file - HISTORY

PRELIMINARY

TECHNICAL DATA

3CX600U7

HIGH-MU UHF TRANSMITTING TRIODE

The EIMAC 3CX600U7 is designed for use above 200 MHz as a CW, pulse, or linear rf amplifier. This high-mu triode is designed with beam-forming cathode and control grid geometry. It is of all metal/ceramic construction, with an external anode rated for 600 watts of dissipation with forced-air cooling.

The combination of an amplification factor over 200 and minimum current interception by the control grid provides good power gain in cathode-driven (grounded grid) amplifiers. Coaxial terminals and continuous cone-shaped conductors for the grid and cathode allow the lowest possible inductance between these tube elements and the cavity.

400 watts of useful CW rf power may be obtained with better than 40% efficiency, and better than 14 dB of gain, at 775 MHz. The amplifier circuit may be essentially a quarter wave radial or rectangular resonator for the anode, and a three-quarter wave coaxial line section between ground and cathode.

GENERAL CHARACTERISTICS [1]

ELECTRICAL

Cathode: Oxide-Coated, Unipotential		
Heater Voltage, Nominal (see derating table for UHF use)	6.0 ± 0.3	V
Heater Current, at 6.0 volts	5.4	A
Amplification Factor, average	225	
Direct Interelectrode Capacitances (grid grounded) [2]		
Cin	26.6	pF
Cout	9.2	pF
Cpk	0.11	pF
Frequency of Maximum Rating:		
CW	1000	MHz

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. EIMAC Division of Varian 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 in accordance with Electronic Industries Association Standard RS-191.

MECHANICAL

Maximum Operating Temperature, Ceramic/Metal Seals & Anode Core	250	°C
Cooling	Forced Air	
Base	Special Coaxial	
Maximum Overall Dimensions: Length	2.33	In.
Diameter	2.08	In.
Net Weight (Approximate)	7.7	Oz.
Tube Operating Position	Any	

(Effective 1 March 1977)

RADIO FREQUENCY POWER AMPLFIER

Class C Telegraphy or FM

(Key-down Conditions)

MAXIMUM RATINGS:

DC PLATE VOLTAGE	2000 VOLTS
DC GRID VOLTAGE	-100 VOLTS
DC PLATE CURRENT	0.6 AMPERE
PLATE DISSIPATION	600 WATTS
GRID DISSIPATION	6 WATTS

TYPICAL OPERATION

(Measured values, cathode-driven Amp.775 MHz)

Plate Voltage	1500	1750	Vdc
Grid Voltage	-10.0	-13.5	Vdc
Plate Current	600	600	mAdc
Grid Current	34	62	mAdc
Measured Driving Power	12	15	W
Power Input	900	1050	W
Useful Power Output . .	383	445	W
Efficiency	42.6	42.4	%
Power Gain	15.0	14.7	dB

A P P L I C A T I O N

HEATER-CATHODE OPERATION - The heater voltage should be operated at the nominal value of 6.0 volts for a minimum of 5 minutes before application of plate voltage or rf driving voltage. Though the nominal heater voltage for the 3CX600U7 is 6.0 volts, for CW operation at frequencies above 300 MHz the heater voltage should be reduced, as the cathode receives additional heating from rf charging currents and transit-time effects. The table gives approximate values of heater voltage recommended versus operating frequency for CW power levels at, or near, the typical operating conditions shown above. It is recommended that a mechanical relay, or other type of switching device, be provided so that near-nominal heater voltage will be provided during warmup and standby periods, and then dropped to the recommended level (or the level empirically found to be correct) when rf drive is applied to the amplifier.

Frequency (MHz)	Heater Volts
300 or lower	6.0
300 to 400	5.7
400 to 500	5.4
500 to 600	5.1
600 to 700	4.8
700 to 800	4.5
800 to 900	4.0
900 to 1000	3.6

INTERLOCKS - An interlock device should be provided to insure that cooling 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.

FAULT PROTECTION - In addition to the normal interlock circuits, and the usual plate overcurrent circuit breaker, it is good practice to protect the tube from internal damage which could result from a plate arc. In all cases a protective resistor, such as a 25 ohm GLOBAR, should be used in series with the tube anode to absorb power supply stored energy in case a tube arc should occur.

COOLING - Forced-air cooling of the tube is required, with 87 cfm of air directed through the anode cooler when operating at full rated 600 W dissipation. The pressure drop across the anode cooler only at this flow rate is approximately 0.4 inch of water. These figures are based on an incoming air temperature of 50°C and a maximum tube anode temperature of 225°C, at sea level, and with air flowing in a base-to-anode direction. When air is flowing in this direction, and the base contacting arrangement does not restrict flow in and around the base seals, additional base cooling may not be required, but the designer is cautioned to verify whether base cooling is adequate before a circuit design is finalized, by means of temperature-sensitive paints which are available for this purpose, or other equivalent means.

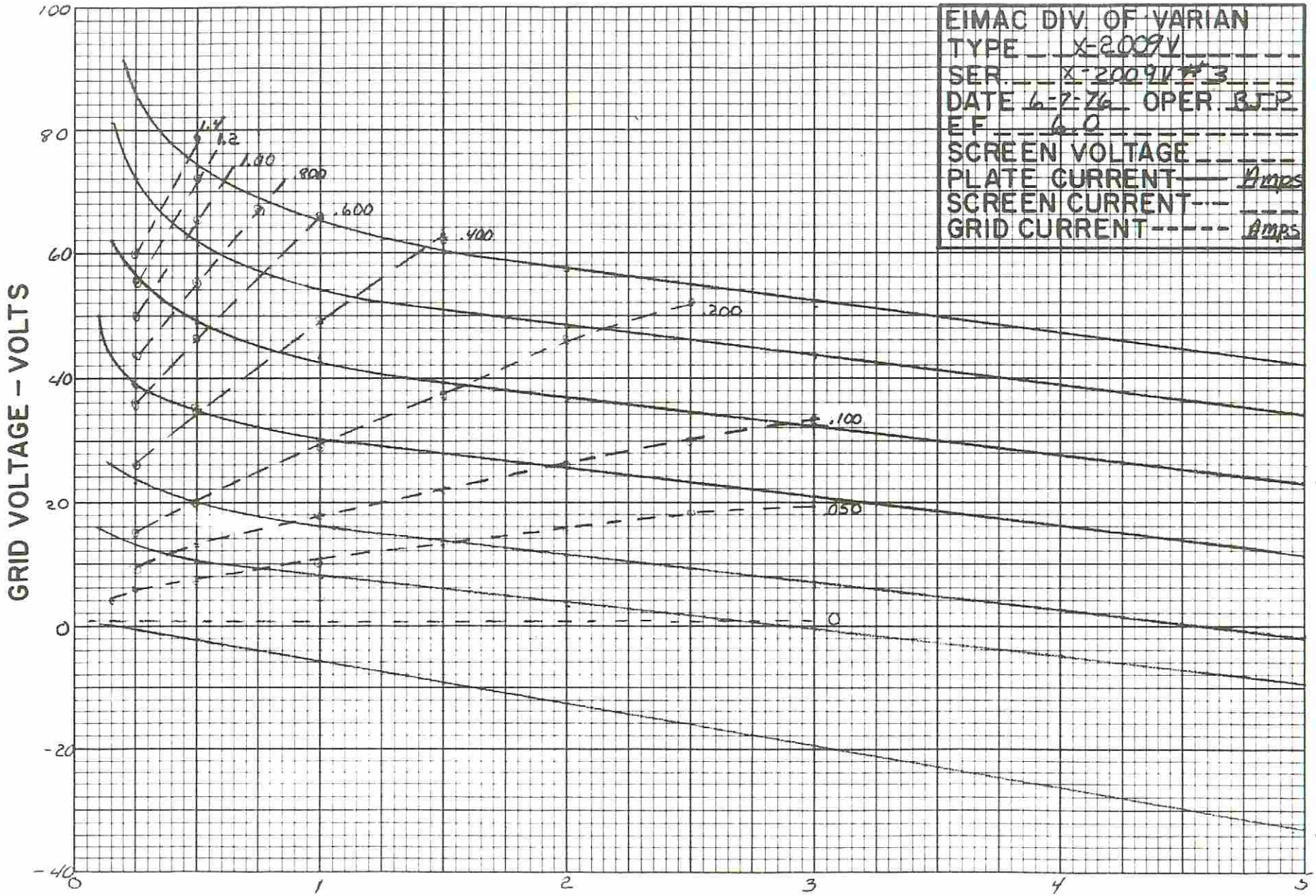
Depending on the circuit or cavity design, allowance must also be made for other losses in the air system, in order to always assure sufficient flow for tube cooling. The designer is also cautioned that it is not good practice to operate at, or very close to, the absolute maximum temperature ratings for the metal/ceramic seals. Where long life and consistent performance are factors, cooling in excess of the minimum requirements is normally beneficial.

HIGH VOLTAGE - Normal operating voltages used with the 3CX600U7 are deadly, and the equipment must be designed properly and operating precautions must be followed. Design all 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 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.

INTERELECTRODE CAPACITANCE - The actual internal interelectrode capacitance of a tube is influenced by many external variables in most applications. 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 a specially constructed test fixture, which effectively shields all external tube surfaces or contacts from each other, and eliminates any capacitance reading to "ground". The test is performed on a cold tube. The capacitance values shown in a manufacturer's technical data, or test specifications, are normally taken in accordance with Standard RS-191.

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

GROUNDED CATHODE
CONSTANT CURRENT CHARACTERISTICS



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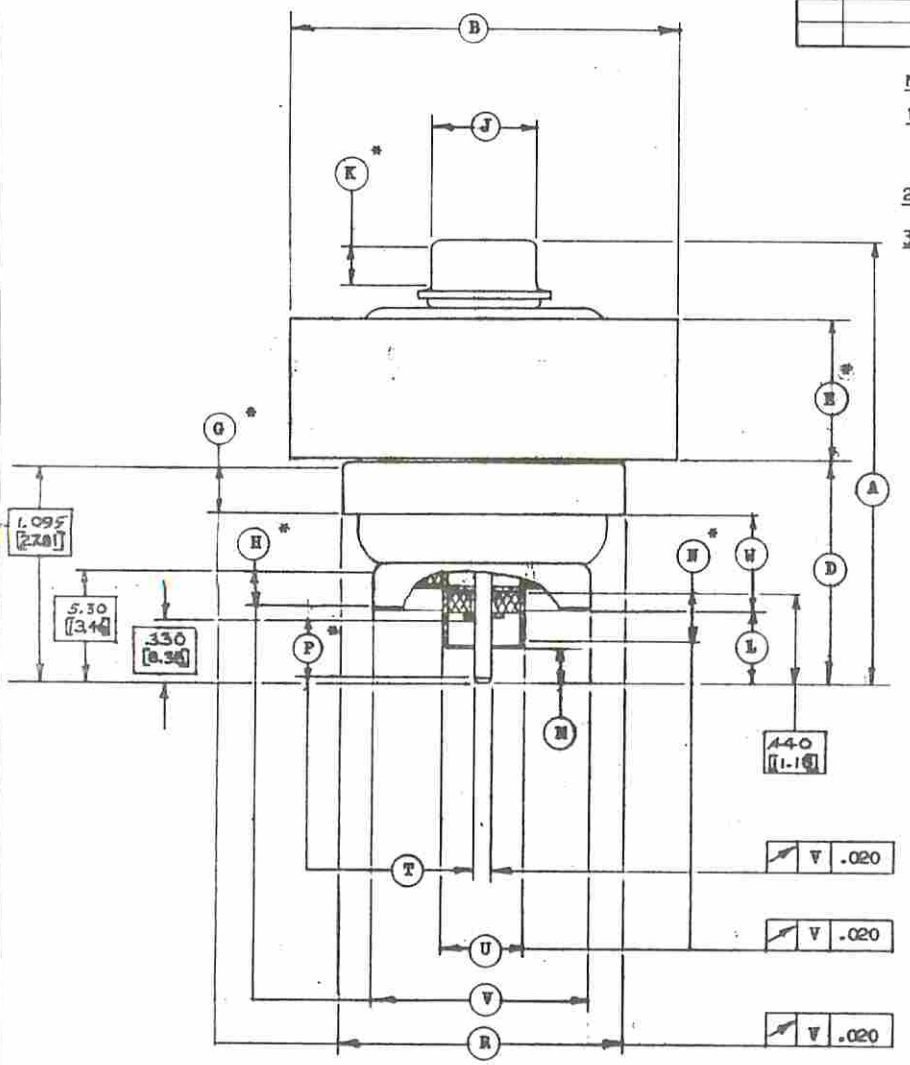
DIMENSIONAL DATA						
	INCHES			MILLIMETERS		
DIM	MIN	MAX	REF	MIN	MAX	REF
A			2.337			59.36
B	2.050	2.080		52.07	52.83	
C						
D			1.180			29.97
E	.710	.790		18.03	20.07	
F						
G	.155			3.94		
H	.120			3.05		
J	.559	.573		14.20	14.55	
K	.240			6.10		
L			.385			9.78
M			.187			4.75
N	.200			5.08		
P	.280			7.11		
R	1.499	1.519		38.07	38.58	
T	.091	.095		2.31	2.41	
U	.436	.446		11.07	11.33	
V	1.145	1.165		29.08	29.59	
W			.518			13.16

NOTES:

1. REF DIMENSIONS ARE FOR INFO ONLY & ARE NOT REQUIRED FOR INSPECTION PURPOSES.
2. (*) CONTACT SURFACE.
3. DIMENSIONS IN [ ] ARE MILLIMETERS.



LTR	DESCRIPTION OF CHANGE	ECO	DATE	BY
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EIMAC, division of varian
San Carlos, California

CODE IDENT No. 06980

PART No. 3CX600U7

OUTLINE

ELECTRON TUBE

DRAWN: L. E. JONES 2-4-77 | ENGR APPR: R. Bruce 2-4-77 | SCALE: NONE

CHK'D: DW 2-4-77 | SUPERSEDES:

No. 3CX600U7-60