

EITEL-McCULLOUGH, INC.

SAN BRUNO, 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 Mc.

The 250TH in class-C r-f service will deliver up to 1000 watts plate power output with 39 watts driving power. Two 250TH's in class-AB₂ modulator service will deliver up to 1180 watts maximum-signal plate power output with 42 watts nominal driving power.

GENERAL CHARACTERISTICS

ELECTRICAL

Filament: Thoriated Tungsten

Voltage - - - - - 5.0 volts

Current - - - - - 10.5 amperes

Amplification Factor (Average) - - - - - 37

Direct Interelectrode Capacitances (Average)

Grid-Plate - - - - - 2.9 $\mu\mu\text{f}$

Grid-Filament - - - - - 4.6 $\mu\mu\text{f}$

Plate-Filament - - - - - 0.5 $\mu\mu\text{f}$

Transconductance ($I_b = 300 \text{ ma.}, E_b = 3000 \text{ v.}$) - - - - - 5600 μmhos

Highest Frequency for Maximum Ratings - - - - - 40 Mc

MECHANICAL

Base - - - - - Special 4-pin

Basing - - - - - See outline drawing

Socket - - - - - { National No. XM-50
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

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

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 - - - - - 40 MAX. WATTS

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

D-C Plate Voltage	-	-	-	-	2000	3000	4000	volts
D-C Grid Voltage	-	-	-	-	-100	-150	-220	volts
D-C Plate Current	-	-	-	-	357	333	313	ma
D-C Grid Current*	-	-	-	-	94	90	93	ma
Peak R-F 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 Mc.)

D-C PLATE VOLTAGE - - - - - 3200 MAX. VOLTS

D-C PLATE CURRENT - - - - - 280 MAX. MA

PLATE DISSIPATION - - - - - 165 MAX. WATTS

GRID DISSIPATION - - - - - 40 MAX. WATTS

TYPICAL OPERATION, per tube¹ (Frequencies up to 40 Mc.)

D-C Plate Voltage	-	-	-	-	2000	2500	3000	volts
D-C Grid Voltage	-	-	-	-	-160	-180	-200	volts
D-C Plate Current	-	-	-	-	250	225	200	ma
D-C Grid Current*	-	-	-	-	60	45	38	ma
Peak R-F 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-AB₂ (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

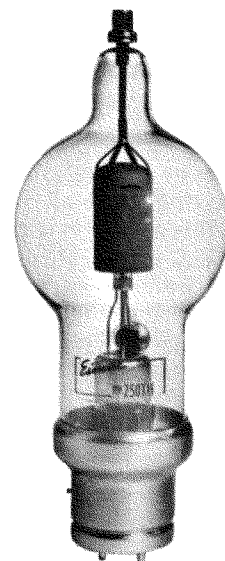
MAX-SIGNAL GRID DISSIPATION - - - - - 40 MAX. WATTS

TYPICAL OPERATION

D-C Plate Voltage	-	-	-	-	1500	2000	3000	volts
D-C Grid Voltage ¹	-	-	-	-	0	-30	-45	volts
Zero-Signal D-C Plate Current	-	-	-	-	220	140	100	ma
Max-Signal D-C Plate Current	-	-	-	-	700	700	560	ma
Effective Load, Plate-to-Plate	-	-	-	-	4200	6000	12,200	ohms
Peak A-F 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.

¹Adjust to give stated Zero-Signal D-C 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 EITEL-McCULLOUGH, INC., 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 Dissipating 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 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, 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.

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

where P_g = grid dissipation,

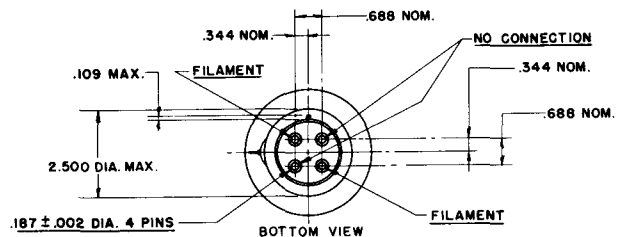
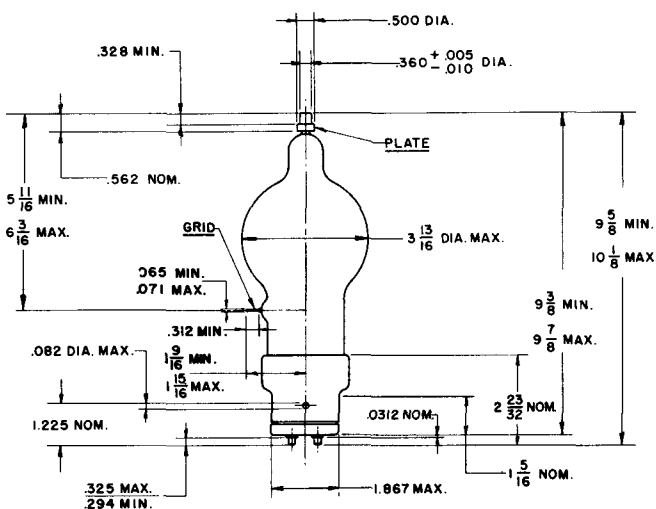
e_{emp} = peak positive grid voltage, and

I_c = d-c grid current.

e_{emp} may be measured by means of a suitable peak-reading voltmeter connected between filament and grid.¹ 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.

¹For 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.



DIMENSIONS
IN INCHES

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.

