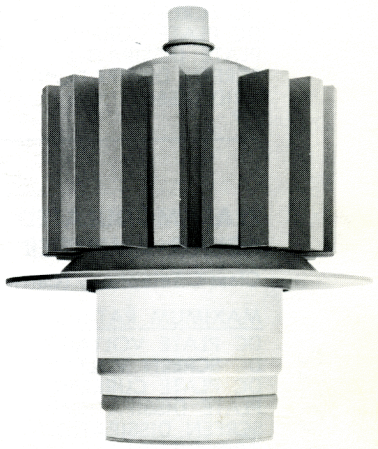
TECHNICAL DATA

4CV35,000A

VAPOR-COOLED RADIAL-BEAM POWER-TETRODE

The EIMAC 4CV35,000A is a ceramic-metal power tetrode intended for use as a Class-C amplifier in radio-frequency applications. It features a new type of internal mechanical structure which results in higher RF operating efficiency. Low RF losses in this mechanical structure permit operation of the 4CV35,000A at full ratings up to 110 megahertz. The 4CV35,000A is also recommended for Class-AB audio-frequency and radio-frequency linear power amplifier service. The vapor-cooled anode is rated at 35 kilowatts of plate dissipation, making the tube attractive for low efficiency applications.



GENERAL CHARACTERISTICS

ELECTRICAL

	Min.	Nom.	Max.	
Filament: Thoriated Tungsten				
Voltage		6.3		volts
Current	152		168	amps
Amplification Factor (Grid-Screen) (average)		4.5		

	Min.	Max.	
Direct Interelectrode Capacitances, Grounded Cathode:			
Input	152	172	μμf
Output	22.0	27.0	μμf
Feedback		2.0	μμf
Direct Interelectrode Capacitances, Grounded Grid and Screen:			
Input	63.0	78.0	μμf
Output	23.0	28.0	μμf
Feedback		0.3	μμf

MECHANICAL

Base	Special, concentric
Maximum Seal Temperature	250°C
Maximum Anode Flange Temperature (See Outline Drawing)	110°C
Recommended Socket	EIMAC, SK-310
Boiler	EIMAC, BR-200
Operating Position	Axis vertical, base up or down
Maximum Dimensions:	
Height	9.44 inches
Diameter	7.75 inches
Base Cooling	Forced Air
Net Weight	20 pounds
Shipping Weight (Approximate)	35 pounds

THESE SPECIFICATIONS ARE BASED ON DATA APPLICABLE AT PRINTING DATE. SINCE EIMAC HAS A POLICY OF CONTINUING PRODUCT IMPROVEMENT, SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

Printed in U.S.A.

RADIO-FREQUENCY POWER AMPLIFIER OR OSCILLATOR

Class-C Telegraphy or FM Telephony (Key-down conditions)

MAXIMUM RATINGS

DC PLATE VOLTAGE	10,000	VOLTS
DC SCREEN VOLTAGE	2,000	VOLTS
DC PLATE CURRENT	5.0	AMPS
PLATE DISSIPATION	35,000	WATTS
SCREEN DISSIPATION	450	WATTS
GRID DISSIPATION	200	WATTS

TYPICAL OPERATION

DC Plate Voltage	7500	10,000	volts
DC Screen Voltage	750	750	volts
DC Grid Voltage	—515	—540	volts
DC Plate Current	4.95	4.8	amps
DC Screen Current	.580	.585	amp
DC Grid Current	.360	.320	amp
Peak RF Grid Voltage	675	700	volts
Driving Power	240	225	watts
Plate Dissipation	9000	10,000	watts
Plate Output Power	27,000	38,000	watts

PLATE-MODULATED RADIO-FREQUENCY POWER AMPLIFIER

Class-C Telephony (Carrier conditions unless noted)

MAXIMUM RATINGS

DC PLATE VOLTAGE	8000	VOLTS
DC SCREEN VOLTAGE	1500	VOLTS
DC PLATE CURRENT	4.0	AMPS
PLATE DISSIPATION*	23,000	WATTS
SCREEN DISSIPATION	450	WATTS
GRID DISSIPATION	200	WATTS

*Corresponds to 35,000 watts at 100 percent sine-wave modulation.

TYPICAL OPERATION

DC Plate Voltage	6000	8000	volts
DC Screen Voltage	750	750	volts
Peak AF Screen Voltage (For 100% modulation)	—740	710	volts
DC Grid Voltage	—600	—640	volts
DC Plate Current	3.75	3.65	amps
DC Screen Current	.450	.430	mA
DC Grid Current	.185	.180	mA
Peak RF Grid Voltage	800	840	volts
Grid Driving Power	150	150	watts
Plate Dissipation	5100	5800	watts
Plate Output Power	17,400	23,500	watts

AUDIO-FREQUENCY AMPLIFIER OR MODULATOR

Class-AB_1

MAXIMUM RATINGS (Per Tube)

DC PLATE VOLTAGE	10,000	VOLTS
DC SCREEN VOLTAGE	2,000	VOLTS
DC PLATE CURRENT	6.0	AMPS
PLATE DISSIPATION	35,000	WATTS
SCREEN DISSIPATION	450	WATTS
GRID DISSIPATION	200	WATTS

*Per Tube
**Approximate Values

TYPICAL OPERATION (Two Tubes)

DC Plate Voltage	8000	10,000	volts
DC Screen Voltage	1500	1500	volts
DC Grid Voltage	—290	—300	volts
Max-Signal Plate Current	10.7	10.7	amps
Zero-Signal Plate Current*	5.0	5.0	amps
Max-Signal Screen Current**	.390	.340	mA
Zero-Signal Screen Current	0	0	amps
Peak AF Driving Voltage*	280	290	volts
Driving Power	0	0	watts
Load Resistance, Plate-to-Plate	1680	2200	ohms
Max-Signal Plate Dissipation*	16,800	20,500	watts
Max-Signal Plate Output Power	50,000	66,000	watts

RADIO-FREQUENCY LINEAR AMPLIFIER

Class-AB_1

MAXIMUM RATINGS

DC PLATE VOLTAGE	10,000	VOLTS
DC SCREEN VOLTAGE	2,000	VOLTS
DC PLATE CURRENT	6.0	AMPS
PLATE DISSIPATION	35,000	WATTS
SCREEN DISSIPATION	450	WATTS
GRID DISSIPATION	200	WATTS

*Approximate Values

TYPICAL OPERATION, Peak-Envelope or Modulation-Crest Conditions

DC Plate Voltage	8000	10,000	volts
DC Screen Voltage	1500	1500	volts
DC Grid Voltage	—290	—300	volts
Max-Signal Plate Current	5.35	5.35	amps
Zero-Signal Plate Current	2.5	2.5	amps
Max-Signal Screen Current*	.195	.170	mA
Peak RF Grid Voltage	280	290	volts
Driving Power	0	0	watts
Plate Dissipation	16,800	20,500	watts
Plate Output Power	25,000	33,000	watts
Resonant Load Impedance	840	1100	ohms

NOTE: "TYPICAL OPERATION" data are obtained by calculation from published characteristic curves and confirmed by direct tests. No allowance is made for circuit losses of any kind. Adjustment of the rf 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 rf driving voltage is applied.

APPLICATION

MECHANICAL

Mounting — The 4CV35,000A must be operated with its axis vertical, base up in an EIMAC BR-200 boiler. Care must be exercised when installing to insure that the boiler is level, the water is at the proper level and that the flange of the tube makes a vapor tight seal against the the rubber O-ring and boiler. A typical vapor cooling system is shown on the opposite page.

Socket — The EIMAC SK-310 socket is available for use with the 4CV35,000A. Filament, control grid and screen grid connections are made to this socket.

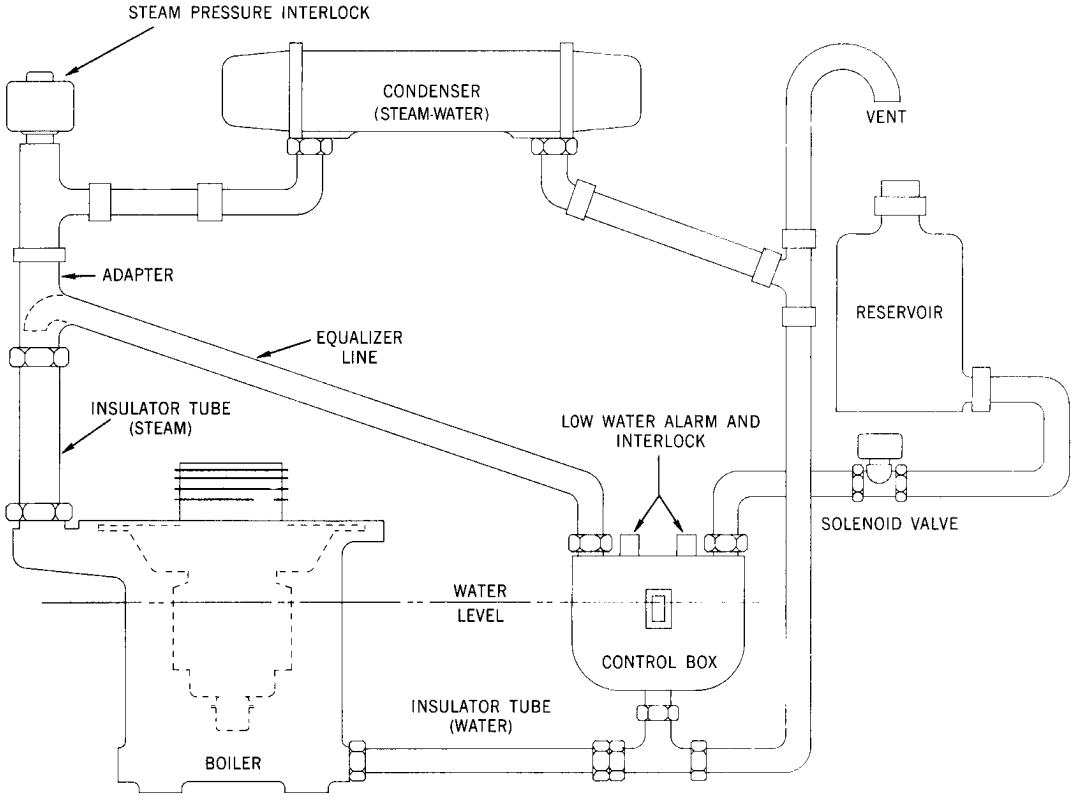
Cooling — Cooling is accomplished by immersing the anode in the distilled water filled BR-200 boiler. The energy dissipated at the anode causes the water to boil at the surfaces of the anode, be converted into steam and be carried away to the condenser. The boiling action keeps the anode surfaces at approximately 100°C. In a properly designed boiler-tube system (such as the 4CV35,000A and BR-200), it is extremely unlikely that the anode surfaces will ever exceed 110°C — well below the 250°C maximum rating — at full dissipation ratings.

The water in the boiler must be maintained at a constant level. Just below the top of the fins on the anode cooler. This is accomplished automatically in the vapor cooling system shown. Condensate from the condenser is returned to the boiler to maintain this constant fluid level. Any losses or drops in liquid level are sensed by the control box CB-202. A low water level in the control box activates the solenoid water valve, allowing make-up water from the reservoir to enter the boiler. When the proper level is reached, the control box de-energizes the solenoid, stopping the flow from the reservoir. A second switch in the control box is energized if the water level drops to a lower level because of an empty reservoir or a constriction in the line. This switch may be used to shut down the equipment or activate an alarm.

For reliable operation, it is important that the control box and boiler be mounted so that the level sensed by the control box is exactly the same as the level in the boiler.

Air cooling of the tube base is required. 100 CFM minimum should be directed straight down toward the center of the SK-310 socket from a blower or duct, not more than 5½ inches from the socket.

VAPOR COOLING SYSTEM



ELECTRICAL

Filament Operation — The rated filament voltage for the 4CV35,000A is 6.3 volts. Filament voltage, as measured at the socket, must be maintained at 6.3 volts plus or minus five percent to obtain maximum tube life. The use of a constant voltage filament transformer is recommended.

Control-Grid Operation — The 4CV35,000A control grid has a maximum dissipation rating of 200 watts. Precautions should be observed to avoid exceeding this rating. Grid dissipation is the product of the dc grid current and the peak positive grid voltage swing.

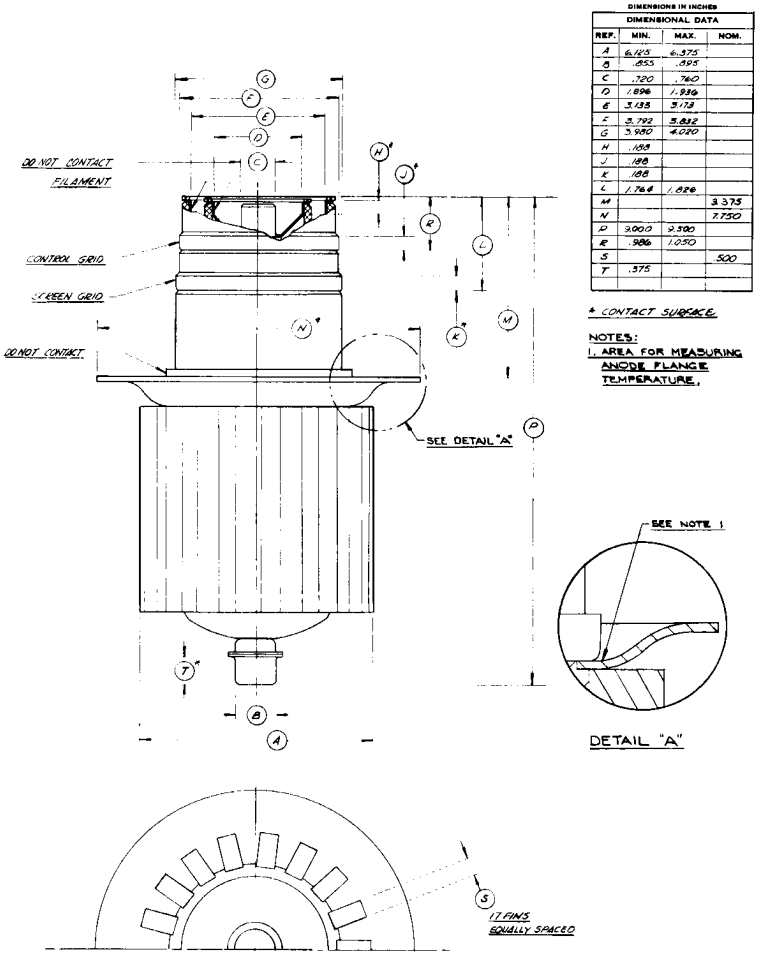
Screen-Grid Operation — The power dissipated by the screen must not exceed 450 watts. Screen dissipation, in cases where no ac is applied to the screen is the product of screen voltage and screen current. If the screen voltage is modulated, the screen dissipation will depend upon loading, driving power and screen voltage.

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 the screen dissipation in the event of these failures.

Plate Dissipation — The plate dissipation rating of 35,000 watts attainable through vapor cooling provides a large margin of safety. It is unlikely that this rating will be exceeded, even during tuning periods.

When the 4CV35,000A is used as a plate-modulated rf amplifier, this rating is reduced to 23,000 watts with a reduced plate input rating of 8000 volts and 4.0 amps.

Special Applications — If it is desired to operate this tube under conditions widely different from those given here, write to Power Grid Tube Marketing Department, EIMAC Division of Varian, 301 Industrial Way, San Carlos, California for information and recommendations.



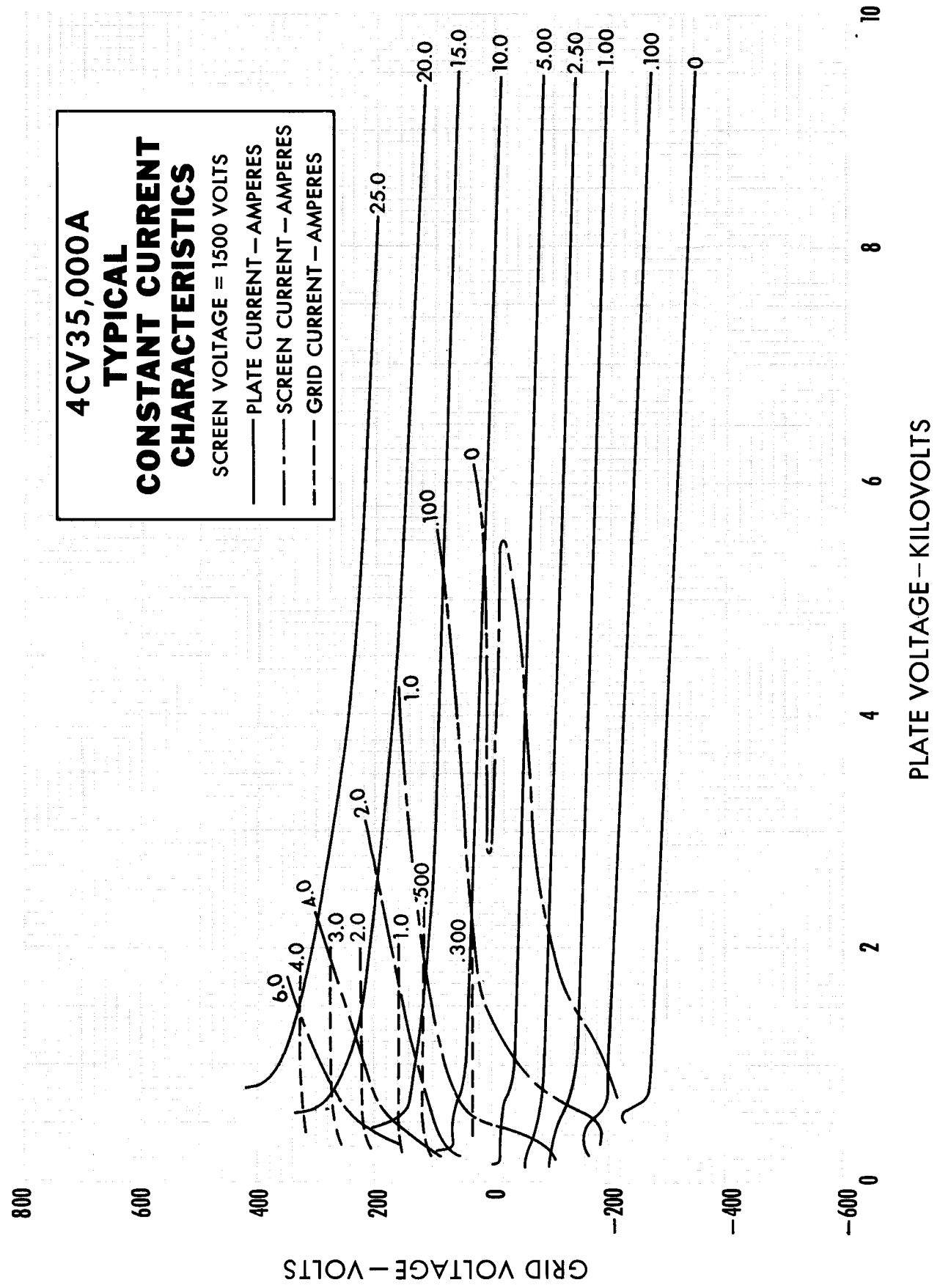
DIMENSIONS IN INCHES

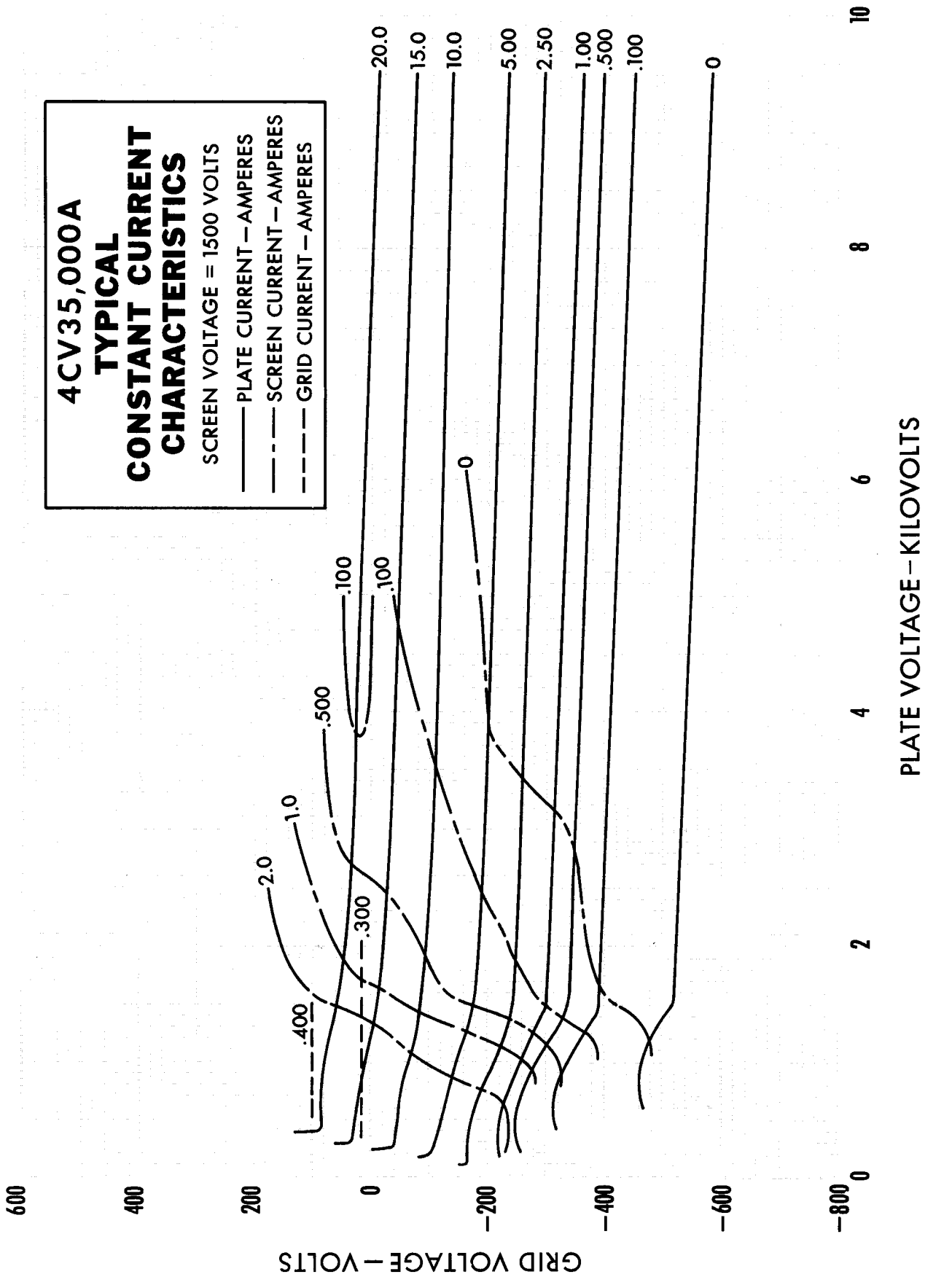
DIMENSIONAL DATA

REF.	MIN.	MAX.	NOM.
A	6.125	6.375	
B	.855	.895	
C	.720	.760	
D	1.898	1.938	
E	3.138	3.178	
F	5.792	5.832	
G	3.990	4.020	
H	.198		
J	.188		
K	.188		
L	1.764	1.826	
M			3.375
N			7.750
P	2.000	2.500	
R	.986	1.050	
S			.500
T	.375		

* CONTACT SURFACE.

NOTES:
1. AREA FOR MEASURING ANODE FLANGE TEMPERATURE.


4CV35,000A
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
SCREEN VOLTAGE = 1500 VOLTS
PLATE CURRENT—AMPERES
SCREEN CURRENT—AMPERES
GRID CURRENT—AMPERES
25.0
20.0
15.0
10.0
5.00
2.50
1.00
.100
0
6.0
4.0
4.0
3.0
2.0
2.0
1.0
1.0
.500
.300
.100
0
800
600
400
200
0
−200
−400
−600
0
2
4
6
8
10
GRID VOLTAGE—VOLTS
PLATE VOLTAGE—KILOVOLTS


4CV35,000A
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
SCREEN VOLTAGE = 1500 VOLTS
PLATE CURRENT – AMPERES
SCREEN CURRENT – AMPERES
GRID CURRENT – AMPERES
20.0
15.0
10.0
5.00
2.50
1.00
.500
.100
0
.100
.500
1.0
2.0
.400
.300
600
400
200
0
−200
−400
−600
−800
0
2
4
6
8
10
GRID VOLTAGE – VOLTS
PLATE VOLTAGE – KILOVOLTS