EITEL-McCULLOUGH, INC.

SAN BRUNO, CALIFORNIA

2000T

MEDIUM-MU TRIODE
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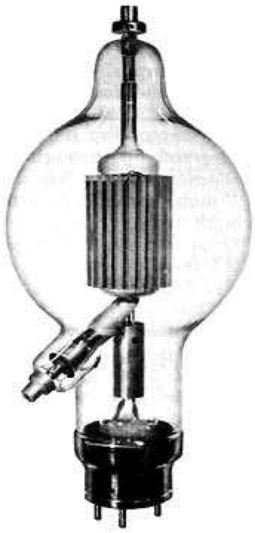
MODULATOR
OSCILLATOR
AMPLIFIER



The 2000T is a medium-mu, high-vacuum transmitting triode intended for amplifier, oscillator and modulator service. It has a maximum plate dissipation rating of 2000 watts. Cooling of the 2000T is accomplished by radiation from the plate, which operates at a visibly red temperature at maximum dissipation, and by means of forced air circulation around the envelope and at the seals.

GENERAL CHARACTERISTICS

ELECTRICAL

Filament: Thoriated Tungsten	
Voltage	10.0 volts
Current	23.5 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)	23
Direct Interelectrode Capacitances (Average)	
Grid-Plate	8.5 $\mu\mu$fd.
Grid-Filament	12.7 $\mu\mu$fd.
Plate-Filament	1.7 $\mu\mu$fd.
Transconductance (i_b = 1.75 amp., E_b = 6000 v.)	11,000 μmhos
Frequency for Maximum Ratings	40 Mc.

MECHANICAL

Base	Special 4-pin, No. 5006B
Basing	RMA type 4BD
Mounting	Vertical, base down or up
Cooling (See "Cooling" under "Application")	Radiation and forced air
Recommended Heat Dissipating Connectors:	
Plate	Eimac HR-8
Grid	Eimac HR-8
Maximum Overall Dimensions:	
Length	17.75 inches
Diameter	8.125 inches
Net weight	3.5 pounds
Shipping weight (Average)	13 pounds

AUDIO FREQUENCY POWER AMPLIFIER AND MODULATOR

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

MAXIMUM RATINGS

D-C PLATE VOLTAGE	8000 MAX. VOLTS
MAX-SIGNAL D-C PLATE CURRENT, PER TUBE	1.75 MAX. AMPS.
PLATE DISSIPATION, PER TUBE	2000 MAX. WATTS

TYPICAL OPERATION—2 TUBES

D-C Plate Voltage	4000	5000	6000	7000	Volts
D-C Grid Voltage (approx.)*	—140	—180	—230	—280	Volts
Zero-Signal D-C Plate Current	400	400	400	300	Ma.
Max-Signal D-C Plate Current	2.30	2.20	2.00	1.80	Amps
Effective Load, Plate-to-Plate	3400	5000	7000	9200	Ohms
Peak A-F Grid Input Voltage (per tube)	500	520	580	600	Volts
Max-Signal Peak Driving Power	300	280	380	350	Watts
Max-Signal Nominal Driving Power (approx.)	150	140	190	175	Watts
Max-Signal Plate Power Output	5200	7000	8000	8600	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 (Frequencies below 40 Mc.)

D-C PLATE VOLTAGE	8000 MAX. VOLTS
D-C PLATE CURRENT	1.75 MAX. AMPS.
PLATE DISSIPATION	2000 MAX. WATTS
GRID DISSIPATION	150 MAX. WATTS

TYPICAL OPERATION, PER TUBE* (Frequencies below 40 Mc.)

D-C Plate Voltage	5000	6000	7000	Volts
D-C Grid Voltage	—350	—500	—600	Volts
D-C Plate Current	1.35	1.35	1.15	Amps.
D-C Grid Current	175	165	120	Ma.
Peak R-F Grid Input Voltage	840	1000	1060	Volts
Driving Power (approx.)	140	160	115	Watts
Grid Dissipation	85	82	55	Watts
Plate Power Input	6750	8000	8000	Watts
Plate Dissipation	2000	2000	2000	Watts
Plate Power Output	4750	6000	6000	Watts

*The performance figures listed under Typical Operation are for radio frequencies up to the VHF region and are obtained by calculation from the characteristic tube curves and confirmed by direct tests. The driving power given includes power taken by the tube grid and the bias circuit. The driving power and output power do not allow for losses in the associated resonant circuits. These losses are not included because they depend principally upon the design and choice of the circuit components.

PLATE MODULATED RADIO FREQUENCY AMPLIFIER

Class-C Telephony (Carrier conditions, per tube)

MAXIMUM RATINGS (Frequencies below 40 Mc.)

D-C PLATE VOLTAGE	6000 MAX. VOLTS
D-C PLATE CURRENT	1.4 MAX. AMPS.
PLATE DISSIPATION	1350 MAX. WATTS
GRID DISSIPATION	150 MAX. WATTS

TYPICAL OPERATION, PER TUBE* (Frequencies below 40 Mc.)

D-C Plate Voltage	4000	5000	6000	Volts
D-C Plate Current	1.25	1.20	1.13	Amps.
Total Bias Voltage	—600	—700	—800	Volts
Fixed Bias Voltage	—300	—330	—375	Volts
Grid Resistor	1500	2000	2500	Ohms
D-C Grid Current	200	185	170	Ma.
Peak R-F Grid Input Voltage (approx.)	1140	1240	1320	Volts
Driving Power (approx.)	228	230	225	Watts
Grid Dissipation	108	100	88	Watts
Plate Power Input	5000	6000	6750	Watts
Plate Dissipation	1350	1350	1350	Watts
Plate Power Output	3650	4650	5400	Watts

*The performance figures listed under Typical Operation are for radio frequencies up to the VHF region and are obtained by calculation from the characteristic tube curves and confirmed by direct tests. The driving power given includes power taken by the tube grid and the bias circuit. The driving power and output power do not allow for losses in the associated resonant circuits. These losses are not included because they depend principally upon the design and choice of the circuit components.

▶ Indicates change from sheet dated 4-1-46

APPLICATION

MECHANICAL

Mounting—The 2000T must be mounted vertically, base up or base down. Flexible connecting straps should be provided between the grid and plate terminals and the external grid and plate circuits. The tube must be protected from severe vibration and shock.

Cooling—Forced-air cooling is required on the envelope and also in the base of the tube. Envelope cooling may be accomplished by locating an ordinary 8- or 10-inch fan about one foot from the tube and directing the air at the middle of the envelope.

Base cooling requires an air flow of 2½ cu. ft. per min. directed up through the bottom of the base toward the filament press. The base of the tube is provided with a 1-inch diameter hole for this purpose. If a socket is used with a 1-inch diameter matching hole and the manifold is of the same diameter, a static pressure of less than 0.1 inch of water is required at the manifold to provide the 2½ cu. ft. per min.

One type of socket provides a ¼ inch diameter pipe for the air inlet to the base. With this type of socket a static pressure of 5½ inches of water is required at the pipe to obtain the necessary 2½ cu. ft. per min. volume.

Suitable electrical interlocks should be provided to remove the plate and filament voltages in the event that the supply of cooling air is interrupted.

ELECTRICAL

Filament Voltage—For maximum tube life the filament voltage, as measured directly at the filament pins, should be the rated value of 10 volts. Unavoidable variations in filament voltage must be kept within the range from 9.5 to 10.5 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 2000T there is little advantage in using bias voltages in excess of those given under "Typical Operation," except in certain very specilaized 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.

Plate Voltage—The plate supply voltage for the 2000T should not exceed 8000 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.

Grid Dissipation—The power dissipated by the grid of the 2000T must not exceed 150 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.[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—Under normal operating conditions, the power dissipated by the plate of the 2000T should not be allowed to exceed 2000 watts. Plate dissipation in excess of the maximum rating is permissible for short periods of time, such as during tuning procedures.

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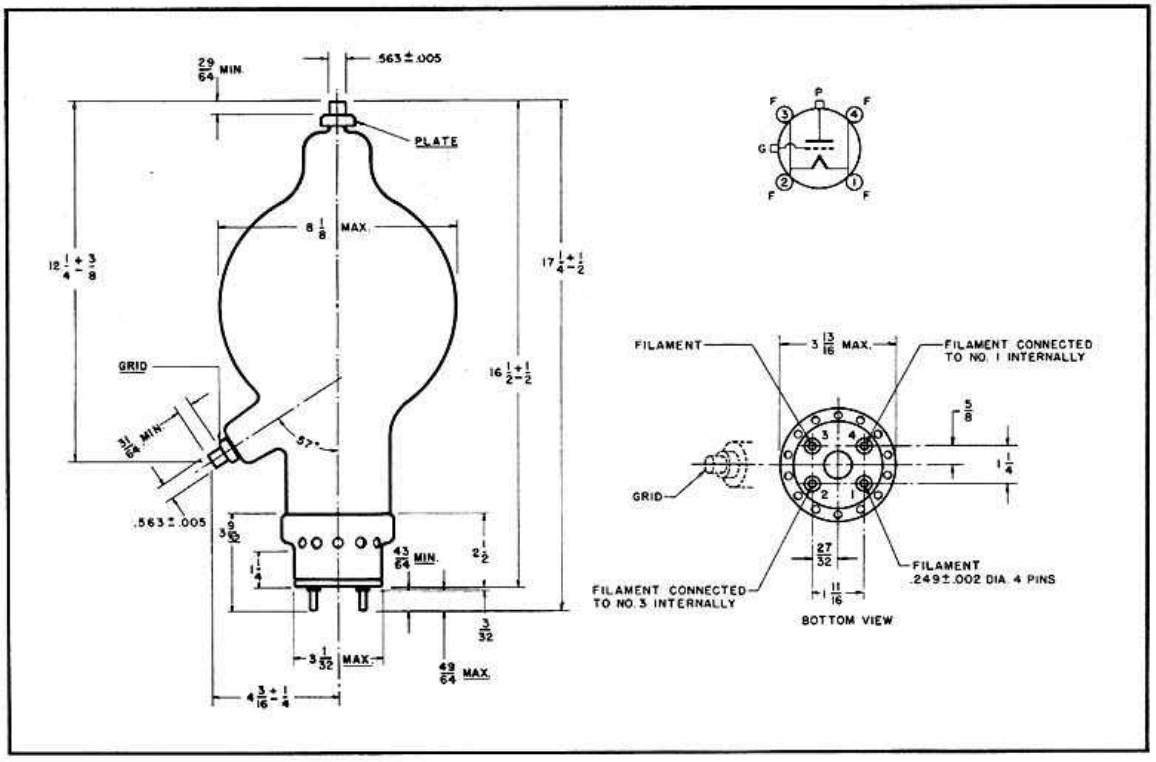
[1]For suitable peak v.t.v.m. circuits see, for instance, "Vacuum Tube Ratings," Eimac News, January, 1945. This article is available in reprint form on request.



DRIVING POWER vs. POWER OUTPUT

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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 5000, 6000, and 7000 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 5000, 6000, and 7000 volts respectively.

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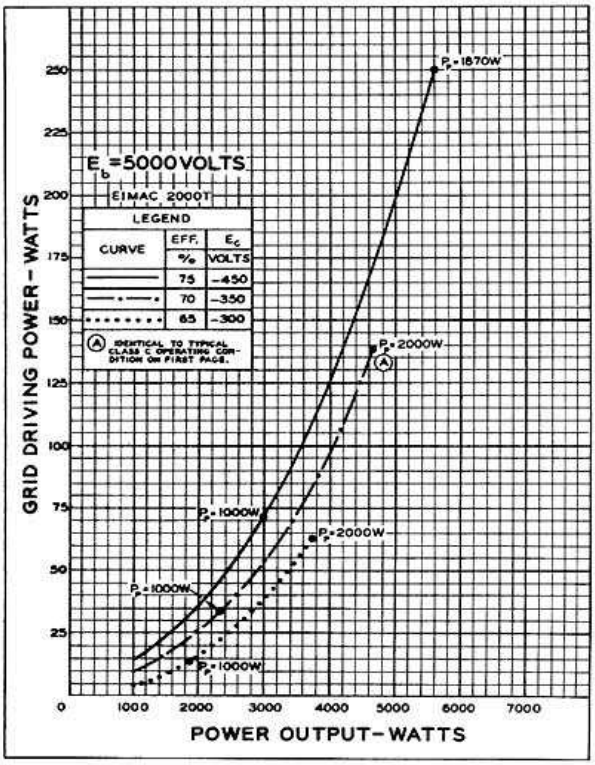

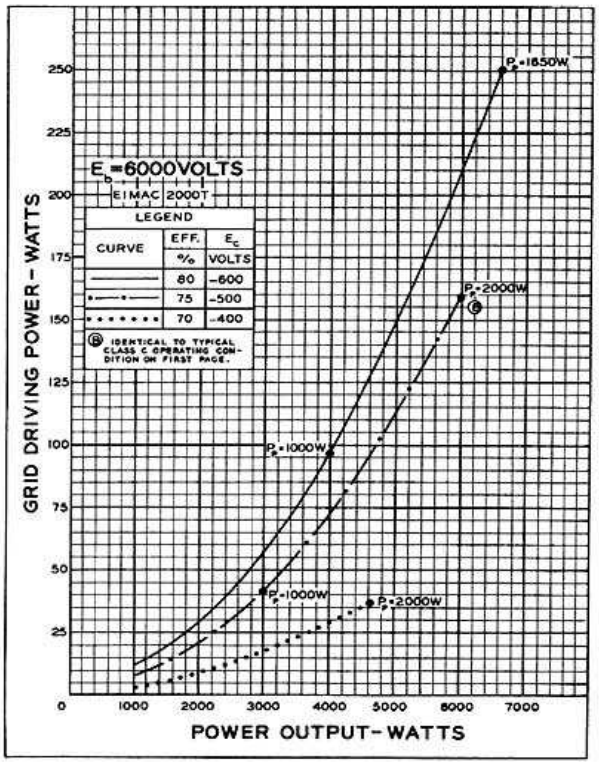

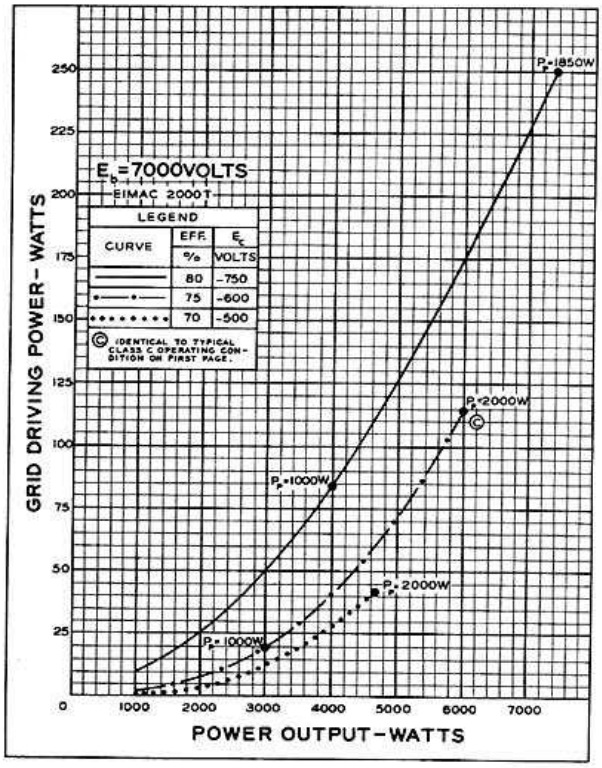

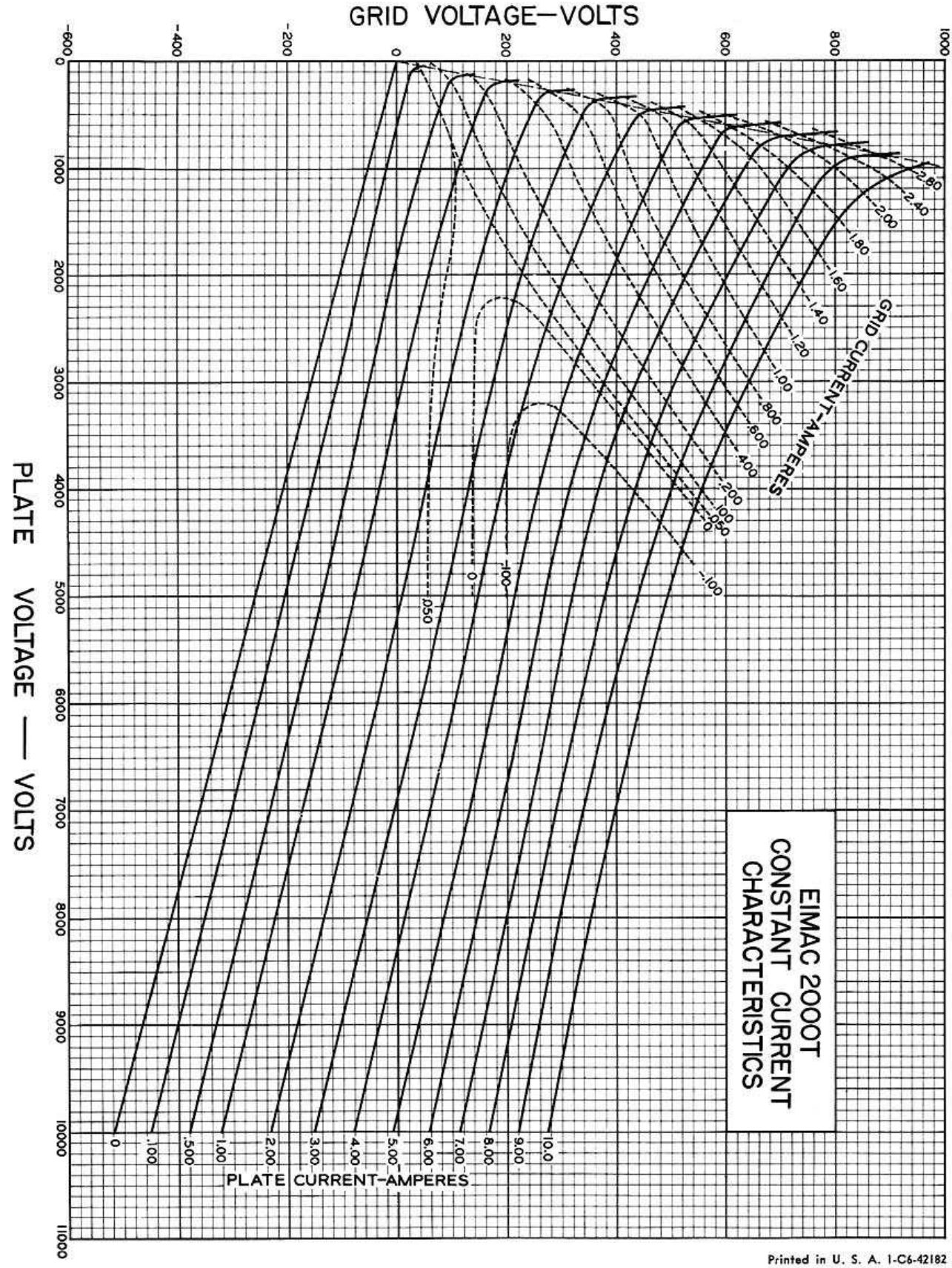

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