8247
4PR125A

RADIAL-BEAM PULSE TETRODE MODULATOR OSCILLATOR AMPLIFIER

TECHNICAL DATA

The Eimac 8247/4PR125A is a pulse tetrode intended for use in pulse-modulator, pulsed-amplifier, and pulsed-oscillator service. This compact, high vacuum, radial-beam tetrode, incorporating a Pyrovac plate and non-emitting grids, is recommended for use in new equipments where high voltage, high current, or high duty factor is encountered.

Cooling of the tube is accomplished by radiation from the plate and by circulation of forced-air through the base and around the envelope. Cooling can be simplified by the use of the Eimac SK-410 Air-System Socket and the SK-406 Air Chimney.

GENERAL CHARACTERISTICS

ELECTRICAL

	Min.	Nom.	Max.	
Filament: Thoriated tungsten				
Voltage	-	5.0	-	volts
Current	6.0	-	7.0	amperes
Amplification Factor (Grid to Screen)	-	5.9	-	
Direct Interelectrode Capacitances, Grounded Cathode: †				
Grid-Plate	-	-	0.07	uuf
Input	9.2	-	12.4	uuf
Output	2.5	-	3.5	uuf
Transconductance (1_b = 50 ma)	-	2,450	-	umhos
Highest Frequency for Maximum Ratings	-	-	120	mc

MECHANICAL

Base	5-pin metal shell
Basing	See drawing
Recommend Socket	Eimac SK-410 Air-System Socket
Operating Position	Vertical, base down or up
Maximum Operating Temperatures:	
Base Seals	200°C
Plate Seal	170°C
Cooling	Radiation and forced-air
Recommended Heat-Dissipating Plate Connector	Eimac HR-6
Maximum Over-all Dimensions:	
Length	5.69 inches
Diameter	2.81 inches
Net Weight (tube only)	6.5 ounces
Shipping Weight	1.5 pounds

† in Shielded Fixture

PULSE MODULATOR SERVICE

MAXIMUM RATINGS	
DC PLATE VOLTAGE	18 MAX. KILOVOLTS
DC SCREEN VOLTAGE	2.0 MAX. KILOVOLTS
DC GRID VOLTAGE	-1.0 MAX. KILOVOLT
PEAK PLATE CURRENT	1.5 MAX. AMPERES
PLATE DISSIPATION (AVG.)	125 MAX. WATTS
SCREEN DISSIPATION (AVG.)	20 MAX. WATTS
GRID DISSIPATION (AVG.)	5 MAX. WATTS

TYPICAL OPERATION				
DC Plate Voltage	10	14	18	kilovolts
DC Screen Voltage	1.0	1.0	1.0	kilovolts
DC Grid Voltage	-245	-260	-275	volts
Pulse Plate Voltage	9.0	13.0	17.0	kilovolts
Peak Plate Current	1.0	1.0	1.0	ampere
Pulse Screen Current	0.2	0.2	0.2	ampere
Pulse Grid Current	25	25	25	ma
Pulse Pos. Grid Voltage	30	30	30	volts
Pulse Drive Power	6.9	7.3	7.7	watts
Pulse Plate Input Power	10	14	18	kilowatts
Pulse Plate Output Power	9	13	17	kilowatts
Duty	10	10	10	percent

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RADIO-FREQUENCY PLATE AND SCREEN-PULSED AMPLIFIER AND OSCILLATOR*

MAXIMUM RATINGS	
PEAK DC PLATE VOLTAGE	12 MAX. KILOVOLTS
DC SCREEN VOLTAGE	2.0 MAX. KILOVOLTS
DC GRID VOLTAGE	-1.0 MAX. KILOVOLT
PEAK CATHODE CURRENT**	2.5 MAX. AMPERES
PLATE DISSIPATION (AVG.)	125 MAX. WATTS
SCREEN DISSIPATION (AVG.)	20 MAX. WATTS
GRID DISSIPATION (AVG.)	5 MAX. WATTS

TYPICAL OPERATION				
Pulse Plate Voltage	8	10	12	kilovolts
Pulse Screen Voltage	1.0	1.0	1.0	kilovolt
DC Grid Voltage	-380	-390	-400	volts
Pulse Plate Current **	416	416	416	ma
Pulse Screen Current	36	36	36	ma
Pulse Grid Current	6	6	6	ma
Peak RF Grid Voltage	520	530	540	volts
Pulse Drive Power	3.12	3.18	3.25	watts
Pulse Plate Input Power	3.33	4.16	5.0	kilowatts
Pulse Plate Output Power	2.52	3.24	4.0	kilowatts
Duty	15	13	12	percent

*When used as a rf Plate-and Screen-Pulsed Amplifier the grid drive must also be pulsed to avoid overheating this element during the inter-pulse periods.

▶RADIO-FREQUENCY GRID-PULSED AMPLIFIER AND OSCILLATOR

MAXIMUM RATINGS	
DC PLATE VOLTAGE	9.0 MAX. KILOVOLTS
DC SCREEN VOLTAGE	2.0 MAX. KILOVOLTS
DC GRID VOLTAGE	-1.0 MAX. KILOVOLT.
PEAK CATHODE CURRENT**	2.5 MAX. AMPERES
PLATE DISSIPATION (AVG.)	125 MAX. WATTS
SCREEN DISSIPATION (AVG.)	20 MAX. WATTS
GRID DISSIPATION (AVG.)	5 MAX. WATTS

TYPICAL OPERATION				
DC Plate Voltage	5	7	9	kilovolts
DC Screen Voltage	1.0	1.0	1.0	kilovolts
DC Grid Voltage	-365	-375	-385	volts
Pulse Plate Current **	416	416	416	ma
Pulse Screen Current	36	36	36	ma
Pulse Grid Current	6	6	6	ma
Peak RF Grid Voltage	505	515	525	volts
Pulse Drive Power	3.0	3.1	3.2	watts
Pulse Plate Input Power	2.08	2.92	3.75	kilowatts
Pulse Plate Output Power	1.44	2.16	2.88	kilowatts
Duty	19	16	14	percent

**
The maximum peak cathode current rating refers to the instantaneous peak cathode current available. This rating is based on available emission throughout life of 80 milliamperes per watt of filament power. The pulse plate current data shown under the Typical Operation section refers to the dc plate current component during the pulse.

APPLICATION

MECHANICAL

Mounting— The 4PR125A must be operated vertically, base up or down. When the SK-410 Air-System Socket is used in conjunction with the SK-406 Air Chimney, the socket must be mounted to the under surface of the chassis to maintain proper air space between the plate seal and the chimney opening, otherwise plate seal cooling will be seriously impaired.

In the event the SK-410 Air-System Socket is not used, the socket must provide clearance for the glass tip-off which extends from the center of the tube. The metal tube-base shell should be grounded by means of suitable spring fingers.

Cooling— Adequate forced-air cooling must be provided to maintain base-seal and plate-seal temperatures below 200° C and 170° C, respectively. In all classes of operation it is recommended that a heat-radiating connector, the Eimac HR-6 or equivalent, be installed on the anode terminal, and that a socket and chimney be employed which provides for proper seal cooling. When the Eimac 4PR125A is operated at d-c or low frequencies in an Eimac SK-410 Air-System Socket, complete with SK-406 Air Chimney and HR-6 Heat Radiator, the minimum airflow requirements to maintain seal temperatures at 170° C in 50° C inlet air are tabulated:

	Sea Level		10,000 Feet	
Ave. Plate Dissipation (watts)	Air Flow (CFM)	Plenum Pressure Drop. (Inches of Water)	Air Flow (CFM)	Plenum Pressure Drop. (Inches of Water)
50	5.0	0.014	7.2	0.020
100	8.0	0.016	10.2	0.023
125	10.0	0.018	14.2	0.026

When the Eimac 4PR125A is used as a pulsed-amplifier or oscillator at frequencies above 30 Mc, additional cooling may be required to compensate for the effects of plate and base-seal heating caused by r-f charging currents and dielectric losses. Since the amount of seal heating varies with the particular application, it is suggested that the user monitor the seal temperatures to determine the adequacy of the cooling air.

Cooling air should be applied before or simultaneously with the application of filament voltage and may be removed simultaneously with filament voltage. In any questionable situation, the only criterion for adequate cooling is temperature. Tube temperature may be measured conveniently by using a temperature-sensitive paint.

▶ Indicates change from data sheet dated 7-15-62

ELECTRICAL

Filament Voltage— For maximum tube life the filament voltage, as measured directly at the filament pins, should be 5.0 volts. Variations in filament voltage must be kept within the range of 4.75 to 5.25 volts.

When the 4PR125A is utilized in pulse applications where high peak currents are demanded, filament voltage must be maintained at the rated value; the normally allowable five-percent variation in this voltage cannot be tolerated if the tube's peak-current capabilities are to be realized.

Element Dissipation—Under normal operating conditions, the average plate dissipation of the 4PR125A should not be allowed to exceed 125 watts. Dissipation in excess of this maximum rating is permissable for short periods of time, such as during tuning procedures.

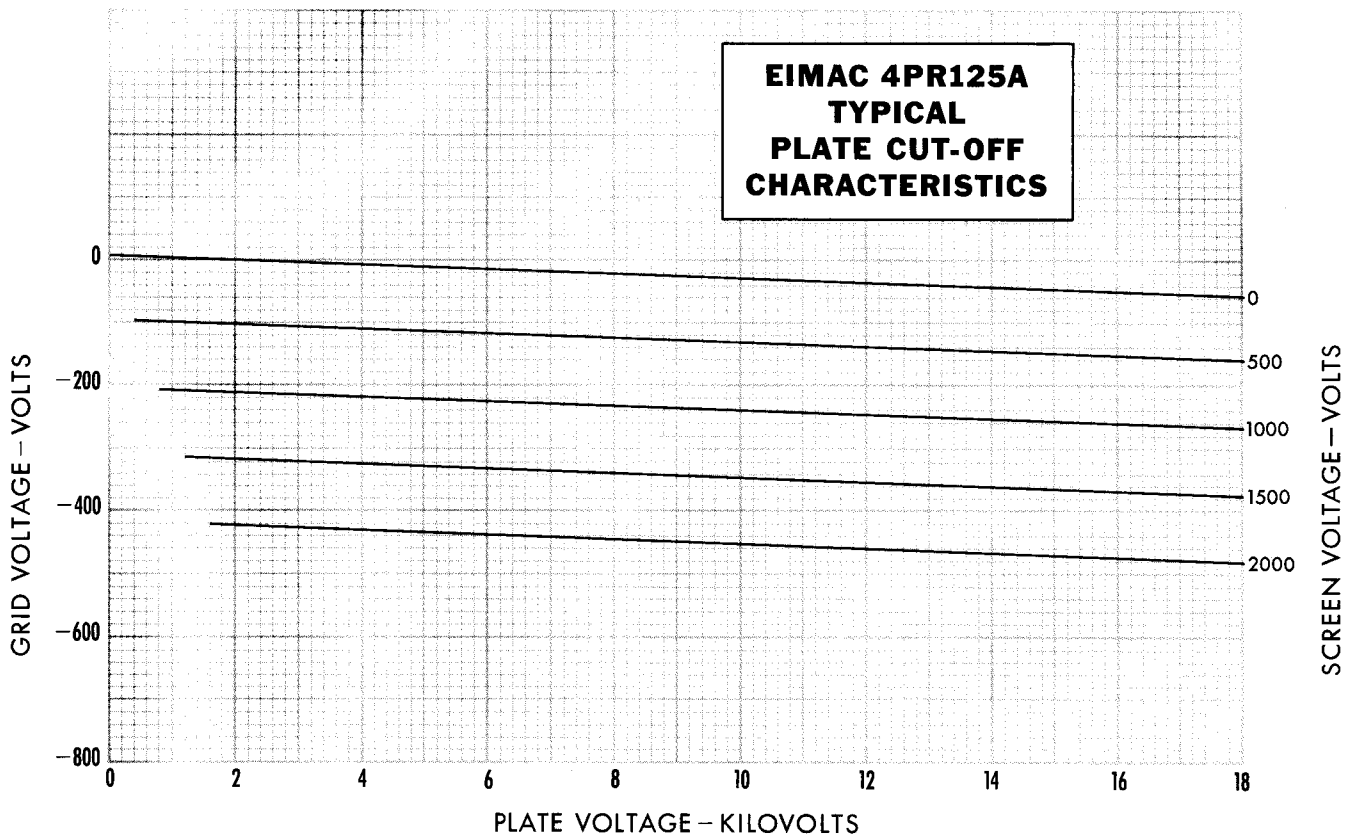
The average power dissipated by the screen-grid and the control-grid must not exceed 20 watts and 5 watts, respectively.

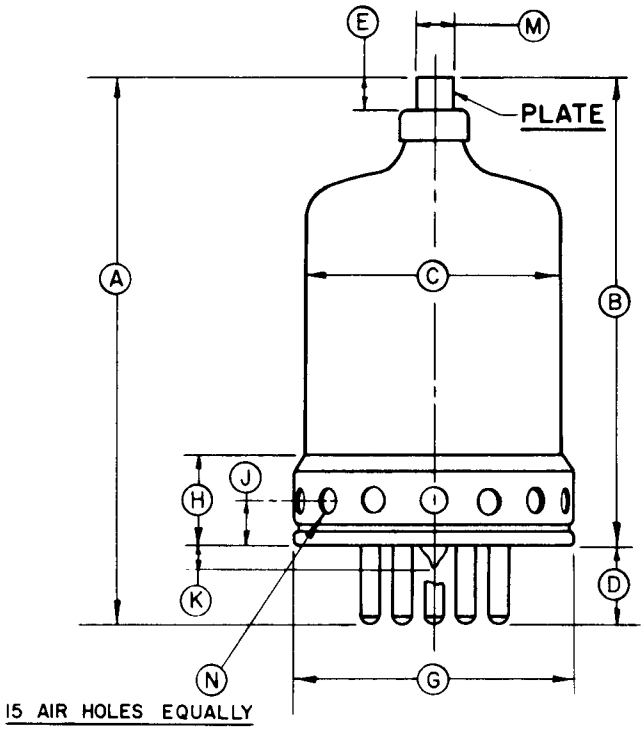
Cut-Off Characteristics— The Plate Current Cut-Off Characteristics of the 4PR125A are shown in the graph below. These curves indicate the value of negative grid voltage required to maintain a plate-current flow of 50 microamperes or less at the various plate and screen voltages noted. These curves were plotted from a "typical" tube whose electrical characteristics closely approximate the mean value in the tube test specification.

Each 4PR125A is tested to insure proper cut-off characteristics at maximum ratings. This cut-off test is made with a plate voltage of 18 KV, a screen voltage of 1.5 KV with the grid voltage adjusted to maintain a plate current of 10 microamperes. Under these test conditions the negative grid bias must not exceed 450 volts. Due to tube-to-tube variation this cut-off point will vary and the typical range can be expected to be between -370 volts and -445 volts.

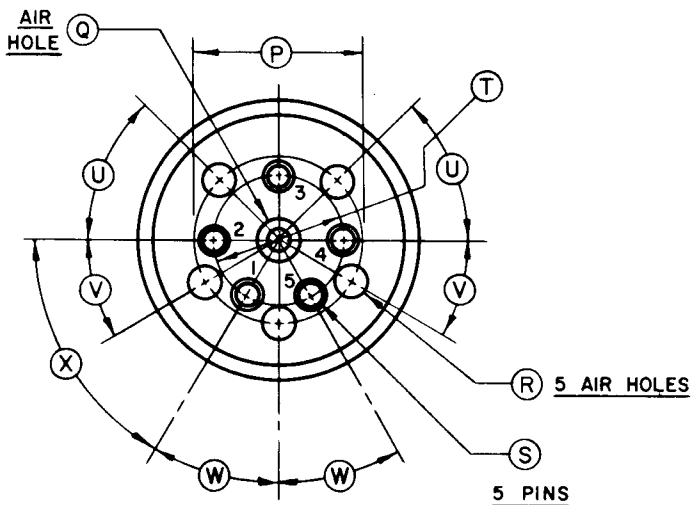
Pulse-Modulator Service— The data shown in the "Typical Operating" section of Pulse-Modulator Service was calculated assuming a rectangular plate voltage waveform, ignoring the effects of shunt capacity. In reality, the total shunt capacitance (including the output capacity of the tube, stray capacitance, etc.) affects the output wave form and can have considerable effect on plate dissipation. Since the actual plate waveform is not rectangular, even though the grid pulse is, additional power will be dissipated during the rise time and can, under some circumstances, be much greater than that dissipated during the remainder of the pulse. The total power dissipated is then the sum of the power dissipated during the rise time and the power dissipated during the remainder of the pulse.

Special Applications— If it is desired to operate this tube under conditions widely different from those given here write to Power Grid Tube Marketing, Eitel-McCullough, Inc., 301 Industrial Way, San Carlos, California, for information and recommendations.

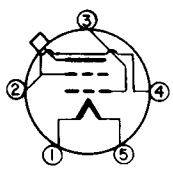


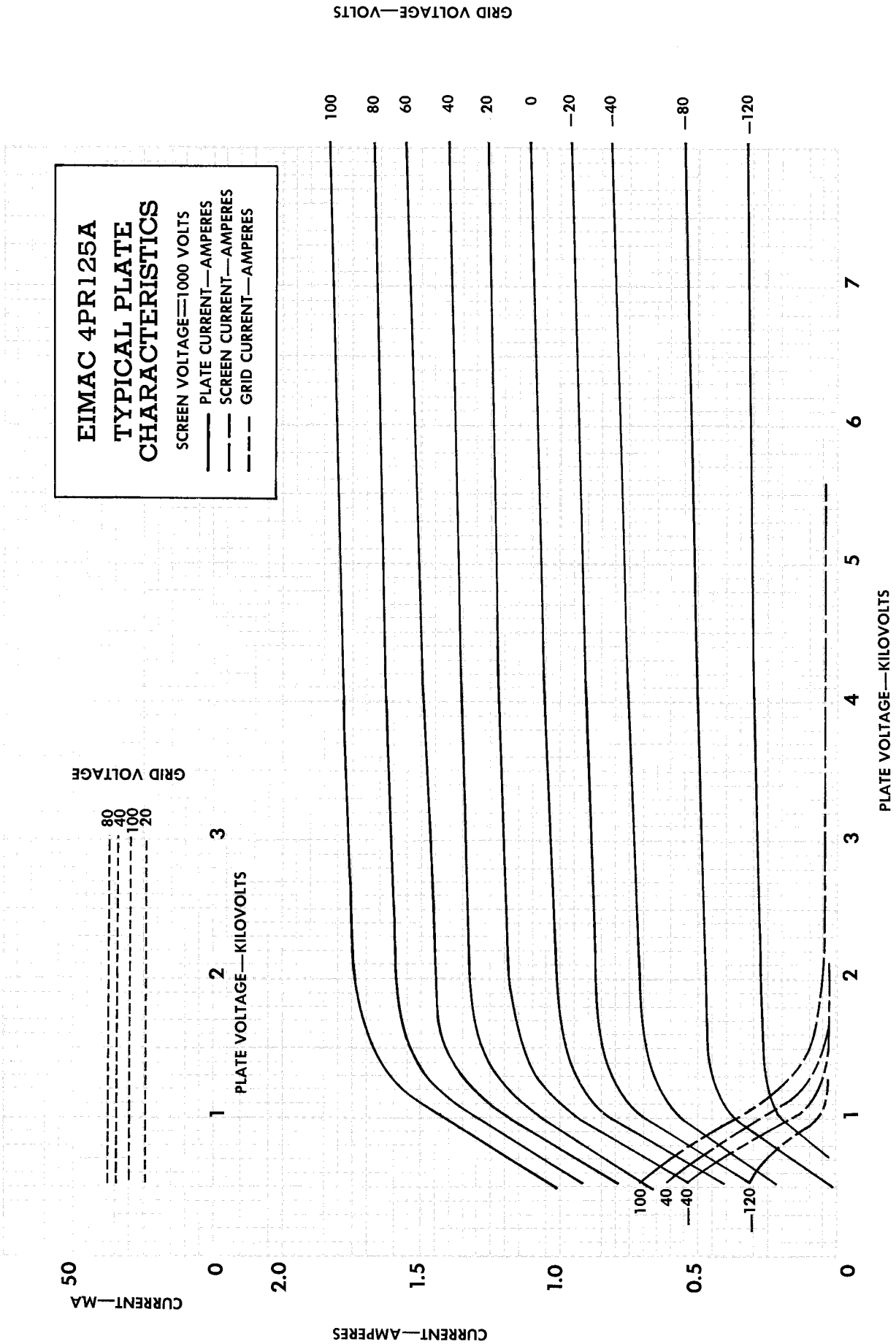


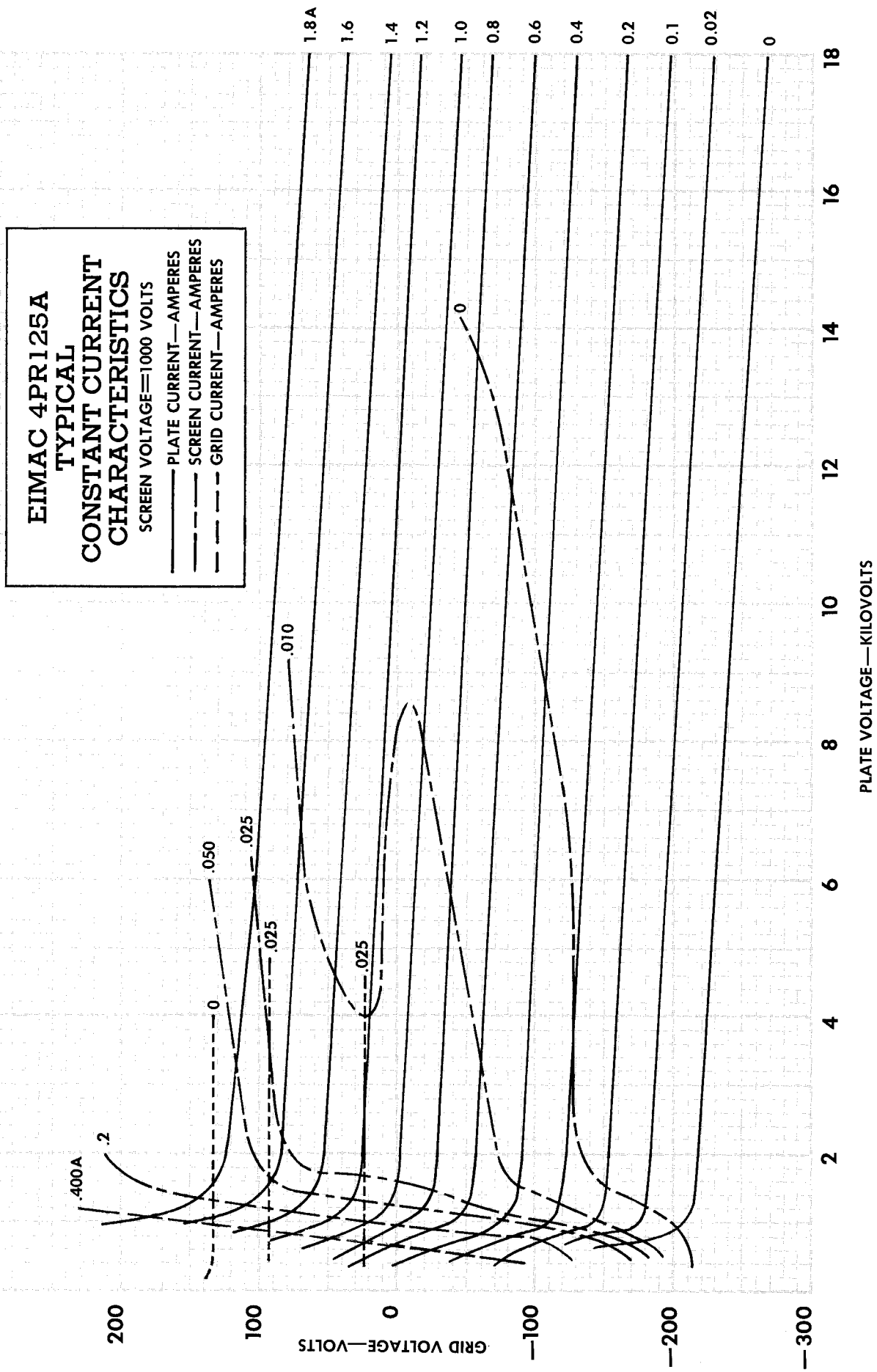
DIMENSIONS IN INCHES			
DIMENSIONAL DATA			
REF.	MIN.	MAX.	NOM.
A	5-3/16	5-11/16	5-7/16
B	4-7/16	4-15/16	4-11/16
C		2-5/8 D.	
D			3/4
E	21/64		
F		2-13/16 D.	
G		2-3/4 D.	
H		31/32	
J			7/16
K		1/4	
L			7/16
M	.350 D.	.365 D.	.360 D.
N			1/4 D.
P			1 5/8 D.
Q			1/2 D.
R			5/16 D.
S	.185 D.	.191 D.	.188 D.
T			1 1/4 D.
U			45°
V			30°
W			30°
X			60°



BOTTOM VIEW




EIMAC 4PR125A
TYPICAL PLATE
CHARACTERISTICS
SCREEN VOLTAGE=1000 VOLTS
PLATE CURRENT—AMPERES
SCREEN CURRENT—AMPERES
GRID CURRENT—AMPERES
GRID VOLTAGE—VOLTS
100
80
60
40
20
0
—20
—40
—80
—120
CURRENT—AMPERES
0
0.5
1.0
1.5
2.0
PLATE VOLTAGE—KILOVOLTS
0
1
2
3
4
5
6
7
100
40
—40
—120
GRID VOLTAGE
80
40
100
20
CURRENT—MA
50
0
PLATE VOLTAGE—KILOVOLTS
1
2
3


EIMAC 4PR125A
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
SCREEN VOLTAGE=1000 VOLTS
PLATE CURRENT—AMPERES
SCREEN CURRENT—AMPERES
GRID CURRENT—AMPERES
1.8A
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.1
0.02
0
.400A
.2
.050
.025
.010
.025
.025
0
200
100
0
—100
—200
—300
GRID VOLTAGE—VOLTS
2
4
6
8
10
12
14
16
18
PLATE VOLTAGE—KILOVOLTS