EIMAC
Division of Varian
SAN CARLOS
CALIFORNIA

4X500A

RADIAL-BEAM POWER TETRODE

The Eimac 4X500A is an external-anode tetrode having a maximum plate dissipation rating of 500 watts. Its small size and low-inductance leads permit efficient operation at relatively large outputs well into the VHF region. The screen grid is mounted on a disc which terminates in a connector ring located between grid and plate, thus making possible effective shielding between the grid and plate circuits. The grid terminal is located at the center of the glass base to facilitate single-tube operation in coaxial circuits.

The combination of low grid-plate capacitance, low screen-lead inductance and functionally located terminals contributes to the stable operation of the 4X500A at high frequencies, making neutralization unnecessary in most cases and greatly simplifying it in others.

GENERAL CHARACTERISTICS

ELECTRICAL

	Min.	Nom.	Max.	
Filament: Thoriated Tungsten				
Voltage		5		volts
Current	12.2		13.7	amperes
Amplification Factor (Grid-to-Screen)	4.5		6.5	
Transconductance (I_b=200 ma., E_b=2500v., E_{c2}=500v.)		5200		umhos
Direct Interelectrode Capacitances Grounded Cathode:				
Input	10.6		14.4	uuf
Output	4.9		6.9	uuf
Feedback			0.1	uuf
Frequency for Maximum Ratings			120	mc.

MECHANICAL

Base	Special 4 pin
Maximum Operating Temperatures:	
Glass-to-Metal Seals	175° C
Anode Core	175° C
Recommended Socket	Eimac SK900
Operating Position	Vertical, base up or down
Maximum Dimension:	
Height	4.75 inches
Diameter	2.625 inches
Cooling (See following page)	Forced Air
Net Weight	1.7 pounds
Shipping Weight (Approximate)	6 pounds

RADIO FREQUENCY POWER AMPLIFIER AND OSCILLATOR

Class-C FM or Telegraphy (Key-down conditions, 1 tube)
MAXIMUM RATINGS (Frequencies up to 120 Mc.)

D-C PLATE VOLTAGE	4000	MAX. VOLTS
D-C SCREEN VOLTAGE	500	MAX. VOLTS
D-C GRID VOLTAGE	—500	MAX. VOLTS
D-C PLATE CURRENT	350	MAX. MA.
PLATE DISSIPATION	500	MAX. WATTS
SCREEN DISSIPATION	30	MAX. WATTS
GRID DISSIPATION	10	MAX. WATTS

TYPICAL OPERATION (Per tube, at 110 Mc.)

D-C Plate Voltage	2500	3000	4000	Volts
D-C Plate Current	310	310	315	Ma.
D-C Screen Voltage	500	500	500	Volts
D-C Screen Current	26	24	22	Ma.
D-C Grid Voltage	—150	—150	—150	Volts
D-C Grid Current	15	16	16	Ma.
Driving Power (approx.)	5	5	5	Watts
Useful Power Output (approx.)	475	600	835	Watts

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RADIO FREQUENCY POWER AMPLIFIER

Class-B Linear Amplifier,

Television Visual Service

MAXIMUM RATINGS (Frequencies below 220 mc.)

D-C PLATE VOLTAGE	3000 MAX. VOLTS
D-C PLATE CURRENT	350 MAX. MA.
D-C SCREEN VOLTAGE	500 MAX. VOLTS
D-C GRID VOLTAGE	—500 MAX. VOLTS
PLATE DISSIPATION	500 MAX. WATTS
SCREEN DISSIPATION	30 MAX. WATTS
GRID DISSIPATION	10 MAX. WATTS

TYPICAL OPERATION

(Per tube at peak synchronizing level, 5-Mc. bandwidth, assumed load resistance 3,000 ohms per tube.)[1]

D-C Plate Voltage	1850	2400	Volts
D-C Screen Voltage	500	500	Volts
D-C Grid Voltage	—100	—100	Volts
D-C Plate Current	285	400[1]	Ma.
D-C Screen Current (approx.)	20	35	Ma.
D-C Grid Current (approx.)	10	15	Ma.
Peak R-F Grid Voltage	140	185	Volts
Driving Power, 220 Mc. (approx.)	15	25	Watts
Plate Power Input	525	960	Watts
Power Output	300	600	Watts
BLACK LEVEL			
D-C Plate Current	215	300	Ma.
D-C Screen Current	2	3	Ma.
D-C Grid Current	2	5	Ma.
Plate Power Input	400	720	Watts
Plate Dissipation	230	380	Watts
Power Output	170	340	Watts

[1] Operating conditions at peak synchronizing level may be permitted to exceed maximum ratings of the tube because of the low duty factor. Maximum ratings apply to black level conditions.

NOTE: "TYPICAL OPERATION" data are obtained by calculation from published characteristic curves and confirmed by direct tests. Adjustment of the r-f grid drive to obtain the specified plate current at the specified grid bias, screen voltage, and plate voltage is assumed. If this procedure is followed, there will be little variation in output power when tubes are changed, even though there may be some variations in grid and screen currents. The grid and screen currents which result when the desired plate current is obtained are incidental and vary from tube to tube. These current variations cause no difficulty so long as the circuit maintains the correct voltage in the presence of the variations in current. If grid bias is obtained principally by means of a grid resistor, the resistor must be adjustable to obtain the required bias voltage when the correct r-f driving voltage is applied.

APPLICATION

MECHANICAL

Mounting—The 4X500A must be operated vertically. The base may be down or up. The recommended socket for this tube is the SK-900 Air-System Socket.

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 150°C.

A flow rate of 20 cfm will be adequate for operation at sea level and with an inlet air temperature up to 50°C. Under these conditions, 20 cfm of air flow corresponds to a pressure difference across the tube and SK-900 socket of 2.25 inch of water column. Experience has shown that if reliable long-life operation is to be obtained, the cooling air flow must be maintained during standby periods when only the heater voltage is applied to the tube.

At higher altitudes increased air flow will be required. For example, at an altitude of 10,000 feet, a flow-rate of 29 cfm will be required and will be obtained with a pressure drop across tube and socket of 3.25 inch of water column. In selecting a blower for use at high altitudes, care must be taken to assure that the blower is designed to deliver the desired volume of air at the corresponding pressure drop and at the particular altitude.

The pressure drop figures indicated above are those measured directly at the air gage hole in the SK-900 air system socket. In the event that a socket is not used, and a plenum pressure drop measurement is required, this plenum pressure drop rating must equal the pressure drop figures indicated above multiplied by 1.5 for the specific application.

ELECTRICAL

Filament Operation—For maximum tube life the filament voltage, as measured directly at the filament pins, should be the rated voltage of 5.0 volts. Variations in filament voltage must be kept within the range from 4.75 to 5.25 volts.

Control Grid Operation—The d-c voltage for the 4X500A 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.

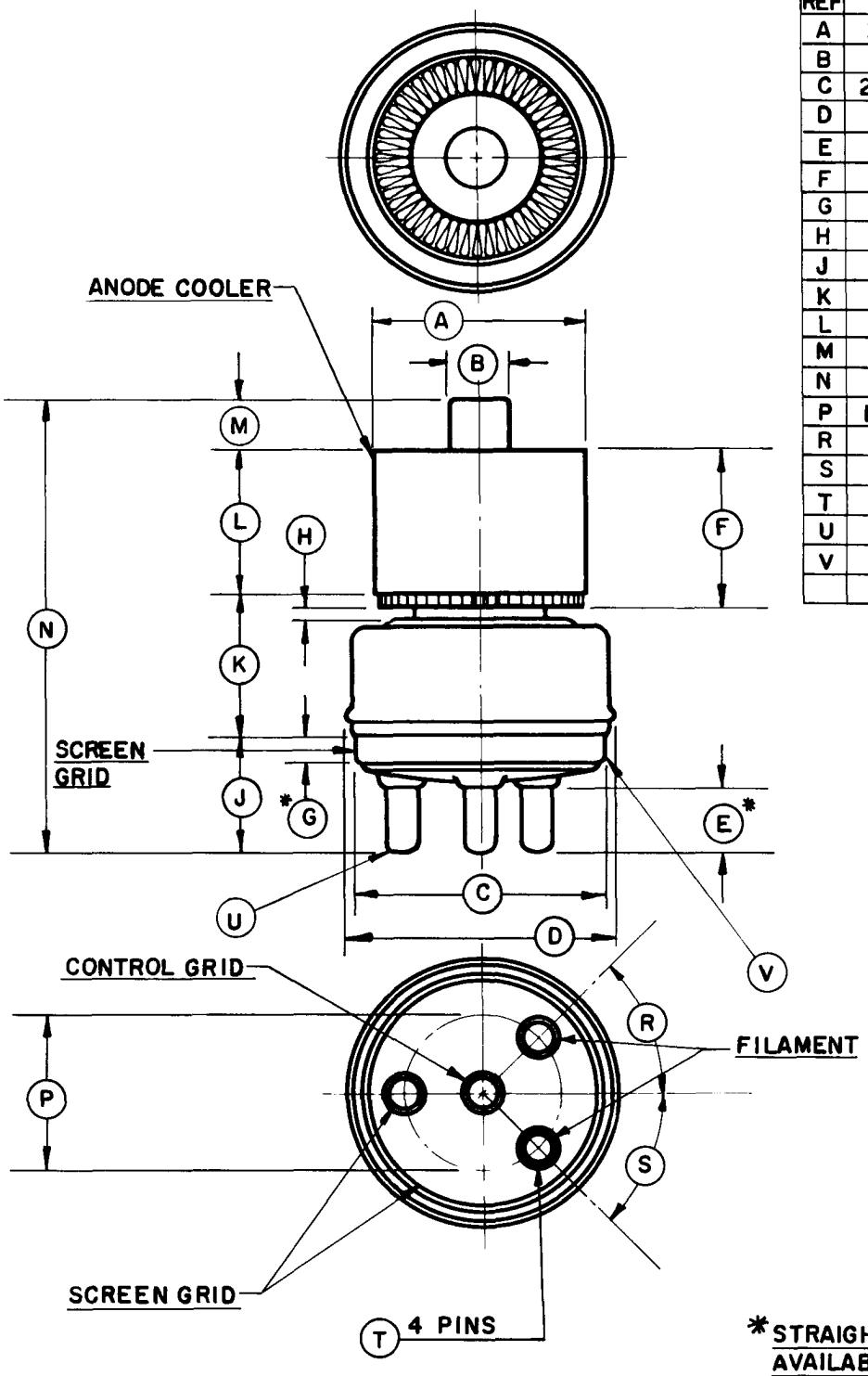
Screen Grid Operation—Power dissipated by the screen of the 4X500A must not exceed 30 watts. Screen dissipation is likely to rise to excessive values when the plate voltage, bias voltage, or plate load are removed with filament and screen voltages applied. Suitable protective means must be provided to limit screen dissipation to 30 watts in event of circuit failure.

Plate Operation—The maximum rated plate-dissipation power is 500 watts. Plate dissipation in excess of the maximum rating is permissible for short periods of time, such as during tuning procedures.

Multiple Operation—Tubes operating in parallel or push-pull must share the load equally. It is good engineering practice to provide for individual metering and individual adjustment of the bias or screen voltage to equalize the inputs.

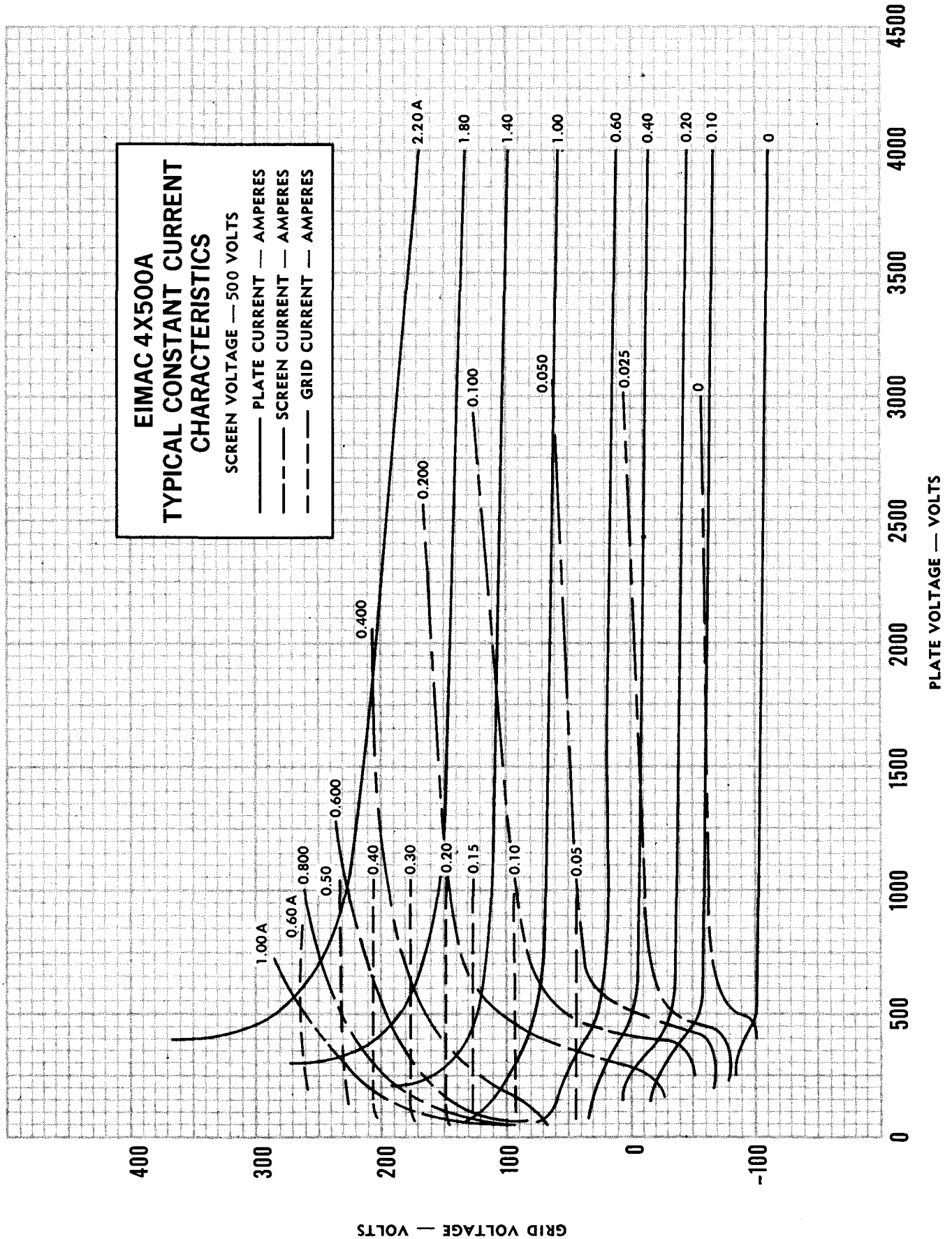
Where overload protection is provided, it should be capable of protecting the surviving tube/s in the event that one tube should fail.

Special Applications— If it is desired to operate this tube under conditions widely different from those given here, write to Application Engineering Department, Eimac Division of Varian, San Carlos, California for information and recommendations.



DIMENSIONS IN INCHES		
REF	MIN.	MAX.
A	1.980	2.020
B	.559	.573
C	2.365	2.385
D		2.625
E	.500	
F	1.438	1.562
G	.156	
H	.062	
J	1	1.125
K	1.406	1.594
L	1.344	1.406
M	.438	.562
N	4.250	4.750
P	1.490	1.510
R	44°	46°
S	44°	46°
T	.308	.318
U	.031R	
V	.094R	

*STRAIGHT SIDE AVAILABLE FOR CONTACT


EIMAC 4X500A
TYPICAL CONSTANT CURRENT
CHARACTERISTICS
SCREEN VOLTAGE — 500 VOLTS
PLATE CURRENT — AMPERES
SCREEN CURRENT — AMPERES
GRID CURRENT — AMPERES
2.20 A
1.80
1.40
1.00
0.60
0.40
0.20
0.10
0
0.400
0.200
0.100
0.050
0.025
0
1.00 A
0.60 A
0.800
0.50
0.600
0.40
0.30
0.20
0.15
0.10
0.05
400
300
200
100
0
-100
GRID VOLTAGE — VOLTS
0
500
1000
1500
2000
2500
3000
3500
4000
4500
PLATE VOLTAGE — VOLTS