



E I M A C

Division of Varian

SAN CARLOS

CALIFORNIA

8251

3CX2500F3

**MEDIUM MU
TRIODE**

The EIMAC 3CX2500F3 is an all ceramic and metal, medium-mu, forced-air cooled, external anode transmitting triode with a maximum plate dissipation rating of 2500 watts. Relatively high power output as an amplifier, oscillator, or modulator may be obtained from this tube at low plate voltages. The 3CX2500F3 is an exact replacement for the EIMAC 3X2500F3 and is suggested for use where higher ambient temperatures are to be expected or greater reliability is required. The all ceramic and metal construction allows a greater margin of safety with respect to tube operating temperatures while permitting higher processing temperatures to insure longer life.

The tube is equipped with flexible filament and grid leads which simplify socketing and equipment design for industrial and communication frequencies below 30 megahertz.

GENERAL CHARACTERISTICS

ELECTRICAL

Filament: Thoriated Tungsten	<u>Min.</u>	<u>Nom.</u>	<u>Max.</u>	
Voltage - - - - -		7.5		volts
Current - - - - -	48		53	amperes
Amplification Factor - - - - -	19		26	
Direct Interelectrode Capacitances				
Grid-Plate - - - - -	16.8		23.2	pF
Grid-Filament - - - - -	29.2		40.2	pF
Plate-Filament - - - - -	0.6		1.2	pF
Transconductance (I _b =830 ma., E _b =3000 v.) -		20,000		umhos
Highest Frequency for Maximum Ratings -			30	MHz

MECHANICAL

Base - - - - -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	See outline drawing
Mounting - - - - -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Vertical, base down or up
Maximum Anode Core and Seal Temperatures -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	250°C
Cooling - - - - -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Forced Air
Maximum Over-all Dimensions:																				
Length (Does not include filament connectors) -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.6 inches
Diameter - - - - -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.16 inches
Length of filament Connectors (Approximate) -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.5 inches
Net Weight - - - - -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.5 pounds
Shipping Weight (Approximate) - - - - -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17 pounds

RADIO-FREQUENCY POWER AMPLIFIER OR OSCILLATOR

Conventional Neutralized Amplifier,
Class-C FM or Telegraphy
(Key-down Conditions)

MAXIMUM RATINGS

DC PLATE VOLTAGE -	6000 VOLTS
DC PLATE CURRENT -	2.5 AMPS
PLATE DISSIPATION -	2500 WATTS
GRID DISSIPATION -	150 WATTS

TYPICAL OPERATION (Frequencies below 30 MHz)

DC Plate Voltage - - - - -	4000	5000	6000	volts
DC Plate Current - - - - -	2.5	2.5	2.08	amps
DC Grid Voltage - - - - -	300	450	500	volts
DC Grid Current - - - - -	245	265	180	ma
Peak RF Grid Input Voltage*	580	750	765	volts
Driving Power*	142	197	136	watts
Grid Dissipation*	68	78	46	watts
Plate Input Power - - - - -	10,000	12,500	12,500	watts
Plate Dissipation - - - - -	2500	2500	2500	watts
Plate Output Power - - - - -	7500	10,000	10,000	watts

*Approximate values.

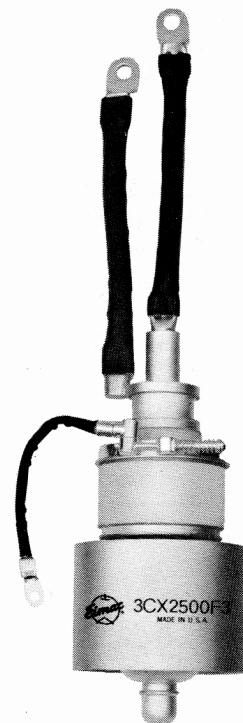


**PLATE-MODULATED RADIO-FREQUENCY AMPLIFIER**Conventional Neutralized Amplifier,
Class-C Telephony (Carrier Conditions)**MAXIMUM RATINGS**

DC PLATE VOLTAGE -	5500 VOLTS
DC PLATE CURRENT -	2.0 AMPS
PLATE DISSIPATION -	1670 WATTS
GRID DISSIPATION -	150 WATTS

TYPICAL OPERATION (Frequencies below 30 MHz)

DC Plate Voltage	-	-	-	-	-	4000	4500	5000	volts
DC Plate Current	-	-	-	-	-	1.67	1.47	1.25	amps
DC Grid Voltage	-	-	-	-	-	-450	-500	-550	volts
DC Grid Current*	-	-	-	-	-	180	140	150	ma
Peak RF Grid Input Voltage*	-	-	-	-	-	685	715	760	volts
Driving Power*	-	-	-	-	-	125	100	115	watts
Grid Dissipation*	-	-	-	-	-	43	30	32	watts
Plate Input Power	-	-	-	-	-	6670	6615	6250	watts
Plate Dissipation	-	-	-	-	-	1670	1315	950	watts
Plate Output Power	-	-	-	-	-	5000	5300	5300	watts

*Approximate values.

AUDIO-FREQUENCY POWER AMPLIFIER OR MODULATOR

Class-AB or B

MAXIMUM RATINGS

DC PLATE VOLTAGE -	6000 VOLTS
DC PLATE CURRENT -	2.5 AMPS
PLATE DISSIPATION -	2500 WATTS
GRID DISSIPATION -	150 WATTS

TYPICAL OPERATION (Sinusoidal wave, two tubes unless noted)

DC Plate Voltage	-	-	-	-	-	4000	5000	6000	volts
DC Grid Voltage ¹	-	-	-	-	-	-150	-190	-240	volts
Zero-Signal DC Plate Current	-	-	-	-	-	0.6	0.5	0.4	amps
Max-Signal DC Plate Current	-	-	-	-	-	4.0	3.2	3.0	amps
Effective Load, Plate to Plate	-	-	-	-	-	2200	3600	4650	ohms
Peak AF Grid Input Voltage (per tube)*	-	-	-	-	-	340	360	390	volts
Max-Signal Peak Driving Power*	-	-	-	-	-	340	230	225	watts
Max-Signal Nominal Driving Power*	-	-	-	-	-	170	115	113	watts
Max-Signal Plate Output Power	-	-	-	-	-	11,000	11,000	13,000	watts

*Approximate values.

¹Adjust to give listed zero-signal 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

Cooling—Forced-air cooling must be provided to hold the ceramic-to-metal seals and anode core temperature below the maximum rating of 250°C. At ambient temperatures above 50°C, at higher altitudes and at operating temperatures above 30 MHz, additional air flow must be provided. Sea level and 10,000 foot altitude air-flow requirements to maintain seal temperatures below 200°C in 50°C ambient air are tabulated below (for operation below 30 MHz).

Anode-to-Base Air Flow ¹				
Sea Level			10,000 Feet	
Anode Dissipation Watts	Air Flow CFM	Pressure Drop Inches Water	Air Flow CFM	Pressure Drop Inches Water
1500	33	.6	48	.9
2500	66	1.25	96	1.82

Base-to-Anode Air Flow				
Sea Level			10,000 Feet	
Anode Dissipation Watts	Air Flow CFM	Pressure Drop Inches Water	Air Flow CFM	Pressure Drop Inches Water
1500	32	.6	47	.9
2500	57	1.0	83	1.5

*Since the power dissipated by the filament represents about 400 watts and since grid dissipation can, under some conditions represent another 150 watts, allowance has been made in preparing this tabulation for an additional 550 watts.

¹ When air is supplied in the anode-to-base direction, a minimum of 3 cfm must be directed into the filament-stem structure between the inner and outer filament terminals to maintain the base seals below 250°C. No separate air is required with base-to-anode airflow.

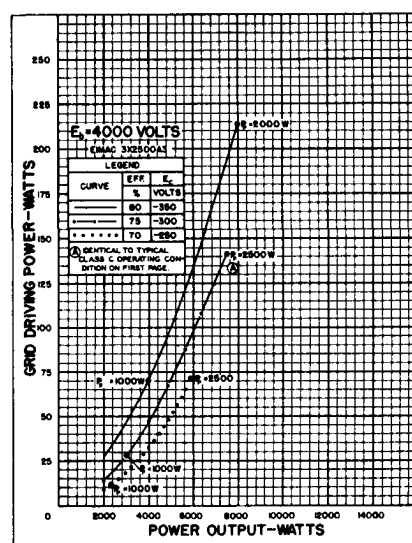
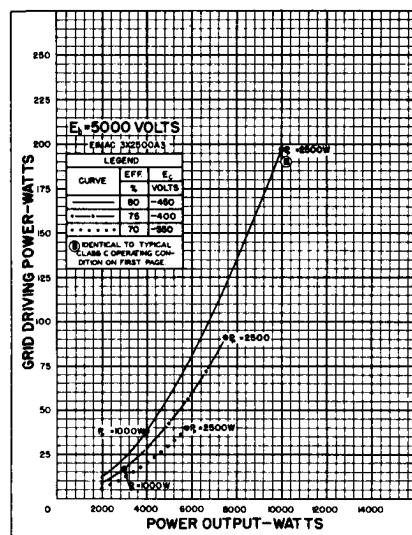
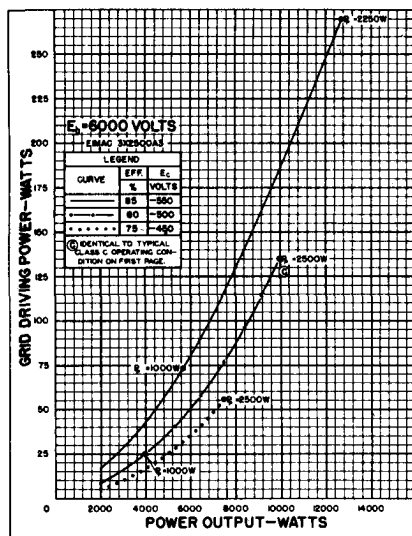
Filament Voltage — The filament voltage, as measured directly at the tube, should be 7.5 volts with maximum allowable variations due to line fluctuation of from 7.12 to 7.87 volts. Tube life may be extended by operation at the lower end of this range.

Bias Voltage — 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 from a grid resistor, suitable protective means must be provided to prevent excessive plate dissipation in the event of loss of excitation.

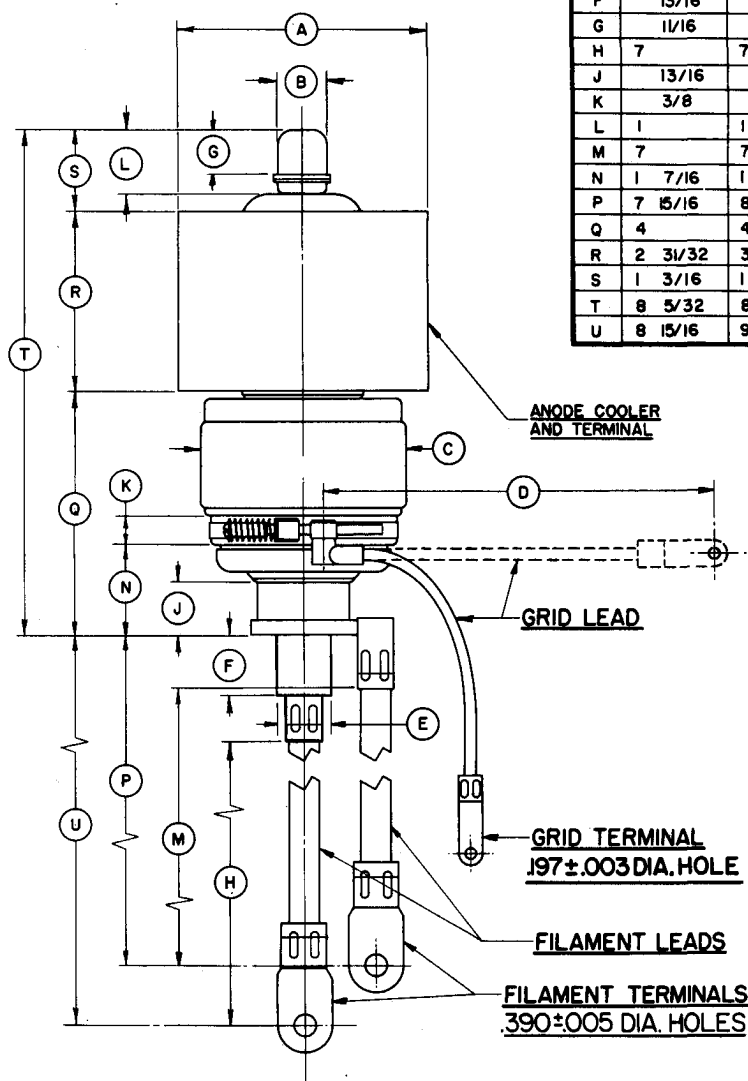
Plate Voltage — The plate-supply voltage for the 3CX2500F3 should not exceed 6000 volts. In most cases there is little advantage in using plate-supply voltages higher than those given under "TYPICAL OPERATION" for the power output desired.

Grid Dissipation — The power dissipated by the grid of the 3CX2500F3 must never exceed 150 watts. Grid dissipation is the product of dc current and peak positive grid voltage.

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. With lightly loaded conditions the grid driving power should be reduced so that the grid current does not exceed one-tenth of the plate current.



DIMENSION DATA		
REF.	MIN	MAX
A	4 3/32	4 5/32
B	25/32	27/32
C		3 5/8
D	6 3/8	6 5/8
E	55/64	57/64
F	13/16	15/16
G	11/16	13/16
H	7	7 1/2
J	13/16	15/16
K	3/8	7/16
L	1	1 1/8
M	7	7 1/2
N	1 7/16	1 9/16
P	7 5/16	8 7/16
Q	4	4 1/8
R	2 31/32	3 1/32
S	1 3/16	1 7/16
T	8 5/32	8 19/32
U	8 15/16	9 7/16



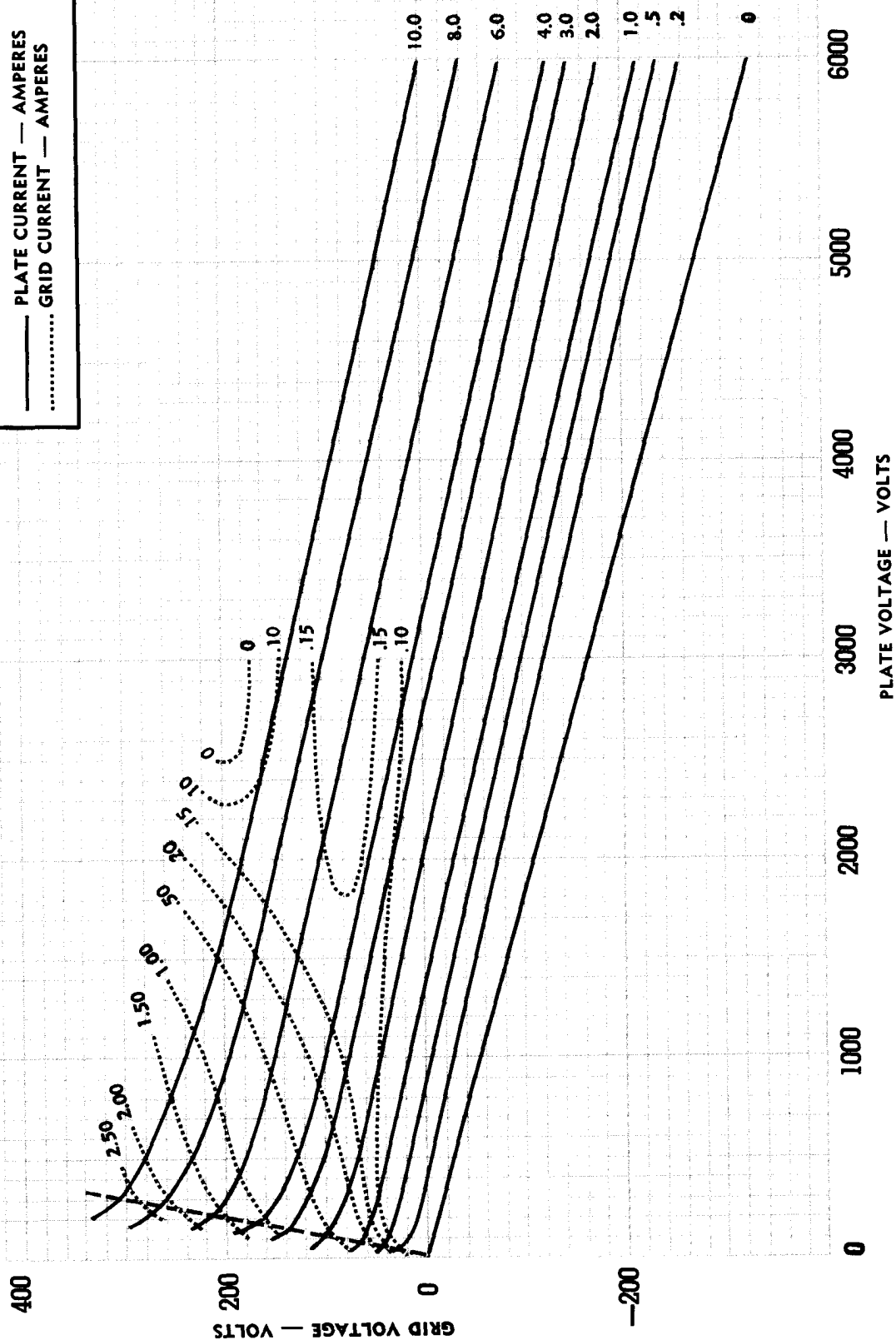
ALL DIMENSIONS
IN INCHES



3CX2500F3

**EIMAC 3CX2500F3
CONSTANT CURRENT
CHARACTERISTICS**

— PLATE CURRENT — AMPERES
..... GRID CURRENT — AMPERES





EITEL-McCULLOUGH, INC.
SAN CARLOS, CALIFORNIA

8251
3X2500F3
MEDIUM-MU
TRIODE

The Eimac 8251/3X2500F3 is a medium-mu, forced-air cooled, external-anode power triode intended for amplifier, oscillator, or modulator service. It has a maximum plate-dissipation rating of 2500 watts and is capable of high output at relatively low plate voltages. A single 8251/3X2500F3 will deliver a radio-frequency plate power output of 7500 watts at a plate voltage of 4000 volts.

The tube is equipped with flexible filament and grid leads which simplify socketing and equipment design for industrial and communication frequencies below 30 megacycles.

The approved Federal Communications Commission rating for the 8251/3X2500F3 is 5000 watts of carrier power when used as a plate-modulated amplifier and 1250 watts of carrier power when used as a grid-modulated or linear amplifier.

GENERAL CHARACTERISTICS

ELECTRICAL

Filament: Thoriated Tungsten	Min.	Nom.	Max.	
Voltage	-	7.5	-	volts
Current	-	48	53	amperes
Amplification Factor	-	19	26	
Direct Interelectrode Capacitances:				
Grid-Plate	-	16.8	23.2	uuf
Grid-Filament	-	29.2	40.2	uuf
Plate-Filament	-	0.6	1.2	uuf
Transconductance ($I_b = 830$ ma., $E_b = 3000$ v.)	-	20,000	-	umhos
Highest Frequency for Maximum Ratings	-	-	30	mc

MECHANICAL

Base	-	-	-	See outline drawing
Mounting	-	-	-	Vertical, base down or up
Maximum Anode Cooler Core and Seal Temperatures	-	-	-	175° C
Cooling	-	-	-	Forced air
Maximum Over-All Dimensions:				
Length (Does not include filament connectors)	-	-	-	8.6 inches
Diameter	-	-	-	4.16 inches
Length of Filament Connectors (Approximate)	-	-	-	9.5 inches
Net Weight	-	-	-	7.5 pounds
Shipping Weight (Approximate)	-	-	-	17 pounds

RADIO-FREQUENCY POWER AMPLIFIER OR OSCILLATOR

Conventional Neutralized Amplifier,
Class-C FM or Telegraphy (Key-Down Conditions)

MAXIMUM RATINGS

D-C PLATE VOLTAGE	-	-	-	6000 MAX. VOLTS
D-C PLATE CURRENT	-	-	-	2.5 MAX. AMPS
PLATE DISSIPATION	-	-	-	2500 MAX. WATTS
GRID DISSIPATION	-	-	-	150 MAX. WATTS

TYPICAL OPERATION (Frequencies below 30 Mc)

D-C Plate Voltage	-	-	-	4000	5000	6000 volts
D-C Plate Current	-	-	-	2.5	2.5	2.08 amps
D-C Grid Voltage	-	-	-	-300	-450	-500 volts
D-C Grid Current	-	-	-	245	265	180 ma
Peak R-F Grid Input Voltage*	-	-	-	580	750	765 volts
Driving Power*	-	-	-	142	197	136 watts
Grid Dissipation*	-	-	-	68	78	46 watts
Plate Input Power	-	-	-	10,000	12,500	12,500 watts
Plate Dissipation	-	-	-	2500	2500	2500 watts
Plate Output Power	-	-	-	7500	10,000	10,000 watts

*Approximate values.

PLATE-MODULATED RADIO-FREQUENCY AMPLIFIER

Conventional Neutralized Amplifier,
Class-C Telephony (Carrier Conditions)

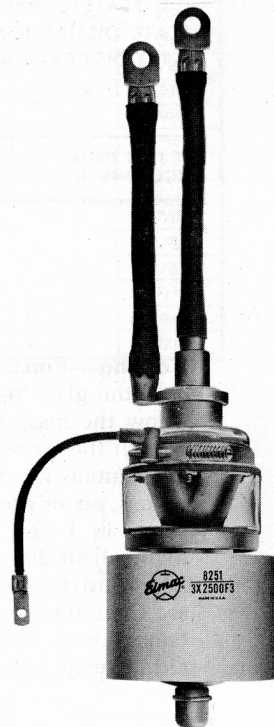
MAXIMUM RATINGS

D-C PLATE VOLTAGE	-	-	-	5500 MAX. VOLTS
D-C PLATE CURRENT	-	-	-	2.0 MAX. AMPS
PLATE DISSIPATION	-	-	-	1670 MAX. WATTS
GRID DISSIPATION	-	-	-	150 MAX. WATTS

TYPICAL OPERATION (Frequencies below 30 Mc)

D-C Plate Voltage	-	-	-	4000	4500	5000 volts
D-C Plate Current	-	-	-	1.67	1.47	1.25 amps
D-C Grid Voltage	-	-	-	-450	-500	-550 volts
D-C Grid Current*	-	-	-	180	140	150 ma
Peak R-F Grid Input Voltage*	-	-	-	685	715	760 volts
Driving Power*	-	-	-	125	100	115 watts
Grid Dissipation*	-	-	-	43	30	32 watts
Plate Input Power	-	-	-	6670	6615	6250 watts
Plate Dissipation	-	-	-	1670	1315	950 watts
Plate Output Power	-	-	-	5000	5300	5300 watts

*Approximate values.





AUDIO-FREQUENCY POWER AMPLIFIER OR MODULATOR

Class-AB or B

MAXIMUM RATINGS

D-C PLATE VOLTAGE	-	-	-	6000 MAX. VOLTS
D-C PLATE CURRENT	-	-	-	2.5 MAX. AMPS
PLATE DISSIPATION	-	-	-	2500 MAX. WATTS
GRID DISSIPATION	-	-	-	150 MAX. WATTS

TYPICAL OPERATION (Sinusoidal wave, two tubes unless noted)

D-C Plate Voltage	-	-	-	4000	5000	6000 volts
D-C Grid Voltage ¹	-	-	-	—150	—190	—240 volts
Zero-Signal D-C Plate Current	-	-	-	0.6	0.5	0.4 amps
Max-Signal D-C Plate Current	-	-	-	4.0	3.2	3.0 amps
Effective Load, Plate to Plate	-	-	-	2200	3600	4650 ohms
Peak A-F Grid Input Voltage (per tube)*	-	-	-	340	360	390 volts
Max-Signal Peak Driving Power*	-	-	-	340	230	225 watts
Max-Signal Nominal Driving Power*	-	-	-	170	115	113 watts
Max-Signal Plate Output Power	-	-	-	11,000	11,000	13,000 watts

*Approximate values.

¹Adjust to give listed zero-signal 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

Cooling—Forced-air cooling must be provided to hold the glass-to-metal seals and the anode cooler core below the maximum rated temperature of 175° C. Although the air requirements stated below are sufficient to maintain rated tube temperatures under many conditions, air in excess of the amounts shown will usually result in longer tube life. At ambient temperatures higher than 20° C and at high altitudes additional air flow must be provided. In all cases, tube temperatures are the criteria which govern air requirements. Surface temperatures may be measured conveniently with the aid of temperature-sensitive paints.

Anode-to-Base Air-Flow				
Plate Dissipation (Watts)	Sea Level		10,000 Feet	
	Air-Flow (CFM)	Pressure Drop (Inches H ₂ O)	Air-Flow (CFM)	Pressure Drop (Inches H ₂ O)
2000	58.5	0.8	85.5	1.15
2500	85.5	1.6	125	2.3

Base-to-Anode Air-Flow				
Plate Dissipation (Watts)	Sea Level		10,000 Feet	
	Air-Flow (CFM)	Pressure Drop (Inches H ₂ O)	Air-Flow (CFM)	Pressure Drop (Inches H ₂ O)
2000	35.5	0.25	52	0.35
2500	42	0.5	61.5	0.75

Under the same conditions, a minimum air-flow rate of 6 CFM directed into the filament-stem structure between the inner and outer filament terminals is required to maintain the base seals below 175° C.

Simultaneous removal of all power and air (as in the case of a power failure) will not ordinarily injure the tube, but it is not recommended as a standard operating practice.

Filament Voltage—The filament voltage as measured directly at the tube, should be 7.5 volts with maximum allowable variations due to line fluctuation of from 7.12 to 7.87 volts. Tube life may be extended by operation at the lower end of this range.

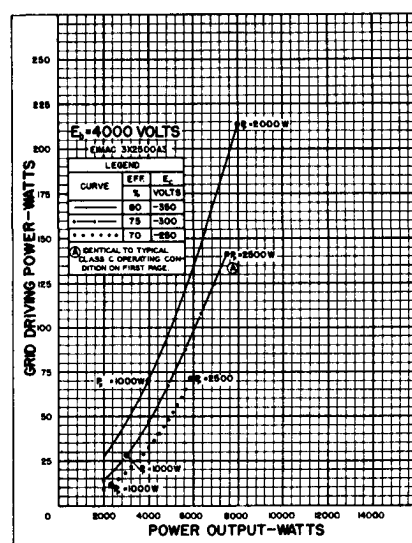
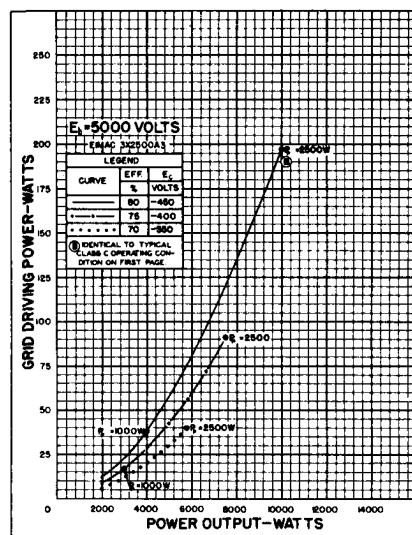
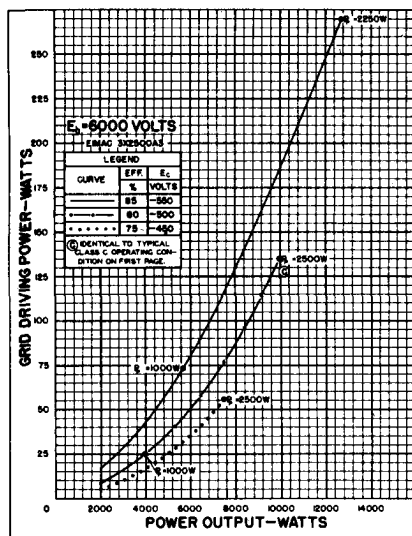
Bias Voltage—There is little advantage in using bias voltages in excess of those given under "Typical Operation," except in certain very specialized applications. Where bias is obtained from a grid resistor, suitable protective means must be provided to prevent excessive plate dissipation in the event of loss of excitation.

Plate Voltage — The plate-supply voltage for the 3X2500F3 should not exceed 6000 volts.

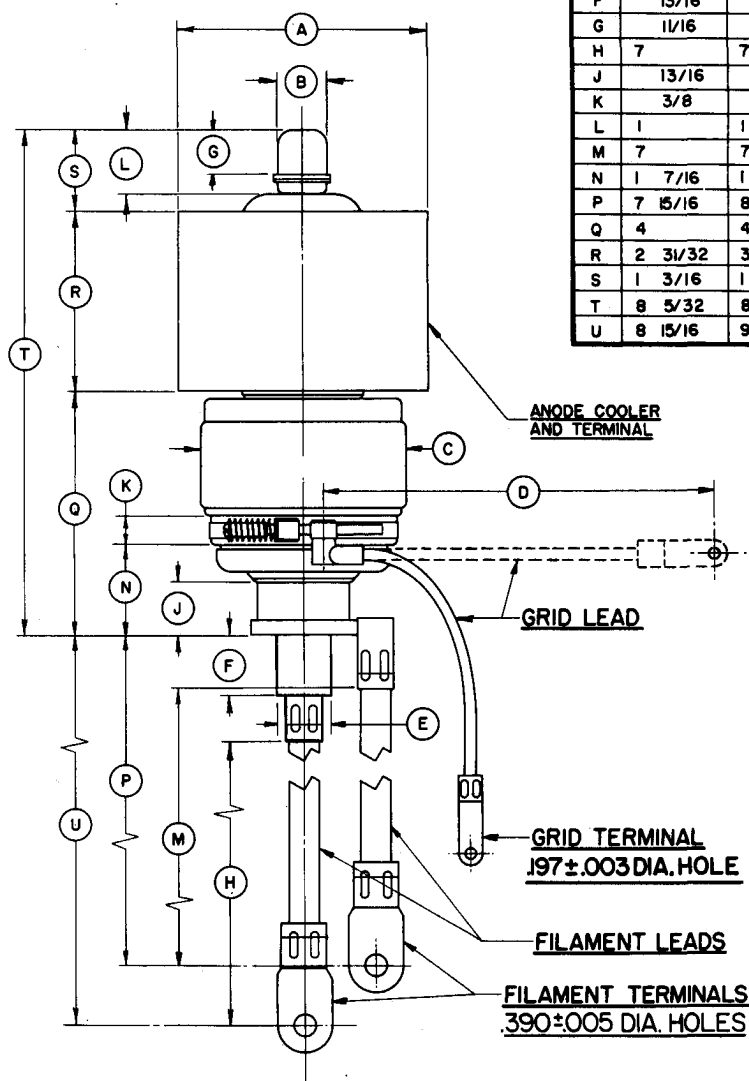
In Class-C FM or Telegraphy service, a 0.1-henry choke, shunted by a spark gap, should be series connected between the plates of the amplifier tubes and the high-voltage plate-supply capacitor to offer protection from transients and surges. In plate-modulated service, where a plate-modulation transformer is used, the protective choke is not normally required.

Grid Dissipation—The power dissipated by the grid of the 3X2500F3 must never exceed 150 watts. Grid dissipation is the product of dc grid current and peak positive grid voltage.

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. With lightly loaded conditions the grid driving power should be reduced so that the grid current does not exceed one-tenth of the plate current.



DIMENSION DATA		
REF.	MIN	MAX
A	4 3/32	4 5/32
B	25/32	27/32
C		3 5/8
D	6 3/8	6 5/8
E	55/64	57/64
F	13/16	15/16
G	11/16	13/16
H	7	7 1/2
J	13/16	15/16
K	3/8	7/16
L	1	1 1/8
M	7	7 1/2
N	1 7/16	1 9/16
P	7 5/16	8 7/16
Q	4	4 1/8
R	2 31/32	3 1/32
S	1 3/16	1 7/16
T	8 5/32	8 19/32
U	8 15/16	9 7/16



ALL DIMENSIONS
IN INCHES



3X2500F3

EIMAC 3X2500F3

CONSTANT CURRENT CHARACTERISTICS

— PLATE CURRENT — AMPERES
..... GRID CURRENT — AMPERES

