



TECHNICAL DATA

8877
3CX1500A7

HIGH-MU
POWER TRIODE

The EIMAC 8877/3CX1500A7 is a rugged ceramic/metal power triode designed for use as a cathode driven Class AB₂ or Class B amplifier, in audio or rf applications including the UHF band, or as a cathode driven plate modulated Class C rf amplifier. As a linear amplifier, high power gain may be obtained without sacrifice of low intermodulation characteristics.

Low grid interception and high amplification factor combine to make the 8877/3CX1500A7 drive power requirements exceptionally low for a tube of this power capacity.



GENERAL CHARACTERISTICS¹

ELECTRICAL

Cathode: Oxide Coated, Unipotential

Heater: Voltage 5.0 ± 0.25 V

Current, at 5.0 volts 10.5 A

Transconductance (Average):

$I_b = 1.0 \text{ A}_{dc}$ 55,000 μmhos

Amplification Factor (Average) 200

Direct Interelectrode Capacitance (grounded cathode)²

C_{in} 38.5 pF

C_{out} 0.1 pF

C_{gp} 10 pF

Direct Interelectrode Capacitance (grounded grid)²

C_{in} 38.5 pF

C_{out} 10 pF

C_{pk} 0.1 pF

C_{k-htr} 9.7 pF

Frequency of Maximum Rating:

CW 250 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.

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MECHANICAL**Maximum Overall Dimensions:**

Length	4.02 in; 102.16 mm
Diameter	3.38 in; 85.85 mm
Net Weight	25.0 oz; 708.8 gm
Operating Position	Any
Maximum Operating Temperature:	
Ceramic/Metal Seals, Anode Core	250°C
Cooling	Forced Air
Base	Special 7-pin
Recommended Air System Socket	
(Grounded Grid)	SK-2210
(Grounded Cathode)	SK-2200
Recommended Air Chimney	
(Teflon)	SK 2216

RANGE VALUES FOR EQUIPMENT DESIGN

	<u>Min.</u>	<u>Max.</u>
Heater: Current at 5.0 volts	9.5	11.5 A
Cathode Warmup Time	90	--- sec
Interelectrode Capacitance (grounded grid circuit)¹		
Cin	36.0	41.0 pF
Cout	9.2	11.2 pF
Cpk	---	0.2 pF

1. Capacitance values are for a cold tube as measured in a special shielded fixture in accordance with Electronic Industries Association Standard RS-191.

RADIO FREQUENCY LINEAR AMPLIFIER
CATHODE DRIVEN Class AB₂
ABSOLUTE MAXIMUM RATINGS:

DC PLATE VOLTAGE	4000 VOLTS
DC PLATE CURRENT	1.0 AMPERE
PLATE DISSIPATION	1500 WATTS
GRID DISSIPATION	25 WATTS

Single-Tone Useful Output Power ³	1085	2075 W
Resonant Load Impedance	1820	2000 Ω
Intermodulation Distortion Products²		
3rd Order	-40	-38 dB
5th Order	-41	-41 dB

1. Positive cathode bias provided by zener diode.
2. The intermodulation distortion products are referenced against one tone of a two equal tone signal.
3. Approximate values.

TYPICAL OPERATION (Frequencies to 30 MHz)
Class AB₂ Cathode Driven, Peak Envelope or
Modulation Crest Conditions

Plate Voltage	2700	3500 Vdc
Cathode Voltage ¹	+8.2	+8.2 Vdc
Zero-Signal Plate Current ³	92	182 mAdc
Single-Tone Plate Current	740	1000 mAdc
Two-Tone Plate Current	480	675 mAdc
Single-Tone Grid Current ³	40	74 mAdc
Two-Tone Grid Current ³	16	25 mAdc
Peak rf Cathode Voltage ³	68	81 v
Peak Driving Power ³	40	64 w

TYPICAL OPERATION (220 MHz)
Class AB₂ Cathode Driven

Plate Voltage	2500 Vdc
Cathode Voltage ¹	+8.2 Vdc
Plate Current	1000 mAdc
Grid Current ²	10 mAdc
Useful Output Power ²	1520 W
Driving Power ²	57 W
Power Gain ²	14 dB

1. Positive cathode bias provided by zener diode.
2. Approximate value.

RADIO FREQUENCY POWER AMPLIFIER

Class B Telegraphy or FM

(Continuous Operating Conditions)

ABSOLUTE MAXIMUM RATINGS:

DC PLATE VOLTAGE	4000 VOLTS
DC PLATE CURRENT	1.0 AMPERE
PLATE DISSIPATION	1500 WATTS
GRID DISSIPATION	25 WATTS

**TYPICAL OPERATION (88-108 MHz) Measured Values
Class B, Cathode Driven**

Plate Voltage	2000	2500	3000	4000	Vdc
Cathode Voltage ^{1,2}	+9	+12	+15	+20	Vdc
Plate Current	1.0	1.0	1.0	1.0	Adc
Grid Current ²	60	58	42	25	mAdc
Driving Power ²	64	54	65	78	W
Useful Power Output ³	1330	1670	1960	2600	W
Efficiency ⁴	66.5	66.7	65.5	65.2	%
Power Gain ⁴	13.2	14.2	14.8	15.3	dB

1. For measured case, idling anode current was set for 10 mAdc.
2. Approximate.
3. Approximate, delivered to the load.
4. For the measured case; may vary from tube to tube.

RADIO FREQUENCY POWER AMPLIFIER

Class C - Cathode Driven, Plate Modulated

ABSOLUTE MAXIMUM RATINGS:

DC PLATE VOLTAGE	3200 VOLTS
DC PLATE CURRENT	0.8 AMPERE
PLATE DISSIPATION	1000 WATTS
GRID DISSIPATION	25 WATTS

**TYPICAL OPERATION Carrier Conditions, Frequencies
to 30 MHz, Cathode Driven**

Plate Voltage	2400	Vdc
Cathode Voltage ¹	+22	Vdc
Plate Current ²	600	mAdc
Grid Current ²	45	mAdc
Plate Load Resistance	2000	Ω
Driving Power ³	41	W
Plate Output Power	1000	W
Power Gain	14	dB

1. Bias may be obtained from a fixed supply of 15.8 volts in series with a 9.5 ohm resistor. The resistor & supply should be bypassed for audio frequencies.
2. Approximate.
3. Approximate, and driver must be modulated approximately 83%.

APPLICATION**MECHANICAL**

MOUNTING - The 8877/3CX1500A7 may be mounted in any position.

SOCKET - The grid of the 8877/3CX1500A7 terminates in the cylindrical grid ring about the base of the tube. This may be contacted by multiple clips or flexible finger stock. Connections to the heater and cathode are made via the 7-pin base.

COOLING - The maximum temperature limit for external tube surfaces and the anode core is 250°C. Tube life is prolonged if these areas are maintained at lower temperatures. For full 1500 watt anode dissipation 38.0 cfm of air is required at a back pressure of 0.60 inches to hold tube temperature below 225°C with 50°C ambient temperature at sea level. At frequencies higher than 30 MHz, or at high altitudes, the air quantity must be increased.

Base-to-Anode Air Flow (sea level)		
Anode Dissipation (watts)	Air Flow (CFM)	Pressure Drop In./H 0
500	7.5	0.10
1000	22.5	0.20
1500	35.0	0.41
Base-to-Anode Air Flow (10,000 ft.)		
Anode Dissipation (watts)	Air Flow (CFM)	Pressure Drop In./H 0
500	11.0	0.15
1000	32.5	0.29
1500	51.0	0.60

Note: 1) Tube mounted in SK-2200 Socket with SK-2216 Chimney.

- 2) An allowance of 25 watts has been made for grid dissipation and 50 watts for filament power.

ELECTRICAL

FILAMENT OPERATION - Rated filament voltage for the 8877/3CX1500A7 is 5.0 volts. Filament voltage, as measured at the socket optimum performance and maximum tube life. In no case should it be allowed to deviate from 5.0 volts by more than plus or minus five per cent.

INPUT CIRCUIT - When the 8877/3CX1500A7 is operated as a cathode driven rf amplifier, the use of a resonant circuit in the cathode is recommended. For best results with a single-ended amplifier it is suggested that the cathode tank circuit operate at a Q of two or more.

ZERO-BIAS OPERATION - Operation at zero-bias is not recommended with plate potentials over 3000 volts, since plate dissipation may be exceeded. Higher plate voltage may be used with the proper protective bias.

HIGH VOLTAGE - The 3CX1500A7 operates 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 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.

RADIO FREQUENCY RADIATION - Avoid exposure to strong rf fields even at relatively low frequency. Absorption of rf energy by human tissue is dependent on frequency. Under 30 MHz, most of the energy will pass completely through the human body with little attenuation or heating effect. Public health agencies are concerned with the hazard, however, even at these frequencies,

and it is worth noting that some commercial dielectric heating units actually operate at frequencies as low as the 13 and 27 MHz bands.

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 tube terminals, and wiring effects. To control the actual capacitance values within the tube, as the key component involved, the industry and the 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 eliminates 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, manufacturer's technical data, or test specifications, normally are taken in accordance with Standard RS-191.

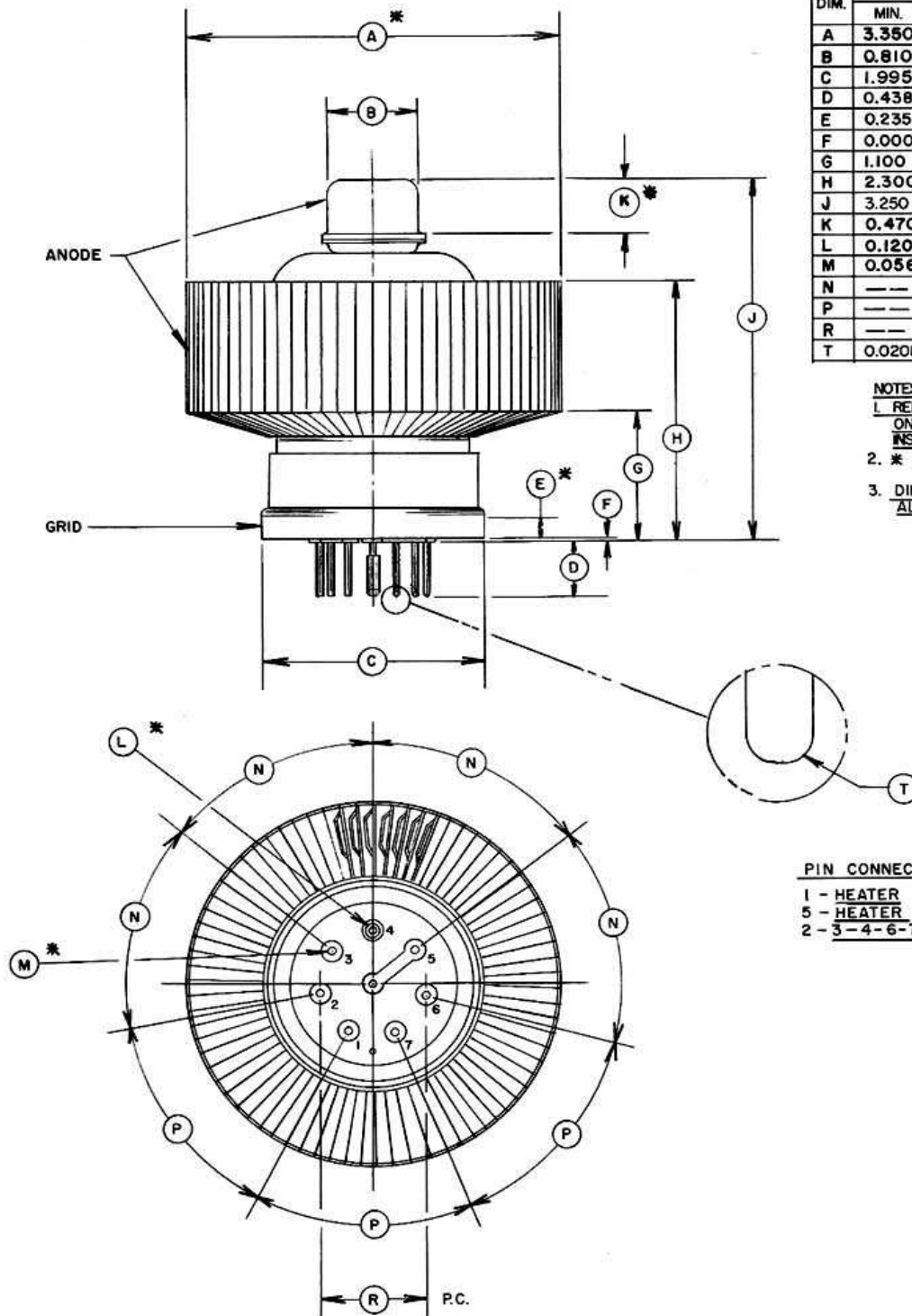
The equipment designer is therefore cautioned to make allowance for the actual capacitance values which will exist in any normal application. Measurements should be taken with the socket and mounting which represent approximate final layout if capacitance values are highly significant in the design.

SPECIAL APPLICATIONS - 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 94070 for information and recommendations.

DIM.	INCHES			MILLIMETERS		
	MIN.	MAX.	REF.	MIN.	MAX.	REF.
A	3.350	3.380	---	85.09	85.85	---
B	0.810	0.820	---	20.57	20.83	---
C	1.995	2.015	---	50.67	51.18	---
D	0.438	0.562	---	11.13	14.27	---
E	0.235	---	---	5.97	---	---
F	0.000	0.040	---	0.00	1.02	---
G	1.100	1.225	---	27.94	31.12	---
H	2.300	2.425	---	58.42	61.60	---
J	3.250	3.420	---	82.55	86.87	---
K	0.470	0.530	---	11.94	13.46	---
L	0.120	0.127	---	3.05	3.23	---
M	0.056	0.062	---	1.42	1.57	---
N	---	---	51°	---	---	51°
P	---	---	52°	---	---	52°
R	---	---	1.000	---	---	25.40
T	0.020R	---	---	0.51R	---	---

NOTES:

1. REF. DIMENSIONS ARE FOR INFO. ONLY & ARE NOT REQUIRED FOR INSPECTION PURPOSES.
2. * CONTACT SURFACE
3. DIMENSION T APPLIES TO ALL BUT CENTER PIN.



PIN CONNECTIONS

- 1 - HEATER
 5 - HEATER
 2 - 3 - 4 - 6 - 7 CATHODE

