



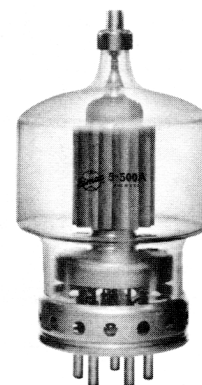
**E I M A C**  
 Division of Varian  
 S A N C A R L O S  
 C A L I F O R N I A

**5-500A**  
 RADIAL-BEAM  
 POWER PENTODE  
 •  
 MODULATOR  
 OSCILLATOR  
 AMPLIFIER

The Eimac 5-500A is a compact, ruggedly constructed radial-beam power pentode having a maximum plate dissipation rating of 500 watts. It is intended for use as an amplifier, oscillator or modulator. The high plate current rating, low grid-plate capacitance and low driving power requirements permit maximum power capability to be combined with circuit simplicity and economic driver requirements.

The Eimac 5-500A is cooled by radiation from the plate and by circulation of forced-air through the base, around the envelope and over the plate seal. Cooling may be greatly simplified by the use of the Eimac SK-400 or SK-410 Air System Socket and the accompanying Eimac SK-426 glass chimney. These sockets are designed to maintain the correct balance of cooling air between the component parts of the tube.

The suppressor element of the 5-500A terminates at the tube base shell, and is designed to be operated at ground (zero) potential. The base shell must be grounded by means of suitable spring clips.



## GENERAL CHARACTERISTICS

### ELECTRICAL

Filament: Thoriated Tungsten, balanced

|                                                      |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |             |              |
|------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-------------|--------------|
| Voltage                                              | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -           | 10.0 volts   |
| Current                                              | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -           | 10.2 amperes |
| Grid-Screen Amplification Factor (Average)           | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | -           | 5.5          |
| Direct Interelectrode Capacitances, Grounded Cathode |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |             |              |
| Grid-Plate                                           | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | <u>Min.</u> | <u>Max.</u>  |
| Input                                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 15.0        | .10 pf       |
| Output                                               | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 9.5         | 19.0 pf      |
|                                                      |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |             | 12.0 pf      |

### MECHANICAL

|                                        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                          |
|----------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|------------------------------------------|
| Base                                   | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | see drawing                              |
| Basing                                 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | see drawing                              |
| Mounting Position                      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Vertical, base up or down                |
| Cooling                                | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Radiation and forced air                 |
| Recommended Heat Dissipating Connector | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Eimac HR-6                               |
| Recommended Socket                     | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Eimac SK-400 or SK-410 Air System Socket |
| Recommended Chimney                    | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Eimac SK-426                             |
| Maximum Overall Dimensions             |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |                                          |
| Length                                 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7.00 inches                              |
| Diameter                               | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3.56 inches                              |
| Net Weight                             | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 11 ounces                                |
| Shipping Weight                        | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2.5 pounds                               |

NOTE: Typical operation data are based on conditions of adjusting the r-f grid drive to a specified plate current, maintaining fixed conditions of grid bias and screen 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 and screen 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 AND OSCILLATOR

Class-C Telephony or FM Telephony

### MAXIMUM RATINGS

|                        |   |   |   |      |            |
|------------------------|---|---|---|------|------------|
| D-C PLATE VOLTAGE      | - | - | - | 4000 | Max. Volts |
| D-C SCREEN VOLTAGE     | - | - | - | 600  | Max. Volts |
| D-C SUPPRESSOR VOLTAGE | - | - | - | 100  | Max. Volts |
| D-C PLATE CURRENT      | - | - | - | 450  | Max. ma    |
| PLATE DISSIPATION      | - | - | - | 500  | Max. Watts |
| SCREEN DISSIPATION     | - | - | - | 35   | Max. Watts |
| GRID DISSIPATION       | - | - | - | 12   | Max. Watts |

### TYPICAL OPERATION

|                             |   |   |   |      |      |      |       |
|-----------------------------|---|---|---|------|------|------|-------|
| D-C Plate Voltage           | - | - | - | 2500 | 3000 | 4000 | Volts |
| D-C Screen Voltage          | - | - | - | 500  | 500  | 500  | Volts |
| D-C Grid Voltage            | - | - | - | -210 | -220 | -240 | Volts |
| D-C Suppressor Voltage      | - | - | - | 0    | 0    | 0    | Volts |
| D-C Plate Current           | - | - | - | 405  | 432  | 450  | ma    |
| D-C Screen Current          | - | - | - | 55   | 65   | 65   | ma    |
| D-C Grid Current            | - | - | - | 28   | 35   | 38   | ma    |
| Screen Dissipation          | - | - | - | 27.5 | 32.5 | 33   | Watts |
| Grid Dissipation            | - | - | - | 2.8  | 3.8  | 5.0  | Watts |
| Peak R-F Grid Input Voltage | - | - | - | 310  | 330  | 365  | Volts |
| MF Driving Power*           | - | - | - | 8.7  | 12   | 14   | Watts |
| Plate Power Input           | - | - | - | 1015 | 1300 | 1800 | Watts |
| Plate Dissipation           | - | - | - | 265  | 495  | 500  | Watts |
| Plate Power Output          | - | - | - | 750  | 805  | 1300 | Watts |

\*Driving Power increases as frequency is increased.

## RADIO-FREQUENCY LINEAR AMPLIFIER

Class AB<sub>1</sub>, Grounded Cathode, one tube

### MAXIMUM RATINGS

|                       |   |   |   |      |            |
|-----------------------|---|---|---|------|------------|
| DC PLATE VOLTAGE      | - | - | - | 4000 | Max. Volts |
| DC SCREEN VOLTAGE     | - | - | - | 1000 | Max. Volts |
| DC SUPPRESSOR VOLTAGE | - | - | - | 100  | Max. Volts |
| DC PLATE CURRENT      | - | - | - | 450  | Max. ma    |
| PLATE DISSIPATION     | - | - | - | 500  | Max. Watts |
| SCREEN DISSIPATION    | - | - | - | 35   | Max. Watts |

### TYPICAL OPERATION (Frequencies below 30 Mc.)

Peak-Envelope or Modulation-Crest Conditions.

Adjusted for minimum distortion.

|                                        |   |   |   |      |      |      |       |
|----------------------------------------|---|---|---|------|------|------|-------|
| DC Plate Voltage                       | - | - | - | 2000 | 3000 | 4000 | Volts |
| DC Screen Voltage                      | - | - | - | 750  | 750  | 750  | Volts |
| DC Suppressor Voltage                  | - | - | - | 0    | 0    | 0    | Volts |
| DC Control Grid Voltage*               | - | - | - | -100 | -112 | -121 | Volts |
| Zero-Signal DC Plate Current           | - | - | - | 150  | 100  | 80   | ma    |
| Single-Tone DC Plate Current           | - | - | - | 338  | 320  | 322  | ma    |
| Two-Tone DC Plate Current              | - | - | - | 252  | 221  | 212  | ma    |
| Single-Tone DC Screen Current          | - | - | - | 31   | 26   | 24   | ma    |
| Two-Tone DC Screen Current             | - | - | - | 15   | 12   | 10   | ma    |
| Peak RF Grid Voltage                   | - | - | - | 100  | 112  | 121  | Volts |
| Useful Output Power                    | - | - | - | 395  | 612  | 832  | Watts |
| Resonant Load Impedance                | - | - | - | 3600 | 5800 | 7700 | Ohms  |
| Third Order Intermodulation Products** | - | - | - | -52  | -33  | -28  | db    |
| Fifth Order Intermodulation Products** | - | - | - | -49  | -41  | -37  | db    |

\*1. Adjust to the specified zero-signal plate current.

\*\*2. Equal or better than stated for all signal levels up to indicated useful output power. Reference to one tone of a two-tone test signal.

## PLATE MODULATED RADIO FREQUENCY AMPLIFIER

Class-C Telephony  
(Carrier conditions unless otherwise specified.)

### MAXIMUM RATINGS

|                       |   |   |   |      |       |
|-----------------------|---|---|---|------|-------|
| DC PLATE VOLTAGE      | - | - | - | 4000 | Volts |
| DC SCREEN VOLTAGE     | - | - | - | 600  | Volts |
| DC SUPPRESSOR VOLTAGE | - | - | - | 100  | Volts |
| DC GRID VOLTAGE       | - | - | - | -500 | Volts |
| DC PLATE CURRENT      | - | - | - | 340  | ma    |
| PLATE DISSIPATION     | - | - | - | 330  | Watts |
| SCREEN DISSIPATION    | - | - | - | 35   | Watts |
| GRID DISSIPATION      | - | - | - | 12   | Watts |

### TYPICAL OPERATION

|                                                   |   |   |   |      |      |      |       |
|---------------------------------------------------|---|---|---|------|------|------|-------|
| DC Plate Voltage                                  | - | - | - | 2700 | 3100 | 3500 | Volts |
| DC Screen Voltage                                 | - | - | - | 450  | 470  | 500  | Volts |
| DC Grid Voltage                                   | - | - | - | -270 | -310 | -300 | Volts |
| DC Suppressor Voltage                             | - | - | - | 0    | 0    | 0    | Volts |
| DC Plate Current                                  | - | - | - | 285  | 260  | 305  | ma    |
| DC Screen Current                                 | - | - | - | 68   | 50   | 55   | ma    |
| DC Grid Current                                   | - | - | - | 20   | 15   | 18   | ma    |
| Screen Dissipation                                | - | - | - | 31   | 23   | 27   | Watts |
| Peak A-F Screen Voltage Approx. (100% Modulation) | - | - | - | 350  | 330  | 350  | Volts |
| Peak R-F Grid Voltage                             | - | - | - | 355  | 385  | 375  | Volts |
| MF Grid Driving Power                             | - | - | - | 7    | 6    | 7    | Watts |
| Plate Dissipation                                 | - | - | - | 160  | 220  | 280  | Watts |
| Plate Power Output                                | - | - | - | 580  | 580  | 780  | Watts |

## AUDIO FREQUENCY POWER AMPLIFIER AND MODULATOR

Class AB

### MAXIMUM RATINGS (Per Tube)

|                              |   |   |   |      |            |
|------------------------------|---|---|---|------|------------|
| D-C PLATE VOLTAGE            | - | - | - | 4000 | Max. Volts |
| D-C SCREEN VOLTAGE           | - | - | - | 1000 | Max. Volts |
| D-C SUPPRESSOR VOLTAGE       | - | - | - | 100  | Max. Volts |
| MAX-SIGNAL D-C PLATE CURRENT | - | - | - | 450  | ma         |
| PLATE DISSIPATION            | - | - | - | 500  | Max. Watts |
| SCREEN DISSIPATION           | - | - | - | 35   | Max. Watts |
| GRID DISSIPATION             | - | - | - | 12   | Max. Watts |

### TYPICAL OPERATION CLASS AB<sub>1</sub>

(Sinusoidal wave, two tubes unless otherwise specified)

|                                        |   |   |   |        |        |       |
|----------------------------------------|---|---|---|--------|--------|-------|
| D-C Plate Voltage                      | - | - | - | 3000   | 4000   | Volts |
| D-C Screen Voltage                     | - | - | - | 750    | 750    | Volts |
| D-C Suppressor Voltage                 | - | - | - | 0      | 0      | Volts |
| D-C Grid Voltage (approx.)*            | - | - | - | -112   | -121   | Volts |
| Zero-Signal D-C Plate Current          | - | - | - | 200    | 160    | ma    |
| Max-Signal D-C Plate Current           | - | - | - | 640    | 645    | ma    |
| Zero-Signal D-C Screen Current         | - | - | - | 0      | 0      | ma    |
| Max-Signal D-C Screen Current          | - | - | - | 52     | 48     | ma    |
| Effective Load, Plate-to-plate         | - | - | - | 11,600 | 15,400 | Ohms  |
| Peak A-F Grid Input Voltage (per tube) | - | - | - | 112    | 121    | Volts |
| Driving Power                          | - | - | - | 0      | 0      | Watts |
| Max-Signal Plate Power Output          | - | - | - | 1224   | 1664   | Watts |

\*Adjust to give stated zero-signal plate current. The D-C resistance in series with the control grid of each tube should not exceed 250,000 ohms.

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 Eimac, A Division of Varian Associates, for information and recommendations.



## APPLICATION

### MECHANICAL

**MOUNTING**—The 5-500A must be mounted vertically, base up or base down. The socket must be constructed so as to allow an unimpeded flow of air through the holes in the base of the tube and must also provide clearance for the glass tip-off which extends from the center of the base. The metal tube-base shell should be grounded by means of suitable spring fingers. The above requirements are met by the Eimac SK-400 and SK-410 Air-System Sockets. A flexible connecting strap should be provided between the Eimac HR-6 cooler on the plate terminal and the external plate circuit. The tube must be protected from severe vibration and shock.

**COOLING**—Adequate forced-air cooling must be provided to maintain the base seals at a temperature below 200°C., and the plate seal at a temperature below 225°C.

When the Eimac SK-400 or SK-410 Air-System Sockets and SK-426 chimney are used, a minimum air flow of 14 cubic feet per minute at a static pressure of 0.25 inches of water, as measured in the socket at sea level, is required to provide adequate cooling under all conditions of operation. Seal temperature limitations require that cooling air be supplied to the tube even when the filament alone is on during standby periods.

In the event an Air-System socket is not used, provision must be made to supply equivalent cooling of the base, the envelope, and the plate lead.

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 filament pins, should be the rated voltage of 10.0 volts. Variations in filament voltage must be kept within the range of 9.5 to 10.5 volts.

The 5-500A features a balanced filament structure to help the designer meet FCC hum and noise specifications in AM service.

**BIAS VOLTAGE** — The d-c bias voltage for the 5-500A should not exceed 500 volts. If grid leak bias is used, suitable means must be provided to prevent excessive plate or screen 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 values from tube to tube. In operation above 50 Mc., it is advisable to keep the bias voltage as low as is practicable.

**SCREEN VOLTAGE**—The d-c screen voltage for the 5-500A should not exceed 800 volts in r-f applications. In audio applications a maximum d-c screen voltage of 1,000 volts may be used. The screen voltages shown under "Typical Operation" are representative voltages for the type of operation involved.

**PLATE VOLTAGE**—The plate-supply voltage for the 5-500A should not exceed 4000 volts in CW and audio applications. In plate-modulated telephony service the d-c plate-supply voltage should not exceed 3200 volts, except below 30 Mc., intermittent service, where 4000 volts may be used.

**GRID DISSIPATION** — Grid dissipation for the 5-500A should not be allowed to exceed 12 watts. Grid dissipation may be calculated from the following expression,

$$P_g = e_{cmp} I_c$$

where  $P_g$  = Grid Dissipation

$e_{cmp}$  = Peak positive grid to cathode voltage, and

$I_c$  = D-C grid current

$e_{cmp}$  may be measured by means of a suitable peak voltmeter connected between filament and grid.

**SCREEN DISSIPATION** — The power dissipated by the screen of the 5-500A must not exceed 35 watts. Screen dissipation is likely to rise to excessive values when the plate voltage, bias voltage or plate load are removed with filament and screen voltages applied. Suitable protective means must be provided to limit screen dissipation to 35 watts in event of circuit failure.

**PLATE DISSIPATION**—Under normal operating conditions, the plate dissipation of the 5-500A should not be allowed to exceed 500 watts.

In plate modulated amplifier applications, the maximum allowable carrier-condition plate dissipation is 330 watts. The plate dissipation may rise to 500 watts under 100% sinusoidal modulation.

Plate dissipation in excess of the maximum rating is permissible for short periods of time, such as during tuning procedures.

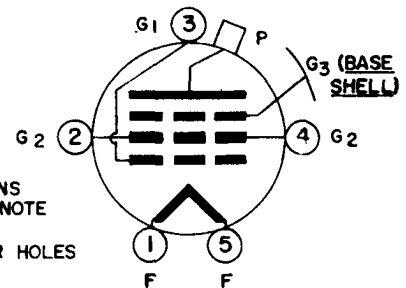
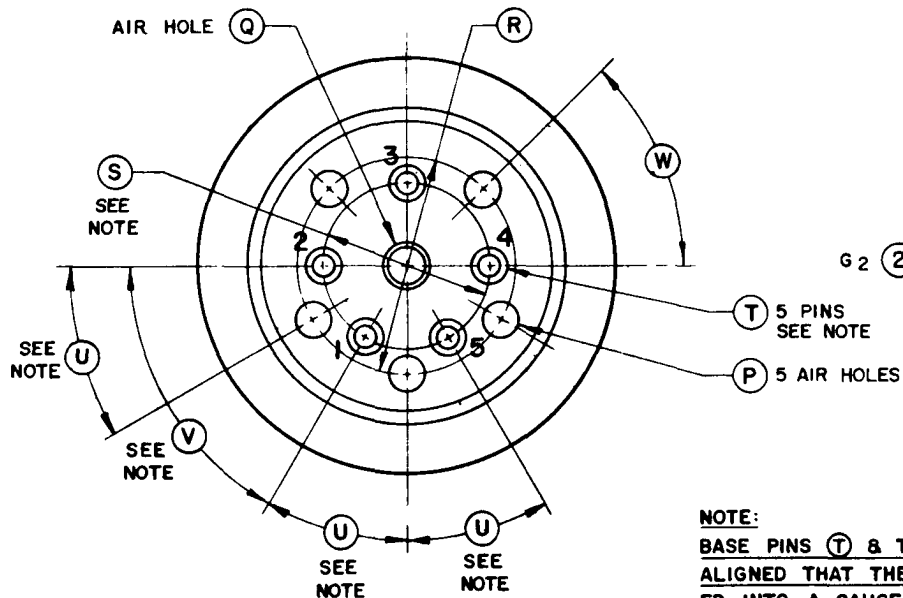
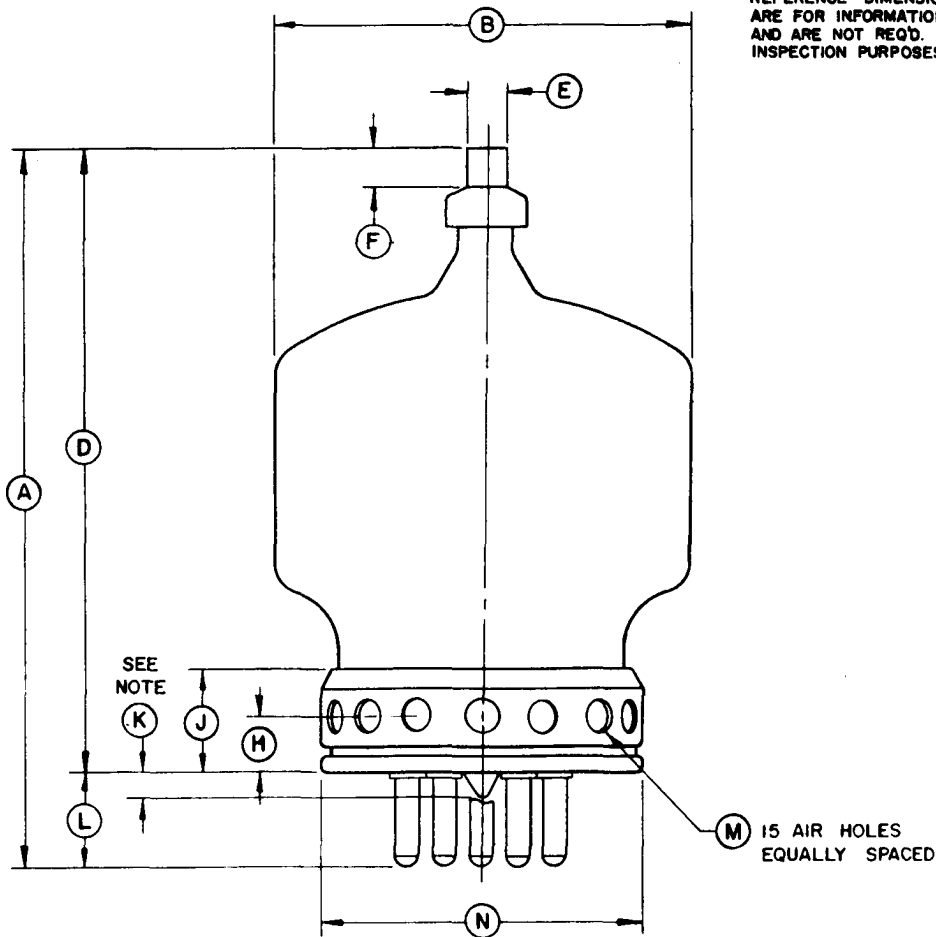
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General information pertaining to the operation of the 5-500A may be found in Application Bulletin No. 8, "The Care and Feeding of Power Tetrodes." This Bulletin is available upon request.

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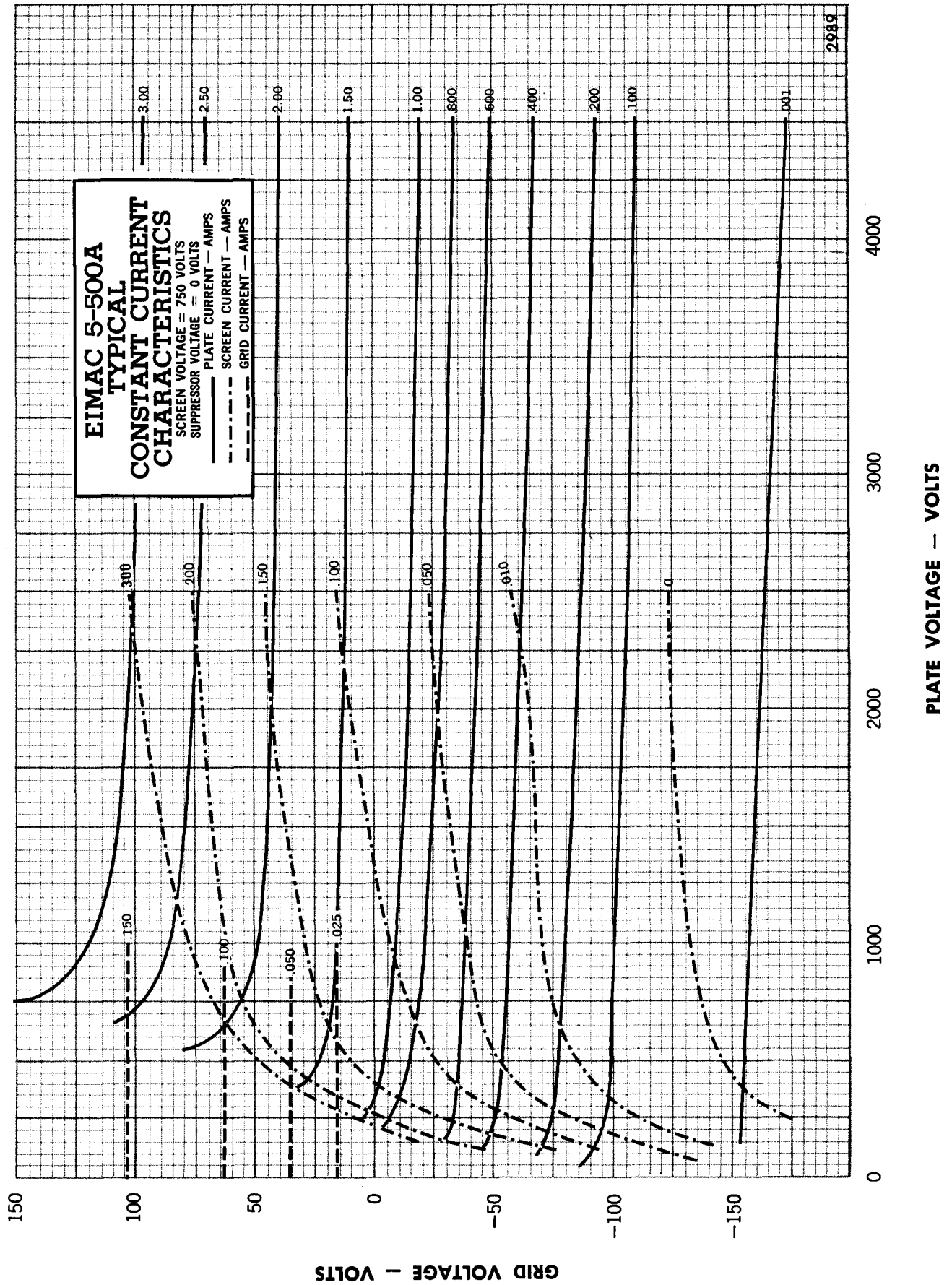
REFERENCE DIMENSIONS  
ARE FOR INFORMATION ONLY  
AND ARE NOT REQ'D. FOR  
INSPECTION PURPOSES.

| DIMENSIONS IN INCHES |         |           |            |
|----------------------|---------|-----------|------------|
| DIMENSIONAL DATA     |         |           |            |
| DIM.                 | MIN.    | MAX.      | REF.       |
| A                    | 6.500   | 7.000     |            |
| B                    |         | 3-9/16 D. |            |
| D                    | 5.750   | 6.250     |            |
| E                    | .350 D. | .365 D.   |            |
| F                    | 21/64   |           |            |
| H                    |         |           | 7/16       |
| J                    |         |           | 3/32       |
| K                    |         | 1/4       |            |
| L                    |         |           | 3/4        |
| M                    |         |           | 1/4 D.     |
| N                    |         | 2-3/4 D.  |            |
| P                    |         |           | 5/16 D.    |
| Q                    |         |           | 1/2 D.     |
| R                    |         |           | 1-5/8 D.   |
| S                    |         |           | 1/4 D.P.C. |
| T                    | .185 D. | .191 D.   |            |
| U                    |         |           | 30°        |
| V                    |         |           | 60°        |
| W                    |         |           | 45°        |



**NOTE:**

BASE PINS (T) & TUBULATION (K) ARE SO  
ALIGNED THAT THEY CAN BE FREELY INSERT-  
ED INTO A GAUGE 1/4" THICK WITH HOLE  
DIAMETERS OF .204 & .500 RESPECTIVELY  
LOCATED ON THE TRUE CENTERS BY THE  
GIVEN DIMENSIONS (V), (U), (S).





5-500A

