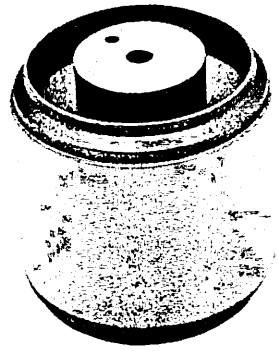
TECHNICAL DATA

Y-812
PLANAR
TRIODE

The **EIMAC** Y-812 tube has been specifically designed for high voltage series regulator or switch tube (modulator) service. The compact, rugged design has very low internal inductance and capacitance to improve rise and fall times for very short pulse applications. The tube can be mounted in optional operating positions and is capable of sustaining vibration and shock.



GENERAL CHARACTERISTICS[1]

ELECTRICAL

Cathode: Oxide Coated, Unipotential	
Heater: Voltage	6.3 ± 5% Volts
Current, at 6.3 volts	2.25 Amperes
Cathode Heating Time	300 Sec
Amplification Factor (Average)	800
(Cut-Off)[3]	600

Direct Interelectrode Capacitance[2] (Grounded Cathode):	
Cin	8.0 pF
Cout	0.003 pF
Cgp	2.5 pF

[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. **Varian EIMAC** should be consulted before using this information for final equipment design.

[2]Capacitance values are for a cold tube. When the cathode is heated to the proper temperature, the grid-cathode capacitance will increase from the cold value by approximately 1 pF due to thermal expansion of the cathode.

[3]Measured with one milliampere plate current and a plate voltage of 1 kVdc.

(Effective 11/16/89)

RANGE VALUES FOR EQUIPMENT DESIGN

	Min.	Max.
Heater: Current at 6.3 Volts	2.05	2.50
Cathode Warm-up Time	300	Sec
Interelectrode Capacitance[2] (Grounded Cathode Connection):		
Cin	-	9.0 pF
Cout	-	.005 pF
Cgp	-	3.0 pF

ENVIORNMENTAL: Shock, 11 ms, non-operating . . . . . 60 G
Vibration, operating, all axes 55 to 500 Hz . 10 G

PULSE MODULATOR & PULSE AMPLIFIER SERVICE

Absolute Maximum Ratings (Refer to notes on next page)

DC Plate Voltage	40 Kilovolts[3]
Peak Plate Voltage	45 Kilovolts
Grid Voltage	-150 Volts

INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE:

Grid Negative to Cathode	-500 Volts
Grid Positive to Cathode	100 Volts
Pulse Cathode Current	10 Amperes
DC Plate Current	150 Milliamperes
DC Grid Current	45 Milliamperes

AVERAGE PLATE DISSIPATION:

Conduction and Convection Cooling	1000 Watts[4]
Grid Dissipation	1.5 Watts
Pulse Duration[5]	6.0 us
Cut-Off MU	600
Duty[5]	0.0033

MECHANICAL

Maximum Overall Dimensions:

Length	2.700 in; 68.58 mm
Diameter	3.010 in; 76.45 mm
Net Weight	18.34 oz; 520 gm
Operating Position	Any

Maximum Operating Temperature:

Ceramic/Metal Seals	90°C[1]
Anode Core	90°C
Cooling	Conduction, in oil with appropriate heat sink.

[1]The maximum operating temperature shown is for standard transformer oil and avoids boiling of the oil. If other insulating media with higher boiling temperatures are used, higher temperatures are possible to a maximum of 250°C.

[2]Capacitance values are for a cold tube.

[3]In oil and in connection with the corona shield, EIMAC Part No. PRB20761, which is required for high voltage operation.

[4]When using the tube without special heat sink or cooling arrangement the anode dissipation in oil is 250 watts maximum.

[5]For applications using longer pulse duration and/or higher duty cycle consult the nearest Varian Electron Tube & Devices Field Office, or the Product Manager, EIMAC Division of Varian, Salt Lake City, Utah, (801) 972-5000.

APPLICATION

MECHANICAL

MOUNTING - The Y-812 may be mounted in any position. A flexible connecting strap should be provided between the plate connector and the external plate circuit. The tube must be protected from severe vibration and shock.

COOLING - This tube was designed to permit high envelope temperatures up to 250°C. However, lower temperatures are required when operating in most liquids. If the tube is operated in a liquid, all envelope surfaces must remain below the liquid's maximum operating temperature. As is the case with all components, long term reliability is enhanced when the tube is kept as cool as possible. In all new applications, the envelope temperature close to the ceramic/glass to metal seals should be monitored.

Temperature sensing paint or stickers are recommended. Monitoring heater and cathode flanges is important, especially when no auxiliary cooling such as forced liquid cooling is used. Anode temperature measurements are also important, particularly when the tube is operated close to the maximum plate dissipation limit. Care in locating and attaching the sensors is important to get proper results.

Cooling can be achieved by conduction, forced air, natural liquid convection, forced liquid or a combination of these methods. When forced air cooling is used, air flow should be provided to the heater and cathode flanges as well as to the anode. With natural convection in liquid, sufficient space around the tube should be allowed to ensure adequate room for circulation.

ELECTRICAL

X-RAY RADIATION HAZARD - High vacuum tubes operating at voltages higher than 15 kV produce progressively more dangerous x-ray radiation as the voltage is increased. This tube, operating at its rated voltages and currents, is a potential x-ray hazard. Only limited shielding is afforded by the tube envelope.

Moreover, the x-ray radiation level may increase significantly with aging and gradual deterioration, due to leakage paths or emission characteristics as they are effected by the high voltage. X-ray shielding must be provided on all sides of a tube operating at these voltages to provide adequate protection throughout the tube's life. The amount of shielding required will vary with tube usage and therefore is beyond Varian's control.

Periodic checks on the x-ray level should be made and the tube should never be operated without adequate shielding in place. Lead glass attenuates x-rays and is available for viewing windows. If there is any doubt as to the adequacy of shielding, an expert in this field should be contacted to perform an x-ray survey of the equipment.

Useful information on this subject can be found in Reports 33 and 39 of the National Council on Radiation Protection, 7910 Woodmont Ave., Suite 1016, Bethesda, MD 20814; telephone (301) 657-2652.

Operation of high voltage equipment with interlock switches rendered inoperative and cabinet doors open in order to better locate an equipment malfunction can result in serious x-ray exposure.

The amount of x-ray radiation is dependent upon the particular tube operating conditions. When the Y-812 is tested per EIA TEPAC Publication #181, the maximum radiation measured 12 inches from the tube surface is 133.2 R/Min.

ABSOLUTE MAXIMUM RATINGS - Values shown for each type of service are based on the "absolute system" and are not to be exceeded under any service conditions. These ratings are limiting values outside which the serviceability of the tube may be impaired. In order not to exceed absolute ratings, the equipment designer has the

responsibility of determining an average design value for each rating below the absolute value of that rating by a safety factor so that the absolute values will never be exceeded under any conditions of supply voltage variation in the equipment itself. It does not necessarily follow that combinations of absolute maximum ratings can be attained simultaneously.

HEATER VOLTAGE - One of the most important factors affecting tube life and ultimate performance is the heater voltage. The heater voltage value indicated under GENERAL CHARACTERISTICS/ELECTRICAL is the nominal value used when evaluating the tube during the manufacturing process.

Optimum heater voltage for a specific use may, or may not be, the same value. Due to the many possible applications, no general definition of optimum heater voltage can be given. Many applications require low heater voltage to assure the longest possible tube life.

When the heater of a planar triode is energized by a dc source, its useful life is always shorter than with equivalent ac operation. Heater life under dc conditions is extended by connecting the common heater/cathode terminal to the positive side of the heater supply.

The tube's initial cold heater resistance is such that damaging filament current in excess of 25 amps can occur without current limiting. When operated after the 300 second warm-up period, the heater current is within the noted range values. To eliminate possible damage to the tube, a maximum of 20 amps peak for 500 milliseconds is recommended. A commercial soft-start thermistor, or equivalent current limiting device, is recommended.

INTERLOCKS - An interlock device should be provided to ensure that cooling water and air flow is established before application of electrical power, including the heater. The circuit should be so arranged that rf drive cannot be applied in the absence of normal plate voltage.

INTERELECTRODE CAPACITANCE - The actual internal interelectrode capacitance of a tube is influenced by many variables in most applications such as stray capacitance to the chassis, capacitance added by the socket used, stray capacitance between the tube terminals, and wiring effects. To control the actual capacitance values within the tube as the key component involved, the industry and military services use a standard test procedure as described in Electronic Industries Association Standard RS-191. This requires the use of specially constructed test fixtures which effectively shield all external tube leads from each other and eliminate any capacitance reading to "ground". The test is performed on a cold tube. Other

factors being equal, controlling internal tube capacitance in this way normally assures good interchangeability of tubes over a period of time, even if the tube is made by different manufacturers. The capacitance values shown in the manufacturer's technical data, or test specifications, normally are taken in accordance with Standard RS-191.

The equipment designer is, therefore, cautioned to make allowance to the actual capacitance values which will exist in any normal application. Measurements should be taken with the socket and mounting which represent approximate final layout if capacitance values are highly significant in the design.

FAULT PROTECTION - It is good practice to protect the tube from internal damage caused by an internal arc which may occur at high anode voltage.

RF RADIATION - Exposure to strong rf fields should be avoided, even at relatively low frequencies. The dangers of rf radiation are more severe at UHF and microwave frequencies and can cause serious bodily and eye injuries. **CARDIAC PACEMAKERS MAY BE AFFECTED.**

HOT SURFACES - When the tube is used in air and air cooled, external surfaces of the tube may reach temperatures up to 200 degrees C and higher. In addition to the anode, the cathode insulator and cathode/heater surfaces may remain hot for an extended time after the tube is shut off. To prevent serious burns, take care to avoid any bodily contact with these surfaces both during, and for a reasonable cool down period after, tube operation.

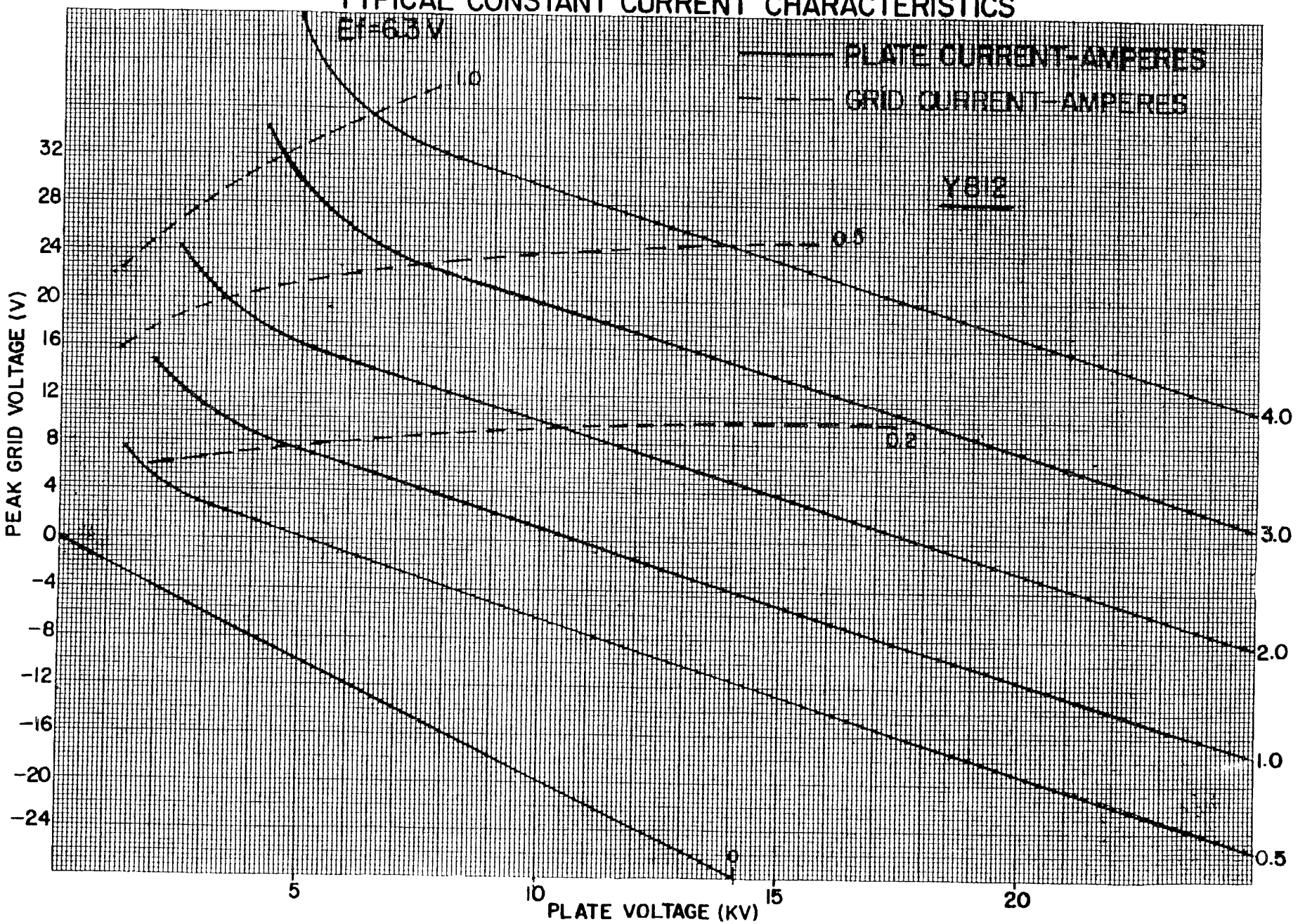
CAUTION-HIGH VOLTAGE - Operating voltage for the Y-812 can be deadly, so the equipment must be designed properly and operating precautions must be followed. Design equipment so that no one can come in contact with high voltages. All equipment must include safety enclosures for high voltage circuits and terminals, with interlock switches to open the primary circuits of the power supply and to discharge high voltage capacitors whenever 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.**

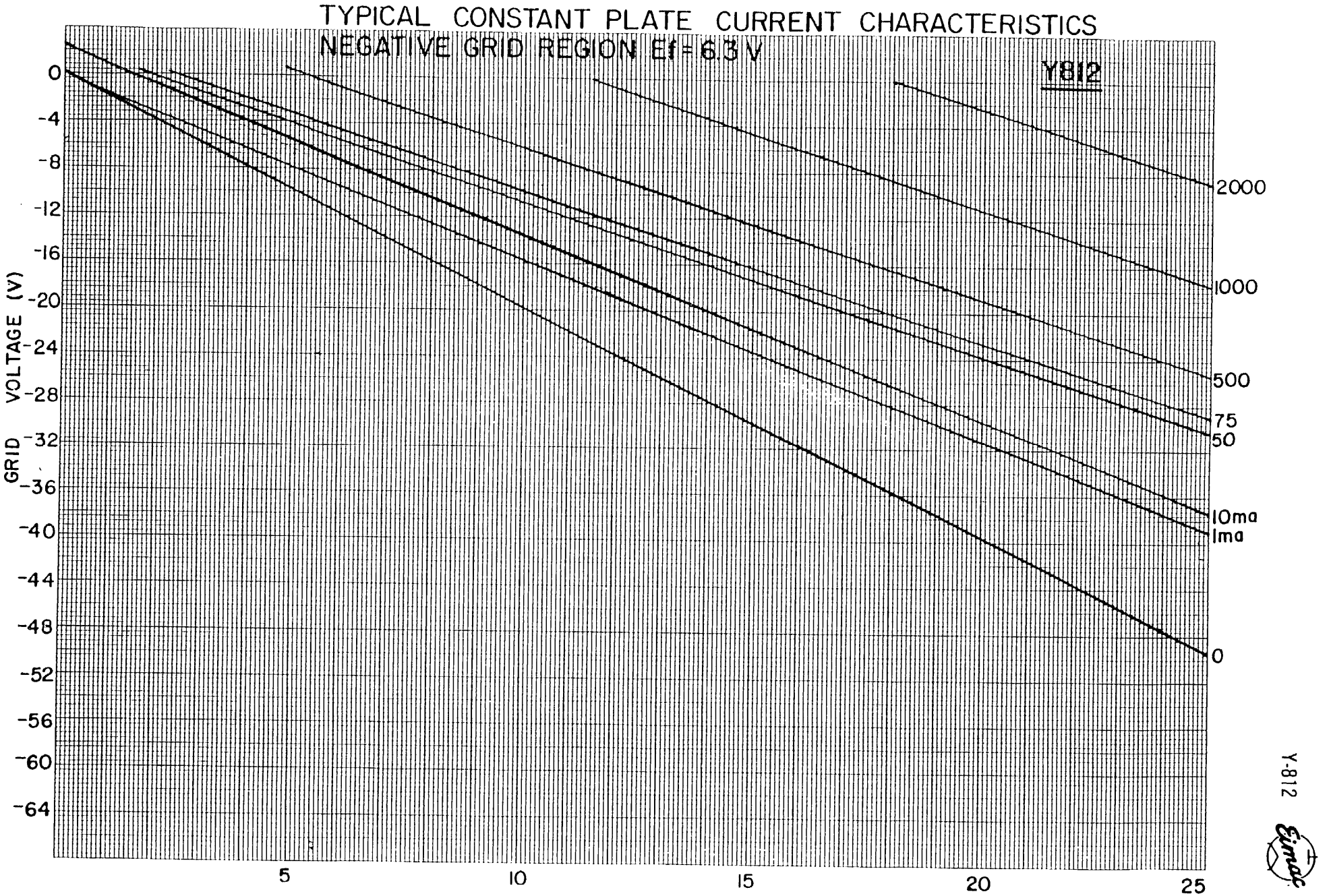
SPECIAL APPLICATIONS - If it is desired to operate this tube under conditions different from those given here, write to the Power Grid Tube Marketing Department, Varian EIMAC, 1678 South Pioneer Road, Salt Lake City, UT 84104, for information and recommendations.

MA2632

Eimac Y-812

TYPICAL CONSTANT CURRENT CHARACTERISTICS




TYPICAL CONSTANT PLATE CURRENT CHARACTERISTICS
NEGATIVE GRID REGION Ef=6.3V
Y812
GRID VOLTAGE (V)
0
-4
-8
-12
-16
-20
-24
-28
-32
-36
-40
-44
-48
-52
-56
-60
-64
5
10
15
20
25
2000
1000
500
75
50
10ma
1ma
0

Y-812

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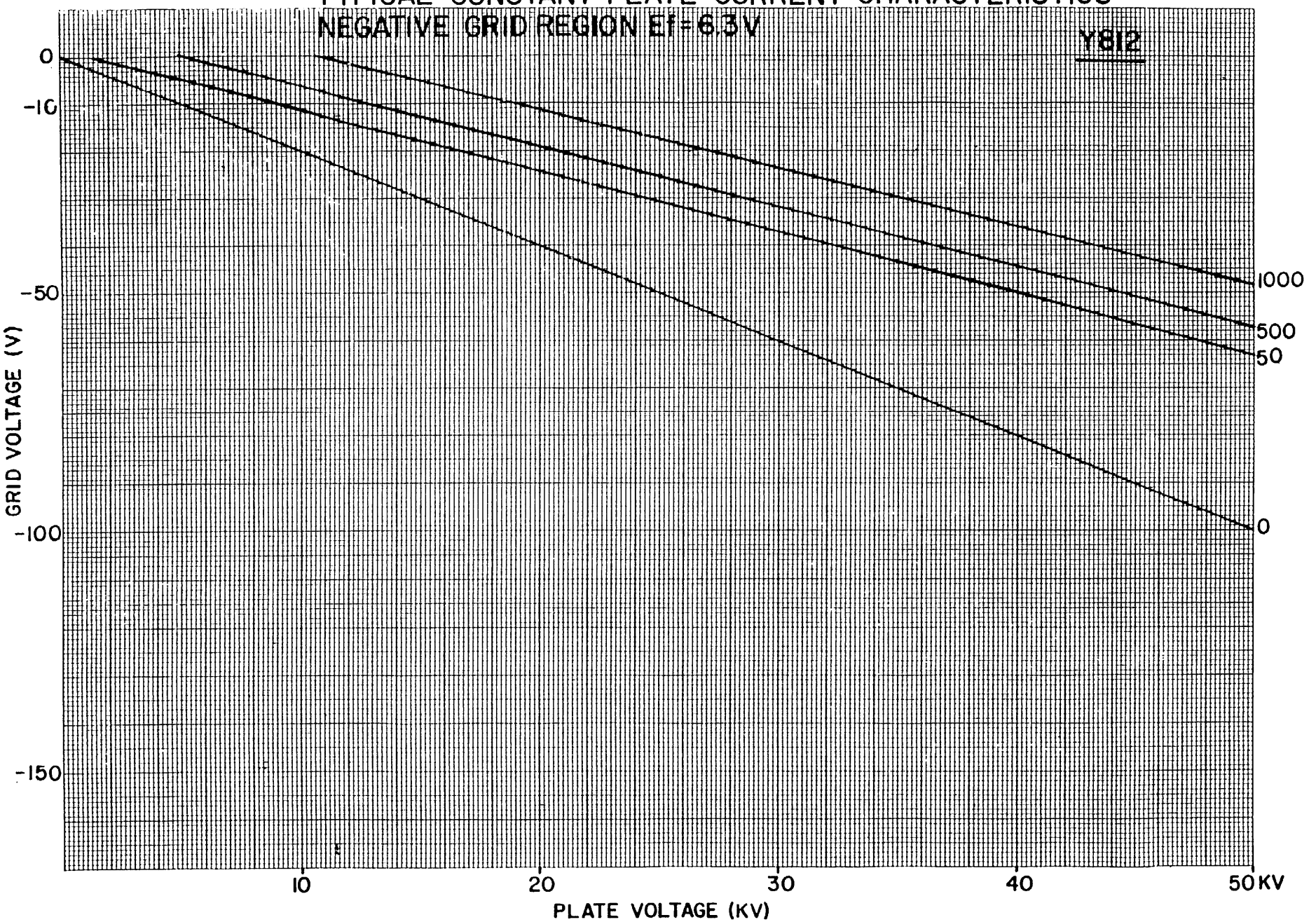
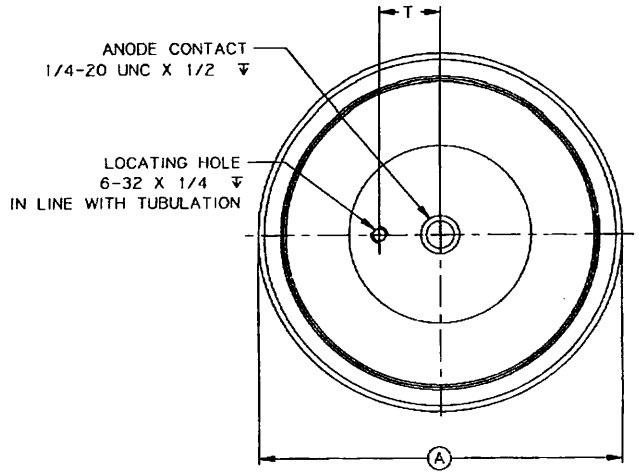
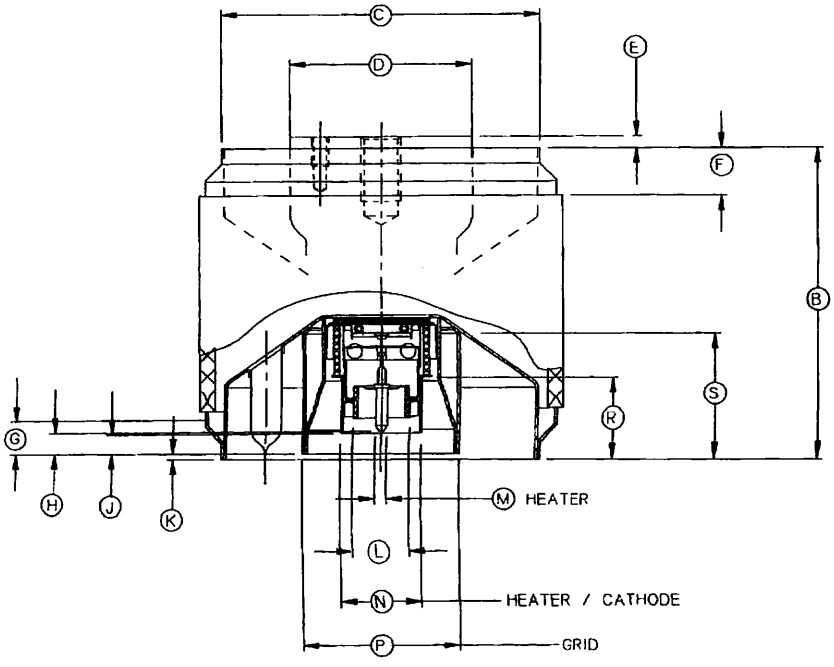
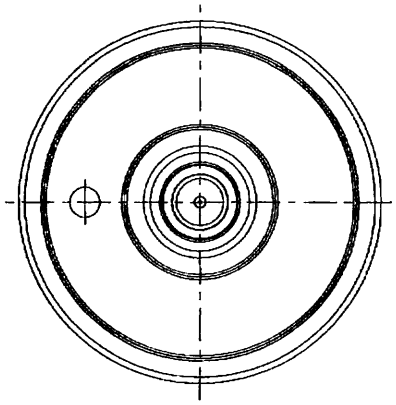
Eimac Y-812

TYPICAL CONSTANT PLATE CURRENT CHARACTERISTICS









DIMENSIONAL DATA						
	INCHES			MILLIMETERS		
DIM.	MIN.	MAX.	REF.	MIN.	MAX.	REF.
QUALITY CONFORMANCE INSPECTION, PART 2						
A	2.990	3.010		75.95	76.45	
B	2.490	2.575		63.25	65.41	
C		2.690				68.33
D	1.485	1.510		37.72	38.35	
E	.075	.125		1.91	3.18	
F			.395			10.03
G			.280			7.11
H			.240			6.10
J			.190			4.83
K			.050			1.27
L			.475			12.06
M	.090	.100		2.29	2.54	
N	.650	.670		16.51	17.02	
P	1.265	1.315		32.13	33.40	
R			.660			16.76
S			1.000			25.40
T			.500			12.70

NOTES:

1. REF. DIMENSIONS ARE FOR INFO ONLY & ARE NOT REQUIRED FOR INSPECTION PURPOSES.
2. 164070, HR-12, IS AN AUXILIARY ITEM TO BE SOLD SEPARATELY.

LTR	DESCRIPTION OF CHANGE	SCO	DATE	BY
B	REDRAWN ON CAD \ DEL NOTE NO. 2 METRIC EQUIV. \ ADD NEW NOTE NO. 2	24638	05/08/98	SM/DB
C	DIFFERENTIATE DIMS. INTO PART 2	24907	06/27/98	SM/JH

DRAWN S. SINGH 05/06/98 ENGR APPR.
CHK'D D. HANKS 05/12/98 SUPERSEDES
FILE PATH: L:\OUTLINE\Y812\

SCALE: NONE

Eimac Div of CPI

PART NO. Y812

OUTLINE

ELECTRON TUBE

NO. Y812 C

Y812