periods. Thus a tremendous saving in battery drain (over that possible with cathode-type tubes) can be gained when transmitting time is a small percentage of total time. Because the HY69 requires no neutralization in properly designed adaptable in band switching transmitters and exciters. Maximum ratings apply up to 60 megacycles.

A-F Power Amplifier and Modulator — Class A₁

Maximum Ratings, Absolute Values

D-c plate potential	600 max	volts
D-c screen grid potential	300 max	volts
D-c plate input power	30 max	watts
D-c screen grid input power	5 max	watts
Plate dissipation	30 max	watts

Typical Operation — Average Characteristics

A-c filament potential ϕ	6.0	6.0	6.0	6.0	6.0	volts
D-c plate potential	300	400	500	300	400	volts
D-c screen grid potential	250	250	250	300	300	volts
D-c control grid bias ϕ #	(a) -20	-20	-20	-25	-25	volts
	(b) ...	...	...	...	...	
	(c) 375	360	360	410	410	ohms
Peak a-f control grid potential	20	20	20	25	25	volts
Zero signal d-c plate current	46	49	51	54	56	ma
Max signal d-c plate current	47	50	53	56	58	ma
Zero signal d-c screen grid current	3	2.5	2	3.5	3	ma
Max signal d-c screen grid current	7	5.5	4.5	9	8.5	ma
Effective load resistance	6500	8500	10000	4700	7000	ohms
Max signal plate power output	6.2	8.4	10.2	7.9	10.6	watts
Total harmonic distortion	7	7	6	8	7	percent

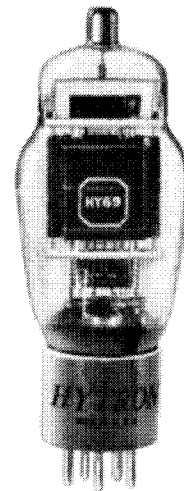
Typical Operation — Push-Pull Amplifier

Unless otherwise specified, the values are for two tubes

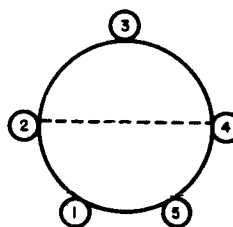
A-c filament potential ϕ	6.0	6.0	6.0	6.0	6.0	6.0	volts
D-c plate potential	300	400	500	300	400	500	volts
D-c screen grid potential	250	250	250	300	300	300	volts
D-c control grid bias ϕ #	(a) -20	-20	-20	-25	-25	-27.5	volts
	(b) ...	...	...	...	...	...	
	(c) 200	195	190	220	210	250	ohms
Peak a-f control grid to control grid potential	40	40	40	50	50	55	volts
Zero signal d-c plate current	92	98	102	108	112	106	ma
Max signal d-c plate current	96	102	106	116	118	114	ma
Zero signal d-c screen grid current	5	5	4	7	6	4	ma
Max signal d-c screen grid current	14	12	9	18	17	15	ma
Effective load resistance (plate to plate)	13000	17000	20000	9400	14000	17000	ohms
Max signal plate power output	13.3	17.4	20.5	15.8	21.2	28.5	watts
Total harmonic distortion	5	5	3	5	5	5	

General Characteristics

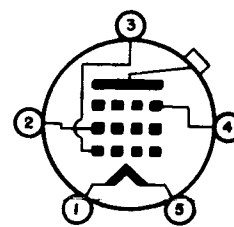
Filament	thoriated tungsten
Potential a-c or d-c	6.0 $\pm$ 5% volts
Current	1.6 amperes
Heating time (approx.) *	1/4 second
Transconductance (for $E_b = 600V$, $E_{c2} = 250V$, $E_f = 6.0V$ a-c, $E_{c1} = -21'$)	2900 μ mhos
Average amplification factor (G_1 to G_2)	6.5
Direct Interelectrode Capacitances	
Grid to plate (max)	0.3 μ fd
Input	17 μ fd
Output	8.5 μ fd
Bulb	ST-16
Maximum overall length	5-3/4 inches
Maximum diameter	2-1/16 inches
Base	5 pin medium low loss phenolic
Cap	small metal
Mounting position	filament plane must be vertical



Filament Plane



Terminal Layout



bottom view of socket

Terminal Connections

1 — Filament	4 — Beam plates
2 — Screen grid	5 — Filament
3 — Control grid	Cap — Plate

A-F Power Amplifier and Modulator — Class AB₂

Maximum Ratings, Absolute Values

D-c plate potential	600 max	volts
D-c screen grid potential	300 max	volts
Peak positive a-f control grid potential	100 max	volts
Max signal d-c plate current	120 max	ma
Max signal plate input power	72 max	watts
Max signal screen grid input power	5 max	watts
Plate dissipation	30 max	watts

Typical Operation — Average Characteristics

Unless otherwise specified, the values are for two tubes

A-c filament potential ϕ	6.0	6.0	6.0	volts
D-c plate potential	400	500	600	volts
D-c screen grid potential	250	250	250	volts
D-c control grid bias ϕ #	(a) -22.5	-22.5	-30	volts
Peak a-f control grid to control grid potential	167	170	193	volts
Zero signal d-c plate current	80	84	54	ma
Max signal d-c plate current	240	240	240	ma
Zero signal d-c screen grid current	3	3	2	ma
Max signal d-c screen grid current	15	16	20	ma
Max signal d-c control grid current	12	12	13	ma
Effective load resistance (plate to plate)	2800	4300	5500	ohms
Max signal control grid driving power	1	1	1.12	watts
Max signal plate power output	50	75	100	watts
Total harmonic distortion	4	4	3	percent

PREPARED BY COMMERCIAL ENGINEERING DEPT.

HYTRON RADIO & ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

HYTRON HY69

R-F Power Amplifier and Oscillator Class C Telegraphy and Frequency Modulation

Key-down Conditions per Tube without Amplitude Modulation Maximum Ratings, Absolute Values

D-c plate potential	600 max	volts
D-c screen grid potential	300 max	volts
D-c control grid bias	-200 max	volts
D-c plate current	100 max	ma
D-c control grid current	7 max	ma
Peak positive r-f control grid potential	100 max	volts
D-c plate input power	60 max	watts
D-c screen grid input power	5 max	watts
Plate dissipation	30 max	watts

Typical Operation — Average Characteristics

A-c filament potential ϕ	6.0	6.0	6.0	volts
D-c plate potential	400	500	600	volts
D-c screen grid potential	250	250	250	volts
D-c control grid bias #	(a) -100	-100	-100	volts
	(b) 17000	17000	17000	ohms
	(c) 850	850	850	ohms
Peak r-f control grid potential	170	170	170	volts
D-c plate current	100	100	100	ma
D-c screen grid current	15	12.5	12.5	ma
D-c control grid current	6	6	6	ma
Control grid driving power (approx.)	1	1	1	watt
Plate power output (approx.) Δ	24	33	42	watts

Plate and Screen Grid Amplitude Modulated R. F. Power Amplifier — Class C Telephony

Carrier conditions for use with a maximum modulation percentage of 100

Maximum Ratings, Absolute Values

D-c plate potential	600 max	volts
D-c screen grid potential	300 max	volts
D-c control grid bias	-200 max	volts
D-c plate current	100 max	ma
D-c control grid current	7 max	ma
Peak positive r-f control grid potential	100 max	volts
D-c plate input power $\dagger$	60 max	watts
D-c screen grid input power $\dagger$	3.3 max	watts
Plate dissipation $\dagger$	25 max	watts

Typical Operation — Average Characteristics

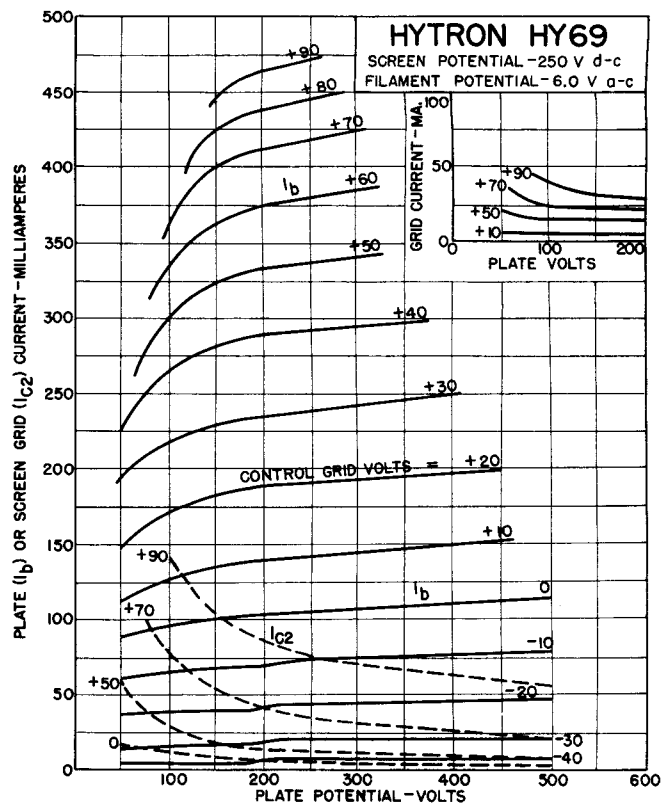
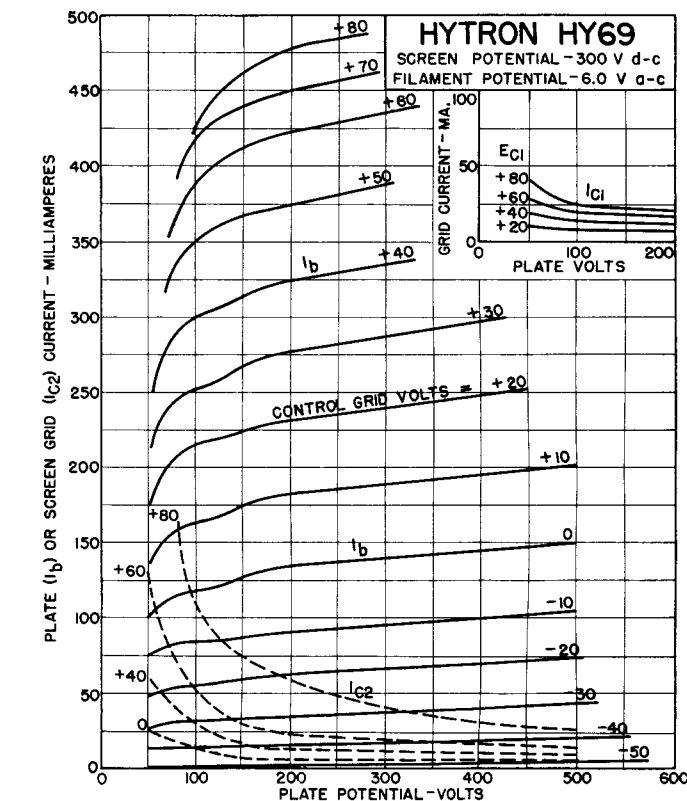
A-c filament potential ϕ	6.0	6.0	volts
D-c plate potential	400	500	volts
D-c screen grid potential	250	250	volts
D-c control grid bias #	(a) -100	-100	volts
	(b) 18000	18000	ohms
	(c) 1000	1000	ohms
Peak r-f control grid potential	163	163	volts
D-c plate current	80	83	ma
D-c screen grid current	12.5	12.5	ma
Screen grid dropping resistor	12000	20000	ohms
D-c control grid current	5.5	5.5	ma
Control grid driving power (approx.)	0.9	0.9	watts
Plate power output (approx.) Δ	22.5	29	watts

NOTES

* The plate supply must be switched off before or simultaneously with the filament in all applications. When the HY69 is driven in r-f service by a tube with a slower heating filament, provision must be made so that plate and screen voltages are not applied without a protective bias on the tube until the driver tube gets to operating temperature.

When the filament is heated from a transformer with a nominal 6.3 volt output, the filament connections may be made with small wire to introduce the necessary drop of 0.3 volts.

Tube conservation. When the standby period is generally less than 15 minutes, additional tube life can be obtained by reducing the filament potential to 80% of the nominal operating voltage. For longer periods of time, the filament should be turned off.



ϕ When d-c is used on the filament, the bias should be reduced approximately $3\frac{1}{2}$ volts and the grid return made to the negative leg of the filament.

Obtained from (a) fixed supply (b) control grid resistor (c) cathode resistor, or by combination of methods.

ψ Averaged over any a-f cycle of sine wave form.

$\dagger$ When modulated 100% with a sine wave, the average power increases by 50%. With a complex wave form, such as is produced by speech or music, the average power increases approximately 20% to 25%.

Δ "Plate power output" includes circuit losses and r-f radiation losses as well as useful power delivered to the load.

BANTAM JR. SERIES

Type HY113 Triode



R. F. Oscillator or Detector

Filament Voltage.....1.4 volts
Filament Current.....70 ma.
Plate Voltage.....45 volts
Grid Voltage.....-4.5 volts
Plate Current.....0.4 ma.
Transconductance.....250 umhos.
Amp. Factor 6.3
Plate Resistance.....25,000 ohms

\$1.75 Net

Type HY115 Pentode



High Gain, High Impedance, Audio Voltage Amplifier

Filament Voltage.....1.4 volts
Filament Current.....70 ma.
Plate Voltage.....45 volts
Screen Voltage.....22.5 volts
Grid Voltage-1.5 volts
Av. Plate Current.....0.03 ma.
Av. Screen Current.....0.008 ma.
Av. Amp. Factor.....300
Transconductance.....58.0 umhos.
Plate Resistance.....5.2 megohms

\$2.50 Net

Type HY125 Pentode



A. F. Power Output Amplifier

Filament Voltage.....1.4 volts
Filament Current.....70 ma.
Plate Voltage.....45 volts
Screen Voltage.....45 volts
Grid Voltage.....-3.0 volts
Av. Plate Current.....0.9 ma.
Av. Screen Current.....0.2 ma.
Av. Amp. Factor.....235
Load Impedance.....50,000 ohms
Power Output.....11.5 milliwatts

\$2.50 Net

9 - 39
Type HY 615

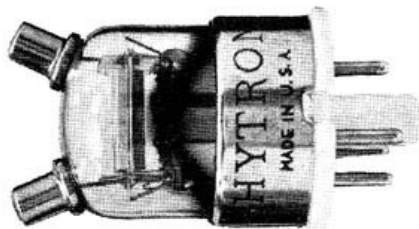
Engineering Bulletin

615 - 1

PHYSICAL DATA

Plate
Grid
Bulb
Base
Insulation
Plate Lead
Grid Lead
Max. Overall Length
Max. Overall Diameter
Net Weight

Processed Nickel
Molybdenum-Nickel
T-9
Special Octal 5 Pin
Ceramic
Metal Top Cap
Metal Top Cap
2-7/16"
1-5/16"
1-1/8 oz.



ELECTRICAL CHARACTERISTICS

Heater Voltage
(A.C. or D.C.)
Heater Current
D.C. Plate Voltage
D.C. Plate Current
D.C. Grid Current
Amplification Factor
Mutual Conductance
Plate Resistance
Plate Dissipation

6.3 volts
0.15 amp.
300 volts max.
20 ma. max.
4 ma. max.
22
2200 ohms
10000 ohms
3.5 watts max.

(actual size)

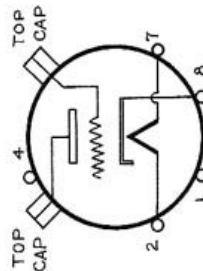
INTER-ELECTRODE CAPACITANCE

Grid to Plate
Grid to Cathode
Plate to Cathode

1.7 mmf.
1.4 mmf.
1.7 mmf.

BASE PIN CONNECTIONS

- 1 - Metal Shell
- 2 - Heater
- 4 - No Connection
- 7 - Heater
- 8 - Cathode
- Cap above #2 Pin - Plate
- Cap above #7 Pin - Grid



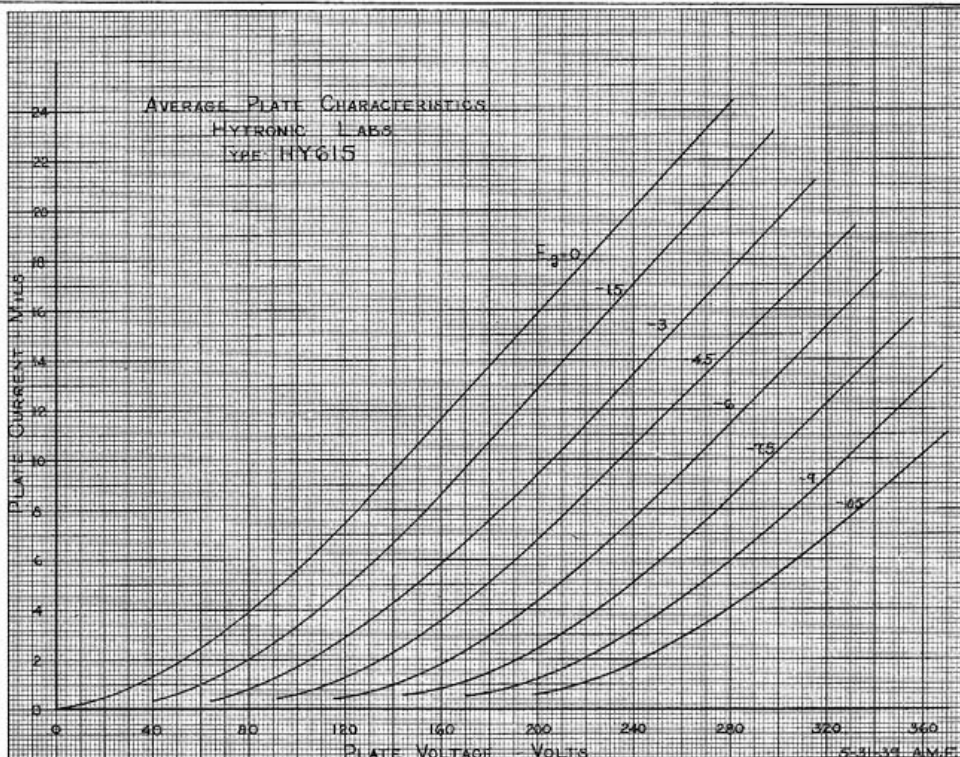
BOTTOM VIEW

ULTRA HIGH FREQUENCY OSCILLATOR, R. F. AMPLIFIER, DETECTOR

The Hytron HY615 Triode was designed for the primary purpose of making available for Amateur use, a tube affording high efficiency at ultra-high frequencies embodying the same rugged physical construction afforded by all high power tubes. The tube features short connection leads, relatively small internal elements resulting in low inter-electrode capacitances. The tube may be universally employed as an oscillator, amplifier or detector and will operate with extremely high efficiency in these services at frequencies up to 300 megacycles.

Product of HYTRON LABORATORIES Salem, Mass.

CONTINUOUS-DUTY RATINGS
USED IN THIS BULLETIN



DIVISION OF

HYTRON CORPORATION - SALEM, MASS., U.S.A.



GENERAL DESCRIPTION

The Hytron HY615 is recommended for use as a low power, ultra-high frequency oscillator in transmitters and super-heterodyne receivers. The HY615 will operate with remarkable stability and efficiency as a bias or grid leak detector and as a super-regenerative self-quenched detector in properly designed circuits.

It is important that all R.F. grounds such as shields, condensers and coil returns be grounded close to the cathode return of the tube to obtain full efficiency at ultra-high frequencies. All connection leads must be short and of heavy enough material to avoid losses due to R.F. resistance.

R. F. POWER AMPLIFIER AND OSCILLATOR CLASS "C"

(Plate Modulated or C.W.)

D.C. Plate Voltage	300	max. volts
D.C. Plate Current	20	max. ma.
D.C. Grid Current	4	max. ma.

Typical Operation:*

D.C. Plate Voltage	300	volts
Grid Voltage	-35	approx. volts
D.C. Plate Current**	20	approx. ma.
D.C. Grid Current**	1.4	approx. ma.
R.F. Power Output**	3.5	approx. watts

* At 240 megacycles. Only moderate reduction in this value will be found for frequencies as high as 300 megacycles. Above this frequency, the power output decreases as the frequency is increased.

**Subject to wide variations controlled by circuit constants and operating characteristics of associated input and output circuits.

DETECTOR OPERATION

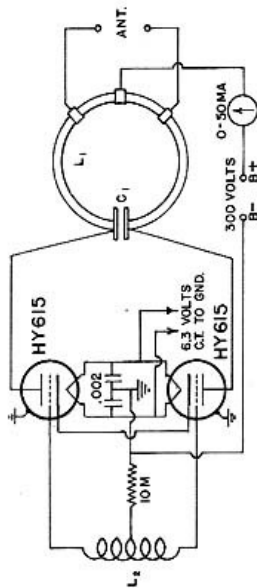
Typical Circuit Conditions:	Biased	Grid Leak
Plate Supply Voltage#	250	180 volts
Grid Voltage	-7 approx.	**# volts
Load Resistance	0.25	0.5 megohm
Plate Current	**#	**# ma.
Self-Bias Resistor	50,000 approx.	--- ohms
Grid Leak	---	1. to 5.0 megohms
Grid Condenser	---	0.00025 mfd.

#This is a plate supply voltage value. The voltage effective at plate will be plate supply voltage less voltage drop in load caused by plate current.

**Grid returns through grid leak to cathode.

**#Adjusted to 0.25 ma. approximate with no input signal.

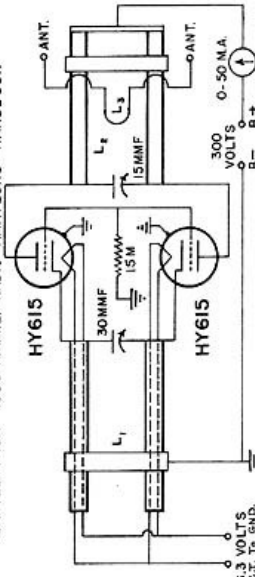
T.N.T. ULTRA-HIGH-FREQUENCY OSCILLATOR



224 MC } L_1 - $\frac{1}{4}$ " COPPER TUBING 2 $\frac{1}{4}$ " DIAMETER
 OPERATION } L_2 - 6 TURNS $\frac{1}{16}$ " WIRE $\frac{1}{8}$ " FORM - $1\frac{1}{2}$ " LONG C.T. "
 C_1 - $\frac{1}{32}$ " COPPER DISCS - 1" DIAMETER SPACED $\frac{1}{32}$ "

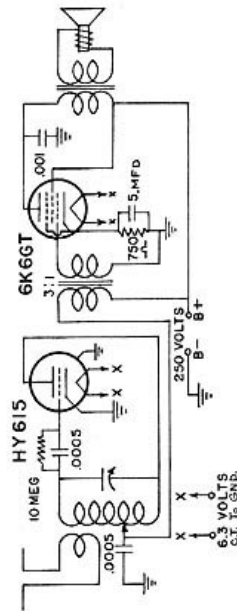
TUNED-PLATE TUNED-CATHODE OSCILLATOR

ADAPTED FROM 1939 A.R.R.L. RADIO AMATEURS' HANDBOOK



224 MC } L_1 - $\frac{1}{4}$ " O.D. COPPER TUBING 10" LONG SPACED $\frac{3}{16}$ "
 OPERATION } L_2 - PLATE LINE $\frac{1}{4}$ " O.D. TUBING 8" LONG SPACED $\frac{1}{16}$ "
 L_3 - ANTENNA LINK APPROX. 4 $\frac{1}{2}$ " LONG

ULTRA-HIGH-FREQUENCY RECEIVER USING SUPER-REGENERATIVE SELF-QUENCHING DETECTOR



ANTENNA COUPLING CAN BE ACCOMPLISHED THROUGH SEVERAL METHODS DEPENDING UPON FREQUENCY RANGE OF RECEIVER AS SHOWN ABOVE AND AT RIGHT

HY1269



R-F OSCILLATOR-AMPLIFIER FREQUENCY MULTIPLIER A-F AMPLIFIER and MODULATOR

HY1269

30-WATT
BEAM PENTODE
INSTANT-HEATING
FILAMENT

The HY1269 is an instant-heating filamentary type 30-watt beam pentode for use in r-f and a-f service. Its versatility permits its use in all stages — r-f and a-f — of an entire transmitter. In portable and mobile applications, its instant-heating filament can be turned off during standby periods. Thus a tremendous saving in battery drain (over that possible with cathode-type tubes) can be gained when transmitting time is a small percentage of total time. Because the HY1269 requires no neutralization in properly designed circuits and needs very little driving power, it is particularly adaptable to band-switching transmitters and exciters. Maximum ratings apply up to 60 megacycles. All ratings are for Continuous Commercial Service (CCS).

A-F Power Amplifier and Modulator — Class A₁

Maximum Ratings, Absolute Values

D-c plate potential	600 max volts
D-c screen grid potential	300 max volts
D-c plate input power	30 max watts
D-c screen grid input power	5 max watts
Plate dissipation	30 max watts

Typical Operation — Average Characteristics

A-c filament potential ϕ	12.0	12.0	12.0	12.0	12.0	volts
D-c plate potential	300	400	500	300	400	volts
D-c screen grid potential	250	250	250	300	300	volts
D-c control grid bias ϕ #	(a) -18	-18	-22	-25	-25	volts
	(b) ...	...	...	...	...	
	(c) 250	240	370	360	335	ohms
Peak a-f control grid potential	13	13	17	18	18	volts
Zero signal d-c plate current	70	75	60	70	75	ma
Max signal d-c plate current	70	75	63	70	75	ma
Zero signal d-c screen grid current	3	3	1	3	3	ma
Max signal d-c screen grid current	10	8	7	13	11	ma
Effective load resistance	5000	6000	7000	3000	5000	ohms
Max signal plate power output	8.5	10	15.5	11	15	watts
Total harmonic distortion	7	5	8	8	8	percent

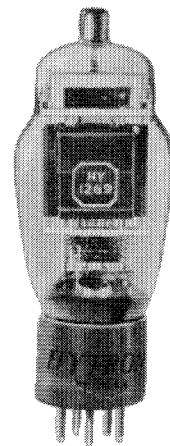
Typical Operation — Push-Pull Amplifier

Unless otherwise specified, the values are for two tubes:

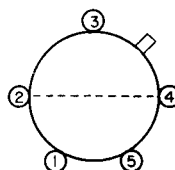
A-c filament potential ϕ	12.0	12.0	12.0	12.0	12.0	volts
D-c plate potential	300	400	500	300	400	volts
D-c screen grid potential	250	250	250	300	300	volts
D-c control grid bias ϕ #	(a) -18	-18	-22	-25	-25	volts
	(b) ...	...	...	...	...	
	(c) 125	120	185	180	170	ohms
Peak a-f control grid to control grid potential	32	32	36	45	45	volts
Zero signal d-c plate current	140	150	120	140	150	ma
Max signal d-c plate current	140	150	126	140	150	ma
Zero signal d-c screen grid current	6	6	2	6	6	ma
Max signal d-c screen grid current	20	16	14	26	22	ma
Effective load resistance (plate to plate)	10000	12000	14000	12000	10000	ohms
Max signal plate power output	17	20	31	22	30	watts
Total harmonic distortion	8	5	7	5	8	percent

General Characteristics

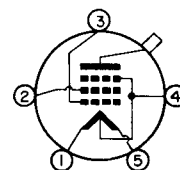
Filament	thoriated tungsten
Potential a-c or d-c	6.0 12.0 $\pm$ 5% volts
Current	3.2 1.6 amperes
Heating time (approx.)*	1/4 second
Transconductance (for $E_b = 600V$, $E_{c2} = 250V$, $E_f = 12.0V$ a-c, $E_{c1} = -25$)	3750 μ mhos
Average amplification factor (G_1 to G_2)	8
Direct Interelectrode Capacitances	
Grid to plate (max)	0.3 μ fd
Input	17 μ fd
Output	8.5 μ fd
Bulb	ST-16
Maximum overall length	5 3/4 inches
Maximum diameter	2 1/8 inches
Base	5-pin medium, low-loss phenolic
Cap	small metal
Mounting position	filament plane must be vertical



Filament Plane



Terminal Layout



bottom view of socket

Terminal Connections

1 — Filament	4 — Beam plates and filament c.t.
2 — Screen grid	5 — Filament
3 — Control grid	Cap — Plate

A-F Power Amplifier and Modulator — Class AB₂

Maximum Ratings, Absolute Values

D-c plate potential	600 max volts
D-c screen grid potential	300 max volts
Peak positive a-f control grid potential	100 max volts
Max signal d-c plate current ψ	120 max ma
Max signal plate input power ψ	72 max watts
Max signal screen grid input power ψ	5 max watts
Plate dissipation ψ	30 max watts

Typical Operation — Average Characteristics

Unless otherwise specified, the values are for two tubes:

A-c filament potential ϕ	12.0	12.0	12.0	volts
D-c plate potential	400	500	600	volts
D-c screen grid potential	250	250	250	volts
D-c control grid bias ϕ # (a)	-22.5	-22.5	-22.5	volts
Peak a-f control grid to control grid potential	105	109	113	volts
Zero signal d-c plate current	100	100	100	ma
Max signal d-c plate current	240	240	240	ma
Zero signal d-c screen grid current	3	3	3	ma
Max signal d-c screen grid current	12	15	18	ma
Max signal d-c control grid current	8	9	9	ma
Effective load resistance (plate to plate)	2800	4400	5800	ohms
Max signal control grid driving power	0.5	0.5	0.5	watts
Max signal plate power output	52	80	110	watts
Total harmonic distortion	4	5	6	percent

PREPARED BY COMMERCIAL ENGINEERING DEPT.

HYTRON RADIO & ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

HYTRON HY1269

R-F Power Amplifier and Oscillator Class C Telephony and Frequency Modulation Key down conditions per tube without amplitude modulation

Maximum Ratings, Absolute Values

D-c plate potential	750 max	volts
D-c screen grid potential	300 max	volts
D-c control grid bias	-200 max	volts
D-c plate current	120 max	ma
D-c control grid current	7 max	ma
Peak positive r-f control grid potential	100 max	volts
D-c plate input power	90 max	watts
D-c screen grid input power	5 max	watts
Plate dissipation	30 max	watts

Typical Operation — Average Characteristics

A-c filament potential ϕ	12.0	12.0	12.0	12.0	volts
D-c plate potential	400	500	600	750	volts
D-c screen grid potential	250	250	250	300	volts
D-c control grid bias $\ddagger$	(a)	-100	-100	-100	volts
	(b)	17000	17000	17000	ohms
	(c)	850	850	850	ohms
Peak r-f control grid potential	150	150	150	150	volts
D-c plate current	100	100	100	120	ma
D-c screen grid current	15	12.5	12.5	15	ma
D-c control grid current	6	6	6	6	ma
Control grid driving power (approx.)	0.9	0.9	0.9	0.9	watts
Plate power output (approx.) Δ	24	33	42	63	watts

Plate and Screen Grid Amplitude Modulated R-F Power Amplifier — Class C Telephony

Carrier conditions for use with a maximum modulation percentage of 100

Maximum Ratings, Absolute Values

D-c plate potential	600 max	volts
D-c screen grid potential	300 max	volts
D-c control grid bias	-200 max	volts
D-c plate current	100 max	ma
D-c control grid current	7 max	ma
Peak positive r-f control grid potential	100 max	volts
D-c plate input power +	60 max	watts
D-c screen grid input power +	3.3 max	watts
Plate dissipation +	20 max	watts

Typical Operation — Average Characteristics

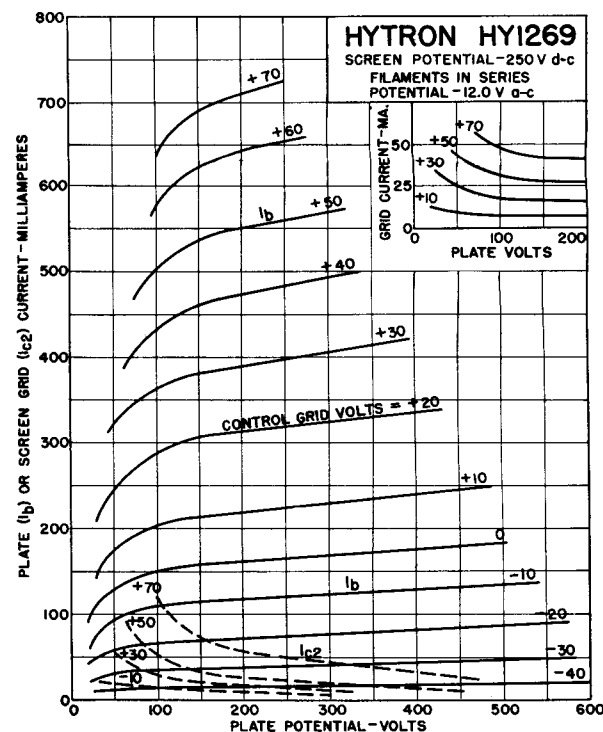
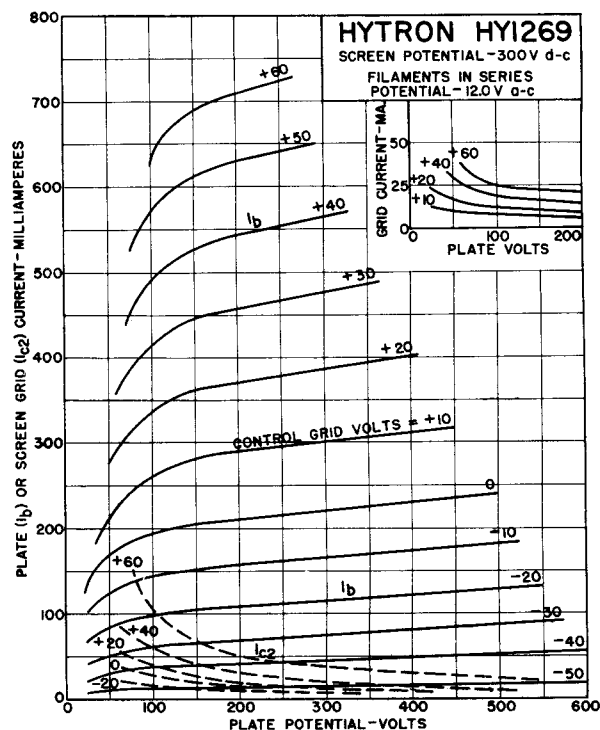
A-c filament potential ϕ	12.0	12.0	12.0	volts	
D-c plate potential	400	500	600	volts	
D-c screen potential	250	250	250	volts	
D-c control grid bias $\ddagger$	(a)	-100	-100	-100	volts
	(b)	18000	18000	17000	ohms
	(c)	1000	1000	850	ohms
Peak r-f control grid potential	140	140	150	volts	
D-c plate current	80	83	100	ma	
D-c screen grid current	12.5	12.5	12.5	ma	
Screen grid dropping resistor	12000	20000	28000	ohms	
D-c control grid current	5.5	5.5	6	ma	
Control grid driving power (approx.)	0.8	0.8	0.9	watts	
Plate power output (approx.) Δ	22.5	29	42	watts	

Notes

* The plate supply must be switched off before or simultaneously with the filament in all applications. When the HY1269 is driven in r-f service by a tube with a slower-heating filament, provision must be made so that plate and screen voltages of the HY1269 are not applied without a protective bias on the tube until the driver tube comes to operating temperature. When the paralleled filaments are heated from a transformer with a nominal 6.3-volt output, the filament connections may be made with small wire to introduce the necessary drop of 0.3 volts.

Tube conservation — When the standby period is generally less than 15 minutes, additional tube life can be obtained by reducing the filament potential during standby to 80% of the nominal operating voltage. For longer periods of standby time, the filament should be turned off.

ϕ The filament potential can be supplied by different methods, and when the various ways are used the bias voltage should be changed according to the following tabulation in order to duplicate the operating results as given in the data.



Filament Potential	Grid Return	Bias Change from Data Given
12.0 V a-c	To center-tap	None
12.0 V d-c	To center-tap	None
12.0 V d-c (see note)	To negative leg	Decrease 7 volts
6.0 V a-c	To center-tap	Decrease 1 volt
6.0 V d-c	To negative leg	Decrease 4.5 volts

Note: This type of operation does not permit the application of enough grid voltage to achieve maximum output in Class A₁ and Class AB₁ operation.

$\ddagger$ Obtained from (a) fixed supply, (b) control grid resistor, (c) cathode resistor, or by combination of methods.

ψ Averaged over any a-f cycle of sine wave form.

+ When modulated 100% with a sine wave, the average power increases by 50%. With a complex wave form, such as is produced by speech or music, the average power increases approximately 20% to 25%.

Δ "Plate power output" includes circuit losses and r-f radiation losses as well as useful power delivered to the load.



TRANSMITTING TUBE SERVICE REPORT FORM

Hytron tubes are guaranteed to be free from mechanical and electrical defects. If you experience difficulties with a Hytron transmitting or special purpose tube, return it, along with this form, through your jobber. If this is not possible, send this form and your request for permission to return the tube directly to the factory. **No adjustment will be made on tubes not accompanied by this form.**

All tubes must be returned via Railway express — PREPAID. Do not use parcel post. We assume no responsibility for breakage enroute to the factory. A tube damaged in transit to you should be turned over to the carrier with your claim. Returned tubes are sometimes broken down for minute examination; it may not be possible to return them to you. Tubes held over thirty days are destroyed.

FILL OUT, GIVING COMPLETE INFORMATION:

Tube Type _____ Serial No. _____ Date Purchased _____

From Whom Purchased _____

Date First Used _____ Date of Failure _____

TYPE OF SERVICE (Check one): R-F Amplifier _____ Modulator _____ Oscillator _____

Frequency Multiplier _____ Diathermy _____ Other (Specify) _____

OPERATING CONDITIONS:

Plate Potential _____ v

Filament Potential—key up _____ v

Screen Potential _____ v

Filament Potential—key down _____ v

Plate Current _____ ma

Bias - Fixed _____ v

Grid Current _____ ma

Bias - Resistor _____ ohms

Screen Current _____ ma

Type of Modulation _____

Number of hours in service with filament voltage only _____

Number of hours in service with all voltages applied _____

Kind of plate voltage (Check one) D-C _____ RAC _____ A-C _____

Frequency at which tube was operated _____ megacycles

Make and model number of equipment in which tube was used _____

Show circuit on reverse side of this sheet, giving values of circuit components.

REASON FOR RETURN — Also explain what happened at time of tube failure.

Customer's Name _____ Call Letters _____

Street Address _____ City _____ State _____

HYTRON RADIO & ELECTRONICS CORP., SALEM, MASS., U. S. A.