EIMAC
Division of Varian
SAN CARLOS
CALIFORNIA

8352
4CX1000K
CERAMIC
POWER TETRODE

The Eimac 8352/4CX1000K is a ceramic and metal, forced-air cooled, radial-beam tetrode with a rated maximum plate dissipation of 1000 watts. It is a low-voltage, high-current tube specifically designed for Class-AB_1 rf linear-amplifier applications where its high gain and low distortion characteristics may be used to advantage. The 8352/4CX1000K is similar to the 8168/4CX1000A but contains a solid screen ring that improves isolation between input and output circuits and permits use of the tube in UHF service.

GENERAL CHARACTERISTICS

ELECTRICAL

	Min.	Nom.	Max.	
Cathode: Oxide Coated, Unipotential				
Heating Time	3			minutes
Heater: Voltage		6.0		volts
Current	8.1		9.9	amperes
Transconductance (I_b=1.0 ampere)		37,000		umhos
Direct Interelectrode Capacitances, Grounded Cathode:*				
Input	77		90	uuf
Output	11		13	uuf
Feedback			0.022	uuf

Direct Interelectrode Capacitances, Grounded Grid and Screen:*	Min.	Nom.	Max.	
Input	32.5		38.0	uuf
Output	11		13	uuf
Feedback			0.004	uuf
Maximum Useable Frequency			400	Mc

*In shielded fixture.

MECHANICAL

Base	Special, breechblock terminal surfaces
Maximum Operating Temperatures:	
Ceramic-to-Metal Seals	250° C
Anode Core	250° C
Recommended Socket	Eimac SK-820 or SK-830
Operating Position	Any
Maximum Over-All Dimensions:	
Height	4.8 inches
Diameter	3.37 inches
Net Weight	27 ounces

RADIO-FREQUENCY LINEAR AMPLIFIER—Class AB or B

(Single Side-Band Suppressed-Carrier Operation)

MAXIMUM RATINGS

DC PLATE VOLTAGE	3000 MAX. WATTS
DC SCREEN VOLTAGE	400 MAX. VOLTS
DC PLATE CURRENT	1.0 MAX. AMP
PLATE DISSIPATION	1000 MAX. WATTS
SCREEN DISSIPATION	12 MAX. WATTS
GRID DISSIPATION	0 MAX. WATTS

TYPICAL OPERATION (Frequencies below 30 Mc)

DC Plate Voltage	2000	2500	3000 volts
DC Screen Voltage	325	325	325 volts
DC Grid Voltage[1]	—60	—60	—60 volts
Zero-Signal DC Plate Current	250	250	250 mA
Single-Tone DC Plate Current	890	885	875 mA
Two-Tone Average DC Plate Current	645	650	635 mA
Zero-Signal DC Screen Current*	8	6	5 mA
Single-Tone DC Screen Current*	35	35	35 mA
Two-Tone Average DC Screen Current*	10	8	8 mA
Plate Output Power	930	1300	1630 watts

*Approximate values.

[1]Adjust grid bias to obtain listed zero-signal plate current.

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AUDIO AMPLIFIER OR MODULATOR Class AB$_1$

MAXIMUM RATINGS	
DC PLATE VOLTAGE	3000 MAX. VOLTS
DC SCREEN VOLTAGE	400 MAX. VOLTS
DC PLATE CURRENT	1.0 MAX. AMP
PLATE DISSIPATION	1000 MAX. WATTS
SCREEN DISSIPATION	12 MAX. WATTS
GRID DISSIPATION	0 MAX. WATTS

TYPICAL OPERATION (Sinusoidal wave, two tubes unless noted)

DC Plate Voltage	2000	2500	3000 volts
DC Screen Voltage	325	325	325 volts
DC Grid Voltage[1]	—60	—60	—60 volts
Zero-Signal DC Plate Current	500	500	500 mA
Max-Signal DC Plate Current	1.78	1.77	1.75 amps
Zero-Signal DC Screen Current*	16	12	10 mA
Max-Signal DC Screen Current*	70	70	70 mA
Effective Load, Plate to Plate	2040	2850	3680 ohms
Driving Power	0	0	0 watts
Max-Signal Plate Output Power	1860	2600	3260 watts

*Approximate values.

[1]Adjust grid bias to obtain listed zero-signal plate current.

"TYPICAL OPERATION" data are obtained by calculation from published characteristic curves; NO ALLOWANCE is made for circuit losses. Adjustment of the grid bias to obtain the specific zero-signal plate current is assumed. The screen voltage required to obtain the listed value of maximum plate current, without drawing grid current, MAY VARY from the typical values shown. These conditions are valid to approximately 100 Mc. at higher frequencies, power output will be lower due to tube and circuit losses.

APPLICATION

MECHANICAL

Cooling—Sufficient cooling must be provided for the anode and ceramic-to-metal seals to maintain operating temperatures below the rated maximum values:

Ceramic-to-Metal Seals	250°C
Anode Core	250°C

A flow rate of 25 cubic feet per minute will be adequate for operation at maximum rated plate dissipation at sea level and with inlet air temperatures up to 40°C. Under these conditions, 25 cfm of air flow corresponds to a pressure difference across the tube and socket of 0.2 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 and at UHF increased air flow will be required. For example, at an altitude of 10,000 feet, a flow rate of 37 cfm will be required and will be obtained with a pressure drop across tube and socket of 0.3 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.*

In cases where there is any doubt regarding the adequacy of the supplied cooling, it should be borne in mind that operating temperature is the sole criterion of cooling effectiveness. Surface temperatures may be easily and effectively measured by using one of the several temperature-sensitive paints or sticks available from various chemical or scientific-equipment suppliers. When these materials are used, extremely thin applications must be made to avoid interference with the transfer of heat from the tube to the air stream, which would cause inaccurate indications.

ELECTRICAL

Heater—The rated heater voltage for the 4CX1000K is 6.0 volts. The voltage, as measured at the socket, should be maintained at this value to minimize variations in operation and to obtain maximum tube life. In no case should the voltage be allowed to exceed 5% above or below the rated value.

The cathode and one side of the heater are internally connected.

It is recommended that the heater voltage be applied for a period of not less than 3 minutes before other operating voltages are applied. From an initial cold condition, tube operation will stabilize after a period of approximately 5 minutes.

Control Grid Operation—The grid dissipation rating of the 4CX1000K is zero watts. The design features which make the tube capable of maximum power operation without driving the grid into the positive region also make it necessary to avoid positive-grid operation.

Although the average grid-current rating is zero, peak grid currents of less than five milliamperes as read on a five-milliamperes meter may be permitted to flow for peak-signal monitoring purposes.

Screen Grid Operation—Tetrode tubes may exhibit reversed screen current to a greater or lesser degree depending on individual tube design. This characteristic is prominent in the 4CX1000K and, under some operating conditions, indicated negative screen currents in the order of 25 milliamperes may be encountered.

The maximum rated power dissipation for the screen grid in the 4CX1000K is 12 watts and the screen power should be kept below this level. The product of the peak screen voltage and the indicated dc screen current approximates the screen input power except when the screen current indication is near zero or negative. In the usual tetrode amplifier, where no signal voltage appears between cathode and screen, the peak screen voltage is equal to the dc screen voltage. Experience has shown that the screen will operate within the limits established for this tube if the indicated screen current, plate voltage and drive voltage approximate the 'Typical Operation" values.

The screen supply voltage must be maintained constant for any values of negative and positive screen currents that may be encountered. Dangerously high plate currents may flow if the screen power supply exhibits a rising voltage characteristic with negative screen current. Stabilization may be accomplished in several different ways. A bleeder resistor may be connected from screen to cathode; a combination of VR tubes may be connected from screen to cathode; or an electron-tube regulator circuit may be used in the

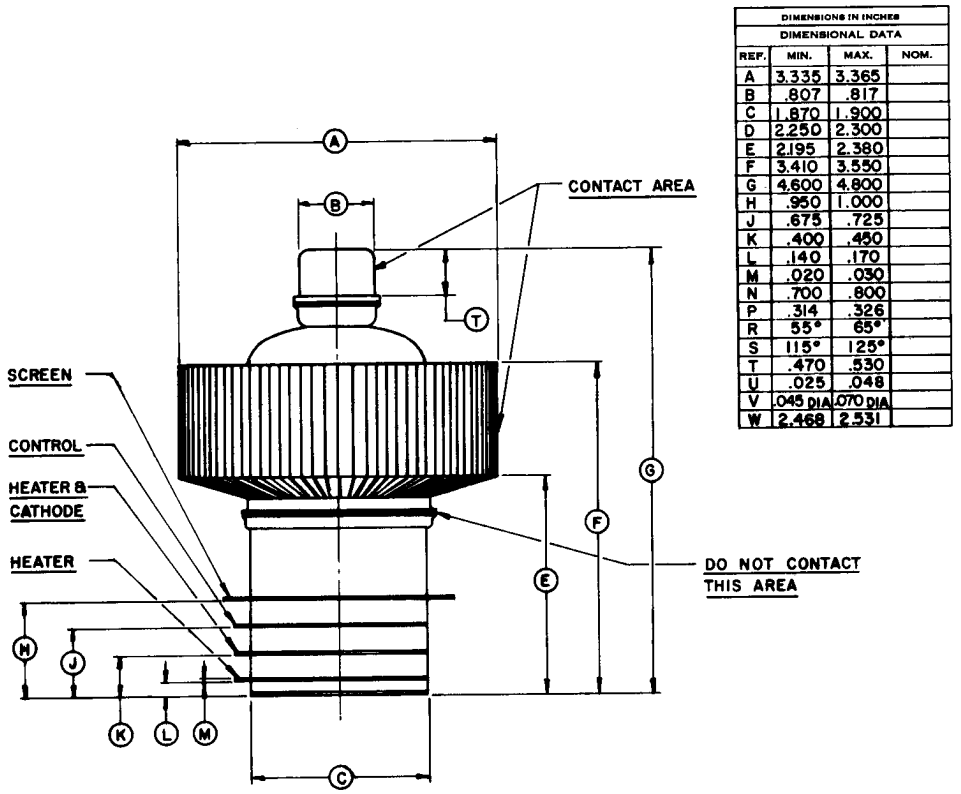
screen supply. It is absolutely essential to use a bleeder if a series electron-tube regulator is employed. The screen bleeder current should approximate 70 milliamperes to adequately stabilize the screen voltage. It should be observed that this bleeder power may be usefully employed to energize low-power stages of the transmitter.

Plate Operation—The maximum rated plate dissipation power is 1000 watts. Except for brief periods during circuit adjustments, this maximum value should not be exceeded.

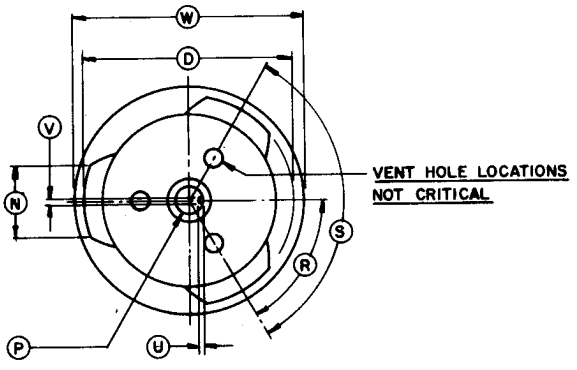
The top cap on the anode cooler may be used as a plate terminal at low frequencies or a circular clamp or spring-finger collet encircling the cylindrical outer surface of the anode cooler may be used at high frequencies.

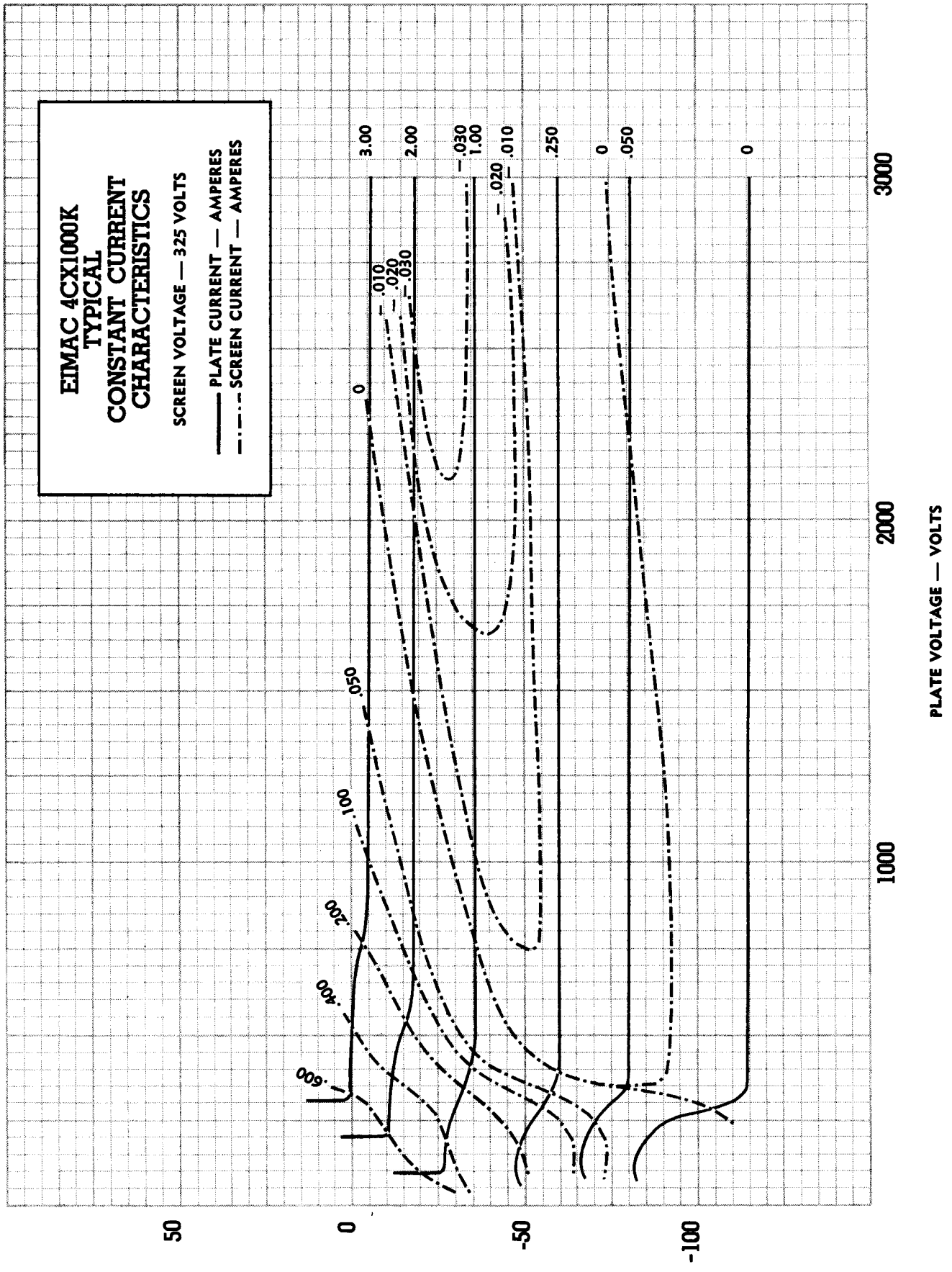
Points of electrical contact with the anode cooler should be kept clean and free of oxide to minimize radio-frequency losses. The anode cooler should be inspected periodically and cleaned when necessary to remove any dirt which might interfere with effective cooling.

Special Applications — If it is desired to operate this tube under conditions different from those given here, write to the Power Grid Tube Marketing, EIMAC, Division of Varian, San Carlos California, for information and recommendations.



DIMENSIONS IN INCHES			
DIMENSIONAL DATA			
REF.	MIN.	MAX.	NOM.
A	3.335	3.365	
B	.807	.817	
C	1.870	1.900	
D	2.250	2.300	
E	2.195	2.380	
F	3.410	3.550	
G	4.600	4.800	
H	.950	1.000	
J	.675	.725	
K	.400	.450	
L	.140	.170	
M	.020	.030	
N	.700	.800	
P	.314	.326	
R	55°	65°	
S	115°	125°	
T	.470	.530	
U	.025	.048	
V	.045 DIA	.070 DIA	
W	2.468	2.531	




EIMAC 4CX1000K
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
SCREEN VOLTAGE — 325 VOLTS
PLATE CURRENT — AMPERES
SCREEN CURRENT — AMPERES
3.00
2.00
1.00
.250
0
.050
.030
.020
.010
.100
.200
.400
.600
50
0
-50
-100
1000
2000
3000
GRID VOLTAGE — VOLTS
PLATE VOLTAGE — VOLTS