

# Eitel-McCULLOUGH, INC.

SAN BRUNO, CALIFORNIA

## 4E27A/5-125B

RADIAL-BEAM  
POWER PENTODE

MODULATOR  
OSCILLATOR  
AMPLIFIER

The Eimac 4E27A/5-125B is a power pentode intended for use as a modulator, oscillator or amplifier. The driving-power requirement is very low, and neutralization problems are simplified or eliminated entirely. The tube has a maximum plate-dissipation rating of 125 watts and a maximum plate voltage rating of 4000 volts at frequencies up to 75 Mc. Cooling is by convection and radiation. Type 4E27A/5-125B unilaterally replaces type 4E27.

The 4E27A/5-125B in class-C r-f service will deliver up to 375 watts plate power output with less than 2 watts driving power. It will deliver up to 75 watts of carrier for suppressor modulation.

Two 4E27A/5-125B's will deliver up to 300 watts maximum-signal plate power output in class AB<sub>1</sub> modulator service, 400 watts in class AB<sub>2</sub> with less than 1 watt driving power.

### GENERAL CHARACTERISTICS

#### ELECTRICAL

Filament: Thoriated tungsten	
Voltage	5.0 volts
Current	7.5 amperes
Grid-Screen Amplification Factor (Average)	5.0
Direct Interelectrode Capacitances (Average)	
Grid-Plate	0.08 $\mu\text{mfd}$
Input	10.5 $\mu\text{mfd}$
Output	4.7 $\mu\text{mfd}$
Transconductance ( $I_b=50\text{ma.}$ , $E_b=2500\text{v.}$ , $E_{c2}=500\text{v.}$ , $E_{c3}=0\text{v.}$ )	2150 $\mu\text{mhos}$
Highest Frequencies for Maximum Ratings	75 Mc.

#### MECHANICAL

Base	7-pin, metal shell
Connections	See drawing
Socket*	E. F. Johnson Co. No. 122-237, or equivalent
Mounting Position	Vertical, base down or up
Cooling	Convection and radiation
Recommended Heat Dissipating Plate Connector	Eimac HR-5
Maximum Over-All Dimensions:	
Length	6.19 inches
Diameter	2.75 inches
Net Weight (Average)	6.0 ounces
Shipping Weight	2.0 pounds

\*See "Cooling" under Application Notes.



Note: Typical operation data are based on conditions of adjusting to a specified plate current, maintaining fixed conditions of grid bias, screen voltage, suppressor voltage and r-f grid voltage. It will be found that if this procedure is followed, there will be little variation in power output between tubes even though there may be some variation in grid, screen and suppressor currents. Where grid bias is obtained principally by means of a grid resistor, to control plate current it is necessary to make the resistor adjustable.

#### RADIO-FREQUENCY POWER AMPLIFIER OR OSCILLATOR

Class-C Telegraphy or FM Telephony, Frequencies up to 75 Mc. (Key-down conditions, per tube)

##### MAXIMUM RATINGS

D-C PLATE VOLTAGE	4000 MAX. VOLTS
D-C SCREEN VOLTAGE	750 MAX. VOLTS
D-C GRID VOLTAGE	-500 MAX. VOLTS
D-C PLATE CURRENT	200 MAX. MA
PLATE DISSIPATION	125 MAX. WATTS
SUPPRESSOR DISSIPATION	20 MAX. WATTS
SCREEN DISSIPATION	20 MAX. WATTS
GRID DISSIPATION	5 MAX. WATTS

##### TYPICAL OPERATION

60 Suppressor Volts, 500 Screen Volts	
D-C Plate Voltage	1000 1500 2000 2500 3000 volts
D-C Grid Voltage	-120 -130 -150 -170 -200 volts
D-C Plate Current	167 200 200 186 167 ma
D-C Suppressor Current*	.6 5 4 3 3 ma
D-C Screen Current**	.11 .11 .11 7 5 ma
D-C Grid Current*	.6 8 8 7 6 ma
Peak R-F Grid Input Voltage	170 200 222 240 260 volts
Driving Power*	1.0 1.6 1.8 1.7 1.6 watts
Grid Dissipation*	.3 .6 .6 .5 .6 watts
Screen Dissipation*	5.5 5.5 5.5 3.5 2.5 watts
Plate Dissipation	47 85 100 115 125 watts
Plate Power Input	167 300 400 465 500 watts
Plate Power Output	120 215 300 350 375 watts

##### TYPICAL OPERATION

Zero Suppressor Volts, 500 Screen Volts	
D-C Plate Voltage	1000 1500 2000 2500 3000 volts
D-C Grid Voltage	-120 -130 -150 -170 -200 volts
D-C Plate Current	145 180 200 184 167 ma
D-C Screen Current*	17 20 23 18 12 ma
D-C Grid Current**	.6 8 11 9 7 ma
Peak R-F Grid Input Voltage	170 200 240 250 270 volts
Driving Power*	1.0 1.6 2.6 2.3 1.9 watts
Grid Dissipation*	.3 .6 1.0 .8 .5 watts
Screen Dissipation*	8.5 10 12 9 6 watts
Plate Dissipation	55 95 125 125 125 watts
Plate Power Input	145 270 400 460 500 watts
Plate Power Output	90 175 275 335 375 watts

##### TYPICAL OPERATION

Zero Suppressor Volts, 750 Screen Volts	
D-C Plate Voltage	1000 1500 2000 2500 3000 volts
D-C Grid Voltage	-170 -180 -200 -225 -250 volts
D-C Plate Current	160 200 200 186 167 ma
D-C Screen Current*	21 24 22 12 9 ma
D-C Grid Current**	.3 6 6 4 3 ma
Peak R-F Grid Input Voltage	205 235 257 270 290 volts
Driving Power*	.6 1.4 1.5 1.1 .9 watts
Grid Dissipation*	.1 .4 .3 .2 .2 watts
Screen Dissipation*	16 18 17 9 7 watts
Plate Dissipation	45 85 100 115 125 watts
Plate Power Input	160 300 400 465 500 watts
Plate Power Output	115 215 300 350 375 watts

\*Approximate Values



**PLATE-MODULATED RADIO-FREQUENCY AMPLIFIER**

Class-C Telephony, Frequencies up to 75 Mc.  
(Carrier conditions, per tube, unless otherwise specified)

**MAXIMUM RATINGS**

D-C PLATE VOLTAGE	- - -	3200 MAX. VOLTS
D-C SCREEN VOLTAGE	- - -	750 MAX. VOLTS
D-C GRID VOLTAGE	- - -	-500 MAX. VOLTS
D-C PLATE CURRENT	- - -	160 MAX. MA
PLATE DISSIPATION	- - -	85 MAX. WATTS
SUPPRESSOR DISSIPATION	- - -	20 MAX. WATTS
SCREEN DISSIPATION	- - -	20 MAX. WATTS
GRID DISSIPATION	- - -	5 MAX. WATTS

**TYPICAL OPERATION**

Zero Suppressor Volts, 500 Screen Volts

D-C Plate Voltage	- - - -	1000	1500	2000	2500	volts
D-C Grid Voltage	- - - -	-190	-195	-200	-205	volts
D-C Plate Current	- - - -	149	150	151	152	ma
D-C Screen Current*	- - - -	20	18	17	16	ma
D-C Grid Current*	- - - -	7	7	8	8	ma
Peak A-F Screen Voltage (100% Modulation)	- - - -	350	350	350	350	volts
Peak R-F Grid Input Voltage	- - - -	260	265	270	275	volts
Driving Power*	- - - -	2	2	2	2	watts
Grid Dissipation*	- - - -	0.5	0.5	0.5	0.5	watts
Screen Dissipation*	- - - -	10	9	8.5	8	watts
Plate Dissipation	- - - -	64	72	80	85	watts
Plate Power Input	- - - -	149	225	300	380	watts
Plate Power Output	- - - -	85	153	220	295	watts

**SUPPRESSOR-MODULATED RADIO-FREQUENCY AMPLIFIER**

Class-C Telephony, Frequencies up to 75 Mc.  
(Carrier conditions, per tube, unless otherwise specified)

**MAXIMUM RATINGS**

D-C PLATE VOLTAGE	- - -	4000 MAX. VOLTS
D-C SCREEN VOLTAGE	- - -	750 MAX. VOLTS
D-C GRID VOLTAGE	- - -	-500 MAX. VOLTS
D-C PLATE CURRENT	- - -	200 MAX. MA
PLATE DISSIPATION	- - -	125 MAX. WATTS
SUPPRESSOR DISSIPATION	- - -	20 MAX. WATTS
SCREEN DISSIPATION	- - -	20 MAX. WATTS
GRID DISSIPATION	- - -	5 MAX. WATTS

**TYPICAL OPERATION**

D-C Plate Voltage	- - - -	1500	2000	2500	3000	volts
D-C Suppressor Voltage	- - - -	-220	-260	-305	-350	volts
Peak A-F Suppressor Voltage (100% Modulation)	- - - -	220	260	305	350	volts
D-C Screen Voltage	- - - -	400	400	400	400	volts
Fixed D-C Screen Voltage	- - - -	610	645	650	610	volts
Screen Dropping Resistor <sup>1</sup>	- - - -	5500	9100	10,000	8300	ohms
D-C Grid Voltage	- - - -	-170	-180	-190	-200	volts
D-C Plate Current	- - - -	59	59	59	60	ma
D-C Screen Current*	- - - -	38	27	25	25	ma
D-C Grid Current*	- - - -	6	5	5	4	ma
Peak R-F Grid Input Voltage	- - - -	230	235	245	250	volts
Driving Power*	- - - -	1.4	1.3	1.2	1.2	watts
Grid Dissipation*	- - - -	.35	.25	.25	.20	watts
Screen Dissipation*	- - - -	15	11	10	10	watts
Plate Dissipation	- - - -	54	68	87	105	watts
Plate Power Input	- - - -	89	118	148	180	watts
Plate Power Output	- - - -	35	50	61	75	watts

<sup>1</sup>Adjust to stated d-c screen voltage.

**AUDIO-FREQUENCY POWER AMPLIFIER OR MODULATOR**

Class-AB<sub>1</sub> Sinusoidal Wave

**MAXIMUM RATINGS (Per Tube)**

D-C PLATE VOLTAGE	- - -	4000 MAX. VOLTS
D-C SCREEN VOLTAGE	- - -	750 MAX. VOLTS
D-C GRID VOLTAGE	- - -	-500 MAX. VOLTS
D-C PLATE CURRENT	- - -	200 MAX. MA
PLATE DISSIPATION	- - -	125 MAX. WATTS
SUPPRESSOR DISSIPATION	- - -	20 MAX. WATTS
SCREEN DISSIPATION	- - -	20 MAX. WATTS
GRID DISSIPATION	- - -	5 MAX. WATTS

**TYPICAL OPERATION (Two tubes unless otherwise specified)**

Class-AB<sub>1</sub>

D-C Plate Voltage	- - - -	1500	2000	2500	volts
D-C Suppressor Voltage	- - - -	0	0	0	volts
D-C Screen Voltage	- - - -	500	500	500	volts
D-C Grid Voltage <sup>1</sup>	- - - -	-70	-80	-85	volts
Zero-Signal D-C Plate Current	- - - -	110	85	65	ma
Max-Signal D-C Plate Current	- - - -	205	210	220	ma
Zero-Signal D-C Screen Current*	- - - -	0	0	0	ma
Max-Signal D-C Screen Current*	- - - -	15	13	8	ma
Effective Plate-to-Plate Load	- - - -	13,700	18,000	20,000	ohms
Peak A-F Grid Voltage (per tube)	- - - -	70	80	85	volts
Max-Signal Driving Power*	- - - -	0	0	0	watts
Max-Signal Plate Power Input	- - - -	310	420	550	watts
Max-Signal Plate Power Output	- - - -	200	250	300	watts

<sup>1</sup>Adjust to stated zero-signal d-c plate current. The effective grid circuit resistance for each tube must not exceed 250,000 ohms.

**TYPICAL OPERATION (Two tubes unless otherwise specified)**

Class-AB<sub>2</sub>

D-C Plate Voltage	- - - -	1500	2000	2500	volts
D-C Suppressor Voltage	- - - -	60	0	0	volts
D-C Screen Voltage	- - - -	500	500	500	volts
D-C Grid Voltage <sup>1</sup>	- - - -	-70	-80	-85	volts
Zero-Signal D-C Plate Current	- - - -	110	85	65	ma
Max-Signal D-C Plate Current	- - - -	365	295	250	ma
Zero-Signal D-C Screen Current*	- - - -	0	0	0	ma
Max-Signal D-C Screen Current*	- - - -	11	16	13	ma
Effective Plate-to-Plate Load	- - - -	7300	13,000	20,000	ohms
Peak A-F Grid Input Voltage (per tube)	- - - -	100	100	95	volts
Max-Signal Driving Power*	- - - -	0.5	0.3	0.2	watts
Max-Signal Plate Power Input	- - - -	550	590	625	watts
Max-Signal Plate Power Output	- - - -	300	350	400	watts

<sup>1</sup>Adjust to stated zero-signal d-c plate current.

\*Approximate values.

IF IT IS DESIRED TO OPERATE THIS TUBE UNDER CONDITIONS WIDELY DIFFERENT FROM THOSE GIVEN UNDER "TYPICAL OPERATION", POSSIBLY EXCEEDING THE MAXIMUM RATINGS GIVEN FOR CW SERVICE, WRITE EITEL-McCULLOUGH, INC., FOR INFORMATION AND RECOMMENDATIONS.

## APPLICATION

### MECHANICAL

**Mounting**—The 4E27A/5-125B must be mounted vertically, base down or up. The plate lead should be flexible, and the tube must be protected from vibration and shock.

**Cooling**—A heat dissipating connector (Eimac HR-5 or equivalent) is required at the plate terminal, and provision must be made for the free circulation of air through the socket and through the holes in the base. If the E. F. Johnson Co. 122-237 socket recommended under "General Characteristics" is to be used, the model incorporating a ventilating hole should be specified.

At high ambient temperatures, at frequencies above 75 Mc., or when the flow of air is restricted, it may become necessary to provide forced air circulation in sufficient quantity to prevent the temperature of the plate and base seals from exceeding 225°C. Forced movement of air across the tube seals and envelope is always beneficial, though not necessarily required.

Tube temperatures may be measured with the aid of "Tempilaq," a temperature-sensitive lacquer manufactured by the Tempil Corporation, 132 West 22nd Street, New York 11, N. Y.

### ELECTRICAL

**Filament Voltage**—For maximum tube life the filament voltage, as measured directly at the base pins, should be the rated value of 5.0 volts. Variations should be held within the range of 4.75 to 5.25 volts.

**Grid Voltage**—Although a maximum of —500 volts bias may be applied to the grid, there is little advantage in using bias voltages in excess of those listed under "Typical Operation," except in certain specialized applications.

When grid-leak bias is used, suitable protective means must be provided to prevent excessive plate dissipation in the event of loss of excitation, and the grid-leak resistor should be made adjustable to facilitate maintaining the bias voltage and plate current at the desired value from tube to tube.

In class-C operation, particularly at high frequency, both grid bias and grid drive should be only great enough to provide satisfactory operation at good plate efficiency.

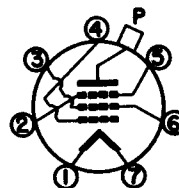
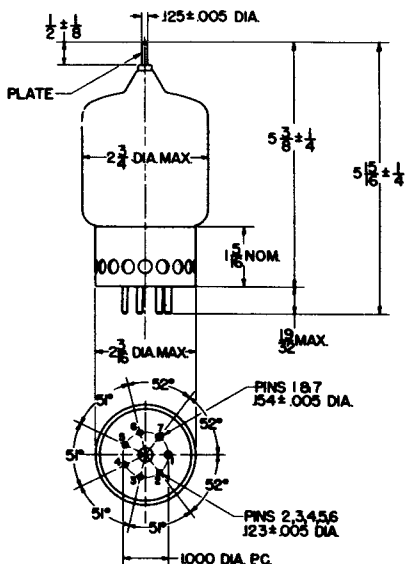
**Screen Dissipation**—Decrease or removal of plate load, plate voltage or bias voltage may result in screen dissipation in excess of the 20 watt maximum rating. The tube may be protected by an overload relay in the screen circuit set to remove the screen voltage when the dissipation exceeds 20 watts.

Resistors placed in the screen circuit for the purpose of developing an audio modulating voltage on the screen in modulated radio-frequency amplifiers should be made variable to permit adjustment when replacing tubes.

**Plate Dissipation**—Plate dissipation in excess of the 125-watt maximum rating is permissible for short periods of time, such as during tuning procedures.

**Operation**—If reasonable precautions are taken to prevent coupling between the input and output circuits, the 4E27A/5-125B may usually be operated at frequencies up to 75 Mc. without neutralization. A conventional method of obtaining the necessary shielding between the grid and plate circuits is to use a suitable metal chassis with the grid circuit mounted below the deck and the plate circuit above. The tube socket should be mounted flush with the under side of the chassis deck, and spring fingers mounted around the socket opening should make contact between the chassis and the metal base shell of the tube. Power-supply leads entering the amplifier should be bypassed to ground and properly shielded. The output circuit and antenna feeders should be arranged so as to preclude any possibility of feedback to other circuits.

Feedback at high frequencies may be due to the inductance of leads, particularly those of the screen and suppressor-grids. By-passing methods and means of placing these grids at r-f ground potential are discussed in Application Bulletin Number Eight, "The Care and Feeding of Power Tetrodes," available from Eitel-McCullough, Inc., for twenty-five cents. Much of the material contained in this bulletin may be applied to pentodes.



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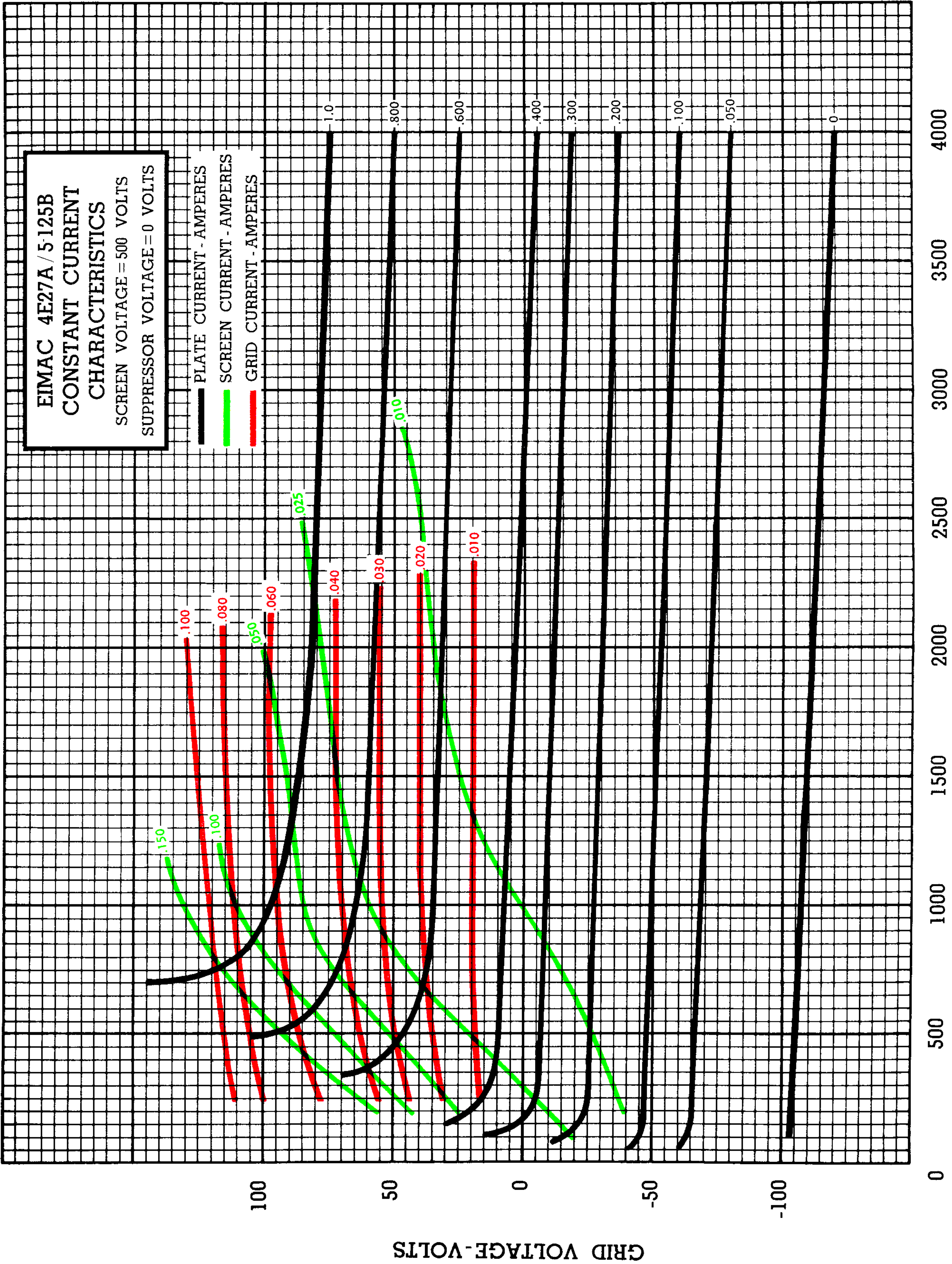


PLATE VOLTAGE - VOLTS





