

**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

**250TL**  
 LOW-MU TRIODE  
 MODULATOR  
 OSCILLATOR  
 AMPLIFIER

The Eimac 250TL is a low-mu triode having a maximum plate dissipation of 250 watts. It is intended for use as an amplifier, oscillator or modulator, and can be used at its maximum ratings at frequencies up to 40 Mc.

Cooling of the 250TL 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**

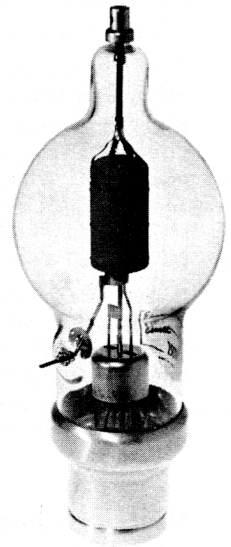
**ELECTRICAL**

Filament: Thoriated tungsten	
Voltage	5.0 volts
Current	10.5 amperes
Amplification Factor (Average)	14
Direct Interelectrode Capacitances (Average)	
Grid-Plate	3.0 $\mu\text{mf}$
Grid-Filament	3.7 $\mu\text{mf}$
Plate-Filament	0.7 $\mu\text{mf}$
Transconductance ( $I_b=350 \text{ ma.}, E_b=3000\text{V.}$ )	2650 $\mu\text{mhos}$
Frequency for Maximum Ratings	40 Mc

**MECHANICAL**

Base: Medium 4-pin bayonet type, fits E. F. Johnson No. 211 series sockets, National XM-50 socket, or the equivalent.  
 For pin connections, see outline drawing.

Mounting	Vertical, base down or up.
Cooling	Convection and radiation.
Recommended Heat Dissipating Connectors:	
Plate	Eimac HR-6
Grid	Eimac HR-3
Maximum Over-all Dimensions:	
Length	10.13 inches
Diameter	3.81 inches
Net Weight	10 ounces
Shipping Weight	3 pounds



**AUDIO FREQUENCY POWER AMPLIFIER AND MODULATOR**

Class-AB<sub>2</sub> (Sinusoidal wave, two tubes unless otherwise specified)  
**MAXIMUM RATINGS**  
 D-C PLATE VOLTAGE - - - 4000 MAX. VOLTS  
 MAX-SIGNAL D-C PLATE CURRENT, PER TUBE - - - 350 MAX. MA.  
 MAX-SIGNAL PLATE DISSIPATION, PER TUBE - - - 250 MAX. WATTS

**TYPICAL OPERATION**

D-C Plate Voltage	1500	2000	3000	Volts
D-C Grid Voltage (approx.)*	-40	-90	-170	Volts
Zero-Signal D-C Plate Current	200	150	100	Ma.
Max-Signal D-C Plate Current	700	650	500	Ma.
Effective Load, Plate-to-Plate	3800	6150	13,000	Ohms
Peak A-F Grid Input Voltage (per tube)	390	410	400	Volts
Max-Signal Peak Driving Power	76	74	32	Watts
Max-Signal Nominal Driving Power	38	37	16	Watts
Max-Signal Plate Power Output	580	800	1000	Watts

\*Adjust for given zero-signal plate current.

**RADIO FREQUENCY POWER AMPLIFIER AND OSCILLATOR**

Class-C Telephony or FM Telephony (Key-down conditions, per tube)  
**MAXIMUM RATINGS**  
 D-C PLATE VOLTAGE - - - 4000 MAX. VOLTS  
 D-C PLATE CURRENT - - - 350 MAX. MA.  
 PLATE DISSIPATION - - - 250 MAX. WATTS  
 GRID DISSIPATION - - - 35 MAX. WATTS

**TYPICAL OPERATION, per tube\* (Frequencies up to 40 Mc.)**

D-C Plate Voltage	2000	3000	4000	Volts
D-C Grid Voltage	-200	-350	-500	Volts
D-C Plate Current	350	335	310	Ma.
D-C Grid Current	45	45	40	Ma.
Peak R-F Grid Input Voltage (approx.)	575	720	900	Volts
Driving Power (approx.)	22	29	33	Watts
Grid Dissipation (approx.)	14	15	14	Watts
Power Input	700	1000	1250	Watts
Plate Dissipation	245	250	250	Watts
Plate Power Output	455	750	1000	Watts

\*These figures show actual measured tube performance and do not allow for variations in circuit losses.

**PLATE MODULATED RADIO FREQUENCY POWER AMPLIFIER**

Class-C Telephony (Carrier conditions, per tube)  
**MAXIMUM RATINGS**  
 D-C PLATE VOLTAGE - - - 3200 MAX. VOLTS  
 D-C PLATE CURRENT - - - 280 MAX. MA.  
 PLATE DISSIPATION - - - 165 MAX. WATTS  
 GRID DISSIPATION - - - 35 MAX. WATTS

**TYPICAL OPERATION, per tube\* (Frequencies up to 40 Mc.)**

D-C Plate Voltage	2000	2500	3000	Volts
D-C Plate Current	250	225	200	Ma.
Total D-C Bias Voltage	-520	-520	-520	Volts
Grid Resistor	13,000	15,000	17,500	Ohms
Fixed D-C Bias Supply Voltage	-140	-220	-264	Volts
D-C Grid Current	29	20	14	Ma.
Peak R-F Grid Input Voltage	840	795	795	Volts
Driving Power (approx.)	24	16	11	Watts
Grid Dissipation (approx.)	9	6	5	Watts
Plate Power Input	500	565	600	Watts
Plate Dissipation	165	165	165	Watts
Plate Power Output	335	400	435	Watts

\*These figures show actual measured tube performance and do not allow for variations in circuit losses.

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, FOR INFORMATION AND RECOMMENDATIONS.



## APPLICATION

### MECHANICAL

**Mounting**—The 250TL must be mounted vertically, base down or up. The plate and grid leads should be flexible, and the tube must be protected from vibration and shock.

**Cooling**—Heat Dissipating Connectors (Eimac HR-6 and HR-3 or equivalent) must be used at the plate and grid terminals of the 250TL. Forced-air cooling is not required in properly designed equipment operating at frequencies below 40 Mc. If the free circulation of air around the tube is restricted, a small fan or centrifugal blower should be used to provide additional cooling.

The temperature of the plate and grid seals must not be allowed to exceed 225° C. One method of measuring these temperatures is by the use of "Tempilaq," a temperature-sensitive lacquer manufactured by the Tempil Corporation, 11 W. 25th St., New York 10, N. Y.

### ELECTRICAL

**Filament Voltage**—The filament voltage, as measured directly at the tube, should be 5.0 volts with maximum allowable variations due to line fluctuations from 5.25 to 4.75 volts.

**Bias Voltage**—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.

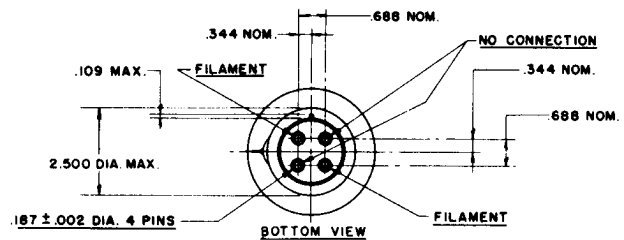
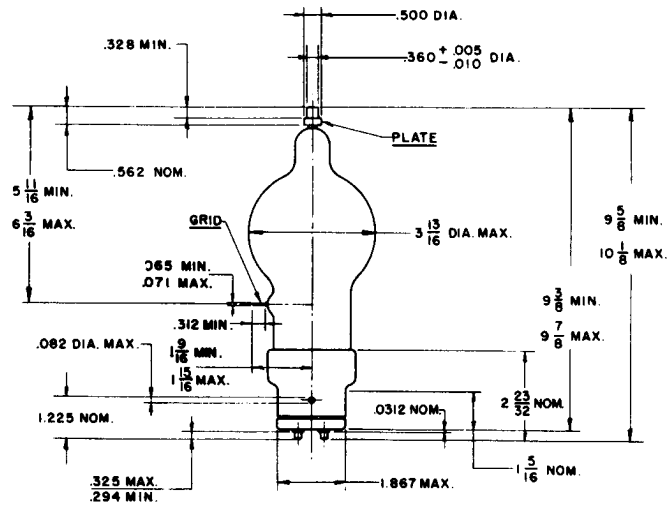
**Grid Dissipation**—The power dissipated by the grid of the 250TL must not exceed 40 watts. Grid dissipation may be calculated from the following expression.

$$P_g = e_{\text{cmp}} I_c$$

where  $P_g$  = grid dissipation,  
 $e_{\text{cmp}}$  = peak positive grid voltage, and  
 $I_c$  = d-c grid current

$e_{\text{cmp}}$  may be measured by means of a suitable peak-reading voltmeter connected between filament and grid.<sup>1</sup> 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 condition of loading.

**Plate Dissipation**—The plates of the 250TL operate at a visibly red color at the maximum rated dissipation of 250 watts. Plate dissipation in excess of the maximum rating is permissible only for short periods of time, such as during tuning procedures.



DIMENSIONS  
IN INCHES

<sup>1</sup>For suitable peak v.t.v.m. circuits see, for instance, "Vacuum Tube Ratings," Eimac News, January, 1945. This article is available in reprint form on request.

## DRIVING POWER vs. POWER OUTPUT

The three charts on this page show the relationship of plate efficiency, power output and approximate grid driving power at plate voltages of 2000, 3000 and 4000 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 2000, 3000, and 4000 volts respectively.

