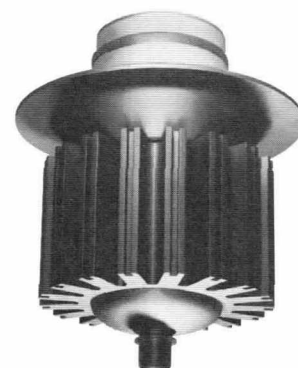


The EIMAC 3CV30,000A3 is a vapor-cooled, ceramic-metal power triode designed primarily for use in industrial radio-frequency heating service. Its vapor-cooled anode is conservatively rated at 30 kilowatts of plate dissipation when mounted in an EIMAC BR-200 boiler.

Full input of 60 kilowatts is permissible up to 100 megahertz. Large reserve emission is available from its one kilowatt filament and the grid structure is rated at one ampere making this tube an excellent choice for severe applications.

It is also recommended as a grounded grid FM amplifier, a conventional plate-modulated amplifier or as a linear amplifier in new equipment designs.



GENERAL CHARACTERISTICS

ELECTRICAL

Filament: Thoriated-Tungsten	<i>Min.</i>	<i>Nom.</i>	<i>Max.</i>	
Voltage - - - - -		6.3		volts
Current - - - - -	152		172	amperes
Amplification Factor - - - - -		20		
Interelectrode Capacitances, Grounded Cathode:				
Grid-Filament - - - - -	48		58	pF
Plate-Filament - - - - -	1.2		1.5	pF
Grid-Plate - - - - -	30		38	pF
Frequency for Maximum Ratings - - - - -	- - - - -	- - - - -	- - - - -	100 MHz

MECHANICAL

[illegible]

RF INDUSTRIAL OSCILLATOR

Class-C (Filtered DC Power Supply)

MAXIMUM RATINGS

DC PLATE VOLTAGE	-	-	-	-	10,000	VOLTS
DC PLATE CURRENT	-	-	-	-	6.0	AMPS
DC GRID CURRENT	-	-	-	-	1.0	AMP
PLATE INPUT POWER	-	-	-	-	60	KW
PLATE DISSIPATION	-	-	-	-	30	KW

TYPICAL OPERATION

DC Plate Voltage	-	-	-	-	7000	10,000	volts
DC Plate Current	-	-	-	-	6.0	6.0	amps
DC Grid Voltage	-	-	-	-	-600	-800	volts
DC Grid Current	-	-	-	-	.66	.315	amps
Peak Positive Grid Voltage	-	-	-	-	440	360	volts
Driving Power	-	-	-	-	660	365	watts
Plate Input Power	-	-	-	-	42	60	kW
Plate Dissipation	-	-	-	-	12	18	kW
Plate Output Power	-	-	-	-	30	42	kW
Approximate Load Impedance	-	-	-	-	600	750	ohms

**RADIO-FREQUENCY POWER AMPLIFIER
PLATE-MODULATED**

Class-C

MAXIMUM RATINGS

DC PLATE VOLTAGE	-	-	-	-	7000 VOLTS
DC PLATE CURRENT	-	-	-	-	5.0 AMPS
PLATE DISSIPATION	-	-	-	-	20 KW
GRID DISSIPATION	-	-	-	-	500 WATTS

TYPICAL OPERATION

DC Plate Voltage	-	-	-	-	5000	7000 volts
DC Grid Voltage	-	-	-	-	—600	—820 volts
DC Plate Current	-	-	-	-	5.0	5.0 amps
DC Grid Current	-	-	-	-	600	600 mA
Driving Power	-	-	-	-	600	750 watts
Plate Output Power	-	-	-	-	17.8	27.5 kW

**RADIO-FREQUENCY
LINEAR AMPLIFIER**Class-AB₂**MAXIMUM RATINGS**

DC PLATE VOLTAGE	-	-	-	-	10,000 VOLTS
DC PLATE CURRENT	-	-	-	-	6.0 AMPS
PLATE DISSIPATION	-	-	-	-	30 KW
GRID DISSIPATION	-	-	-	-	500 WATTS

TYPICAL OPERATION

DC Plate Voltage	-	-	-	-	7000	10,000 volts
DC Grid Voltage*	-	-	-	-	—250	—400 volts
Zero-Sig Plate Current	-	-	-	-	2.0	2.0 amps
Max-Sig DC Plate Current	-	-	-	-	6.0	6.0 amps
Max-Sig DC Grid Current	-	-	-	-	375	333 mA
Peak RF Grid Voltage	-	-	-	-	530	700 volts
Driving Power	-	-	-	-	200	240 watts
Plate Output Power	-	-	-	-	26.4	41 kW

*Adjust to give specified zero-signal dc plate current.

Note: "TYPICAL OPERATION" data are obtained by calculation from published characteristic curves. No allowance for circuit losses has been made.

APPLICATION**ELECTRICAL**

Filament—The rated filament voltage for the 3CV30,000A3 is 6.3 volts. Filament voltage, as measured at the socket, must be maintained at 6.3 volts plus or minus five percent for maximum tube life and consistent performance.

Control Grid Operation — The grid current rating is one ampere dc. This value should not be exceeded for more than very short periods such as during tuning and over-current protection in the grid circuit should be provided. Ordinarily it will not be necessary to operate with more than 0.4 to 0.6 amperes grid current to obtain reasonable efficiency. In industrial heating service with varying loads, grid current should be monitored continuously with a dc current meter. The maximum grid dissipation rating is 500 watts.

Plate Operation — The maximum plate input power rating is 60 kilowatts at 10,000 volts and 6.0 amperes dc. This rating applies for Class C amplifier or oscillator service and for Class AB

applications. When used as a plate modulated rf amplifier, input is reduced to 7000 volts at 5.0 amperes dc. Maximum input may be exceeded for short periods during tuning without exceeding plate dissipation ratings.

Plate over-current protection should be provided to remove plate voltage quickly in the event of an overload or an arc-over at the load. In addition current limiting power supply resistors should be used. These precautions are especially important in industrial service with its wide variations in loading.

Spark gaps from plate to ground should be used to prevent transient voltages from flashing across the tube envelope during any fault conditions.

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

MECHANICAL

Mounting — The 3CV30,000A3 must be mounted vertically, base up in an EIMAC BR-200 boiler. It is very important that the boiler tube assembly be mounted vertically, the water be maintained at the suggested level, and that the flange of the tube makes a vapor-tight seal against the rubber "O" ring and boiler.

Sockets — The EIMAC SK-1310 socket is available for use with the 3CV30,000A3. Filament and grid connection are made to this socket.

Cooling — Cooling is accomplished by immersion of the anode in a distilled water-filled BR-200 boiler. The energy dissipated at the anode causes the water to boil and be converted into steam. Steam is carried away by convection to the condenser where it is cooled and condenses into water. Condensate is then returned to the boiler.

The boiling action maintains the anode surface temperature at approximately 100°C. In a properly designed system (such as the 3CV30,000A3 and BR-200) it unlikely that anode surface temperature will ever exceed 125°C — well below the rated maximum for the tube — even

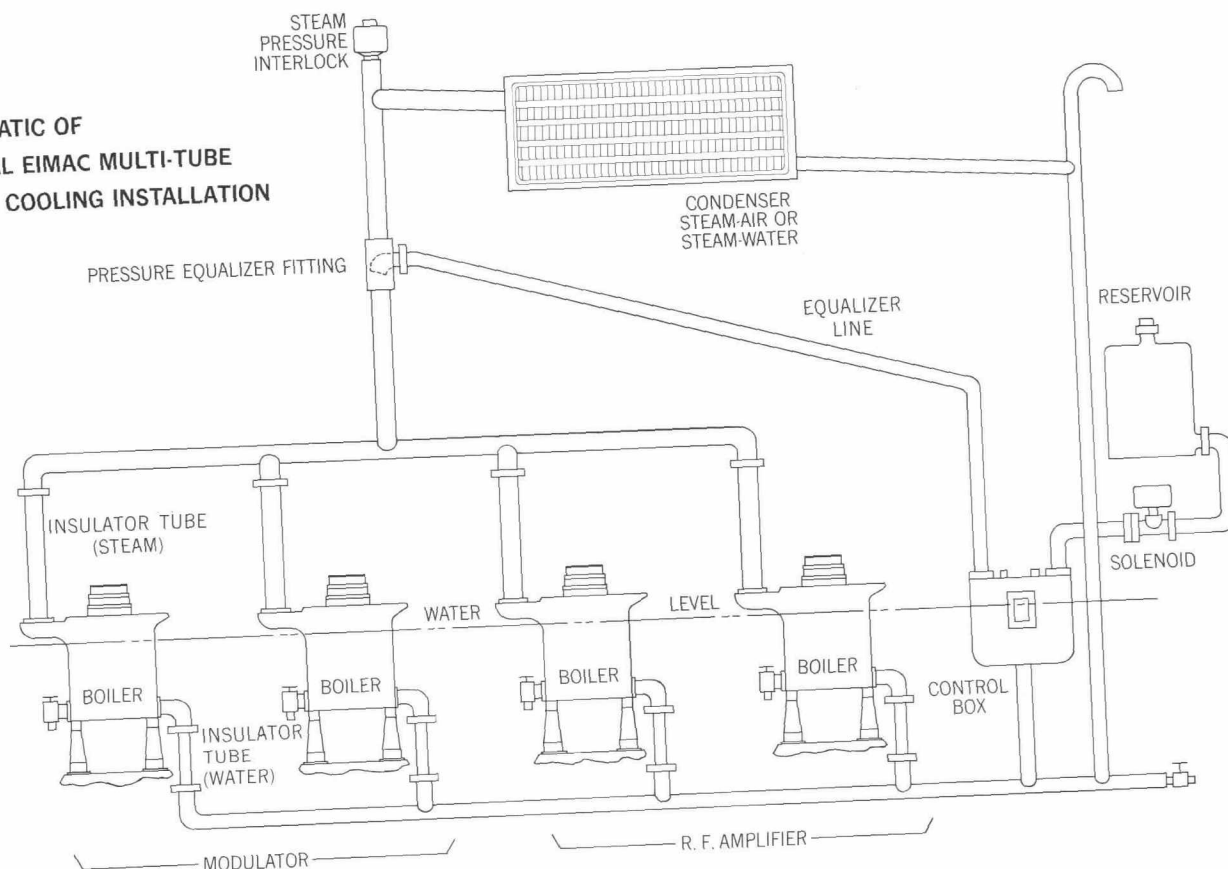
at full plate dissipation levels.

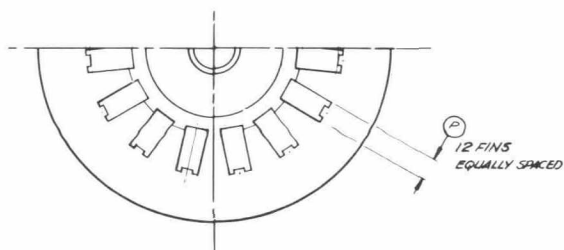
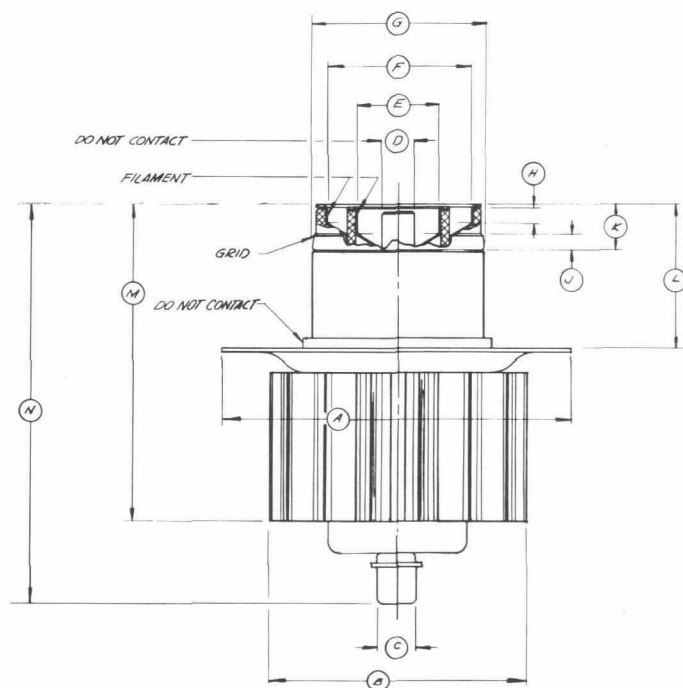
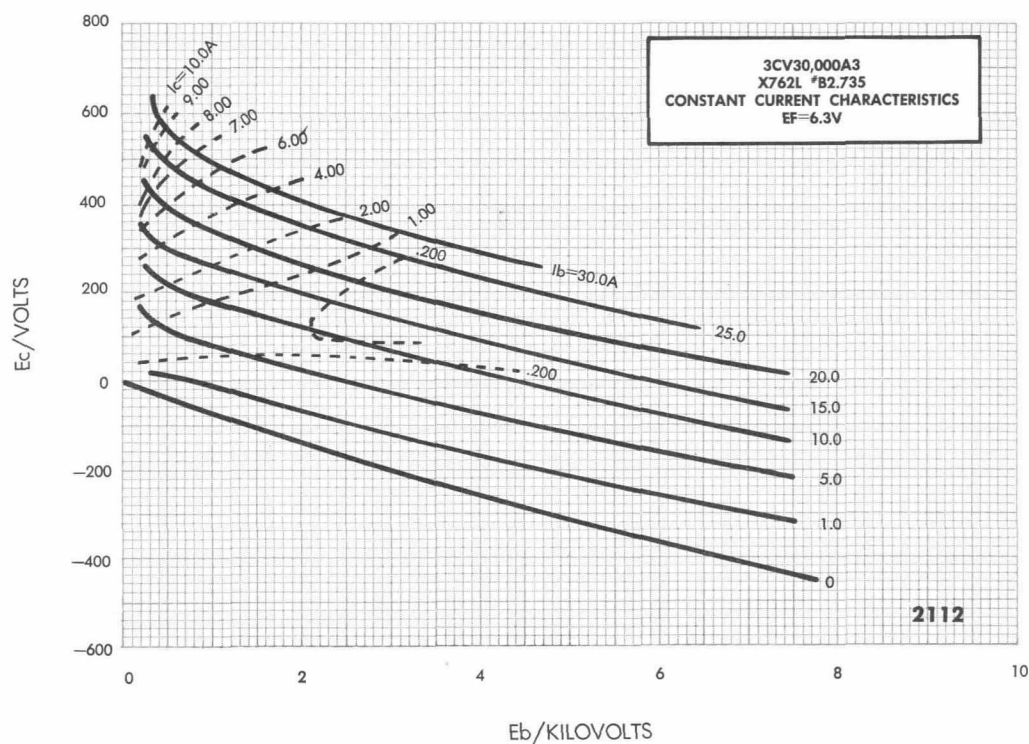
The water in the boiler must be maintained at a constant level, just below the top of the anode fins. This level is marked on the boiler. A recommended system for assuring constant water level is shown in the system diagram below. This system incorporates an EIMAC CB-202 Control Box to sense water level and a small reservoir to supply make-up water on demand. In the event of a drop in system water level, a switch is closed in the control box, energizing a solenoid water valve in the line from the reservoir. When the make-up water brings the system back to the proper level, the switch is opened, de-energizing the solenoid valve. A second switch in the CB-202 Control Box senses a lower, danger level and can be used to actuate an alarm or shut down the system.

For reliable operation, it is essential that the Control Box be mounted so that the level sensed is the actual level in the boiler.

Separate cooling of the tube base is required and is accomplished by directing 100 CFM of cooling air into the base structure from the top of the socket.

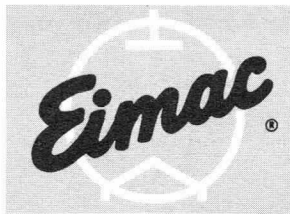
SCHEMATIC OF
TYPICAL EIMAC MULTI-TUBE
VAPOR COOLING INSTALLATION





DIMENSIONS IN INCHES

DIMENSIONAL DATA			
REF.	MIN.	MAX.	NOM.
A			7.750
B			5.812
C	.855	.895	
D	.720	.760	
E	1.896	1.936	
F	3.133	3.173	
G	3.792	3.832	
H	.188		
J	.188		
K	.986	1.050	
L			3.062
M	6.920	6.990	
N	8.250	8.750	
P			.510



E I M A C
Division of Varian
S A N C A R L O S
C A L I F O R N I A

3CV30,000H3

**MEDIUM-MU
VAPOR-COOLED
POWER TRIODE**

The EIMAC 3CV30,000H3 is a vapor-cooled, ceramic-metal power triode designed primarily for use in industrial radio-frequency heating service. Its vapor-cooled anode is conservatively rated at 30 kilowatts of plate dissipation when mounted in an EIMAC BR-200 boiler.

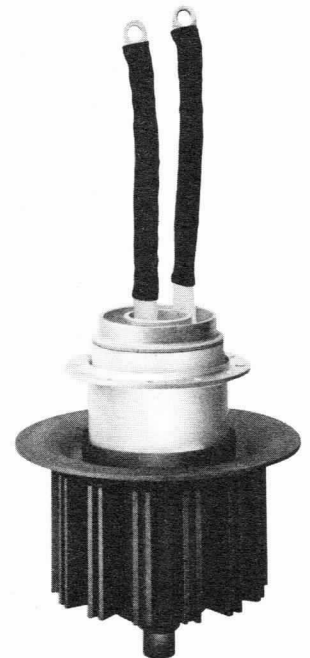
Full input of 60 kilowatts is permissible up to 100 megahertz. Large reserve emission is available from its one kilowatt filament and the grid structure is rated at one ampere making this tube an excellent choice for severe applications.

It is also recommended as an audio amplifier, a conventional plate-modulated amplifier or as a linear amplifier in new equipment designs.

GENERAL CHARACTERISTICS

ELECTRICAL

Filament: Thoriated-Tungsten	Min.	Nom.	Max.	
Voltage - - - - -		6.3		V
Current - - - - -	152		172	A
Amplification Factor - - - - -		20		
Interelectrode Capacitances, Grounded Cathode:				
Grid-Filament - - - - -	48		58	pF
Plate-Filament - - - - -	1.2		1.5	pF
Grid-Plate - - - - -	30		38	pF
Frequency for Maximum Ratings - - - - -				100 MHz



MECHANICAL

Filament Connections - - - - -	Flexible Leads
Grid Connection - - - - -	Terminal Ring
Recommended Boiler - - - - -	EIMAC BR-200
Operating Position - - - - -	Vertical, Base up
Cooling - - - - -	Vapor and Forced air
Maximum Operating Temperatures:	
Ceramic-to-metal Seals - - - - -	250°C
Maximum Dimensions: - - - - -	See Outline
Net Weight - - - - -	18 pounds

RF INDUSTRIAL OSCILLATOR

Class-C (Filtered DC Power Supply)

MAXIMUM RATINGS

DC PLATE VOLTAGE - - - - -	10,000 VOLTS
DC PLATE CURRENT - - - - -	6.0 AMPS
DC GRID CURRENT - - - - -	1.0 AMPS
PLATE INPUT POWER - - - - -	60 KW
PLATE DISSIPATION - - - - -	30 KW

TYPICAL OPERATION

DC Plate Voltage - - - - -	7000	10,000	volts
DC Plate Current - - - - -	6.0	6.0	amps
DC Grid Voltage - - - - -	-600	-800	volts
DC Grid Current - - - - -	.66	.315	amps
Peak Positive Grid Voltage - - - - -	440	360	volts
Driving Power - - - - -	660	365	watts
Plate Input Power - - - - -	42	60	kW
Plate Dissipation - - - - -	12	18	kW
Plate Output Power - - - - -	30	42	kW
Approximate Load Impedance - - - - -	600	750	ohms



RADIO-FREQUENCY POWER AMPLIFIER

PLATE-MODULATED

Class-C

MAXIMUM RATINGS

DC PLATE VOLTAGE	- - - - -	7000	VOLTS
DC PLATE CURRENT	- - - - -	5.0	AMPS
PLATE DISSIPATION	- - - - -	20	KW
GRID DISSIPATION	- - - - -	500	WATTS

TYPICAL OPERATION

DC Plate Voltage	- - - - -	5000	7000	volts
DC Grid Voltage	- - - - -	-600	-820	volts
DC Plate Current	- - - - -	5.0	5.0	amps
DC Grid Current	- - - - -	600	600	mA
Driving Power	- - - - -	600	750	watts
Plate Output Power	- - - - -	17.8	27.5	kW

AUDIO AMPLIFIER

OR MODULATOR

Class-AB₂

MAXIMUM RATINGS

DC PLATE VOLTAGE	- - - - -	10,000	VOLTS
DC PLATE CURRENT	- - - - -	6.0	AMPS
PLATE DISSIPATION	- - - - -	30	KW
GRID DISSIPATION	- - - - -	500	WATTS

TYPICAL OPERATION (two tubes)

DC Plate Voltage	- - - - -	6000	9600	volts
DC Grid Voltage*	- - - - -	-280	-480	volts
Zero-Sig Plate Current	- - - - -	.5	.25	amps
Max-Sig DC Plate Current	- - - - -	4.2	3.1	amps
Max-Sig DC Grid Current	- - - - -	145	42	mA
Peak Driving Voltage	- - - - -	480	590	volts
Drive Power	- - - - -	140	50	watts
Plate-to-Plate Load Resistance	- - - - -	1300	2740	ohms
Power Output	- - - - -	31	36	kW

Note: "TYPICAL OPERATION" data are obtained by calculation from published characteristic curves. No allowance for circuit losses has been made.

APPLICATION

ELECTRICAL

Filament The rated filament voltage for the 3CV30,000H3 is 6.3 volts. Filament voltage, as measured at the socket, must be maintained at 6.3 volts plus or minus five percent for maximum tube life and consistent performance.

Control Grid Operation The grid current rating is one ampere dc. This value should not be exceeded for more than very short periods such as during tuning and over-current protection in the grid circuit should be provided. Ordinarily it will not be necessary to operate with more than 0.4 to 0.6 amperes grid current to obtain reasonable efficiency. In industrial heating service with varying loads, grid current should be monitored continuously with a dc current meter. The maximum grid dissipation rating is 500 watts.

Plate Operation The maximum plate input power rating is 60 kilowatts at 10,000 volts and 6.0 amperes dc. This rating applies for Class C amplifier or oscillator service and for Class AB applica-

tions. When used as a plate modulated rf amplifier, input is reduced to 7000 volts at 5.0 amperes dc. Maximum input may be exceeded for short periods during tuning without exceeding plate dissipation ratings.

Plate over-current protection should be provided to remove plate voltage quickly in the event of an overload or an arc-over at the load. In addition, current limiting power supply resistors should be used. These precautions are especially important in industrial service with its wide variations in loading.

Spark gaps from plate to ground should be used to prevent transient voltages from flashing across the tube envelope during any fault conditions.

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

MECHANICAL

Mounting The 3CV30,000H3 must be mounted vertically, base up in an EIMAC BR-200 boiler. It is very important that the boiler tube assembly be mounted vertically, the water be maintained at the suggested level, and that the flange of the tube makes a vapor-tight seal against the rubber "O" ring and boiler.

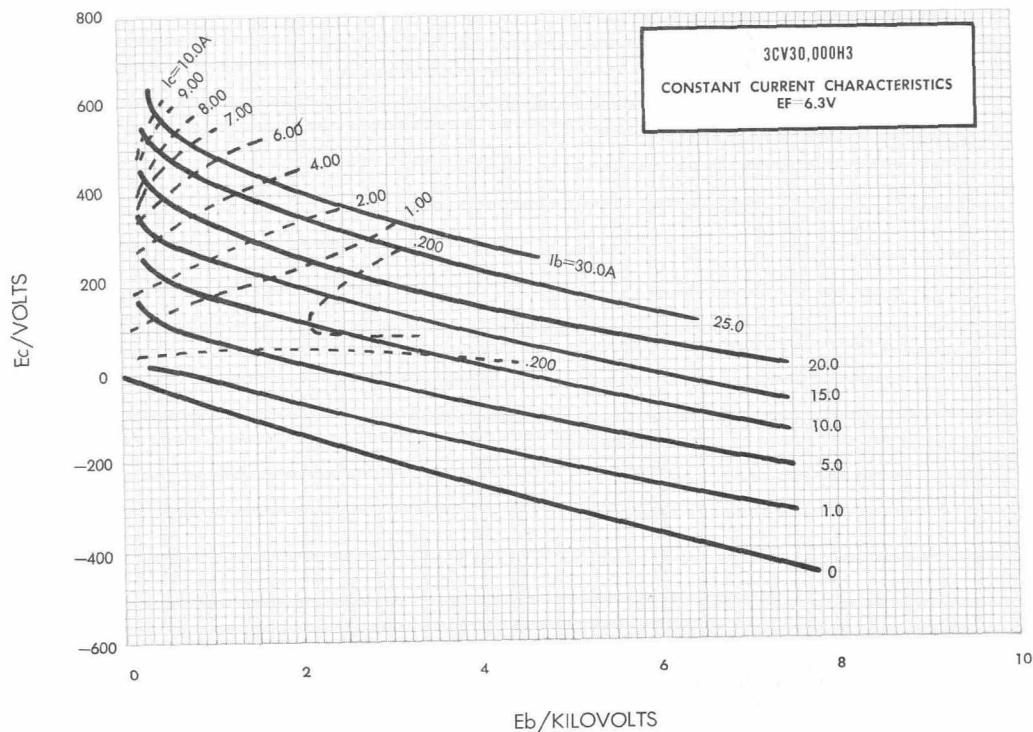
Cooling Cooling is accomplished by immersion of the anode in a distilled water-filled BR-200 boiler. The energy dissipated at the anode causes the water to boil and be converted into steam. Steam is carried away by convection to the condenser where it is cooled and condenses into water. Condensate is then returned to the boiler.

The boiling action maintains the anode surface temperature at approximately 100°C . In a properly designed system (such as the 3CV30,000H3 and BR-200) it is unlikely that anode surface temperature will ever exceed 125°C — well below the rated maximum for the tube — even at full plate dissipation levels.

The water in the boiler must be maintained at a constant level, just below the top of the anode fins. This level is marked on the boiler. A recommended system for assuring constant water level is shown in the system diagram below. This system incorporates an EIMAC CB-202 Control Box to sense water level and a small reservoir to supply make-up water on demand. In the event of a drop in system water level, a switch is closed in the control box, energizing a solenoid water valve in the line from the reservoir. When the make-up water brings the system back to the proper level, the switch is opened, de-energizing the solenoid valve. A second switch in the CB-202 Control Box senses a lower, danger level and can be used to actuate an alarm or shut down the system.

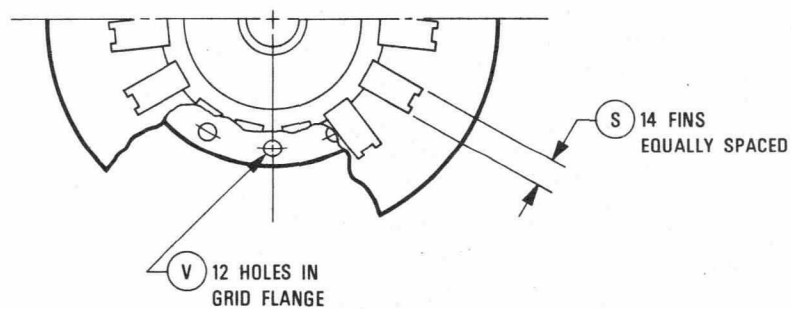
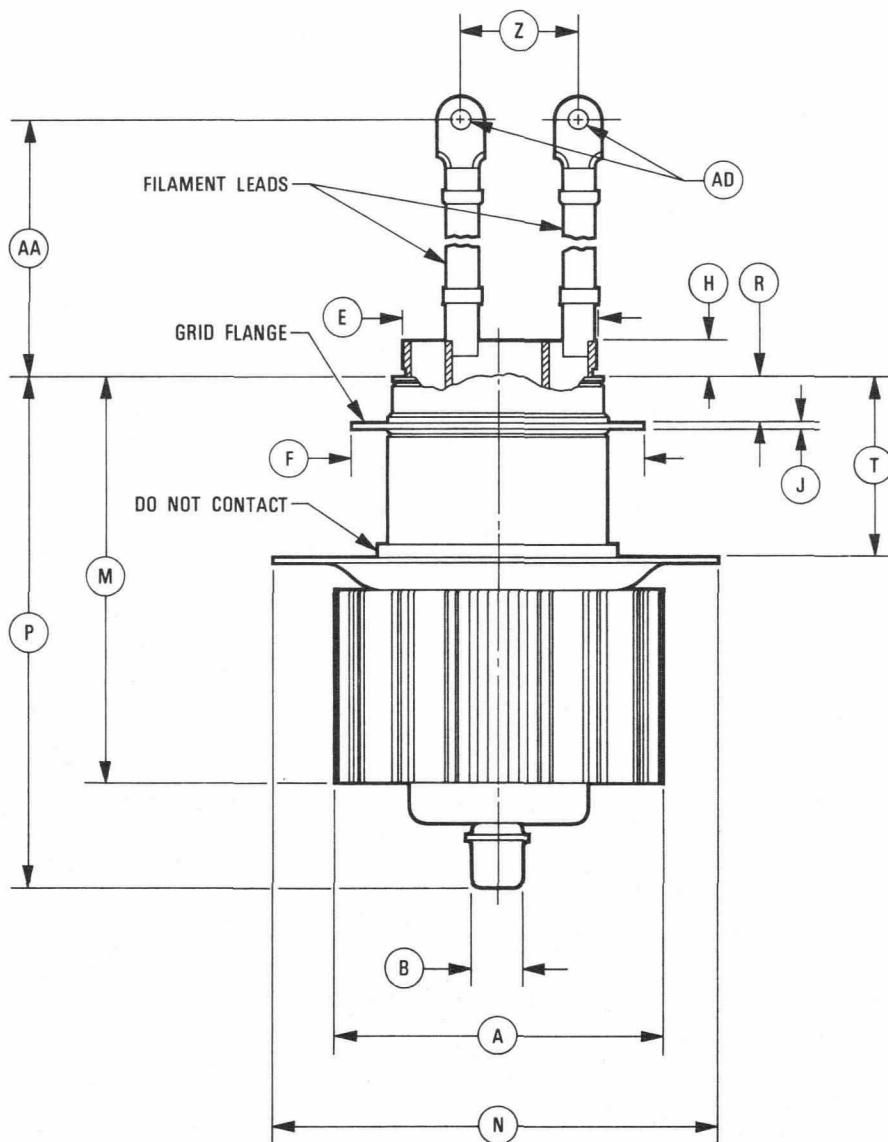
For reliable operation, it is essential that the Control Box be mounted so that the level sensed is the actual level in the boiler.

Separate cooling of the tube base is required and is accomplished by directing 100 CFM of cooling air into the base structure from the top of the socket.





3CV30,000H3



DIMENSIONS IN INCHES

DIMENSIONAL DATA

DIM.	MIN.	MAX.	REF.
A			5.812
B	.855	.895	
E	3.230	3.270	
F	5.030	5.090	
H	.530	.700	
J			.125
M	6.643	6.775	
N			7.750
P	8.400	8.625	
R	.700	.860	
S			.510
T			2.806
V			.265
Z			2.000
AA	8.500	9.000	
AD			.390

NOTE:

REF. DIMS. ARE FOR INFO. ONLY &
ARE NOT REQ'D. FOR INSP. PURPOSES.



TECHNICAL DATA

8240
3CW5000A1
8241
3CW5000F1
LOW-MU
WATER-COOLED
TRIODES

The EIMAC 8240/3CW5000A1 and 8241/3CW5000F1 are low-mu water-cooled power triodes intended for use as audio amplifiers or modulators. Their maximum rated plate dissipation is 5000 watts. The two types are identical except for the addition of flexible leads for the grid and filament terminals on the 8241/3CW5000F1.

Two of these tubes, in Class AB₁ audio service, will deliver more than 10 kilowatts maximum-signal plate output power at 6000 plate volts without drawing grid current.

These two types are electrically identical to the air-cooled EIMAC 8238/3CX3000A1 except for the plate dissipation rating.

GENERAL CHARACTERISTICS¹

ELECTRICAL

Filament: Thoriated Tungsten

Voltage 7.5 ± 0.37 V

Current, at 7.5 volts

8240/3CW5000A1 51.5 A

8241/3CW5000F1 50.5 A

Transconductance (Average)

$I_b = 1.0$ Adc, $E_b = 3000$ Vdc . 11,000 μ mhos

Amplification Factor (Average) 4.9

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

MECHANICAL

Maximum Overall Dimensions:

Length (excluding leads on 8241/3CW5000F1) 12.625 in; 321 mm

Diameter 3.255 in; 86.2 mm

Net Weight (Approximate) 3.5 lbs; 1.6 kg

Operating Position Axis vertical, base down or up

Maximum Operating Temperature:

Ceramic/Metal Seals or Envelope 250°C

Cooling:

Seals and Envelope Forced Air

Plate Water

Base See Outline Drawings



(Effective 5-15-71) © by Varian

Printed in U.S.A.

AUDIO FREQUENCY POWER AMPLIFIER OR MODULATORClass AB₁, Grid Driven (Sinusoidal Wave)**ABSOLUTE MAXIMUM RATINGS (per tube)**

DC PLATE VOLTAGE	6000 VOLTS
DC PLATE CURRENT	2.5 AMPERES
PLATE DISSIPATION	5000 WATTS
GRID DISSIPATION	50 WATTS

1. Approximate value; adjust to give stated zero-signal plate current.

2. Per tube.

TYPICAL OPERATION (Class AB₁, Sinusoidal Wave, Two Tubes)

Plate Voltage	4000	5000	6000	Vdc
Grid Voltage ¹	-860	-1080	-1300	Vdc
Zero-Signal Plate Current	500	400	335	mAdc
Max. Signal Plate Current	3.00	2.80	2.65	Adc
Peak af Grid Voltage ²	760	995	1250	v
Peak Driving Power	0	0	0	w
Max. Signal Plate Input Power	12,000	14,000	16,000	W
Max. Signal Plate Dissipation ²	3000	3000	3000	W
Max. Signal Plate Output Power	6000	8000	10,000	W
Load Resistance (plate to plate)	2160	3320	4560	Ω

NOTE: TYPICAL OPERATION data are obtained by measurement or calculation from published characteristic curves. Adjustment of the grid voltage to obtain the specified plate current at the specified bias, and plate voltages is assumed. If this procedure is followed, there will be little variation in output power when the tube is changed.

RANGE VALUES FOR EQUIPMENT DESIGN

	<u>Min.</u>	<u>Max.</u>
Filament: Current at 7.5 volts (8240/3CW5000A1)	49.0	54.0 A
(8241/3CW5000F1)	48.0	53.0 A
Amplification Factor	4.3	5.6

APPLICATION**MECHANICAL**

MOUNTING - The 3CW5000A1 and 3CW5000F1 must be mounted vertically, base down or up at the convenience of the circuit designer. The filament connections to the 3CW5000A1 should be made through spring collets. These are available from EIMAC with the following part numbers: 149575 Inner line collet;

149576 Outer line collet

Reasonable care should be taken that these collets do not impart undue strain to the terminals or the base of the tube.

COOLING - With an anode dissipation of 5000 watts and with an incoming water temperature of 50°C maximum, 7.7 gpm of cooling water must be supplied to the anode cooling jacket. Outlet water temperature from the cooling jacket should never exceed 70°C, and water pressure on the jacket should not exceed 60 psi. The pressure drop across the anode cooling jacket itself, with a water flow of 7.7 gpm, will be approximately 6 psi.

The grid-terminal contact surface and adjacent ceramic must be cooled by forced air, with quantity, velocity, and direction adjusted to limit the maximum seal temperature to less than 250°C.

The filament stem structure also requires forced-air cooling. A minimum of 6 cfm should be directed into the space between the inner and outer filament contacting surfaces.

Both air and water flow must be supplied before or simultaneously with the application of electrode voltages, including the filament, and may be removed simultaneously with them. Where long life and consistent performance are factors, cooling in excess of minimum requirements is normally beneficial.

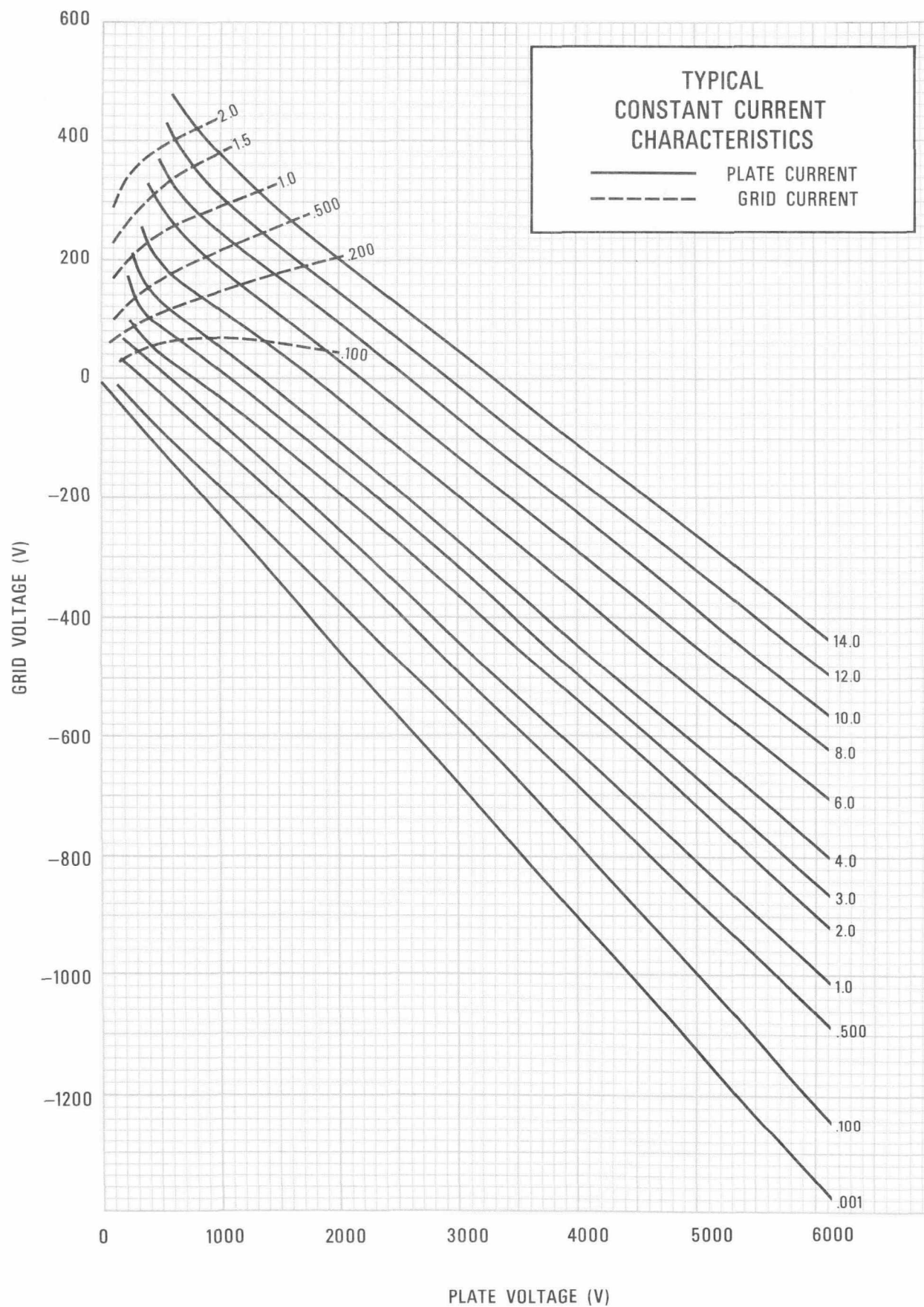
ELECTRICAL

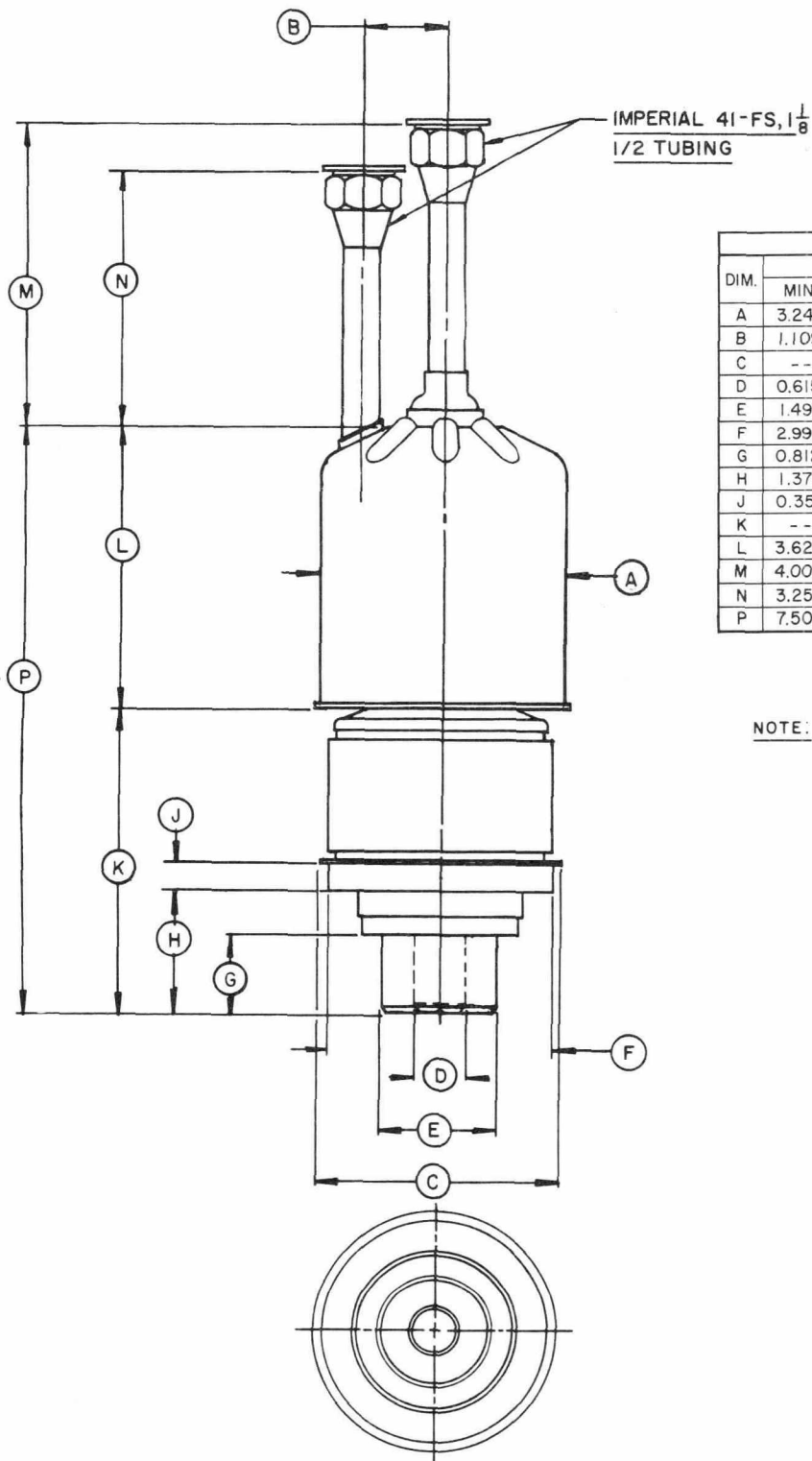
FILAMENT OPERATION - The filament voltage, as measured at the filament terminals, should be 7.5 volts, with maximum allowable variations due to line fluctuations of from 7.12 to 7.87 volts.

HIGH VOLTAGE - The 3CW5000A1 and 3CW-5000F1 operate at voltages which can be deadly, and the equipment must be designed properly and operating precautions must be followed. Equipment must be designed so that no one can come in contact with high voltages. All equipment must include safety enclosures for high-voltage circuits and terminals, with interlock switches to open the primary circuits of the power supplies and to discharge high-voltage condensers when access doors are opened.

Interlock switches must not be bypassed or "cheated" to allow operation with access doors open. Always remember that HIGH VOLTAGE CAN KILL.

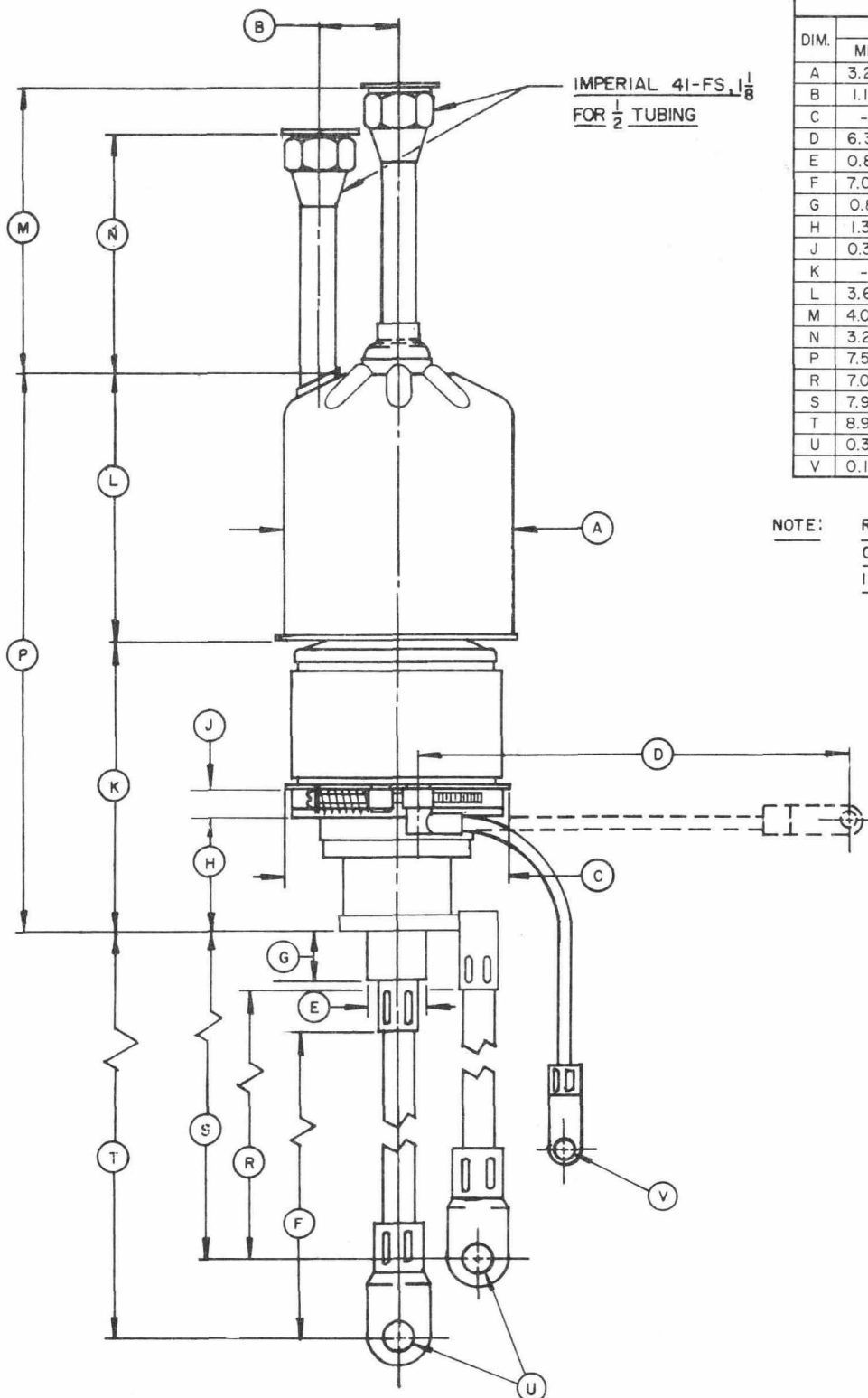
SPECIAL APPLICATIONS - If it is desired to operate these tubes under conditions widely different from those given here write to the Power Grid Tube Division, EIMAC Division of Varian, 301 Industrial Way, San Carlos, CA. 94070, for information and recommendations.





DIMENSIONAL DATA						
DIM.	INCHES			MILLIMETERS		
	MIN.	MAX.	REF.	MIN.	MAX.	REF.
A	3.245	3.255	--	82.42	82.68	--
B	1.109	1.141	--	28.17	28.98	--
C	--	3.625	--	--	92.08	--
D	0.615	0.635	--	15.62	16.13	--
E	1.490	1.510	--	37.85	38.35	--
F	2.990	3.010	--	75.95	76.45	--
G	0.812	0.938	--	20.62	23.83	--
H	1.375	1.625	--	34.93	41.28	--
J	0.359	0.422	--	9.12	10.72	--
K	--	--	3.599	--	--	91.41
L	3.625	3.875	--	92.08	98.43	--
M	4.000	4.500	--	101.60	114.30	--
N	3.250	3.750	--	82.55	95.25	--
P	7.500	8.125	--	190.50	206.38	--

NOTE: REF. DIMS ARE FOR INFO
ONLY AND NOT REQ. FOR
INSPECTION PURPOSES.



DIMENSIONAL DATA						
DIM.	INCHES			MILLIMETERS		
	MIN.	MAX.	REF.	MIN.	MAX.	REF.
A	3.245	3.255	--	82.42	82.68	--
B	1.109	1.141	--	28.17	28.98	--
C	--	3.625	--	--	92.08	--
D	6.375	6.625	--	161.93	168.28	--
E	0.859	0.890	--	21.82	22.61	--
F	7.000	7.500	--	177.80	190.50	--
G	0.812	0.938	--	20.62	23.83	--
H	1.375	1.625	--	34.93	41.28	--
J	0.359	0.422	--	9.12	10.72	--
K	--	--	3.599	--	--	91.41
L	3.625	3.875	--	92.08	98.43	--
M	4.000	4.500	--	101.60	114.30	--
N	3.250	3.750	--	82.55	95.25	--
P	7.500	8.125	--	190.50	206.38	--
R	7.000	7.500	--	177.80	190.50	--
S	7.937	8.437	--	201.60	214.30	--
T	8.937	9.437	--	226.99	239.70	--
U	0.385	0.395	--	9.78	10.03	--
V	0.194	0.200	--	4.93	5.08	--

NOTE: REF. DIMS ARE FOR INFO
ONLY AND NOT REQ. FOR
INSPECTION PURPOSES.