



TECHNICAL DATA

4CX600B

4CX600F

RADIAL BEAM
POWER TETRODE

The EIMAC 4CX600B and 4CX600F are ceramic/metal, air cooled radial beam tetrodes designed for use in wideband amplifiers, particularly distributed amplifiers.

The mechanical and electrical features of these tubes are compatible with wideband amplifier circuit requirements; i.e., low lead inductance, low input and output capacitances, small size and high transconductance.

Rugged construction consisting of a unitized electrode structure and direct mounting to the chassis combine to make the 4CX600B and 4CX600F suitable for environments of severe shock and vibration.

The maximum rated plate dissipation of either type is 600 watts.



GENERAL CHARACTERISTICS¹

ELECTRICAL

Cathode: (4CX600B) Oxide Coated, Unipotential

Heater: Voltage	6.0 ± 0.3 V
Current, at 6.0 volts	4.3 A

Cathode: (4CX600F) Oxide Coated, Unipotential

Heater: Voltage	26.5 ± 1.3 V
Current, at 26.5 volts	1.05 A

Transconductance (Average):

$I_b = 0.6 \text{ A}_{dc}$	41,000 μmhos
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Input Conductance:

$I_b = 0.6 \text{ A}_{dc}$ (F = 30 MHz)	$0.1 \times 10^{-3} \text{ mhos}$
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Direct Interelectrode Capacitances (grounded cathode)²

Input	45 pF
Output	5.8 pF
Feedback	0.10 pF

Frequency of Maximum Rating:

CW	500 MHz
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1. Characteristics and operating values are based upon performance tests. These figures may change without notice as the result of additional data or product refinement. EIMAC Division of Varian should be consulted before using this information for final equipment design.

2. In Shielded Fixture.

MECHANICAL

Maximum Overall Dimensions:

Length	2.45 in; 62.23 mm
Diameter	2.08 in; 52.83 mm
Net Weight	7.0 oz; 198 gm
Operating Position	Any

Maximum Operating Temperature:

Ceramic/Metal Seals and Anode Core	250°C
SK-680 capacitor when used	150°C
Cooling	Air
Base	Special

BROADBAND LINEAR AMPLIFIER

Class AB

ABSOLUTE MAXIMUM RATINGS:

DC PLATE VOLTAGE	3000 VOLTS
DC SCREEN VOLTAGE	400 VOLTS
DC GRID VOLTAGE	-150 VOLTS
DC PLATE CURRENT	0.6 AMPERE
PLATE DISSIPATION	600 WATTS
SCREEN DISSIPATION	15 WATTS
GRID DISSIPATION	3 WATTS

TYPICAL OPERATION

Plate Voltage	1000	1500	2500	Vdc
Screen Voltage	275	275	275	Vdc
Grid Voltage ¹	-40	-40	-40	Vdc
Zero-Signal Plate Current	100	100	100	mAdc
Single Tone Plate Current	570	580	585	mAdc
Single-Tone Screen Current ²	32	29	17	mAdc
Peak rf Grid Voltage	44	43	42	v
Screen Dissipation	8.8	8.0	4.7	W
Plate Input Power	570	870	1460	W
Plate Dissipation	250	280	460	W
Plate Output Power	320	590	1000	W
Rf Load Impedance	765	1225	2325	Ω

1. Adjust to specified zero-signal dc plate current.
2. Approximate value.

RADIO FREQUENCY POWER AMPLIFIER

Class AB

(Key-Down Conditions)

ABSOLUTE MAXIMUM RATINGS (890 MHz):

DC PLATE VOLTAGE	2500 VOLTS
DC SCREEN VOLTAGE	400 VOLTS
DC GRID VOLTAGE	-150 VOLTS
DC PLATE CURRENT	0.6 AMPERE
PLATE DISSIPATION	600 WATTS
SCREEN DISSIPATION	15 WATTS
GRID DISSIPATION	3 WATTS

1. Approximate value
2. Grid driven. Grounded screen, rf grounded cathode.
3. For CW operation on 865 MHz heater voltage is reduced 15%. Inquire for voltage recommended for other UHF conditions.

4CX600F TYPICAL OPERATION

	NOTE 2	NOTE 4	
Frequency	432	865	MHz
Plate to Cathode Voltage	1830	2000	Vdc
Screen to Cathode Voltage	300	300	Vdc
Grid Voltage	-54	-53	Vdc
Plate Current	600	600	mAdc
Screen Current ¹	7.5	8	mAdc
Grid Current ¹	12	-1.0	mAdc
Zero-Signal dc Plate Current ¹	20	15	mAdc
Measured Driving Power ¹	25	52	W
Plate Input Power	1100	1200	W
Plate Dissipation	350	550	W
Useful Output Power	700	585	W
Heater Voltage ³	22.0	22.0	V
Gain	15.0	10.4	db
Efficiency	65	48	%
Bandwidth (3db) output circuit	10.7	13.5	MHz

4. Grid driven. Neutralized cavity. Grounded screen.

RADIO-FREQUENCY POWER AMPLIFIER

Class-B, Television Service (Frequencies to 890 MHz)

ABSOLUTE MAXIMUM RATINGS:

DC PLATE VOLTAGE	2500 VOLTS
DC SCREEN VOLTAGE	400 VOLTS
DC PLATE CURRENT	0.6 AMPERE
PLATE DISSIPATION	600 WATTS
SCREEN DISSIPATION	15 WATTS
GRID DISSIPATION	3 WATTS
DC GRID VOLTAGE	-150 VOLTS

TYPICAL OPERATION (865 MHz)

Grid driven, neutralized cavity, grounded screen. Rf grounded cathode, single tuned input and output circuits. Output circuit efficiency 80%.

Plate to Cathode Voltage	2000 Vdc
Screen to Cathode Voltage	300 Vdc
Grid Voltage ¹	-54 Vdc
Heater voltage (See note 3 page 2)	
Bandwidth at 3 db points	9 MHz
Zero-Signal dc Plate Current	100 mAdc
During Sync-Pulse	
dc Plate Current	600 mAdc
Pulse Screen Current ¹	8 mAdc
Drive Power ¹	52 W
Zero-Signal dc Plate Current	100 mAdc
Plate Dissipation	550 W
Useful Power Output	585 W
Black Level:	
dc Plate Current	450 mAdc
Drive Power ¹	25 W
Zero-Signal dc Plate Current	100 mAdc
Plate Dissipation	550 W
Useful Power Output	350 W

¹. Approximate

NOTE: TYPICAL OPERATION data are obtained from direct measurement or by calculation from published characteristic curves. Adjustment of the rf grid voltage to obtain the specified plate current at the specified bias, screen and plate voltages is assumed. If this procedure is followed, there will be little variation in output power when the tube is changed, even though there may be some variation in grid and screen current. 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. In the case of Class C Service, 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 rf grid voltage is applied.

RANGE VALUES FOR EQUIPMENT DESIGN

	<u>Min.</u>	<u>Max.</u>	
4CX600B			
Heater: Current at 6.0 volts	4.0	4.7	A
Cathode Warmup Time	180	--	sec.
4CX600F			
Heater: Current at 26.5 volts	0.85	1.25	A
Cathode Warmup Time	180	--	sec.
Interelectrode Capacitances ¹ (grounded cathode connection)			
Input	42	48	pF
Output	5.3	6.3	pF
Feedback	---	0.2	pF

APPLICATION

MECHANICAL

MOUNTING - The 4CX600B and 4CX600F may be mounted in any position. No socket is required. The tube may be mounted directly on the SK-680 Screen Bypass Capacitor which in turn is mounted to the chassis with four screws. The chassis thickness should be 0.062 inches to insure adequate space for connections to the base of the tube and care should be exercised to insure a flat mounting surface to minimize cathode lead inductance.

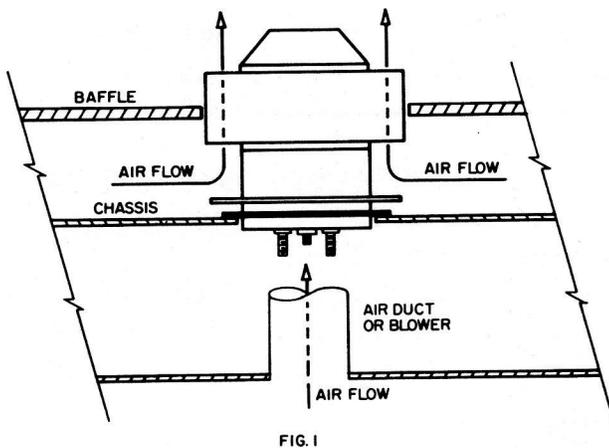
COOLING - Sufficient forced-air cooling must be provided to maintain the anode core and seal temperatures below 250°C. The tabulation (page 4) lists the minimum cooling requirements at sea level and 10,000 feet with 50°C ambient air. At VHF and UHF, additional cooling air will be required due to circuit loss, a portion of which is chargeable to the tube.

4CX600B/4CX600F

Air cooling of the tube base is required. 10 CFM minimum should be directed straight up toward the center of tube base from a duct or blower, not more than 2-1/2 inches from the tube.

PLATE DISSIPATION (WATTS)	SEA LEVEL		10,000 FEET	
	AIR FLOW (CFM)	STATIC PRESSURE (W.C.)	AIR FLOW (CFM)	STATIC PRESSURE (W.C.)
300	5.5	0.14	8.0	0.20
450	11.4	0.47	16.6	0.68
600	14.1	0.65	20.6	0.94

The following diagram illustrates a typical cooling installation.



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.

ELECTRICAL

HEATER - The rated heater voltage is 6.0 volts for the 4CX600B and 26.5 volts for the 4CX600F. The voltage, as measured at the tube, 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 the rated value. (See note 3 page 2).

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 three minutes before current is drawn from the cathode. Tube operation will stabilize after a period of approximately five minutes from a cold start.

GRID OPERATION - The 4CX600B and 4CX600F control grid has a maximum dissipation of 3.0 watts and precautions should be observed to avoid exceeding this rating. Derating of the control grid dissipation will be necessary if the base flange temperature exceeds 150°C.

The 4CX600B and 4CX600F have four threaded grid pins on the base of the tube. These pins can be used separately or in parallel to control the amount of grid lead inductance to suit the requirements of the circuit. The grid lead inductance for one pin is 2.4 nanohenries.

Caution should be exercised when tightening the nuts on the control grid pins. Maximum torque of three inch-pounds is sufficient for good electrical connection and should not be exceeded due to possible damage to the vacuum seal.

SCREEN OPERATION - The maximum rated screen dissipation for the 4CX600B and 4CX600F is 15 watts.

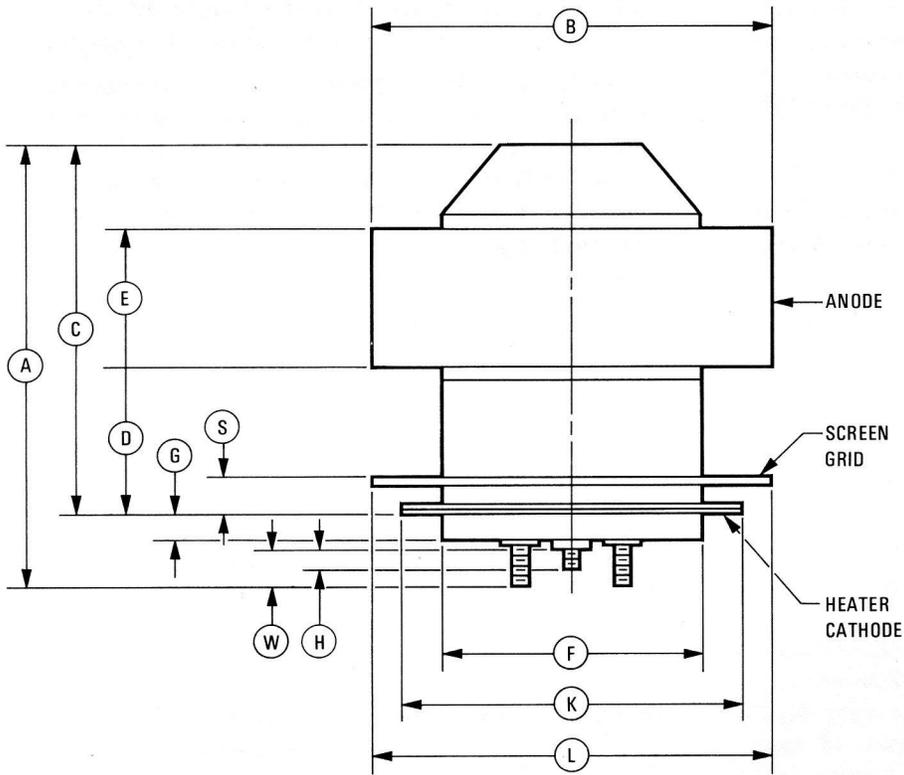
Under certain operating conditions the screen current of a tetrode may reverse as indicated on the screen current meter. This condition is the result of secondary emission from the screen and is normal for a power tetrode. If the impedance of the screen power supply is high, negative screen current will cause the screen voltage to approach the anode voltage, and the results will be a runaway condition which could lead to a catastrophic failure. This condition can be avoided if sufficient bleeder current is drawn from the screen supply by an appropriate bleeder or regulator tube. The recommended bleeder current for the 4CX600B and 4CX600F is 20 mA for each tube connected to a common screen power supply.

A low inductance screen bypass capacitor, Eimac SK-680, is available for the 4CX600B and 4CX600F. This capacitor is easily installed with six 0-80 screws. With the SK-680 capacitor installed, the screen self-resonant frequency of the 4CX600B or 4CX600F is in excess of 900 MHz.

PLATE OPERATION - The maximum rated plate dissipation power for the 4CX600B and

4CX600F is 600 watts. Except for brief periods during circuit adjustments, this maximum value should not be exceeded. Connection to the anode is accomplished by a clamp around the anode.

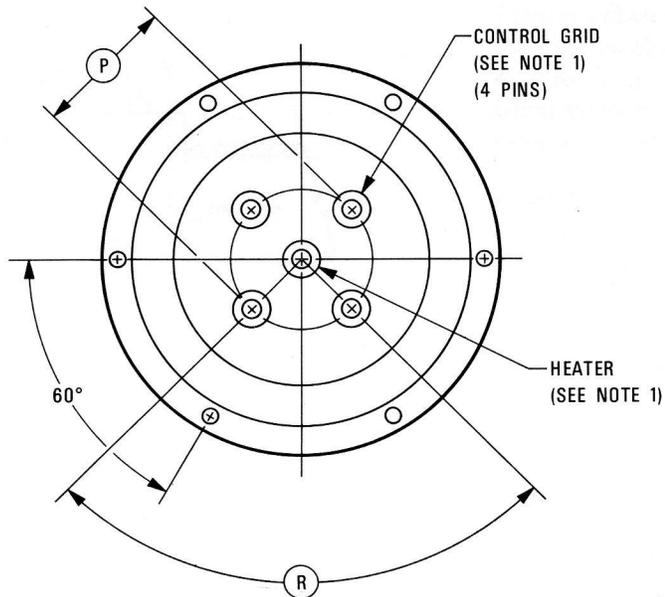
SPECIAL APPLICATIONS - If it is desired to operate the tube under conditions different from those given here, contact the Power Grid Division, EIMAC Division of Varian, San Carlos, California, 94070, for information and recommendations.



DIM.	DIMENSIONAL DATA			
	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	--	2.450	--	62.23
B	2.040	2.080	51.82	52.83
C	1.825	1.975	46.35	50.16
D	.675	.810	17.14	20.57
E	.720	.800	18.29	20.32
F	1.305	1.325	33.15	33.65
G	.130	.155	3.30	3.94
H	.130	.180	3.30	4.57
K	1.710	1.750	43.43	44.45
L	1.930	2.025	49.02	51.43
P	.550	.600	13.97	15.24
R	88°	92°	88°	92°
S	.180	.210	4.57	5.33
W	.250	.300	6.35	7.62

NOTES:

1. 2-56 UNC-2A
2. REF. DIM. ARE FOR INFO. ONLY AND ARE NOT REQ'D. FOR INSPECTION PURPOSES.

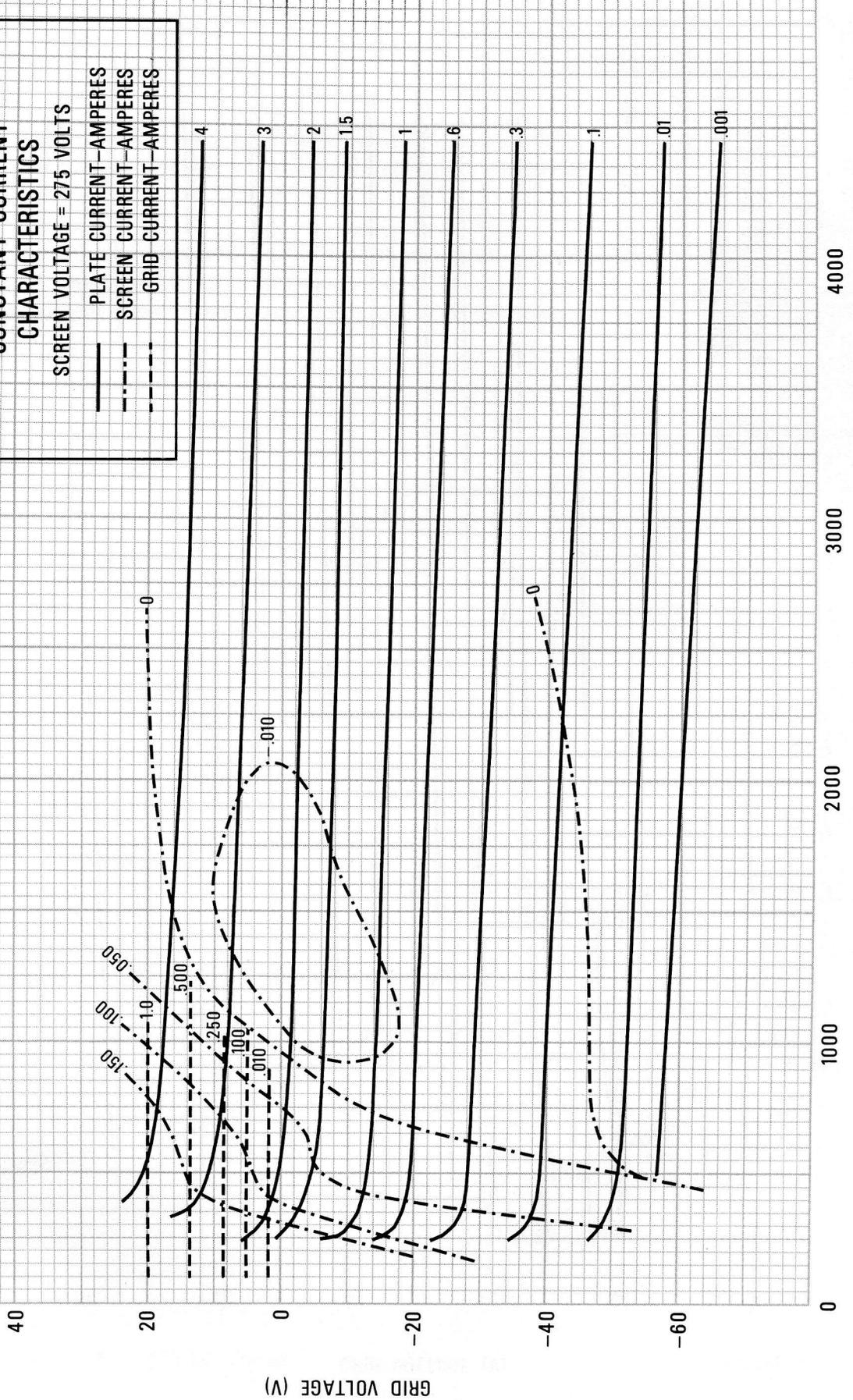


EIMAC 4CX600B & 4CX600F

TYPICAL CONSTANT CURRENT CHARACTERISTICS

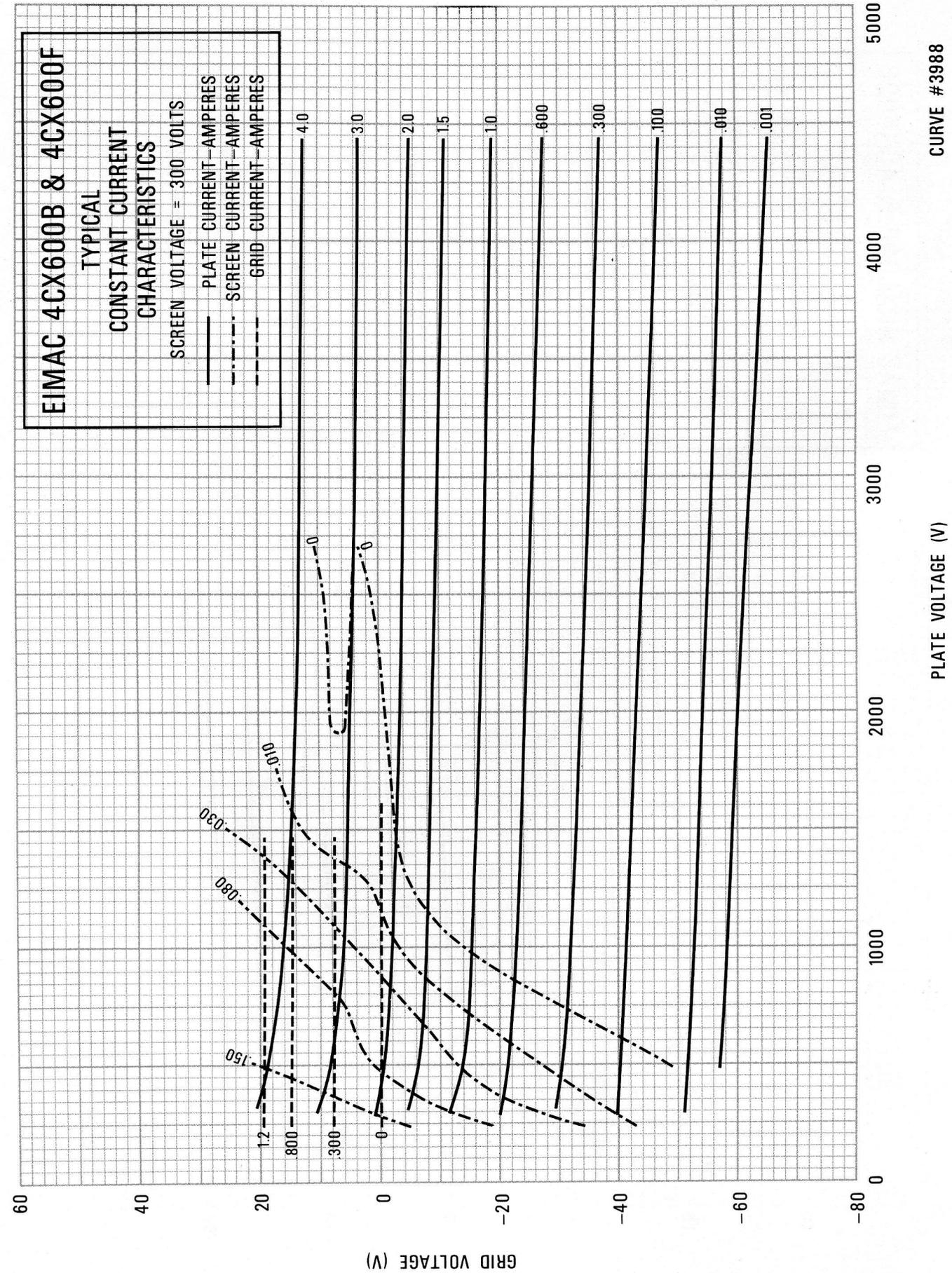
SCREEN VOLTAGE = 275 VOLTS

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



CURVE # 3371

PLATE VOLTAGE (V)



CURVE #3988

PLATE VOLTAGE (V)