



EITEL-McCULLOUGH, INC.
SAN CARLOS · CALIFORNIA

TENTATIVE DATA

4CX1000A

**CERAMIC
POWER TETRODE**

The Eimac 4CX1000A 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-AB₁ r-f linear-amplifier or audio-amplifier applications where its high gain and low distortion characteristics may be used to advantage. At its rated maximum plate voltage of 3000 volts, it is capable of producing 1680 watts of peak-envelope output power. Two 4CX1000As operating in Class-AB₁ will produce 3360 watts of audio power.

GENERAL CHARACTERISTICS

ELECTRICAL

	Min.	Nom.	Max.	
Cathode: Oxide Coated, Unipotential				
Heating Time	-	-	-	3 minutes
Heater: Voltage	-	-	6.0	volts
Current	9.5	-	11.5	amperes
Transconductance (I _b =1.0 ampere)	-	37,000	-	umhos
Direct Interelectrode Capacitances, Grounded Cathode:*				
Input	77	-	90	uuf
Output	11	-	13	uuf
Feedback	-	-	0.02	uuf
Direct Interelectrode Capacitances, Grounded Grid and Screen:*				
Input	-	-	-	35 uuf
Output	-	-	-	11 uuf
Feedback	-	-	-	0.005 uuf
Frequency for Maximum Ratings	-	-	-	30 mc

*In shielded fixture.



	Min.	Nom.	Max.
Input	-	35	uuf
Output	11	-	13 uuf
Feedback	-	-	0.005 uuf
Frequency for Maximum Ratings	-	-	30 mc

MECHANICAL

Base	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Special, breechblock terminal surfaces																			
Maximum Operating Temperatures:																																							
Ceramic-to-Metal Seals																			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200° C		
Anode Core																			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	250° C	
Recommended Socket																			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Eimac SK-800 Series	
Operating Position																			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Any
Maximum Over-All Dimensions:																																							
Height																			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.75 inches	
Diameter																			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.36 inches
Net Weight																			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27 ounces
Shipping Weight (Approximate)																			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3 pounds

CLASS-AB₁ RADIO-FREQUENCY LINEAR AMPLIFIER

(Single Side-Band Suppressed-Carrier Operation)

MAXIMUM RATINGS

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

TYPICAL OPERATION

D-C Plate Voltage	-	-	-	2000	2500	3000	volts
D-C Screen Voltage	-	-	-	325	325	325	volts
D-C Grid Voltage ¹	-	-	-	-60	-60	-60	volts
Zero-Signal D-C Plate Current	-	-	-	250	250	250	ma
Single-Tone D-C Plate Current	-	-	-	1.0	1.0	0.9	amp
Two-Tone Average D-C Plate Current	-	-	-	700	700	640	ma
Zero-Signal D-C Screen Current*	-	-	-	-2	-2	-2	ma
Single-Tone D-C Screen Current*	-	-	-	35	35	35	ma
Two-Tone Average D-C Screen Current*	-	-	-	11	10	9	ma
Plate Output Power	-	-	-	1020	1450	1680	watts

*Approximate values.

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

**CLASS-AB₁ AUDIO AMPLIFIER OR MODULATOR**

MAXIMUM RATINGS	-	-	-	-
D-C PLATE VOLTAGE	-	-	-	3000 MAX. VOLTS
D-C SCREEN VOLTAGE	-	-	-	400 MAX. VOLTS
D-C 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)

D-C Plate Voltage	-	-	-	-	-	2000	2500	3000	volts
D-C Screen Voltage	-	-	-	-	-	325	325	325	volts
D-C Grid Voltage ¹	-	-	-	-	-	-60	-60	-60	volts
Zero-Signal D-C Plate Current	-	-	-	-	-	500	500	500	ma
Max-Signal D-C Plate Current	-	-	-	-	-	2.0	2.0	1.8	amps
Zero-Signal D-C Screen Current*	-	-	-	-	-	-4	-4	-4	ma
Max-Signal D-C Screen Current*	-	-	-	-	-	70	70	70	ma
Effective Load, Plate to Plate	-	-	-	-	-	1650	2400	3450	ohms
Driving Power	-	-	-	-	-	0	0	0	watts
Max-Signal Plate Output Power	-	-	-	-	-	2040	2900	3360	watts

*Approximate values.

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

NOTE: "TYPICAL OPERATION" data are obtained by calculation from the published characteristic curves and confirmed by direct tests. Adjustment of the grid bias to obtain the specified zero-signal plate current is assumed. When grid drive is applied, the screen voltage required to obtain the specified value of plate current without drawing grid current may vary somewhat from the typical values shown.

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	200°C
Anode Core	250°C

A flow rate of 28 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, 28 cfm of air flow corresponds to a pressure difference across the tube and socket of 0.25 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 40 cfm will be required and will be obtained with a pressure drop across tube and socket of 0.35 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 4CX1000A 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 4CX1000A 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 one milliamperere as read on a one-milliamperere 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 4CX1000A and, under some operating conditions, indicated negative screen currents in the order of 25 milliampereres may be encountered.

The maximum rated power dissipation for the screen grid in the 4CX1000A is 12 watts and the screen power should be kept below this level. The product of the peak screen voltage and the indicated d-c 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 d-c 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.

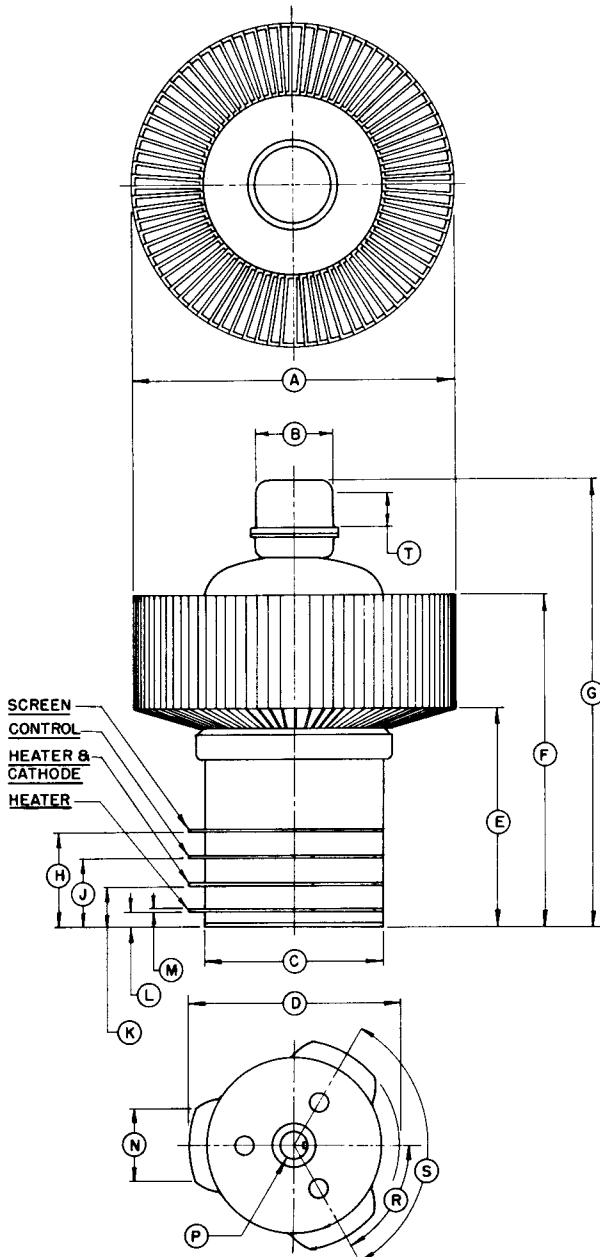
Plate Operation—The maximum rated plate dissipation power is 1000 watts. Except for brief periods during circuit adjustments, this maximum value should not be exceeded.

The top cap on the anode cooler may be used as a plate terminal or a circular clamp or spring-finger

collet encircling the cylindrical outer surface of the anode cooler may be used.

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 Application Engineering Department, Eitel-McCullough, Inc., San Carlos, California, for information and recommendations.



DIMENSION DATA			
REF.	NOM.	MIN.	MAX.
A	3.350	3.340	3.360
B	.8125	.810	.815
C	1.875	1.870	1.890
D	2.265 DIA.	2.254 DIA.	2.278 DIA.
E	2.234	2.195	2.380
F	3.500	3.410	3.550
G	4.720	4.690	4.750
H	.980	.950	1.000
J	.705	.695	.720
K	.425	.400	.450
L	.155	.145	.170
M	.023	.019	.026
N	.750	.700	.800
P	.321 DIA.	.316 DIA.	.326 DIA.
R	60°		
S	120°		
T	.410	.360	.460



4CX1000A

**EIMAC 4CX1000A
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS**

SCREEN VOLTAGE — 325 VOLTS

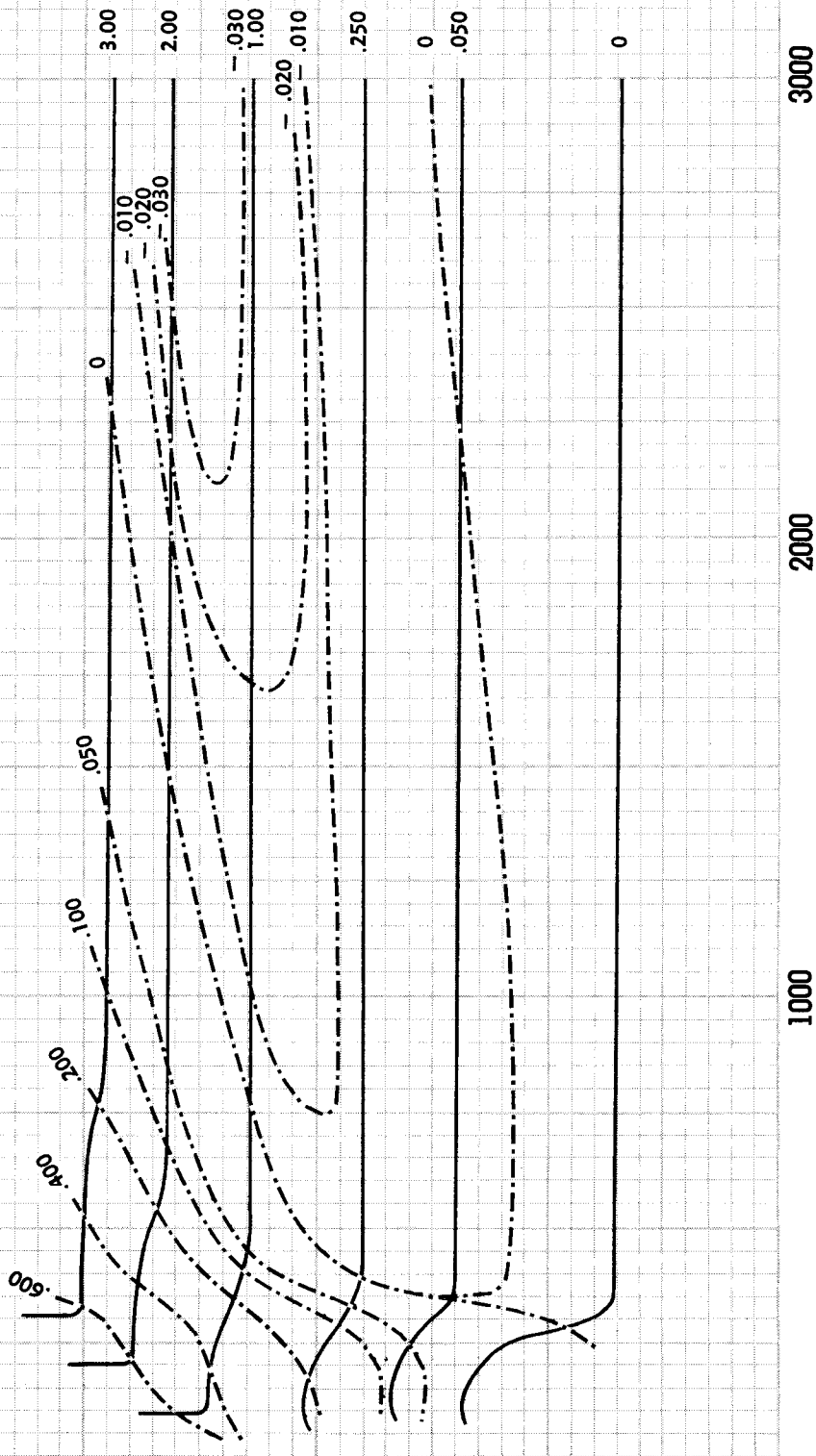
— PLATE CURRENT — AMPERES
- - - - SCREEN CURRENT — AMPERES

50

0

-50

-100



3000

2000

1000

PLATE VOLTAGE — VOLTS

GRID VOLTAGE — VOLTS