

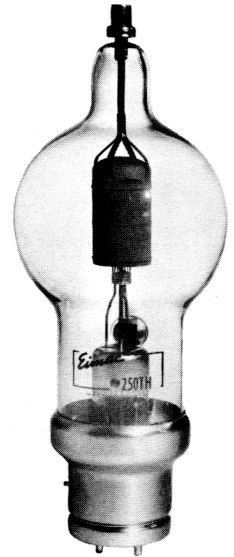


**E I M A C**  
 Division of Varian  
 SAN CARLOS  
 CALIFORNIA

**250TH**  
 HIGH-MU TRIODE  
 MODULATOR  
 OSCILLATOR  
 AMPLIFIER

The EIMAC 250TH is a high-mu power triode intended for use as an amplifier, oscillator or modulator. It has a maximum plate-dissipation rating of 250 watts and a maximum plate-voltage rating of 4000 volts at frequencies up to 40 MHz.

The 250TH in class-C rf service will deliver up to 1000 watts plate power output with 39 watts driving power. Two 250TH's in class-AB<sub>2</sub> modulator service will deliver up to 1180 watts maximum-signal plate power output with 42 watts nominal driving power.



**ELECTRICAL GENERAL CHARACTERISTICS**

<b>Filament: Thoriated Tungsten</b>	
Voltage	5.0 volts
Current	10.5 amperes
Amplification Factor (Average)	37
<b>Direct Interelectrode Capacitances (Average)</b>	
Grid-Plate	2.9 $\mu\text{mf}$
Grid-Filament	4.6 $\mu\text{mf}$
Plate-Filament	0.5 $\mu\text{mf}$
Transconductance ( $I_b=300 \text{ ma.}, E_b=3000 \text{ v.}$ )	5600 $\mu\text{mhos}$
Highest Frequency for Maximum Ratings	40 MHz

**MECHANICAL**

Base	Special 4-pin
Basing	See outline drawing
Socket	(National No. XM-50 or E. F. Johnson No. 123-211) or equivalent
Mounting Position	Vertical, base down or up
Cooling	Convection and radiation
Maximum Temperature of Plate and Grid Seals	225°C
<b>Recommended Heat-Dissipating Connectors:</b>	
Plate	EIMAC HR-6
Grid	EIMAC HR-3
<b>Maximum Over-all Dimensions:</b>	
Length	10.13 inches
Diameter	3.81 inches
Net Weight	10 ounces
Shipping Weight	3 pounds

**RADIO FREQUENCY POWER AMPLIFIER AND OSCILLATOR**

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

MAXIMUM RATINGS

DC PLATE VOLTAGE	4000 VOLTS
DC PLATE CURRENT	350 MA
PLATE DISSIPATION	250 WATTS
GRID DISSIPATION	40 WATTS

TYPICAL OPERATION, per tube (Frequencies up to 40 MHz)

DC Plate Voltage	2000	3000	4000	volts
DC Grid Voltage	100	150	220	volts
DC Plate Current	357	333	313	ma
DC Grid Current*	94	90	93	ma
Peak RF Grid Voltage (approx.)	345	395	470	volts
Driving Power*	29	32	39	watts
Grid Dissipation	20	19	18	watts
Plate Power Input	714	1000	1250	watts
Plate Dissipation	250	250	250	watts
Plate Power Output	464	750	1000	watts



**PLATE MODULATED RADIO FREQUENCY POWER AMPLIFIER**

Class-C Telephony (Carrier conditions)  
 MAXIMUM RATINGS, PER TUBE  
 (Frequencies up to 40 MHz)

DC PLATE VOLTAGE	3200 VOLTS
DC PLATE CURRENT	280 MA
PLATE DISSIPATION	165 WATTS
GRID DISSIPATION	40 WATTS

TYPICAL OPERATION, per tube<sup>1</sup> (Frequencies up to 40 MHz)

DC Plate Voltage	2000	2500	3000	volts
DC Grid Voltage	-160	-180	-200	volts
DC Plate Current	250	225	200	ma
DC Grid Current*	60	45	38	ma
Peak RF Grid Voltage	365	365	375	volts
Driving Power*	22	17	14	watts
Grid Dissipation*	12	8	6	watts
Plate Power Input	500	565	600	watts
Plate Dissipation	165	165	165	watts
Plate Power Output	335	400	435	watts

**AUDIO FREQUENCY POWER AMPLIFIER AND MODULATOR**

Class-AB<sub>2</sub> (Sinusoidal wave, two tubes unless otherwise specified)  
 MAXIMUM RATINGS

DC PLATE VOLTAGE	4000 VOLTS
MAX-SIGNAL DC PLATE CURRENT, PER TUBE	350 MA
MAX-SIGNAL PLATE DISSIPATION, PER TUBE	250 WATTS
MAX-SIGNAL GRID DISSIPATION	40 WATTS

TYPICAL OPERATION

DC Plate Voltage	1500	2000	3000	volts
DC Grid Voltage†	0	-30	-65	volts
Zero-Signal DC Plate Current	220	140	100	ma
Max-Signal DC Plate Current	700	700	560	ma
Effective Load, Plate-to-Plate	4200	6000	12,200	ohms
Peak AF Grid Voltage (per tube)	230	260	260	volts
Max-Signal Peak Driving Power*	92	104	83	watts
Max-Signal Nominal Driving Power*	46	52	42	watts
Max-Signal Plate Power Input	1050	1400	1680	watts
Max-Signal Plate Power Output	630	900	1180	watts

\*Approximate values.  
 †Adjust to give stated Zero-Signal DC Plate Current.

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, DIVISION OF VARIAN, FOR INFORMATION AND RECOMMENDATIONS.

**APPLICATION**

**MECHANICAL**

**Mounting** — The 250TH 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 Dissipation Connectors (EIMAC HR-6 and HR-3 or equivalent) must be used at the plate and grid terminals of the 250TH. Forced-air cooling is not required in properly designed equipment operating at frequencies below 40 MHz. 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, 132 W. 22nd St., New York 11, 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.

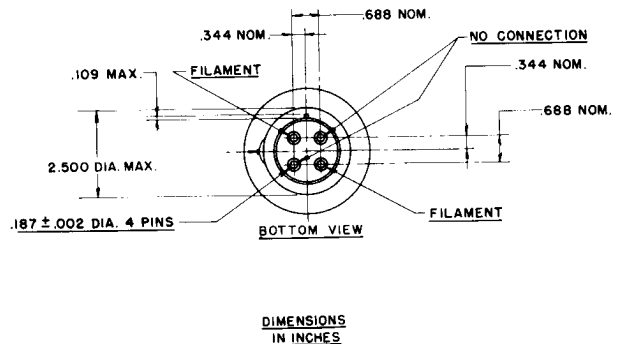
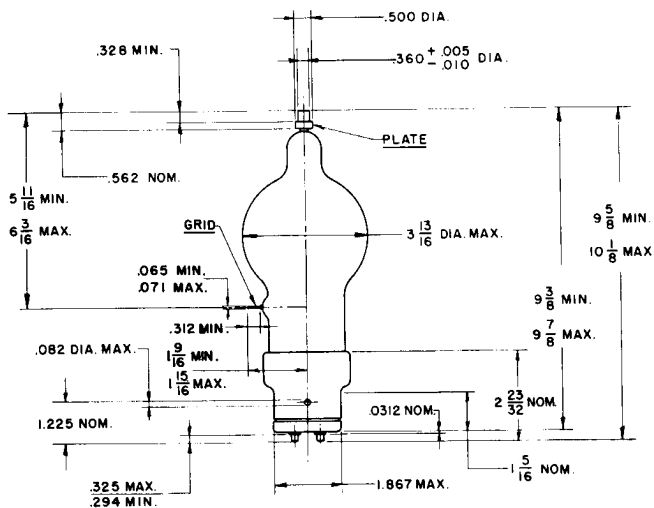
**Grid Dissipation** — The power dissipated by the grid of the 250TH must not exceed 40 watts. Grid dissipation may be calculated from the following expression:

$$P_g = e_{mp} I_c$$

where  $P_g$  = grid dissipation,  
 $e_{mp}$  = peak positive grid voltage, and  
 $I_c$  = dc grid current.

$e_{mp}$  may be measured by means of a suitable peak-reading 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 condition of loading.

**Plate Dissipation** — The plates of the 250TH 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.



### 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. 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.

