8164
3-1000Z

TECHNICAL DATA

HIGH-MU
POWER TRIODE

The EIMAC 8164/3-1000Z is a compact power triode intended to be used as a zero-bias Class-B amplifier in audio or radio-frequency applications. Operation with zero grid bias simplifies associated circuitry by eliminating the bias supply. In addition, grounded-grid operation is attractive since a power gain as high as twenty times can be obtained with the 8164/3-1000Z in a cathode driven circuit.



GENERAL CHARACTERISTICS[1]

ELECTRICAL

Filament: Thoriated Tungsten	
Voltage	7.5 ± 0.37 V
Current	20 A
Amplification Factor (Average)	200
Interelectrode Capacitance (Grounded Cathode)[2]	
Cin	17.0 pF
Cout	0.2 pF
Cgp	7.5 pF
Interelectrode Capacitance (Grounded Grid)[2]	
Cin	17.0 pF
Cout	7.5 pF
Cpk	0.2 pF
Frequency of Maximum Rating (CW)	110 MHz

1. Characteristics and operating values are based upon performance tests. These figures may change without notice as the result of additional data or product refinement. EIMAC Division of Varian should be consulted before using this information for final equipment design.

2. Capacitance values are for a cold tube as measured in a special shielded fixture in accordance with Electronic Industries Association Standard RS-191.

MECHANICAL

Base	5-Pin Special
Mounting Position	Vertical, base down or up
Cooling	Radiation and Forced Air
Recommended Heat-Dissipating Plate Connector	EIMAC HR-8
Recommended Air-System Socket	EIMAC SK-510
Recommended Air-System Chimney	EIMAC SK-516
Maximum Operating Temperatures:	
Plate Seal	225°C
Base Seals	200°C

(Effective 8-15-74) © 1962, 1964, 1967, 1968, 1974 by Varian Printed in U.S.A.

Maximum Overall Dimensions:

Height	7.875 In; 200.02 mm
Diameter	5.250 In; 133.35 mm
Net Weight	1.2 lb; 0.55 kg

RADIO FREQUENCY POWER AMPLIFIER

Class C, Grid Driven

MAXIMUM RATINGS:

DC PLATE VOLTAGE	6000	VOLTS
DC PLATE CURRENT	700	MA
GRID DISSIPATION	50	WATTS
PLATE DISSIPATION	1000	WATTS

TYPICAL OPERATION

Plate Voltage	3000	4500	6000	Vdc
Grid Voltage	-30[1]	-75	-100	Vdc
Plate Current	700	700	700	mAdc
Grid Current[2]	230	240	250	mAdc
Peak RF Grid Voltage[2]	107	200	230	v
Grid Driving Power[2]	27	48	57	W
Output Power[2]	1300	2250	3200	W

1. Operating bias may be wholly derived from grid current flowing through 130 ohm, 25 watt resistor.
2. Approximate value.

PLATE MODULATED RF AMPLIFIER

Class C

MAXIMUM RATINGS:

DC PLATE VOLTAGE	4500	VOLTS
DC PLATE CURRENT	550	MA
GRID DISSIPATION	50	WATTS
PLATE DISSIPATION	670	WATTS

1. Drive modulation is required with a high-mu triode.
2. Approximate value.

TYPICAL OPERATION[1]

Plate Voltage	4500	Vdc
Grid Voltage	-100	Vdc
Plate Current	500	mAdc
Grid Current[2]	170	mAdc
Drive Power[2]	35	W
Output Power (carrier)[2]	1765	W

RADIO-FREQUENCY LINEAR AMPLIFIER

Class B, Zero Bias, Cathode Driven

MAXIMUM RATINGS:

DC PLATE VOLTAGE	6000	VOLTS
DC PLATE CURRENT	800	MA
GRID DISSIPATION	50	WATTS
PLATE DISSIPATION	1000	WATTS

1. Approximate value.
2. Referenced against one tone of a two-equal tone signal.

TYPICAL OPERATION

Plate Voltage	2500	3000 Vdc
Zero-Signal Plate Current[1]	162	240 mAdc
Max. Signal Plate Current	800	670 mAdc
Max. Signal Grid Current[1]	260	220 mAdc
Max. Signal Drive Power[1]	100	47 W
Plate Load Impedance	1760	2650 ohms
Nominal Cathode Impedance	65	67 ohms
Plate Output Power[1]	1050	1080 W
Intermodulation Distortion[2]		
Products: 3rd Order	-32	-29 dB
5th Order	-39	-37 dB

AUDIO FREQUENCY AMPLIFIER OR MODULATOR

Class B

MAXIMUM RATINGS (per tube):

DC PLATE VOLTAGE	6000	VOLTS
DC PLATE CURRENT	800	MA
PLATE DISSIPATION	1000	WATTS
GRID DISSIPATION	50	WATTS

1. Approximate Value. Adjust to provide stated zero-signal plate current.
2. Approximate value.

TYPICAL OPERATION
(Sinusoidal Wave, Two Tubes, Grid Driven)

Plate Voltage	3000	5000 Vdc
Grid Voltage[1]	0	-13 Vdc
Zero-Signal Plate Current	350	200 mAdc
Max. Signal Plate Current	1450	1000 mAdc
Max. Signal Grid Current[2]	485	310 mAdc
Driving Power[2]	48	28 W
Peak AF Driving Voltage[2]	100	90 v
Load Resistance Plate to Plate	3940	10,200 ohms
Max. Sig. Plate Output Power[2]	2540	3560 W

RANGE VALUES FOR EQUIPMENT DESIGN:

	Min.	Max.	
Filament Current, at 7.5 volts	20.0	22.7	A
Zero Bias Plate Current (E_b = 3000 Vdc)	160	260	mAdc
Cut-Off Voltage (E_b = 3000 Vdc; I_b = 1.0 mAdc)	---	-24.0	Vdc
Interelectrode Capacitance (Grounded Cathode Connection)[1]			
Cin	15.0	19.0	pF
Cout	---	0.30	pF
Cgp	6.0	9.0	pF
Interelectrode Capacitance (Grounded Grid Connection)[1]			
Cin	15.0	19.0	pF
Cout	6.0	9.0	pF
Cpk	---	0.30	pF

1. Capacitance values are for a cold tube as measured in a special shielded fixture in accordance with Electronic Industries Association Standard RS-191.

APPLICATION

MOUNTING - The 3-1000Z must be operated vertically, base up or base down. A flexible connecting strap should be provided between the EIMAC HR-8 Heat Dissipating Connector on the plate terminal and the external plate circuit. The tube must be protected from severe vibration and shock. The EIMAC SK-510 socket or equivalent must be employed to prevent excess lateral pressure on base pins and seal of the tube.

COOLING - Forced-air cooling is required to maintain the base seals at a temperature below 200°C, and the plate seal at a temperature below 225°C. When using the EIMAC SK-510 Air-System Socket and SK-516 Chimney, a minimum air flow rate of 25 cubic feet per minute at a static pressure of approximately 0.43 inch of water, as measured at the socket at sea level, is required to provide adequate cooling at an inlet air temperature of 50°C. Above 30 megahertz the required air flow is increased to 35 cubic feet per minute at a static pressure of approximately 0.8 inch of water, as measured at the SK-510 socket. Cooling air must be supplied to the tube even when the filament alone is on during stand-by periods.

When a socket other than the SK-510 is used, provisions must be made for equivalent cooling of the base, the envelope, and the plate seal. In all cases air flow rates in excess of the minimum requirements will prolong tube life.

FILAMENT OPERATION - The rated filament voltage for the 3-1000Z is 7.5 volts. Filament voltage, as measured at the socket, must be maintained within the range of 7.13 to 7.87 volts to obtain maximum tube life. Operation at reduced voltage decreases emission capability, but increases life expectancy.

INTERMODULATION DISTORTION - Typical Operating Conditions and Intermodulation Distortion Product values are derived from measurements made at 2 MHz and are referred to one tone of a two-tone test signal. As the driving signal is reduced below full peak envelope power, distortion products remain at, or better than, the indicated value.

CLASS C OPERATION - Although designed for Class B service, the 3-1000Z may be operated as a Class-C power amplifier or oscillator, or as a plate-modulated rf amplifier. The zero-bias characteristics can be used to advantage in Class C amplifiers by employing only grid leak bias. If driving power fails, plate dissipation is kept to a low level since the tube will operate at normal, static zero-bias conditions.

ZERO-BIAS OPERATION - Operating at zero-bias is not recommended with plate voltages over 3500 volts since plate dissipation may be exceeded. Similarly, the safety of zero-bias opera-

tion as mentioned above under "Class-C Operation" is not available at plate voltages above 3500 volts. Straight Class-C or Class-B operation is, of course, permissible up to 6000 volts where other ratings are not exceeded.

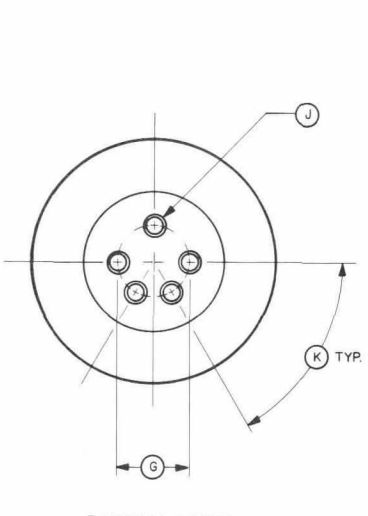
INPUT CIRCUIT - When the 3-1000Z is operated as a grounded-grid rf amplifier, the use of a resonant tank in the cathode circuit is recommended in order to obtain greatest linearity and power output. For best results with a single-ended amplifier it is suggested that the cathode tank circuit operate at a "Q" of five or more.

HIGH VOLTAGE - Normal operating voltages used with the 3-1000Z are deadly, and the equipment must be designed properly and operating precautions must be followed. Design all equipment so that no one can come in contact with high voltages. All equipment must include safety enclosures for high-voltage circuits and terminals, with interlock switches to open primary circuits of the power supply and to discharge high-voltage condensers whenever access doors are opened. Interlock switches must not be bypassed or "cheated" to allow operation with access doors open. Always remember that HIGH VOLTAGE CAN KILL.

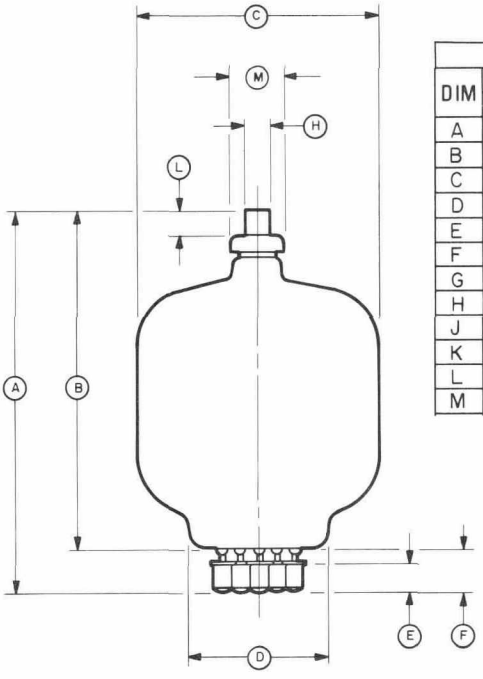
INTERELECTRODE CAPACITANCE - The actual internal interelectrode capacitance of a tube is influenced by many variables in most applications; such as stray capacitance to the chassis, capacitance added by the socket used, stray capacitance between tube terminals, and wiring effects. To control the actual capacitance values within the tube, as the key component involved, the industry and the Military Services use a standard test procedure as described in Electronic Industries Association Standard RS-191. This requires the use of specially constructed test fixtures which effectively shield all external tube leads from each other and eliminates any capacitance reading to "ground". The test is performed on a cold tube. Other factors being equal, controlling internal tube capacitance in this way normally assures good interchangeability of tubes over a period of time, even when the tube may be made by different manufacturers The capacitance values shown in the manufacturer's technical data, or test specifications, normally are taken in accordance with Standard RS-191.

The equipment designer is therefore cautioned to make allowance for the actual capacitance values which will exist in any normal application. Measurements should be taken with the socket and mounting which represent approximate final layout if capacitance values are highly significant in the design.

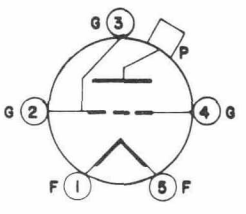
SPECIAL APPLICATIONS - If it is desired to operate these tubes under conditions widely different from those given here, write to Power Grid Tube Division, EIMAC Division of Varian, San Carlos, Calif. 94070 for information and recommendations.

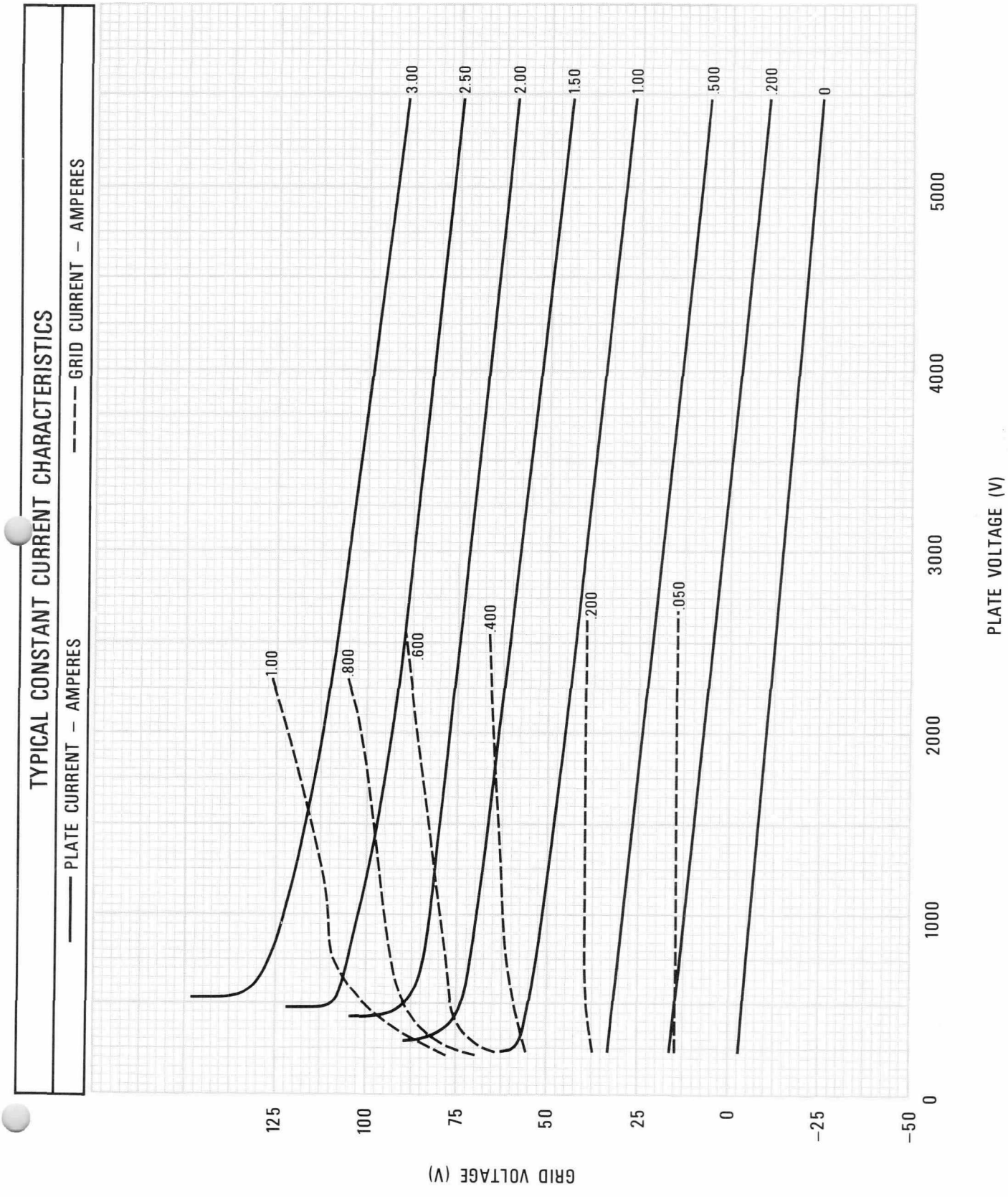


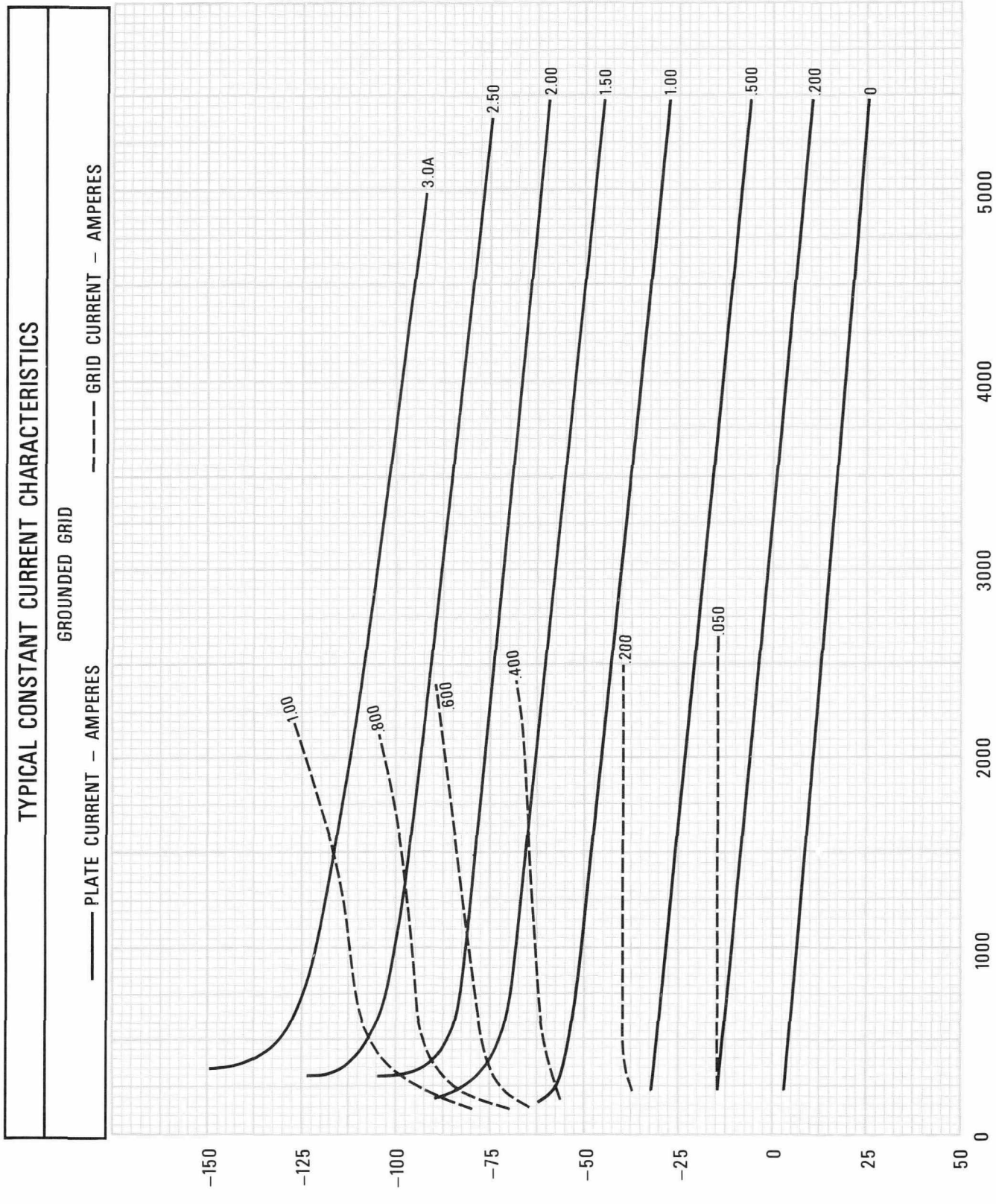
BOTTOM VIEW



DIMENSIONAL DATA						
DIM	INCHES			MILLIMETERS		
	MIN.	MAX.	REF.	MIN.	MAX.	REF.
A	7.500	7.875	- -	190.5	200.0	- -
B	6.812	7.187	- -	173.0	182.5	- -
C	- -	5.250	- -	- -	133.3	- -
D	3.062	3.187	- -	77.77	80.95	- -
E	0.531	0.656	- -	13.49	16.66	- -
F	0.718	0.843	- -	18.24	21.41	- -
G	- -	- -	1.500	- -	- -	38.10
H	0.559	0.573	- -	14.20	14.55	- -
J	0.371	0.377	- -	9.42	9.57	- -
K	- -	- -	60°	- -	- -	60°
L	0.484	- -	- -	12.29	- -	- -
M	- -	- -	1.125	- -	- -	28.57




TYPICAL CONSTANT CURRENT CHARACTERISTICS
PLATE CURRENT – AMPERES
GRID CURRENT – AMPERES
3.00
2.50
2.00
1.50
1.00
.500
.200
0
1.00
.800
.600
.400
.200
.050
125
100
75
50
25
0
-25
-50
0
1000
2000
3000
4000
5000
GRID VOLTAGE (V)
PLATE VOLTAGE (V)


TYPICAL CONSTANT CURRENT CHARACTERISTICS
GROUNDED GRID
PLATE CURRENT – AMPERES
GRID CURRENT – AMPERES
3.0A
2.50
2.00
1.50
1.00
.800
.600
.500
.400
.200
.100
.050
0
FILAMENT TO GRID VOLTAGE (V)
–150
–125
–100
–75
–50
–25
0
25
50
PLATE TO GRID VOLTAGE (V)
0
1000
2000
3000
4000
5000

EIMAC
Division of Varian
SAN CARLOS
CALIFORNIA

3C24

MEDIUM-MU TRIODE
•
MODULATOR
OSCILLATOR
AMPLIFIER

The Eimac 3C24 is a medium-mu, power triode intended for use as an amplifier, oscillator or modulator. It has a maximum plate dissipation rating of 25 watts and can be operated at its maximum ratings at frequencies up to 60 megacycles.

The 3C24 is cooled by radiation from the plate and by air circulation around the envelope. The plate operates at a visible red color at maximum rated dissipation.

This tube is identical to the 25T except that the grid terminal is located at the side of the envelope instead of the base.



GENERAL CHARACTERISTICS

ELECTRICAL

Filament: Thoriated tungsten	
Voltage	6.3 volts
Current	3.0 amperes
Amplification Factor (Average)	24
Direct Interelectrode Capacitances (Average)	
Grid-Plate	1.6 $\mu\mu$f
Grid-Filament	1.7 $\mu\mu$f
Plate-Filament	0.2 $\mu\mu$f
Transconductance (i_b=25 ma., E_b=1000 v.)	2500 μmhos
Frequency for Maximum Ratings	60 Mc.

MECHANICAL

Base	UX Small 4-pin
Basing - Fits E. F. Johnson Co. No. 122-224, National Co. No. XC-4 or CIR-4, or equivalent socket	
Mounting	Vertical, base down or up
Cooling	Convection and Radiation
Recommended Heat Dissipating Connector:	
Plate	HR-1
Grid	HR-1
Maximum Over-all Dimensions:	
Length	4.38 inches
Diameter	1.44 inches
Net Weight	1.5 ounces
Shipping Weight (Average)	1.0 pound

AUDIO FREQUENCY POWER AMPLIFIER AND MODULATOR

Class-B and AB

MAXIMUM RATINGS, PER TUBE

D-C PLATE VOLTAGE	2000 MAX. VOLTS
MAX-SIGNAL D-C PLATE CURRENT	75 MAX. MA.
PLATE DISSIPATION	25 MAX. WATTS
GRID DISSIPATION	7 MAX. WATTS

TYPICAL OPERATION, CLASS AB_2
Sinusoidal wave, two tubes unless otherwise specified

D-C Plate Voltage	750	1000	1250	Volts
D-C Grid Voltage (approx.)*	—20	—30	—42	Volts
Zero-Signal D-C Plate Current	43	32	24	Ma.
Max-Signal D-C Plate Current	127	127	130	Ma.
Effective Load, Plate-to-Plate	12,000	17,000	21,400	Ohms
Peak A-F Grid Input Voltage (per tube)	110	120	135	Volts
Max-Signal Peak Driving Power	5.5	6.0	6.8	Watts
Max-Signal Nominal Driving Power (approx.)	2.8	3.0	3.4	Watts
Max-Signal Plate Power Output	60	85	112	Watts

*Adjust to give stated zero-signal plate current.

PLATE MODULATED RADIO FREQUENCY AMPLIFIER

Class-C Telephony (Carrier conditions, per tube)

MAXIMUM RATINGS

D-C PLATE VOLTAGE	1600 MAX. VOLTS
D-C PLATE CURRENT	60 MAX. MA.
PLATE DISSIPATION	17 MAX. WATTS
GRID DISSIPATION	7 MAX. WATTS

TYPICAL OPERATION

D-C Plate Voltage	1000	1250	1600	Volts
D-C Plate Current	60	60	53	Ma.
D-C Grid Voltage	—120	—140	—170	Volts
D-C Grid Current	14	13	11	Ma.
Peak R-F Grid Input Voltage	235	255	280	Volts
Driving Power	3.3	3.3	3.1	Watts
Grid Dissipation	1.6	1.5	1.2	Watts
Plate Power Input	60	75	85	Watts
Plate Dissipation	13	15	17	Watts
Plate Power Output	47	60	68	Watts

The above figures show actual measured tube performance and do not allow for variations in circuit losses.

RADIO FREQUENCY POWER AMPLIFIER AND OSCILLATOR

Class-C Telegraphy or FM Telephony (Key-down conditions, per tube)

MAXIMUM RATINGS

D-C PLATE VOLTAGE	2000 MAX. VOLTS
D-C PLATE CURRENT	75 MAX. MA.
PLATE DISSIPATION	25 MAX. WATTS
GRID DISSIPATION	7 MAX. WATTS

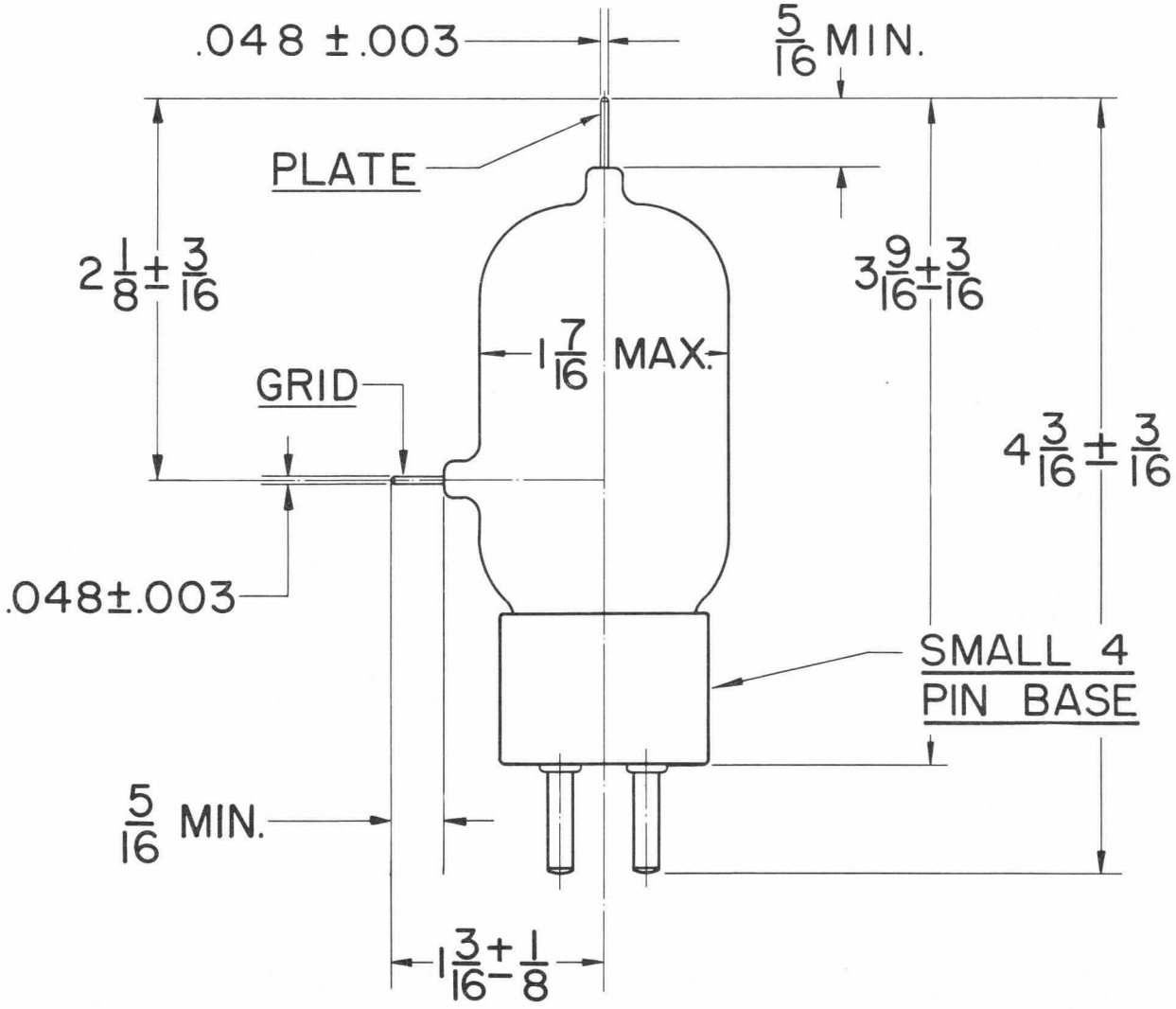
TYPICAL OPERATION

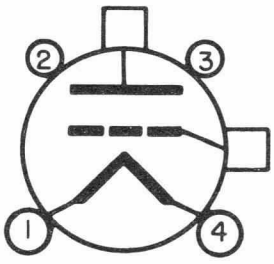
D-C Plate Voltage	1000	1500	2000	Volts
D-C Plate Current	72	67	63	Ma.
D-C Grid Voltage	—70	—95	—130	Volts
D-C Grid Current	9	13	18	Ma.
Peak R-F Grid Input Voltage	170	195	245	Volts
Driving Power	1.3	2.2	4.0	Watts
Grid Dissipation	.9	1.3	2.1	Watts
Plate Power Input	72	100	125	Watts
Plate Dissipation	25	25	25	Watts
Plate Power Output	47	75	100	Watts

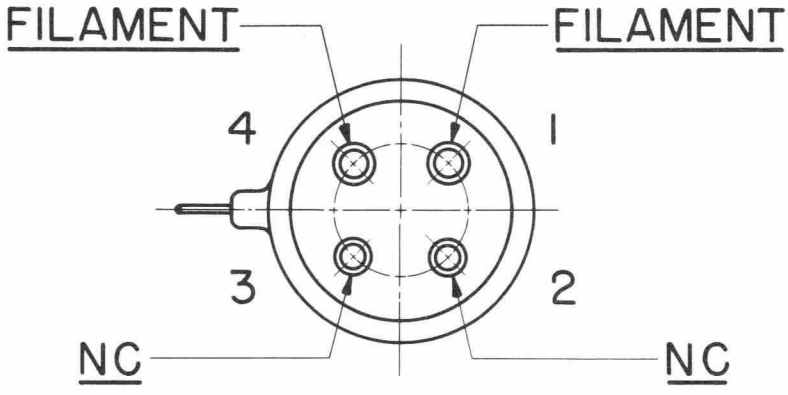
The above figures show actual measured tube performance and do not allow for variations in circuit losses.

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.048 ± .003
5/16 MIN.
PLATE
2 1/8 ± 3/16
3 9/16 ± 3/16
1 7/16 MAX.
GRID
4 3/16 ± 3/16
.048 ± .003
SMALL 4
PIN BASE
5/16 MIN.
1 3/16 + 1/8 − 1/8


2
3
1
4

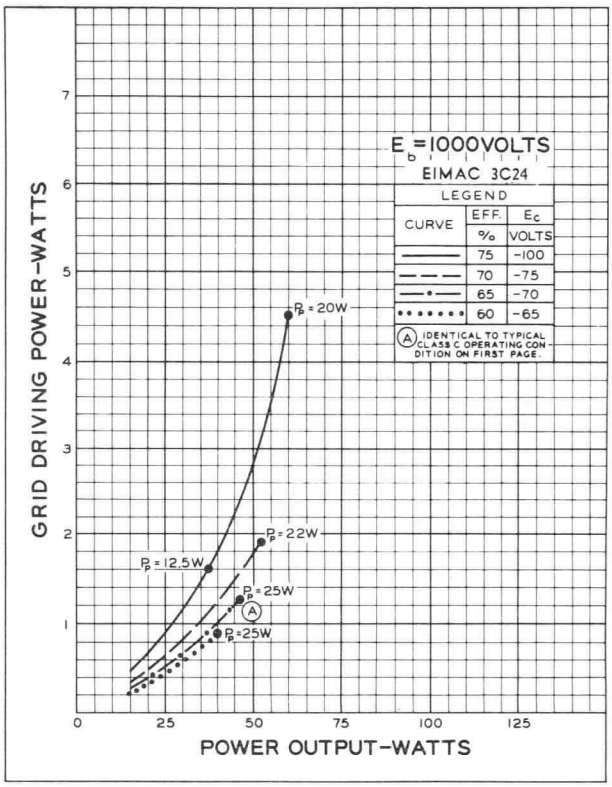

FILAMENT
FILAMENT
4
1
3
2
NC
NC

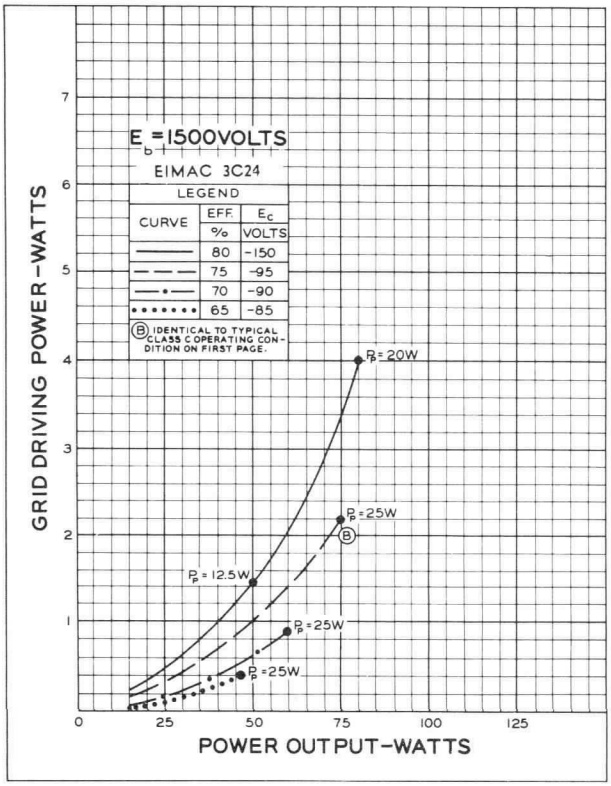
BOTTOM VIEW

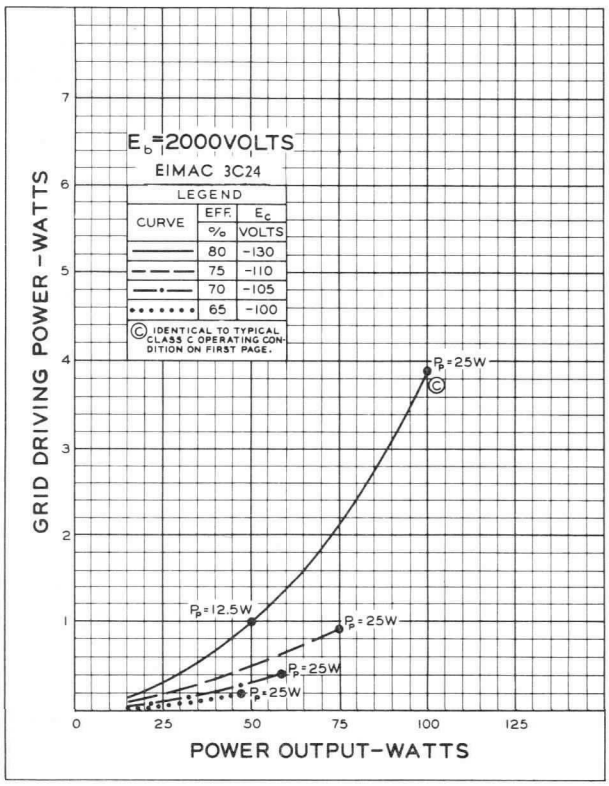
DRIVING POWER vs. POWER OUTPUT

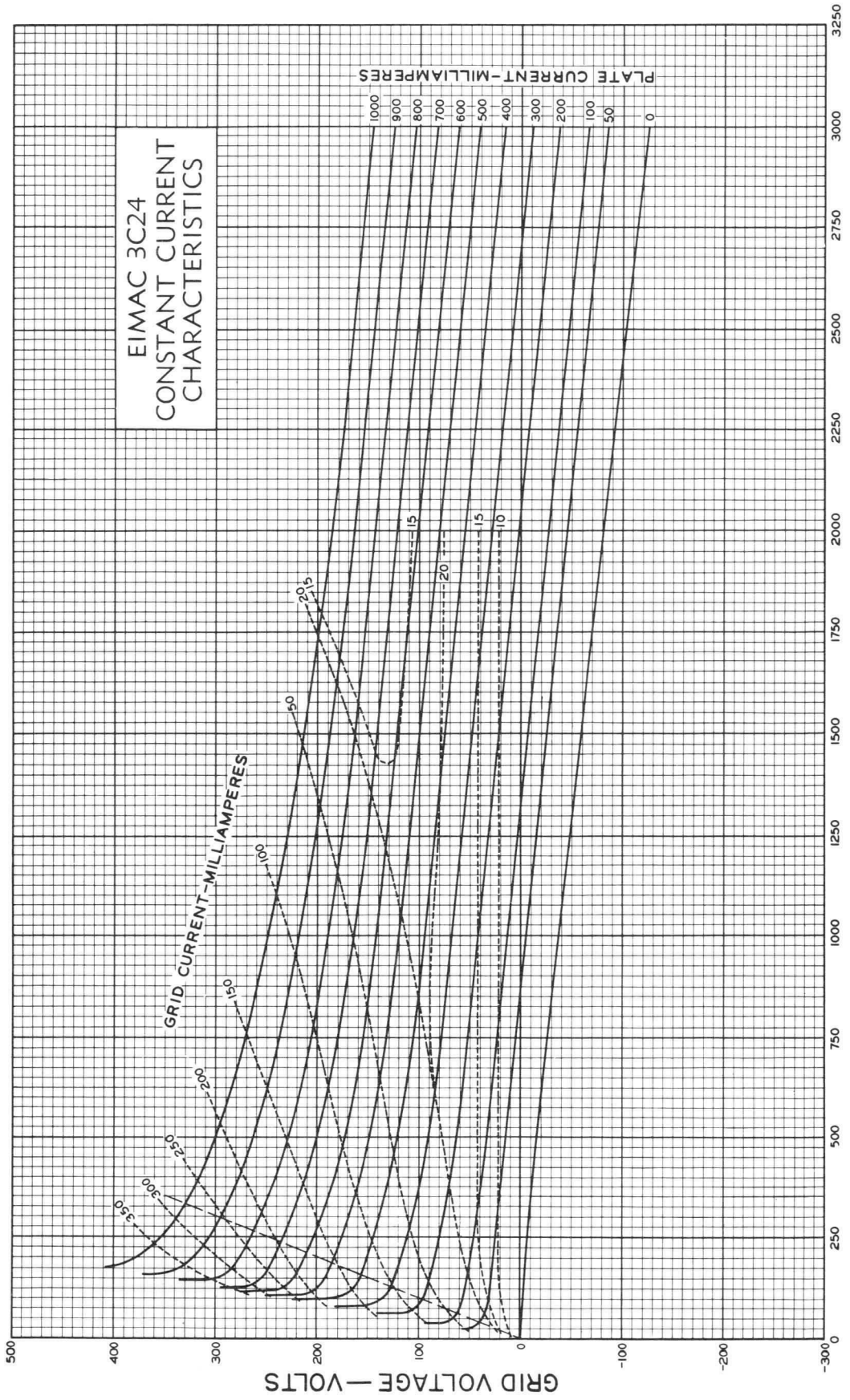
The three charts on this page show the relationship of plate efficiency, power output and grid driving power at plate voltages of 1000, 1500 and 2000 volts. These charts show combined grid and bias losses only. The driving power and power output figures do not include circuit losses. The plate dissipation in watts is indicated by P_p.

Points A, B, and C are identical to the typical Class C operating conditions shown on the first page under 1000, 1500, and 2000 volts respectively.








EIMAC 3C24
CONSTANT CURRENT
CHARACTERISTICS
PLATE CURRENT-MILLIAMPERES
1000
900
800
700
600
500
400
300
200
100
50
0
GRID CURRENT-MILLIAMPERES
350
300
250
200
150
100
50
20
15
10
5
GRID VOLTAGE — VOLTS
500
400
300
200
100
0
-100
-200
-300
PLATE VOLTAGE — VOLTS
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
2750
3000
3250

3CV1500A7

TECHNICAL DATA

HIGH-MU
POWER TRIODE

The 3CV1500A7 is an integral-boiler, ceramic/metal, vapor cooled zero-bias triode, intended for Class AB2 linear amplifier service in either grid driven or cathode driven configuration. Except for the anode dissipation rating, the 3CV1500A7 is electrically identical to the EIMAC 8283/3CX-1000A7.

The 3CV1500A7 is especially recommended when the ambient noise level must be reduced to a minimum, since high-pressure/high-volume forced-air cooling is not required.



GENERAL CHARACTERISTICS[1]

ELECTRICAL

Filament: Thoriated-tungsten Mesh		
Voltage	5.0 ± 0.25	V
Current, at 5.0 volts	30	A
Amplification Factor (average)	200	
Direct Interelectrode Capacitances (grounded filament) [2]		
Cin	32.0	pF
Cout	0.15	pF
Cgp	14.0	pF
Direct Interelectrode Capacitances (grounded grid) [2]		
Cin	32.0	pF
Cout	14.0	pF
Cpk	0.15	pF
Frequency of Maximum Rating:		
CW	220	MHz

1. Characteristics and operating values are based upon performance tests. These figures may change without notice as a result of additional data or product refinement. EIMAC Division of Varian should be consulted before using this information for final equipment design.

2. Capacitance values are for a cold tube, as measured in a shielded fixture in accordance with Electronic Industries Association Standard RS-191.

MECHANICAL

Maximum Overall Dimensions:	
Length	5.110 in; 129.8 mm
Diameter	3.355 in; 85.2 mm
Net Weight	2.38 lb; 1.08 kg
Operating Position	Vertical, base down
Maximum Operating Temperature:	
Ceramic/metal seals	250°C
Cooling	Vapor and Forced Air
Base	Special Breechlock
Recommended Socket	EIMAC SK-861

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RADIO FREQUENCY LINEAR AMPLIFIER CATHODE DRIVEN Class AB_2

MAXIMUM RATINGS:

DC PLATE VOLTAGE	3500	VOLTS
DC PLATE CURRENT	1.0	AMPERE
PLATE DISSIPATION	1500	WATTS
GRID DISSIPATION	45	WATTS

1. Adjust to specified zero-signal dc plate current.
2. The intermodulation distortion products are referenced against one tone of a two equal tone signal.
3. Approximate values.

TYPICAL OPERATION (Frequencies to 30 MHz)
Class AB2 Peak Envelope or Modulation Crest Conditions

Plate Voltage	2000	2500	3500	Vdc
Grid Voltage[1]	0	0	-12	Vdc
Zero-Signal Plate Current	238	305	129	mAdc
Single Tone Plate Current	875	800	857	mAdc
Two-Tone Plate Current	600	585	590	mAdc
Single-Tone Grid Current[3]	230	205	225	mAdc
Two-Tone Grid Current[3]	130	120	120	mAdc
Peak rf Drive Voltage[3]	80	74	110	v
Peak Driving Power	80	60	100	w
Plate Dissipation	800	830	940	W
Useful Output Power	940	1170	2060	W
Resonant Load Impedance	1100	1670	2300	Ω
Intermodulation Distortion Products[2]				
3rd Order	-29	-31	-31	db
5th Order	-37	-40	-39	db

AUDIO FREQUENCY POWER AMPLIFIER OR MODULATOR Class AB_2, Grid Driven(Sinusoidal Wave)

MAXIMUM RATINGS (Per Tube)

DC PLATE VOLTAGE[1]	3500	VOLTS
DC PLATE CURRENT	1.0	AMPERE
PLATE DISSIPATION	1500	WATTS
GRID DISSIPATION	45	WATTS

1. See zero-bias operation in Application Section.
2. Approximate value.
3. Per Tube.
4. Nominal drive power is one-half peak power.

TYPICAL OPERATION (Two Tubes)

Plate Voltage	2000	2500	Vdc
Grid Voltage	0	0	Vdc
Zero-Signal Plate Current	400	500	mAdc
Max. Signal Plate Current	2.0	2.0	Adc
Max. Signal Grid Current[2]	590	480	mAdc
Peak af Grid Voltage[3]	95	90	v
Peak Driving Power[4]	25	44	w
Plate Input Power	4000	5000	W
Max. Signal Plate Dissipation	1650	1900	W
Plate Output Power	2350	3100	W
Load Resistance (plate to plate)	1900	2580	Ω

NOTE: TYPICAL OPERATION data are obtained by measurement or calculation from published characteristic curves. Adjustment of the rf grid voltage to obtain the specified plate current at the specified bias, and plate voltages is assumed. If this procedure is followed, there will be little variation in output power when the tube is changed, even though there may be some variation in grid current. The grid current which results when the desired plate current is obtained is incidental and varies from tube to tube. These current variations cause no difficulty so long as the circuit maintains the correct voltage in the presence of the variations in current. If grid bias is obtained principally by means of a grid resistor, the resistor must be adjustable to obtain the required bias voltage when the correct rf grid voltage is applied.

RANGE VALUES FOR EQUIPMENT DESIGN

	Min.	Max.	
Heater: Current at 5.0 volts	28.0	33.0	A
Cathode Warmup Time	5	---	sec.
Interelectrode Capacitance[1] (grounded grid connection)			
Cin	29.0	35.0	pF
Cout	12.0	16.0	pF
Cpk	---	0.2	pF

1. Capacitance values are for a cold tube as measured in a special shielded fixture in accordance with Electronic Industries Association Standard RS-191.

APPLICATION

MECHANICAL

MOUNTING - The 3CV1500A7 must be mounted with its axis vertical, base down, with sufficient clearance for an insulated makeup water line to connect to the side of the integral anode boiler and an outlet steam line to attach to the top of the boiler. The use of the EIMAC socket SK-861 is recommended.

COOLING - Cooling is accomplished by the presence of distilled water at a controlled level in the integral anode boiler. The energy dissipated by the anode causes the water to boil at the anode surface, to be converted into steam and carried away to a condenser. This boiling action keeps the anode surface at approximately 100°C.

The water in the boiler must be maintained at the correct level, as shown on the outline drawing for the tube. This is normally accomplished with a special control unit, mounted with the correct relationship to the tube so as to maintain the water level in the tube boiler at the specified level. A condenser unit is used to convert the steam back to water, which is then returned to reservoir/control-box/boiler system.

Forced-air cooling of the tube base is required, with 15 cfm minimum directed across and through the socket and base of the tube. Air flow should be applied simultaneously with the application of electrode voltages, including the filament, and may be removed simultaneously with the removal of filament voltage.

ELECTRICAL

FILAMENT - Rated filament voltage for the 3CV1500A7 is 5.0 volts. Filament voltage, as measured at the socket, should be maintained at this value to obtain optimum performance and maximum tube life. In no case should it be allowed to deviate from 5.0 volts by more than plus or minus five per cent.

INPUT CIRCUIT - When the 3CV1500A7 is operated as grounded-grid rf amplifier, the use of a resonant tank in the cathode circuit is recommended to obtain greatest linearity and power output. For best results with a single-ended amplifier, it is suggested that the cathode tank circuit operate at a "Q" of five or more.

CLASS-C OPERATION - Although designed for Class-AB2 service, the 3CV1500A7 may be operated as a Class-C power amplifier or oscillator, or as a plate-modulated rf amplifier. The zero-bias characteristic can be used to advantage in Class-C amplifiers by employing only grid leak bias. If driving power fails, plate dissipation is kept to a low level since the tube will operate at normal, static zero-bias conditions.

ZERO-BIAS OPERATION - Operating at zero-bias is not recommended with plate voltages over 2500 volts since plate dissipation may be exceeded. Similarly, the safety of zero-bias operation as mentioned above under "Class-C Operation" is not available at plate voltages above 2500 volts. Straight Class-C or Class-AB2 operation is, of course, permissible up to 3500 volts where other ratings are not exceeded. Higher plate voltage may be used with the proper bias.

PLATE DISSIPATION - The plate dissipation of 1500 watts attainable through vapor cooling provides a large margin of safety in most applications. The rating may be exceeded during tuning for brief periods.

Since the tube anode is usually at high potential to ground, water and steam connections to the anode are made through insulating tubing. These insulating sections should be long enough so that column resistance is above 100,000 ohms per 1000 supply volts. It is essential that high purity water be used to minimize power loss and corrosion of metal fittings. Good distilled or deionized water will have a resistance of 1 to 2 megohms per cm3. Water should be discarded if resistivity falls to 50,000 ohms cm3.

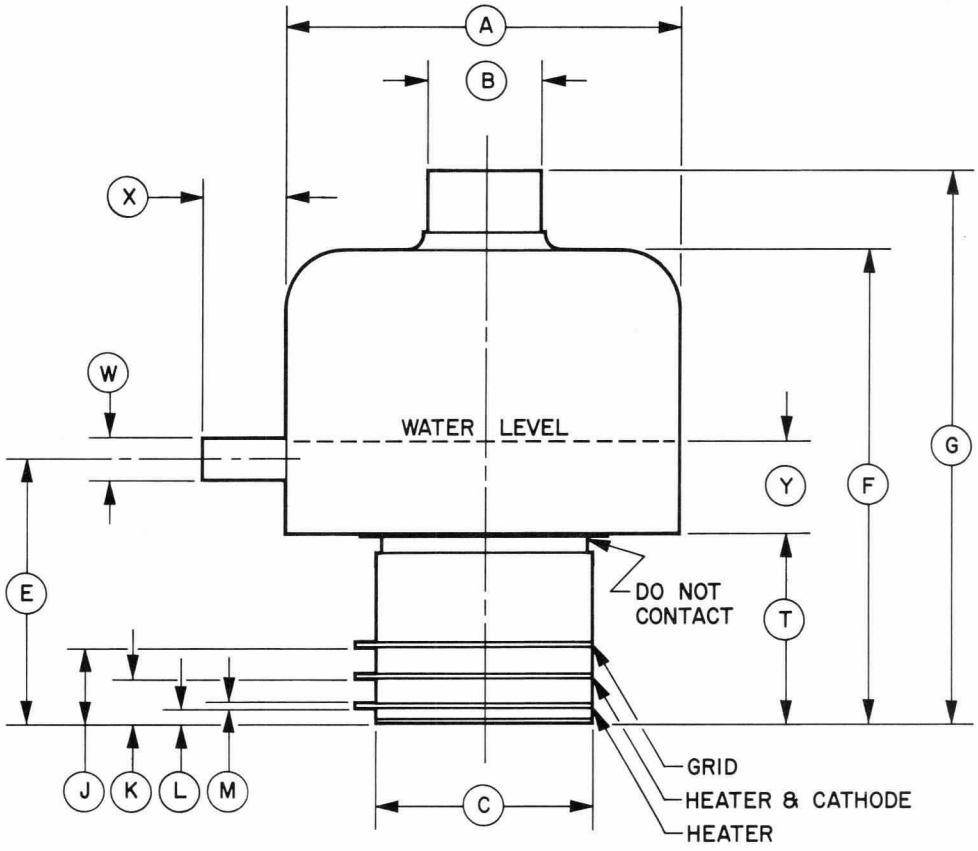
HIGH VOLTAGE - Normal operating voltages used with the 3CV1500A7 are deadly, and the equipment must be designed properly and operating precautions must be followed. Design all equipment so that no one can come in contact with high voltages. All equipment must include safety enclosures for high-voltage circuits and terminals, with interlock switches to open primary circuits of the power supply and to discharge high-voltage condensers whenever access doors are opened. Interlock switches must not be bypassed or "cheated" to allow operation with access doors open. Always remember that HIGH VOLTAGE CAN KILL.

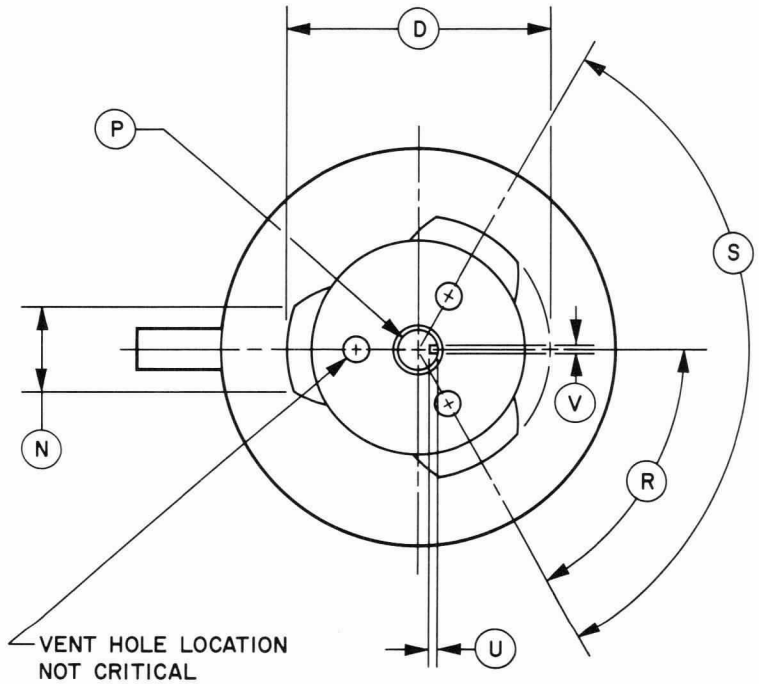
RADIO FREQUENCY RADIATION - Avoid exposure to strong rf fields even at relatively low frequency. Absorption of rf energy by human tissue is dependent on frequency. Under 30 MHz, most of the energy will pass completely through the human body with little attenuation or heating effect. Public health agencies are concerned with the hazard, however, even at these frequencies, and it is worth noting that some commercial dielectric heating units actually operate at frequencies as low as the 13 and 27 MHz bands.

INTERELECTRODE CAPACITANCE - The actual internal interelectrode capacitance of a tube is influenced by many variables in most applications, such as stray capacitance to the chassis, capacitance added by the socket used, stray capacitance between tube terminals, and wiring effects. To control the actual capacitance values within the tube, as the key component involved, the industry and the Military Services use a standard test procedure as described in Electronic Industries Association Standard RS-191. This requires the use of specially constructed test fixtures which effectively shield all external tube leads from each other and eliminates any capacitance reading to "ground". The test is performed on a cold tube. Other factors being equal, controlling internal tube capacitance in this way normally assures good interchangeability of tubes over a period of time, even when the tube may be made by different manufacturers. The capacitance values shown in the manufacturer's technical data, or test specifications, normally are taken in accordance with Standard RS-191.

The equipment designer is therefore cautioned to make allowance for the actual capacitance values which will exist in any normal application. Measurements should be taken with the socket and mounting which represent approximate final layout if capacitance values are highly significant in the design.

SPECIAL APPLICATION - If it is desired to operate this tube under conditions widely different from those listed here, write to Power Grid Tube Division, EIMAC Division of Varian, 301 Industrial Way, San Carlos, California 94070, for information and recommendations.

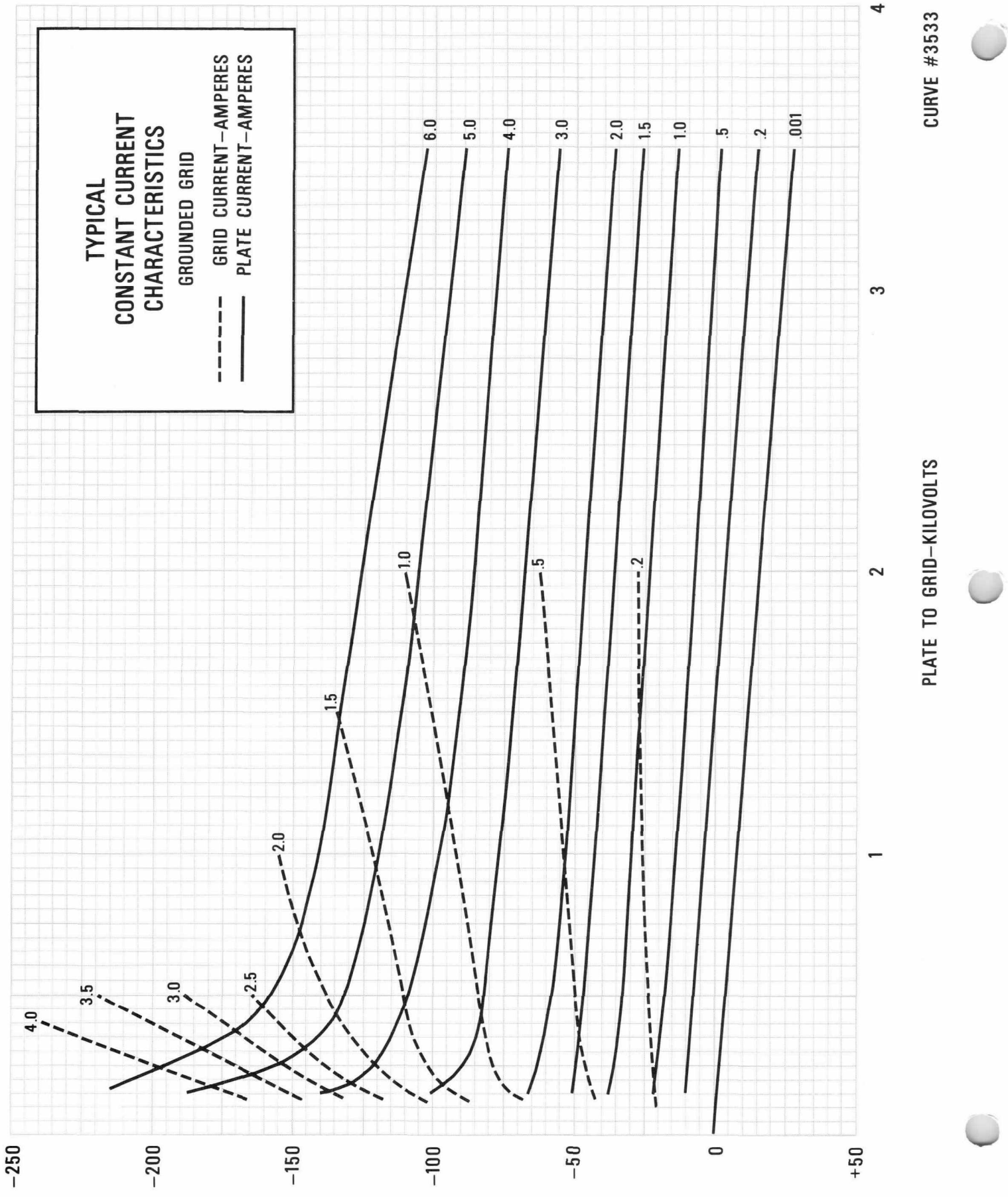




DIMENSIONAL DATA

DIM.	INCHES			MILLIMETERS		
	MIN.	MAX.	REF.	MIN.	MAX.	REF.
A	- -	- -	3.355	- -	- -	85.22
B	- -	- -	1.000	- -	- -	25.40
C	1.870	1.900	- -	47.50	48.26	- -
D	2.250	2.300	- -	57.15	58.42	- -
E	- -	- -	2.400	- -	- -	60.96
F	4.190	4.315	- -	106.43	109.60	- -
G	4.850	5.110	- -	123.19	129.79	- -
J	0.690	0.710	- -	17.53	18.03	- -
K	0.415	0.435	- -	10.54	11.05	- -
L	0.140	0.165	- -	3.57	4.19	- -
M	0.020	0.030	- -	0.50	0.76	- -
N	0.700	0.800	- -	17.78	20.32	- -
P	0.314	0.316	- -	7.98	8.03	- -
R	55°	65°	- -	55°	65°	- -
S	115°	125°	- -	115°	125°	- -
T	- -	- -	1.720	- -	- -	43.69
U	0.025	0.048	- -	0.64	1.22	- -
V	0.045	0.070	- -	1.14	1.78	- -
W	- -	- -	0.375	- -	- -	9.53
X	- -	- -	0.750	- -	- -	19.05
Y	0.500	1.000	- -	- -	- -	- -

NOTES:
1. REF. DIMENSIONS ARE FOR INFO. ONLY & ARE NOT REQUIRED FOR INSPECTION PURPOSES.


TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
GROUNDED GRID
GRID CURRENT–AMPERES
PLATE CURRENT–AMPERES
6.0
5.0
4.0
3.0
2.0
1.5
1.0
.5
.2
.001
4.0
3.5
3.0
2.5
2.0
1.5
1.0
.5
.2
−250
−200
−150
−100
−50
0
+50
1
2
3
4
CATHODE TO GRID–VOLTS
PLATE TO GRID–KILOVOLTS
CURVE #3533