EIMAC
Division of Varian
SAN CARLOS
CALIFORNIA

# 450TL

**MEDIUM-MU TRIODE**

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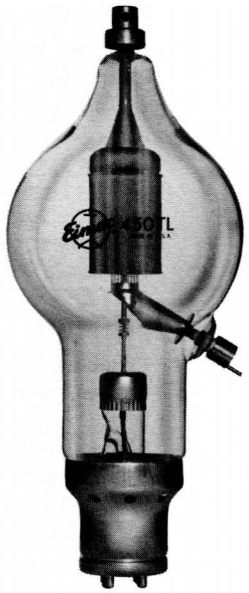
**MODULATOR**
**OSCILLATOR**
**AMPLIFIER**

The Eimac 450TL is a medium-mu power triode having a maximum plate dissipation rating of 450 watts, and is intended for use as an amplifier, oscillator and modulator. It can be used at its maximum ratings at frequencies as high as 40-Mc.

Cooling of the 450TL is accomplished by radiation from the plate, which operates at a visible red color at maximum dissipation, and by means of air circulation around the envelope.



## GENERAL CHARACTERISTICS

### ELECTRICAL

| | |
|---|---|
| Filament: Thoriated tungsten | |
| Voltage | 7.5 volts |
| Current | 12.0 amperes |

Note: Dual connections for each filament lead are provided within the base of the tube (see basing diagram). Corresponding socket terminals must be connected in parallel to provide proper distribution of filament and R-F charging currents.

| | |
|---|---|
| Amplification Factor (Average) | 18 |
| Direct Interelectrode Capacitances (Average) | |
| Grid-Plate | 4.5 $\mu\mu$f |
| Grid-Filament | 6.8 $\mu\mu$f |
| Plate-Filament | 0.8 $\mu\mu$f |
| Transconductance ($i_b$=500ma, $E_b$=4000v, $e_c$= —75v.) | 5000 $\mu$mhos |
| Frequency for Maximum Ratings | 40-Mc. |

### MECHANICAL

| | |
|---|---|
| Base | Special 4 pin, No. 5002B |
| Basing | RMA type 4AQ |
| Mounting | Vertical, base down or up |
| Cooling | Radiation and air circulation |

Note: Adequate ventilation or air cooling must be provided so that the seals and envelope do not exceed 200°C under operating conditions.

| | |
|---|---|
| Socket | Johnson Type No. 211 or National Type No. XM50 or equivalent. |
| Recommended Heat Dissipating Connectors: | |
| Plate | Eimac HR-8 |
| Grid | Eimac HR-8 |

Note: The grid terminal of the 450TL is now .560" in diameter. To accommodate existing equipment designed for the older style 450TL having .098" diameter grid terminals, an adapter pin is provided with the newer tubes. This adapter pin is threaded so that it may be removed from the grid terminal of the tube. The small grid terminal, if used, requires an HR-4 heat dissipating connector. (See outline drawing.)

| | |
|---|---|
| Maximum Overall Dimensions: | |
| Length | 12.625 inches |
| Diameter | 5.125 inches |
| Net weight | 1.3 pounds |
| Shipping weight (Average) | 5.6 pounds |

## AUDIO FREQUENCY POWER AMPLIFIER AND MODULATOR

Class $AB_2$ (Sinusoidal wave, two tubes unless otherwise specified)

MAXIMUM RATINGS

| | |
|---|---|
| D-C PLATE VOLTAGE | 6000 MAX. VOLTS |
| MAX-SIGNAL D-C PLATE CURRENT PER TUBE | 600 MAX. MA. |
| PLATE DISSIPATION, PER TUBE | 450 MAX. WATTS |

TYPICAL OPERATION—2 TUBES

| | | | | |
|---|---|---|---|---|
| D-C Plate Voltage | 3000 | 4000 | 5000 | Volts |
| D-C Grid Voltage (approx.)* | —110 | —175 | —240 | Volts |
| Zero-Signal D-C Plate Current | 200 | 150 | 120 | Ma. |
| Max-Signal D-C Plate Current | 770 | 675 | 620 | Ma. |
| Effective Load, Plate-to-Plate | 7700 | 12,800 | 18,500 | Ohms |
| Peak A-F Grid Input Voltage (per tube) | 325 | 365 | 430 | Volts |
| Max-Signal Peak Driving Power | 40 | 33 | 56 | Watts |
| Max-Signal Nominal Driving Power (approx.) | 20 | 17 | 28 | Watts |
| Max-Signal Plate Power Output | 1400 | 1800 | 2200 | Watts |

*Adjust to give stated zero-signal plate current.

## RADIO FREQUENCY POWER AMPLIFIER AND OSCILLATOR

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

MAXIMUM RATINGS

| | |
|---|---|
| D-C PLATE VOLTAGE | 6000 MAX. VOLTS |
| D-C PLATE CURRENT | 600 MAX. MA. |
| PLATE DISSIPATION | 450 MAX. WATTS |
| GRID DISSIPATION | 65 MAX. WATTS |

TYPICAL OPERATON, PER TUBE*

| | | | | |
|---|---|---|---|---|
| D-C Plate Voltage | 3000 | 4000 | 5000 | Volts |
| D-C Grid Voltage | —275 | —400 | —500 | Volts |
| D-C Plate Current | 500 | 450 | 450 | Ma. |
| D-C Grid Current | 65 | 53 | 54 | Ma. |
| Peak R-F Grid Input Voltage | 640 | 740 | 870 | Volts |
| Driving Power (approx.) | 38 | 35 | 42 | Watts |
| Grid Dissipation | 20 | 13 | 15 | Watts |
| Plate Power Input | 1500 | 1800 | 2250 | Watts |
| Plate Dissipation | 450 | 450 | 450 | Watts |
| Plate Power Output | 1050 | 1350 | 1800 | Watts |

*The figures show actual measured tube performance and do not allow for circuit losses.

## PLATE MODULATED RADIO FREQUENCY AMPLIFIER

Class-C Telephony (Carrier conditions, per tube)

MAXIMUM RATINGS

| | |
|---|---|
| D-C PLATE VOLTAGE | 4500 MAX. VOLTS |
| D-C PLATE CURRENT | 500 MAX. MA. |
| PLATE DISSIPATION | 300 MAX. WATTS |
| GRID DISSIPATION | 65 MAX. WATTS |

TYPICAL OPERATION, PER TUBE*

| | | | | |
|---|---|---|---|---|
| D-C Plate Voltage | 3000 | 4000 | 4500 | Volts |
| D-C Plate Current | 380 | 340 | 345 | Ma. |
| Total Bias Voltage | —400 | —500 | —550 | Volts |
| Fixed Bias Voltage | —200 | —250 | —275 | Volts |
| Grid Resistor | 5000 | 7000 | 7500 | Ohms |
| D-C Grid Current | 40 | 36 | 36 | Ma. |
| Peak R-F Grid Input Voltage | 700 | 790 | 850 | Volts |
| Driving Power | 28 | 29 | 31 | Watts |
| Grid Dissipation | 12 | 11 | 11 | Watts |
| Plate Power Input | 1150 | 1360 | 1550 | Watts |
| Plate Dissipation | 300 | 300 | 300 | Watts |
| Plate Power Output | 850 | 1060 | 1250 | Watts |

*The figures are for one tube operating at maximum plate dissipation as a plate modulated Class-C amplifier. The output figures do not allow for circuit losses.

# APPLICATION

## MECHANICAL

**Mounting**—The 450TL must be mounted vertically, base up or base down. Flexible connecting straps should be provided from the grid and plate terminals to the external grid and plate circuits. The tube must be protected from severe vibration and shock.

**Cooling**—Provision should be made for ample circulation of air around the 450TL. In the event that the design of the equipment restricts natural circulation, the use of a small fan or centrifugal blower to provide additional cooling for the tube will aid in obtaining maximum tube life. Special heat-dissipating connectors (Eimac HR-8) are available for use on the plate and grid terminals. These connectors help to prolong tube life by reducing the temperature of the seals.

## ELECTRICAL

**Filament Voltage**—For maximum tube life the filament voltage, as measured directly at the filament pins, should be the rated value of 7.5 volts. Unavoidable variations in filament voltage must be kept within the range from 7.03 to 7.88 volts. All four socket terminals should be used, putting two in parallel for each filament connection.

**Bias Voltage**—Although there is no maximum limit on the bias voltage which may be used on the 450TL, there is little advantage in using bias voltages in excess of those given under "Typical Operation," except in certain very specialized applications. Where bias is obtained by a grid leak, suitable protective means must be provided to prevent excessive plate dissipation in the event of loss of excitation.

**Grid Dissipation**—The power dissipated by the grid of the 450TL must not exceed 65 watts. Grid dissipation may be calculated from the following expression:

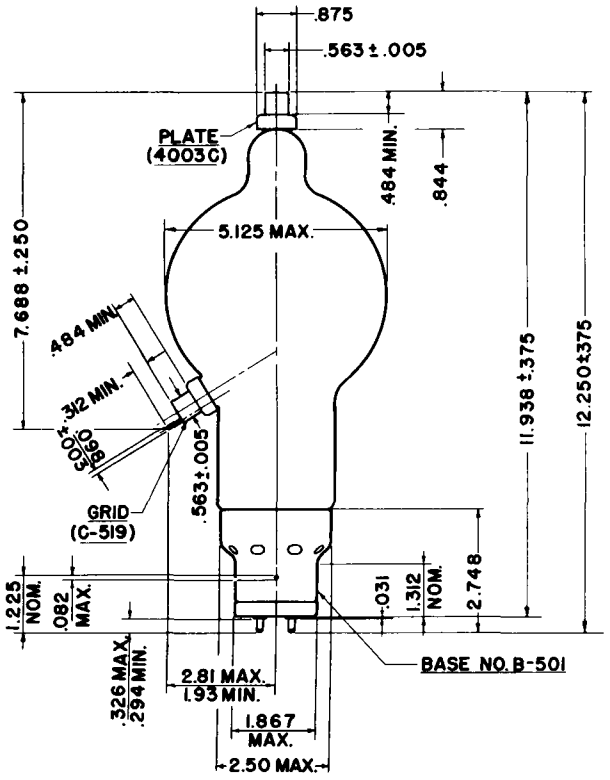
$$P_g = e_{cmp} I_c$$

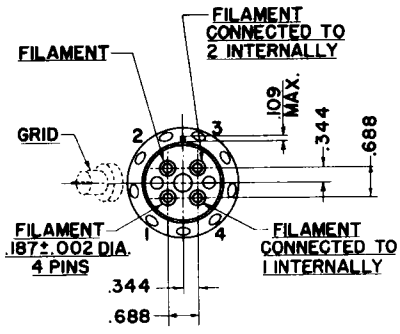
where $P_g$ = Grid dissipation
$e_{cmp}$ = Peak positive grid voltage, and
$I_c$ = D-c grid current.

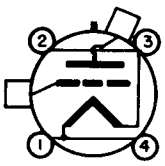
$e_{cmp}$ may be measured by means of a suitable peak voltmeter connected between filament and grid. In equipment in which the plate loading varies widely, such as oscillators used for radio-frequency heating, care should be taken to make certain that the grid dissipation does not exceed the maximum rating under any conditions of loading.

**Plate Voltage**—Except in very special applications, the plate supply voltage for the 450TL should not exceed 6000 volts. In most cases there is little advantage in using plate-supply voltages higher than those given under "Typical Operation" for the power output desired.

**Plate Dissipation**—Under normal operating conditions, the power dissipated by the plate of the 450TL should not be allowed to exceed 450 watts. At this dissipation the brightness temperature of the plate will appear a red-orange in color. The value of this color is somewhat affected by light from the filament as well as from external sources. Plate dissipation in excess of the maximum rating is permissible for short periods of time, such as during tuning procedures.




NOTE:—The grid terminal on the new 450TH and TL type tube is now .563" in diameter. To accommodate existing equipment which uses the 450TH or TL tubes with the old style .098" grid terminal, an adaptor pin is provided. This adaptor pin, if not needed, may be removed by unscrewing.

# DRIVING POWER vs. POWER OUTPUT

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The three charts on this page show the relationship of plate efficiency, power output and grid driving power at plate voltages of 3000, 4000, and 5000 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 3000, 4000, and 5000 volts respectively.

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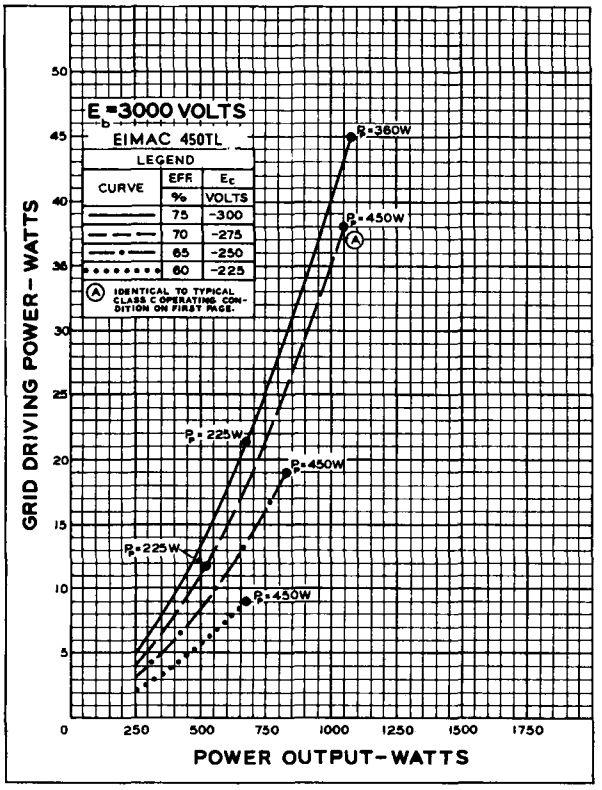


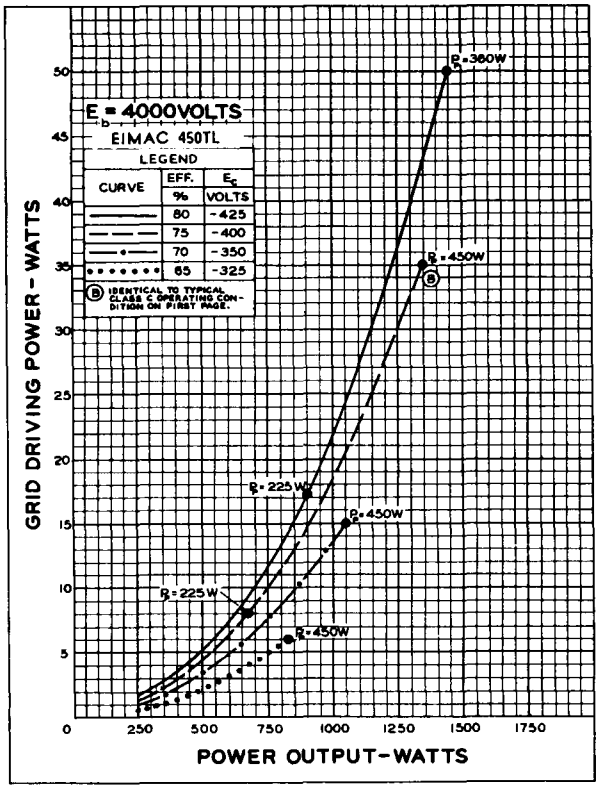


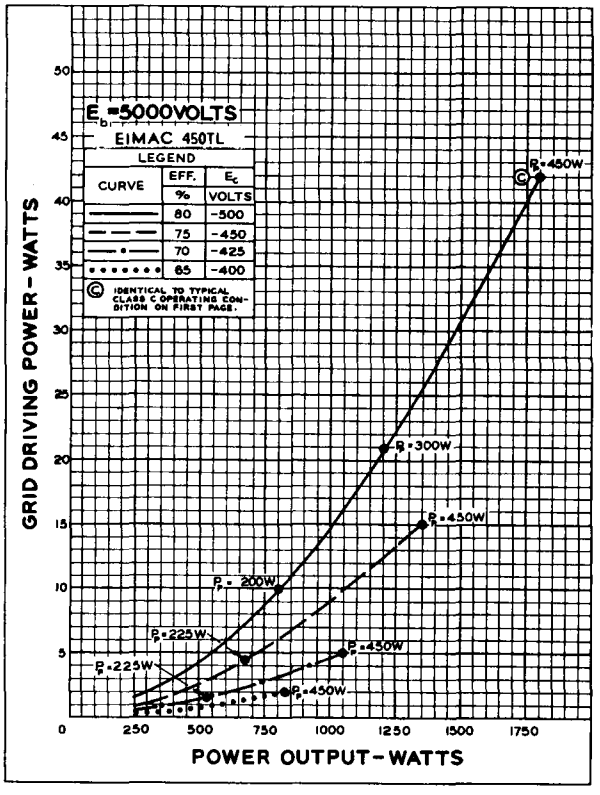

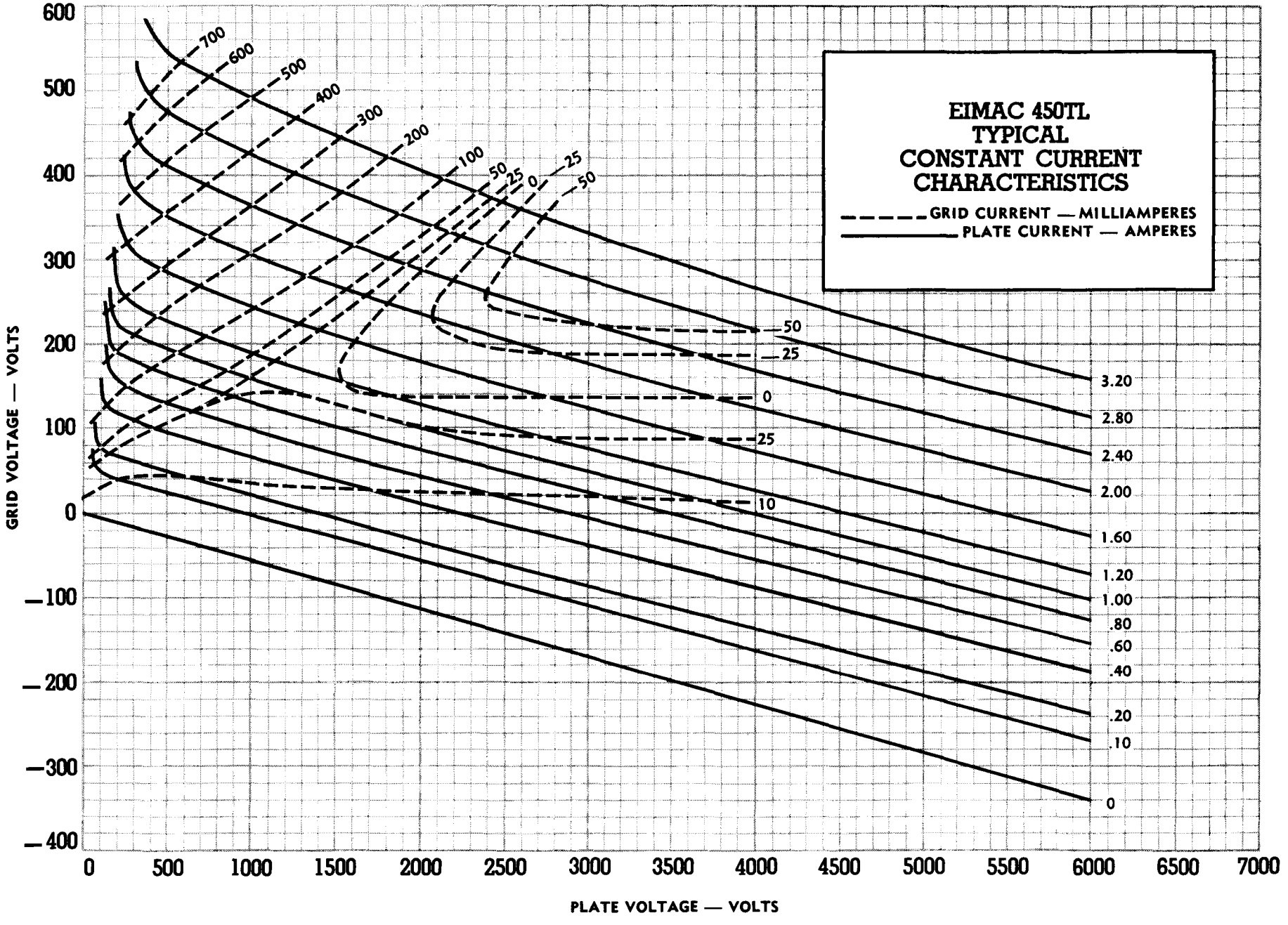
EIMAC 450TL
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
GRID CURRENT — MILLIAMPERES
PLATE CURRENT — AMPERES
GRID VOLTAGE — VOLTS
PLATE VOLTAGE — VOLTS
600
500
400
300
200
100
0
—100
—200
—300
—400
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
700
600
500
400
300
200
100
50
25
0
—25
—50
50
25
0
25
10
3.20
2.80
2.40
2.00
1.60
1.20
1.00
.80
.60
.40
.20
.10
0