

varian®

power grid & x-ray tube products

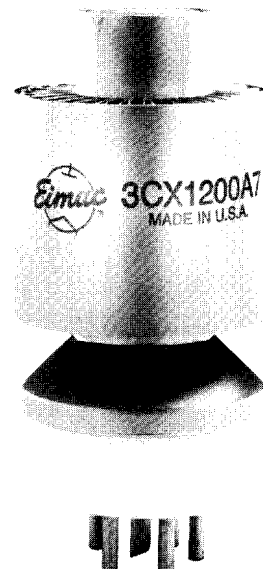
TECHNICAL DATA



3CX1200A7

**HIGH-MU
TRIODE**

The 3CX1200A7 is a high mu, compact, forced air cooled, rugged, ceramic/metal power triode, intended to be used as a zero bias Class AB₂ amplifier. Grounded grid operation is also attractive since a power gain as high as twenty times can be obtained in a grid driven circuit.



GENERAL CHARACTERISTICS¹

ELECTRICAL

Filament: Thoriated Tungsten

Voltage	7.5 ± 0.37 Volts
Current	21.3 Amperes
Frequency for Maximum Ratings	110 MHz
Amplification Factor	200

Direct Interelectrode Capacitance (Grounded Filament)²

Cin	20 pF
Cout	0.6 pF
Cgp	10.3 pF

Direct Interelectrode Capacitance (Grounded Grid)²

Cin	20 pF
Cout	10.3 pF
Cgp	0.6 pF

¹ Characteristics and operating values are based upon performance tests. These figures may change without notice as a result of additional data or product refinement. Varian Power Grid & X-Ray Tube Products should be consulted before using this information for final equipment design.

² Capacitance values are for a cold tube as measured in a special shielded fixture.

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1678 South Pioneer Road / Salt Lake City, Utah 84104 / (801) 972-5000

RADIO FREQUENCY LINEAR AMPLIFIER CATHODE DRIVEN Class AB₂

TYPICAL OPERATION

(Frequencies to 30 MHz) Class AB₂

Cathode Driven, Peak Envelope or Modulation Crest Conditions

Plate Voltage	2500	3000	3500	4000	Vdc
Cathode Voltage ¹	0	0	0	0	Vdc
Zero-Signal Plate Current ³	130	165	205	240	mA dc
Single-Tone Plate Current	800	800	800	800	mA dc
Two-Tone Plate Current	540	560	570	565	mA dc
Single-Tone Grid Current	255	250	275	250	mA dc
Two-Tone Grid Current ³	140	130	140	112	mA dc
Peak rf Cathode Voltage ³	115	105	120	115	vAc
Peak Driving Power	102	105	110	100	Watts
Single-Tone Useful Output Power ³	1250	1600	1870	2055	Watts
Resonant Load Impedance	1750	2080	2430	2780	Ohms
Intermodulation Distortion Produces ²					
3rd Order	-37	-35	-30	-33	dB
5th Order	-42	-47	-43	-48	dB

¹Positive cathode bias may be provided by a zener diode.

²The intermodulation distortion products are referenced against one tone of a two-equal-tone signal.

³Approximate values.

ABSOLUTE MAXIMUM RATINGS:

DC Plate Voltage	5500 Volts
DC Plate Current	0.9 Adc
Grid Dissipation	50 Watts
Plate Dissipation	1200 Watts

RADIO FREQUENCY POWER AMPLIFIER GRID DRIVEN Class C

TYPICAL OPERATION

Carrier Conditions, Frequencies to 30 MHz

Plate Voltage	5000 Vdc
Cathode Voltage	+65 Vdc
Plate Current	800 mA dc
Grid Current	240 mA dc
Plate Load Resistance	3200 Ohms
Driving Power	43 Watts
Plate Output Power	2700 Watts
Power Gain	18 dB

RANGE VALUE FOR EQUIPMENT DESIGN

	<u>Min.</u>	<u>Max.</u>	
Filament: Current at 7.5 Volts	20.0	22.7	Aac
Interelectrode Capacitance ¹ (Grounded Grid Connection)			
Input	18.5	22.5	pF
Output	8.8	11.8	pF
Feedback	—	0.9	pF
Interlectrode Capacitance ¹ (Grounded Cathode Connection)			
Input	18.5	22.5	pF
Output	—	0.9	pF
Feedback	8.8	11.8	pF

MECHANICAL

Maximum Overall Dimensions:

Length	6.0 in; 147 mm
Diameter	2.91 in; 73.1 mm
Net Weight	2.5 lb. 1.1 kg
Operating Position	Vertical, base up or down

Maximum Operating Temperature:

Plate Seals	250°C
Base Seals	250°C
Cooling	Forced Air
Recommended Socket	EIMAC SK-410
Recommended Chimney	EIMAC SK-436

APPLICATION**MECHANICAL**

MOUNTING - The 3CX1200A7 must be operated vertically, base up or down. 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.

SOCKET - The SK-410 air system socket and the SK-436 chimney are recommended for use with the 3CX1200A7. When a socket other than the SK-410 is used, provisions must be made for equivalent cooling of the base, the envelope, and the plate lead.

If a socket other than the SK-410 is employed, the user should ensure that strong lateral pressure is not applied to the tube base pins. Otherwise, even though the base of the tube is reinforced, damage to the base seals may result.

COOLING - Forced air cooling is required to maintain the base seals at a temperature below 250°C, and the plate

seal at a temperature below 250°C. Air flow requirements to maintain the above maximum temperatures are shown on cooling data curve.

ELECTRICAL

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 usual conditions of supply voltage variation in the equipment itself. It does not necessarily follow that combinations of absolute maximum ratings can

3CX1200A7

be attained simultaneously.

ZERO-BIAS OPERATION - Operation at zero bias is not recommended with plate voltages over 4000 since plate dissipation may be exceeded. A zener diode placing positive bias on the cathode or other constant voltage source may be used to reduce zero signal plate current at plate potentials over 4000 Volts.

CLASS-C OPERATION - Although specifically designed for linear amplifier service, the 3CX1200A7 may be operated as a class-C power amplifier or oscillator or as a plate modulated radio frequency power amplifier. The zero bias characteristic of the 3CX1200A7 can be used to advantage in class-C amplifiers operating at plate voltages of 4000 Volts or below by employing only grid resistor bias. If driving power fails, plate dissipation is then kept to a low value because the tube will be operating at the normal static zero bias conditions.

FILAMENT OPERATION - The rated filament voltage for the 3CX1200A7 is 7.5 Volts. Filament voltage, as measured at the socket, must be maintained within the range of 7.87 to 7.13 Volts to obtain maximum tube life.

For best tube life, the inrush current to the filament should be limited to two times normal current during turn on. This will minimize thermal stress on the thoriated tungsten filament wire, which can cause internal tube geometry changes with repeated cycling.

INTERMODULATION DISTORTION - Typical operating conditions with distortion values included are the result of data taken during actual operation at 2 megahertz. Intermodulation values listed are those measured at the full peak envelope power noted.

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 for 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.

INPUT CIRCUIT - When the 3CX1200A7 is operated as a grounded grid rf amplifier, the use of a resonant tank in the cathode circuit is recommended in order to obtain the greatest linearity and power output. For best results with a single ended amplifier, it is suggested that the cathode tank circuit operate at a Q of two or more.

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.**

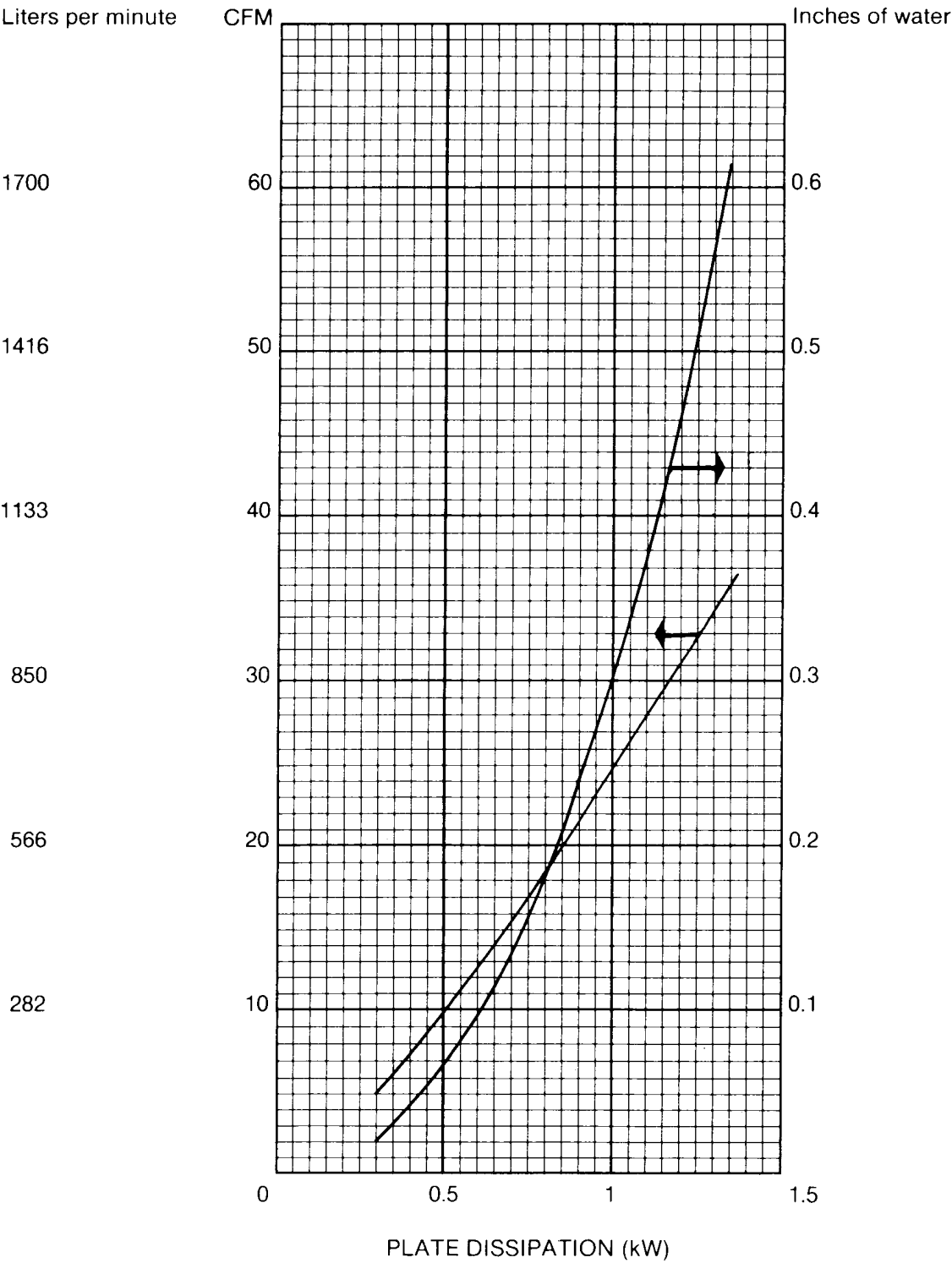
HOT SURFACES - When the tube is used in air and air cooled, external surfaces of the tube may reach temperatures up to 200 degrees C and higher. In addition to the anode, the cathode insulator and cathode/heater surfaces may remain hot for an extended time after the tube is shut off. To prevent serious 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 3CX1200A7 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 Varian Power Grid & X-Ray Tube Products Marketing, 1678 South Pioneer Road, Salt Lake City, UT 84104, for information and recommendations.

COOLING DATA

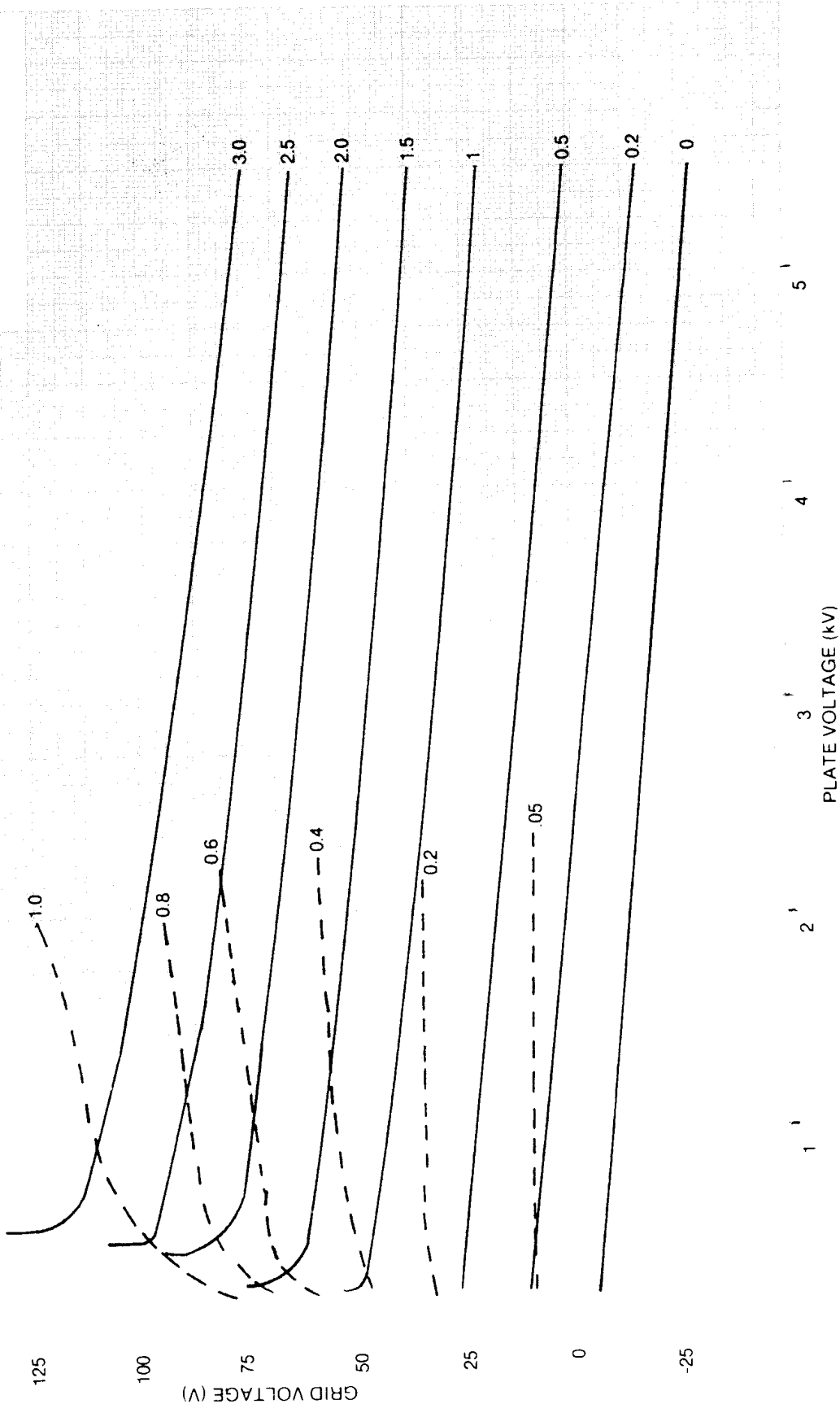
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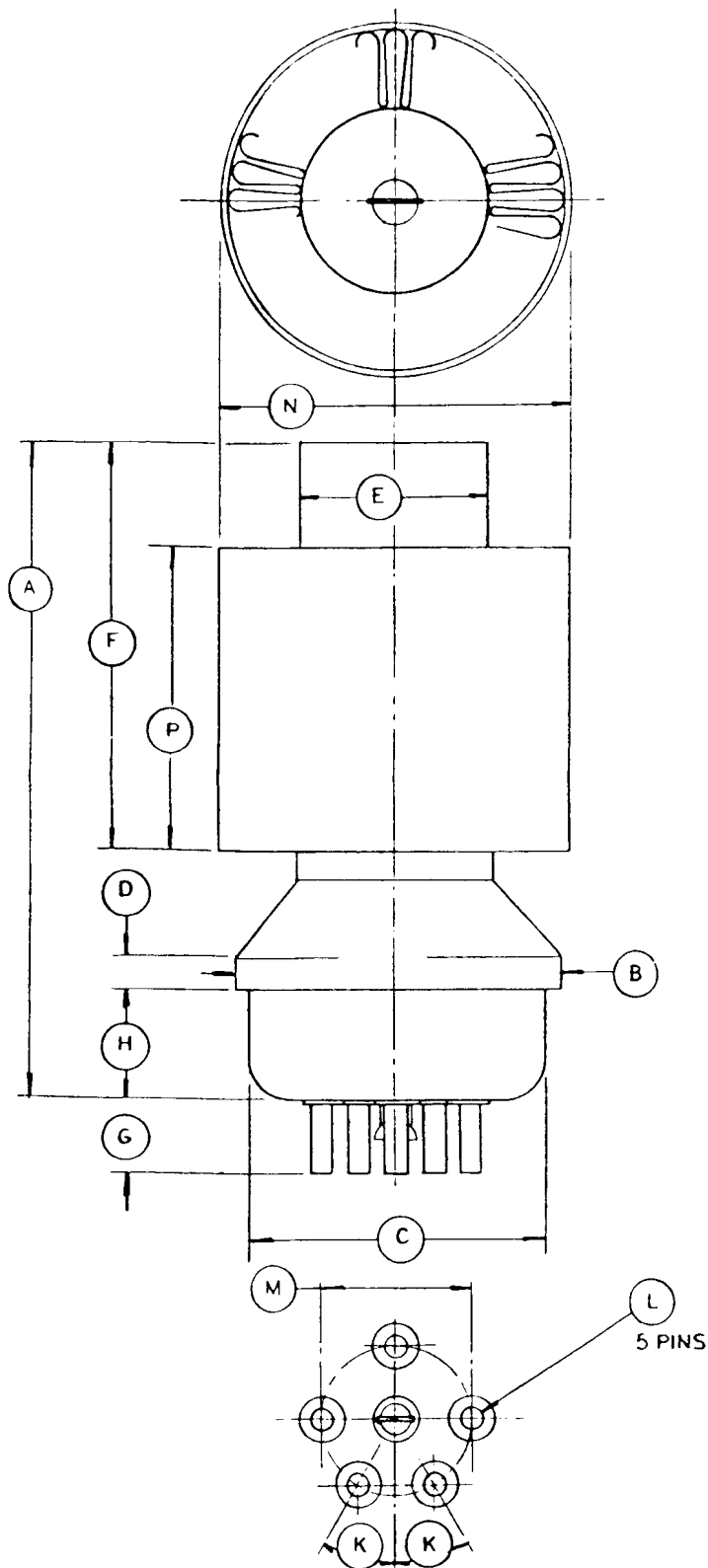


CFM and pressure required to keep anode temperature at 225°C.
Standard conditions 25°C at 29.92 In. Hg
1 PAS = .00407 X In. of water
1 cubic meter/min. = 2.832 X 10⁻² X CFM

3CX1200A7
CONSTANT CURRENT
CHARACTERISTICS

GROUND CATHODE
— PLATE CURRENT — AMPERES
--- GRID CURRENT — AMPERES



[illegible]

NOTES:

1. REF DIMENSIONS ARE FOR INFO
ONLY & ARE NOT REQUIRED FOR
INSPECTION PURPOSES.