

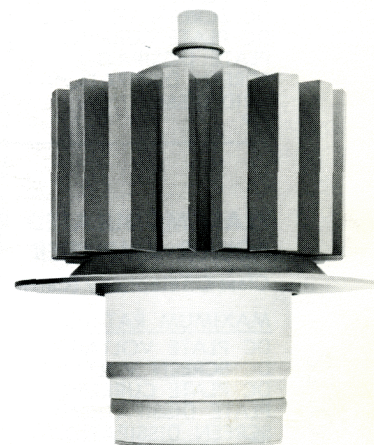


TECHNICAL DATA

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

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

Direct Interelectrode Capacitances, Grounded Cathode:

	<u>Min.</u>	<u>Max.</u>	
Input - - - - -	152	172	$\mu\mu\text{f}$
Output - - - - -	22.0	27.0	$\mu\mu\text{f}$
Feedback - - - - -		2.0	$\mu\mu\text{f}$

Direct Interelectrode Capacitances, Grounded Grid and Screen:

Input - - - - -	63.0	78.0	$\mu\mu\text{f}$
Output - - - - -	23.0	28.0	$\mu\mu\text{f}$
Feedback - - - - -		0.3	$\mu\mu\text{f}$

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.

**RADIO-FREQUENCY POWER AMPLIFIER
OR OSCILLATOR**

Class-C Telephony 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-AB₁MAXIMUM 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 AMPLIFIERClass-AB₁MAXIMUM 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 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.

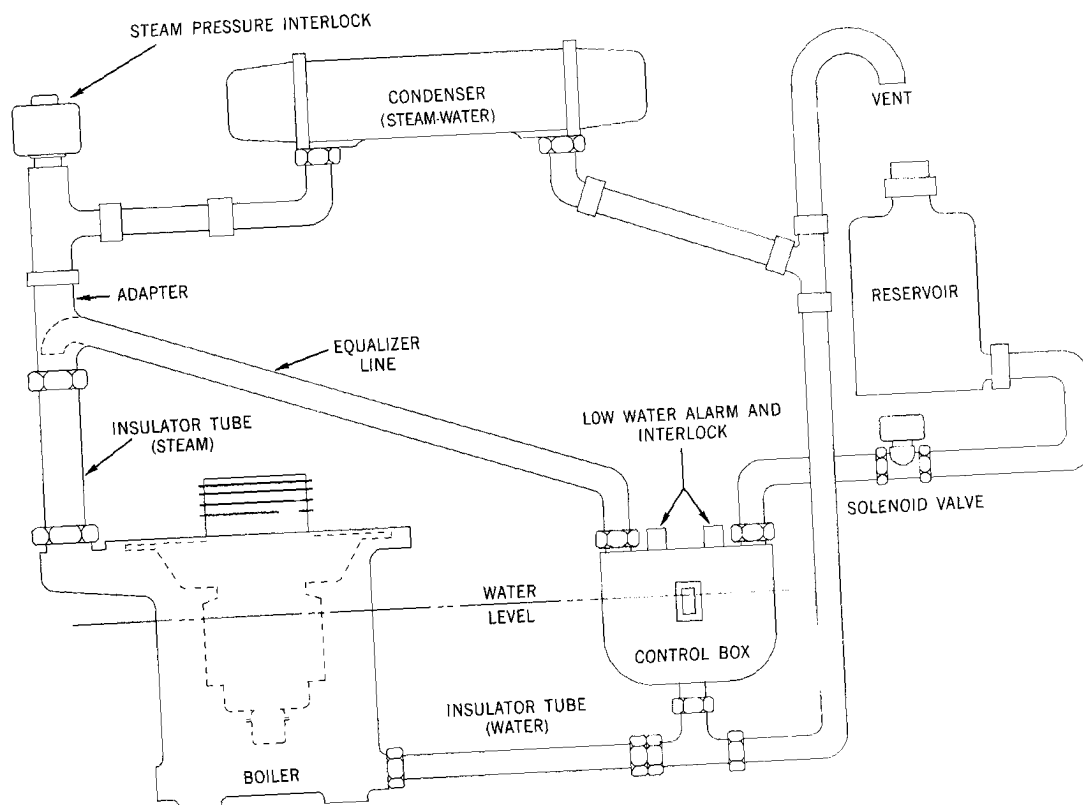
Cooling — Cooling is accomplished by immersing the anode in the distilled water filled BR-200 boiler. The energy dissipated at the anode causes the water to boil at the surfaces of the anode, be converted into steam and be carried away to the condenser. The boiling action keeps the anode surfaces at 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.

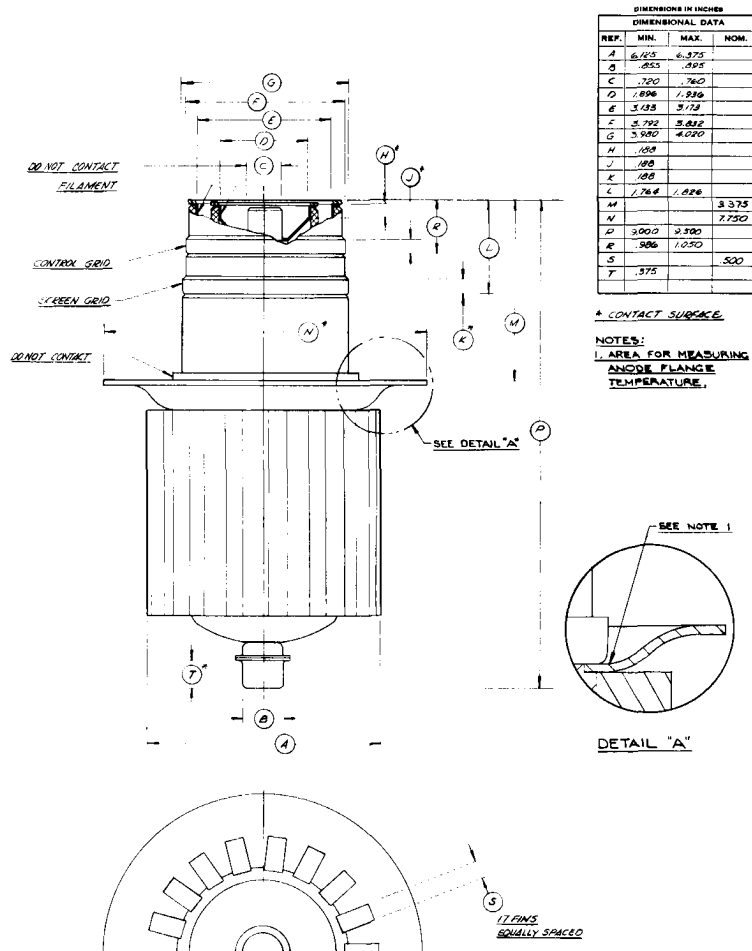
Screen dissipation is likely to rise to excessive

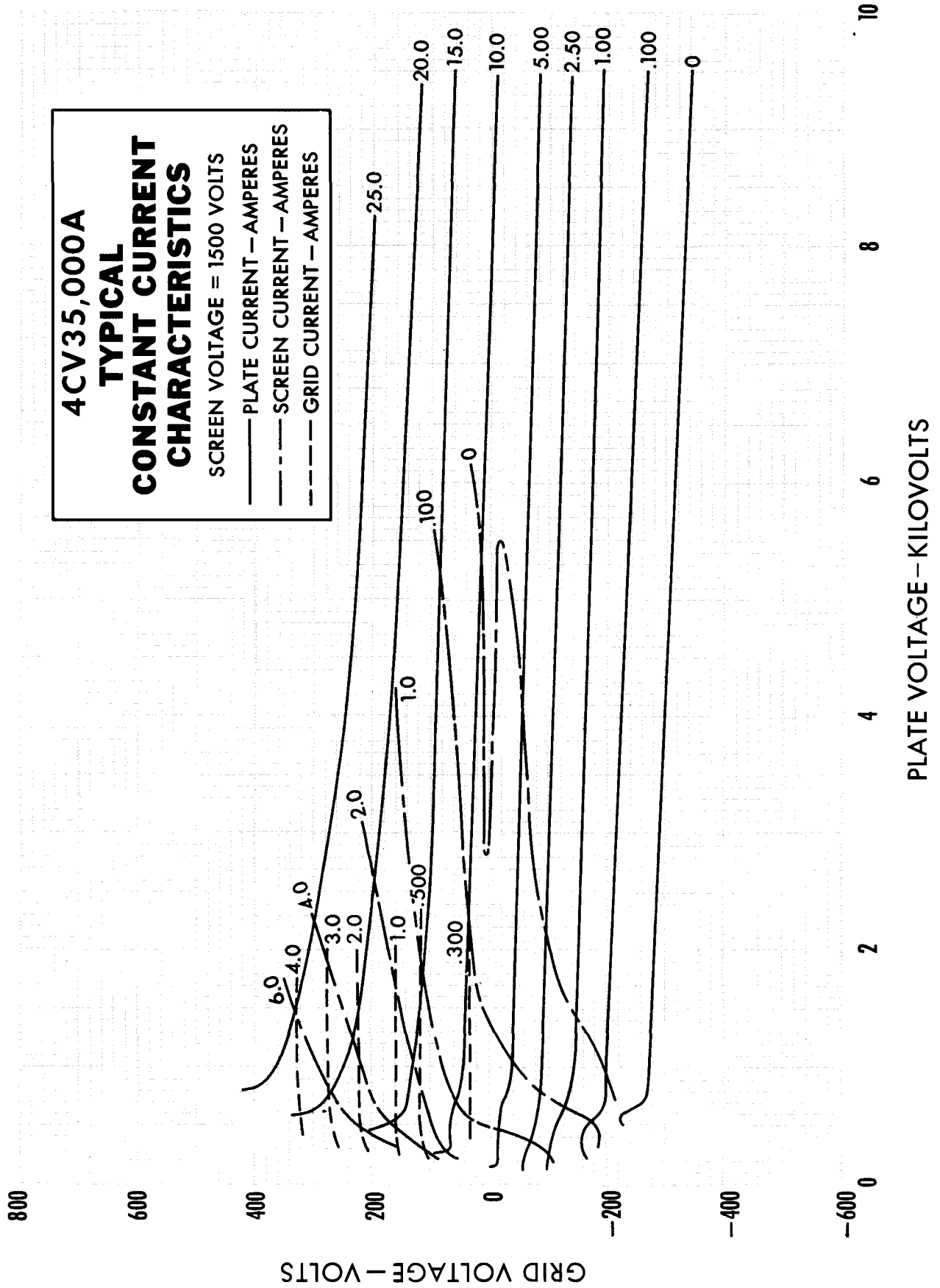
values when the plate voltage, bias voltage or plate load are removed with filament and screen voltages applied. Suitable protective means must be provided to limit the screen dissipation in the event of these failures.

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.







4CV35,000A

TYPICAL CONSTANT CURRENT CHARACTERISTICS

SCREEN VOLTAGE = 1500 VOLTS

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

