



E I M A C
Division of Varian
SAN CARLOS
CALIFORNIA

5-500A
RADIAL-BEAM
POWER PENTODE
•
MODULATOR
OSCILLATOR
AMPLIFIER

The Eimac 5-500A is a compact, ruggedly constructed radial-beam power pentode having a maximum plate dissipation rating of 500 watts. It is intended for use as an amplifier, oscillator or modulator. The high plate current rating, low grid-plate capacitance and low driving power requirements permit maximum power capability to be combined with circuit simplicity and economic driver requirements.

The Eimac 5-500A is cooled by radiation from the plate and by circulation of forced-air through the base, around the envelope and over the plate seal. Cooling may be greatly simplified by the use of the Eimac SK-400 or SK-410 Air System Socket and the accompanying Eimac SK-426 glass chimney. These sockets are designed to maintain the correct balance of cooling air between the component parts of the tube.

The suppressor element of the 5-500A terminates at the tube base shell, and is designed to be operated at ground (zero) potential. The base shell must be grounded by means of suitable spring clips.



GENERAL CHARACTERISTICS

ELECTRICAL

Filament: Thoriated Tungsten, balanced

Voltage - - - - -	10.0 volts
Current - - - - -	10.2 amperes

Grid-Screen Amplification Factor (Average) - - - - -	5.5
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Direct Interelectrode Capacitances, Grounded Cathode	<u>Min.</u>	<u>Max.</u>	
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Grid-Plate - - - - -	—	.10	pf
Input - - - - -	15.0	19.0	pf
Output - - - - -	9.5	12.0	pf

MECHANICAL

Base - - - - -	see drawing
Basing - - - - -	see drawing
Mounting Position - - - - -	Vertical, base up or down
Cooling - - - - -	Radiation and forced air
Recommended Heat Dissipating Connector - - - - -	Eimac HR-6
Recommended Socket - - - - -	Eimac SK-400 or SK-410 Air System Socket
Recommended Chimney - - - - -	Eimac SK-426
Maximum Overall Dimensions	
Length - - - - -	7.00 inches
Diameter - - - - -	3.56 inches
Net Weight - - - - -	11 ounces
Shipping Weight - - - - -	2.5 pounds

NOTE: Typical operation data are based on conditions of adjusting the r-f grid drive to a specified plate current, maintaining fixed conditions of grid bias and screen voltage. It will be found that if this procedure is followed there will be little variation in power output between tubes even though there may be some variation in grid and screen currents. Where grid bias is obtained principally by means of a grid resistor, to control plate current it is necessary to make the resistor adjustable.



RADIO FREQUENCY POWER AMPLIFIER AND OSCILLATOR

Class-C Telephony or FM Telephony

MAXIMUM RATINGS

D-C PLATE VOLTAGE	-	-	-	4000	Max. Volts
D-C SCREEN VOLTAGE	-	-	-	600	Max. Volts
D-C SUPPRESSOR VOLTAGE	-	-	-	100	Max. Volts
D-C PLATE CURRENT	-	-	-	450	Max. ma
PLATE DISSIPATION	-	-	-	500	Max. Watts
SCREEN DISSIPATION	-	-	-	35	Max. Watts
GRID DISSIPATION	-	-	-	12	Max. Watts

TYPICAL OPERATION

D-C Plate Voltage	-	-	-	2500	3000	4000	Volts
D-C Screen Voltage	-	-	-	500	500	500	Volts
D-C Grid Voltage	-	-	-	-210	-220	-240	Volts
D-C Suppressor Voltage	-	-	-	0	0	0	Volts
D-C Plate Current	-	-	-	405	432	450	ma
D-C Screen Current	-	-	-	55	65	65	ma
D-C Grid Current	-	-	-	28	35	38	ma
Screen Dissipation	-	-	-	27.5	32.5	33	Watts
Grid Dissipation	-	-	-	2.8	3.8	5.0	Watts
Peak R-F Grid Input Voltage	-	-	-	310	330	365	Volts
MF Driving Power*	-	-	-	8.7	12	14	Watts
Plate Power Input	-	-	-	1015	1300	1800	Watts
Plate Dissipation	-	-	-	265	495	500	Watts
Plate Power Output	-	-	-	750	805	1300	Watts

*Driving Power increases as frequency is increased.

RADIO-FREQUENCY LINEAR AMPLIFIER

Class AB₁, Grounded Cathode, one tube

MAXIMUM RATINGS

DC PLATE VOLTAGE	-	-	-	4000	Max. Volts
DC SCREEN VOLTAGE	-	-	-	1000	Max. Volts
DC SUPPRESSOR VOLTAGE	-	-	-	100	Max. Volts
DC PLATE CURRENT	-	-	-	450	Max. ma
PLATE DISSIPATION	-	-	-	500	Max. Watts
SCREEN DISSIPATION	-	-	-	35	Max. Watts

TYPICAL OPERATION (Frequencies below 30 Mc.)

Peak-Envelope or Modulation-Crest Conditions.

Adjusted for minimum distortion.

DC Plate Voltage	-	-	-	2000	3000	4000	Volts
DC Screen Voltage	-	-	-	750	750	750	Volts
DC Suppressor Voltage	-	-	-	0	0	0	Volts
DC Control Grid Voltage*	-	-	-	-100	-112	-121	Volts
Zero-Signal DC Plate Current	-	-	-	150	100	80	mA
Single-Tone DC Plate Current	-	-	-	338	320	322	mA
Two-Tone DC Plate Current	-	-	-	252	221	212	mA
Single-Tone DC Screen Current	-	-	-	31	26	24	mA
Two-Tone DC Screen Current	-	-	-	15	12	10	mA
Peak RF Grid Voltage	-	-	-	100	112	121	Volts
Useful Output Power	-	-	-	395	612	832	Watts
Resonant Load Impedance	-	-	-	3600	5800	7700	Ohms
Third Order Intermodulation Products**	-	-	-	-52	-33	-28	db
Fifth Order Intermodulation Products**	-	-	-	-49	-41	-37	db

*1. Adjust to the specified zero-signal plate current.

**2. Equal or better than stated for all signal levels up to indicated useful output power. Reference to one tone of a two-tone test signal.

PLATE MODULATED RADIO FREQUENCY AMPLIFIER

Class-C Telephony
(Carrier conditions unless otherwise specified.)

MAXIMUM RATINGS

DC PLATE VOLTAGE	-	-	-	4000	Volts
DC SCREEN VOLTAGE	-	-	-	600	Volts
DC SUPPRESSOR VOLTAGE	-	-	-	100	Volts
DC GRID VOLTAGE	-	-	-	-500	Volts
DC PLATE CURRENT	-	-	-	340	ma
PLATE DISSIPATION	-	-	-	330	Watts
SCREEN DISSIPATION	-	-	-	35	Watts
GRID DISSIPATION	-	-	-	12	Watts

TYPICAL OPERATION

DC Plate Voltage	-	-	-	2700	3100	3500	Volts
DC Screen Voltage	-	-	-	450	470	500	Volts
DC Grid Voltage	-	-	-	-270	-310	-300	Volts
DC Suppressor Voltage	-	-	-	0	0	0	Volts
DC Plate Current	-	-	-	285	260	305	ma
DC Screen Current	-	-	-	68	50	55	ma
DC Grid Current	-	-	-	20	15	18	ma
Screen Dissipation	-	-	-	31	23	27	Watts
Peak A-F Screen Voltage Approx. (100% Modulation)	-	-	-	350	330	350	Volts
Peak R-F Grid Voltage	-	-	-	355	385	375	Volts
MF Grid Driving Power	-	-	-	7	6	7	Watts
Plate Dissipation	-	-	-	160	220	280	Watts
Plate Power Output	-	-	-	580	580	780	Watts

AUDIO FREQUENCY POWER AMPLIFIER AND MODULATOR

Class AB

MAXIMUM RATINGS (Per Tube)

D-C PLATE VOLTAGE	-	-	-	4000	Max. Volts
D-C SCREEN VOLTAGE	-	-	-	1000	Max. Volts
D-C SUPPRESSOR VOLTAGE	-	-	-	100	Max. Volts
MAX-SIGNAL D-C PLATE CURRENT	-	-	-	450	ma
PLATE DISSIPATION	-	-	-	500	Max. Watts
SCREEN DISSIPATION	-	-	-	35	Max. Watts
GRID DISSIPATION	-	-	-	12	Max. Watts

TYPICAL OPERATION CLASS AB₁

(Sinusoidal wave, two tubes unless otherwise specified)

D-C Plate Voltage	-	-	-	3000	4000	Volts
D-C Screen Voltage	-	-	-	750	750	Volts
D-C Suppressor Voltage	-	-	-	0	0	Volts
D-C Grid Voltage (approx.)*	-	-	-	-112	-121	Volts
Zero-Signal D-C Plate Current	-	-	-	200	160	ma
Max-Signal D-C Plate Current	-	-	-	640	645	ma
Zero-Signal D-C Screen Current	-	-	-	0	0	ma
Max-Signal D-C Screen Current	-	-	-	52	48	ma
Effective Load, Plate-to-plate	-	-	-	11,600	15,400	Ohms
Peak A-F Grid Input Voltage (per tube)	-	-	-	112	121	Volts
Driving Power	-	-	-	0	0	Watts
Max-Signal Plate Power Output	-	-	-	1224	1664	Watts

*Adjust to give stated zero-signal plate current. The D-C resistance in series with the control grid of each tube should not exceed 250,000 ohms.

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, A Division of Varian Associates, for information and recommendations.



APPLICATION

MECHANICAL

MOUNTING—The 5-500A must be mounted vertically, base up or base down. The socket must be constructed so as to allow an unimpeded flow of air through the holes in the base of the tube and must also provide clearance for the glass tip-off which extends from the center of the base. The metal tube-base shell should be grounded by means of suitable spring fingers. The above requirements are met by the Eimac SK-400 and SK-410 Air-System Sockets. A flexible connecting strap should be provided between the Eimac HR-6 cooler on the plate terminal and the external plate circuit. The tube must be protected from severe vibration and shock.

COOLING—Adequate forced-air cooling must be provided to maintain the base seals at a temperature below 200°C., and the plate seal at a temperature below 225°C.

When the Eimac SK-400 or SK-410 Air-System Sockets and SK-426 chimney are used, a minimum air flow of 14 cubic feet per minute at a static pressure of 0.25 inches of water, as measured in the socket at sea level, is required to provide adequate cooling under all conditions of operation. Seal temperature limitations require that cooling air be supplied to the tube even when the filament alone is on during standby periods.

In the event an Air-System socket is not used, provision must be made to supply equivalent cooling of the base, the envelope, and the plate lead.

Tube temperatures may be measured with the aid of "Tempilaq," a temperature-sensitive lacquer manufactured by the Tempil Corporation, 132 West 22nd Street, New York 11, N.Y.

ELECTRICAL

FILAMENT VOLTAGE—For maximum tube life the filament voltage, as measured directly at the filament pins, should be the rated voltage of 10.0 volts. Variations in filament voltage must be kept within the range of 9.5 to 10.5 volts.

The 5-500A features a balanced filament structure to help the designer meet FCC hum and noise specifications in AM service.

BIAS VOLTAGE — The d-c bias voltage for the 5-500A should not exceed 500 volts. If grid leak bias is used, suitable means must be provided to prevent excessive plate or screen 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 values from tube to tube. In operation above 50 Mc., it is advisable to keep the bias voltage as low as is practicable.

SCREEN VOLTAGE—The d-c screen voltage for the 5-500A should not exceed 800 volts in r-f applications. In audio applications a maximum d-c screen voltage of 1,000 volts may be used. The screen voltages shown under "Typical Operation" are representative voltages for the type of operation involved.

PLATE VOLTAGE—The plate-supply voltage for the 5-500A should not exceed 4000 volts in CW and audio applications. In plate-modulated telephony service the d-c plate-supply voltage should not exceed 3200 volts, except below 30 Mc., intermittent service, where 4000 volts may be used.

GRID DISSIPATION — Grid dissipation for the 5-500A should not be allowed to exceed 12 watts. Grid dissipation may be calculated from the following expression,

$$P_g = \epsilon_{cmp} I_c$$

where P_g = Grid Dissipation

ϵ_{cmp} = Peak positive grid to cathode voltage, and

I_c = D-C grid current

ϵ_{cmp} may be measured by means of a suitable peak voltmeter connected between filament and grid.

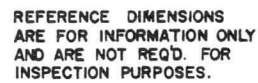
SCREEN DISSIPATION — The power dissipated by the screen of the 5-500A must not exceed 35 watts. Screen dissipation is likely to rise to excessive values when the plate voltage, bias voltage or plate load are removed with filament and screen voltages applied. Suitable protective means must be provided to limit screen dissipation to 35 watts in event of circuit failure.

PLATE DISSIPATION—Under normal operating conditions, the plate dissipation of the 5-500A should not be allowed to exceed 500 watts.

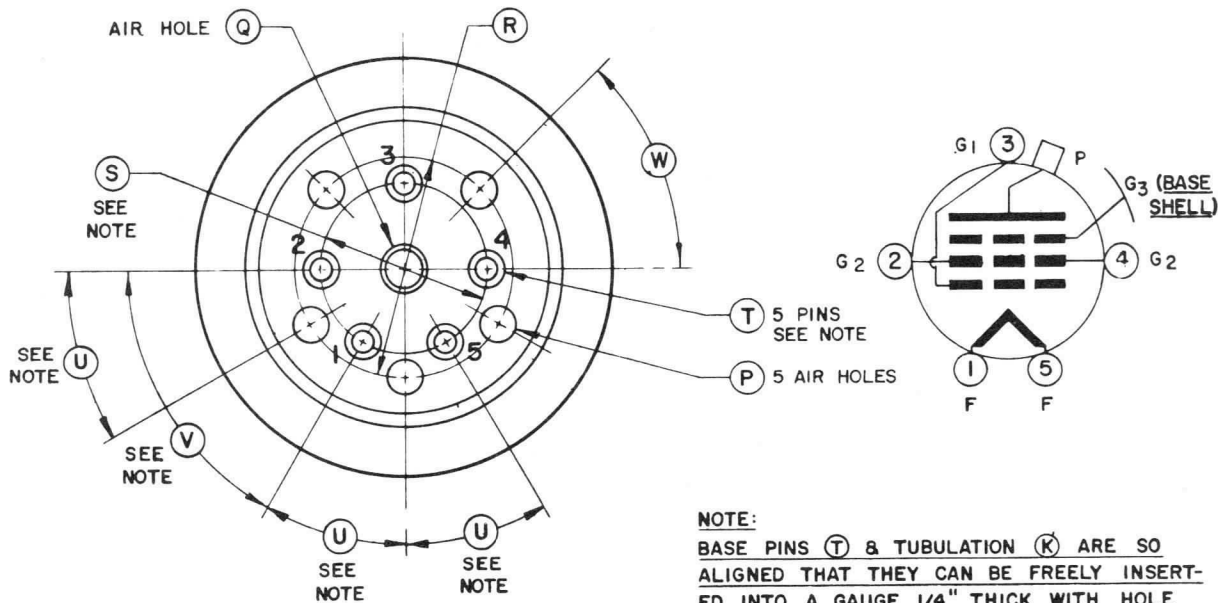
In plate modulated amplifier applications, the maximum allowable carrier-condition plate dissipation is 330 watts. The plate dissipation may rise to 500 watts under 100% sinusoidal modulation.

Plate dissipation in excess of the maximum rating is permissible for short periods of time, such as during tuning procedures.

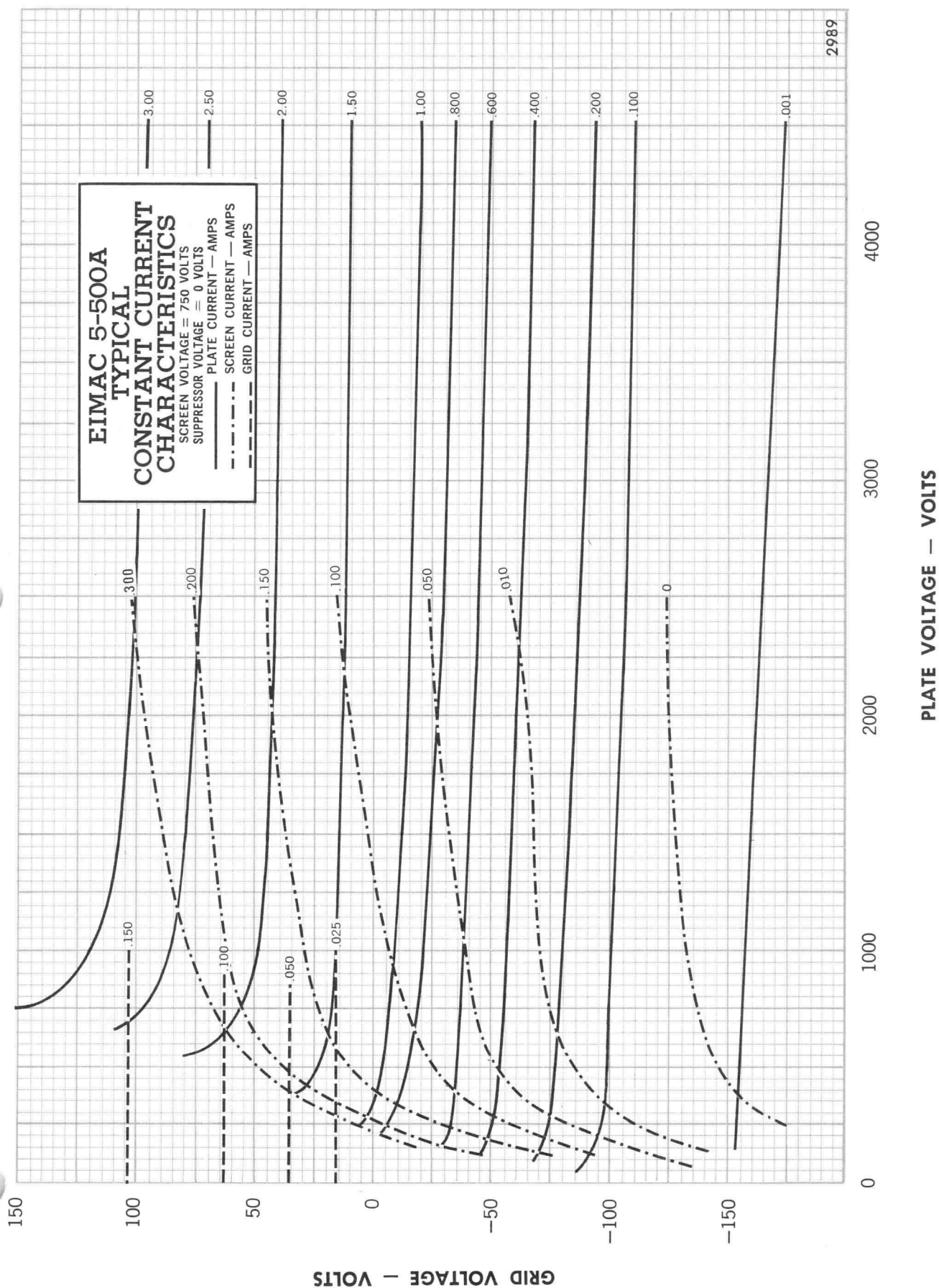
General information pertaining to the operation of the 5-500A may be found in Application Bulletin No. 8, "The Care and Feeding of Power Tetrodes." This Bulletin is available upon request.



DIMENSIONS IN INCHES			
DIMENSIONAL DATA			
DIM.	MIN.	MAX.	REF.
A	6.500	7.000	
B		3-9/16 D.	
D	5.750	6.250	
E	.350 D.	.365 D.	
F	21/64		
H			7/16
J			31/32
K		1/4	
L			3/4
M			1/4 D.
N		2-3/4 D.	
P			5/16 D.
Q			1/2 D.
R			1-5/8 D.
S			H/4 D.P.C.
T	.185 D.	.191 D.	
U			30°
V			60°
W			45°



BASE PINS (T) & TUBULATION (K) ARE SO
ALIGNED THAT THEY CAN BE FREELY INSERT-
ED INTO A GAUGE 1/4" THICK WITH HOLE
DIAMETERS OF .204 & .500 RESPECTIVELY
LOCATED ON THE TRUE CENTERS BY THE
 GIVEN DIMENSIONS (V), (U), (S).





5-500A

