



## TECHNICAL DATA

# 3CW20,000A7

**WATER-COOLED  
HIGH-MU  
POWER TRIODE**

The Eimac 3CW20,000A7 is a ceramic and metal power triode intended to be used as a zero-bias Class-B amplifier in audio or radio-frequency applications. Operation with zero grid bias offers circuit simplicity by eliminating the bias supply. In addition, grounded-grid operation is attractive since a power gain as high as twenty times can be obtained with the 3CW20,000A7.

The 3CW20,000A7 is electrically identical to the air-cooled 3CX10,000A7 except for its 20kW plate dissipation rating.



### GENERAL CHARACTERISTICS

#### ELECTRICAL

Filament: Thoriated-Tungsten	Min.	Nom.	Max.
Voltage - - - - -		7.5	volts
Current - - - - -	94		104 amperes
Amplification Factor - - - - -		200	
Direct Interelectrode Capacitances:			Min. Max.
Grid-Filament - - - - -			50.0 62.0 uuf
Grid-Plate - - - - -			32.0 40.0 uuf
Plate-Filament - - - - -			0.3 uuf
Frequency for Maximum Ratings - - - - -			140 Mc

#### MECHANICAL

Base - - - - -	Coaxial
Recommended Socket - - - - -	Eimac SK-1300
Operating Position - - - - -	Vertical, base up or down
Cooling - - - - -	Water and Forced air
Maximum Operating Temperatures:	
Anode Core - - - - -	250° C
Ceramic-to-Metal Seals - - - - -	250° C
Maximum Dimensions:	
Height - - - - -	11.4 inches
Diameter - - - - -	4.7 inches
Net Weight - - - - -	12 pounds

#### RADIO-FREQUENCY LINEAR AMPLIFIER

Grounded Grid, Class-B

#### MAXIMUM RATINGS

DC PLATE VOLTAGE - - - - -	7000 MAX. VOLTS
DC PLATE CURRENTS - - - - -	5.0 MAX. AMPS
PLATE DISSIPATION - - - - -	20 MAX. KW
GRID DISSIPATION - - - - -	500 MAX. WATTS

\*Approximate Values

#### TYPICAL OPERATION, Single-Tone Conditions

DC Plate Voltage - - - - -	7000	7000 volts
Zero-Sig DC Plate Current* - - - - -	0.60	0.60 amps
Max-Sig DC Plate Current - - - - -	3.72	5.00 amps
Max-Sig DC Grid Current - - - - -	0.71	1.00 amp
Driving Impedance - - - - -	35	32 ohms
Resonant Load Impedance - - - - -	1020	745 ohms
Max-Sig Driving Power - - - - -	885	1540 watts
Peak Envelope Plate		
Output Power - - - - -	17,700	24,200 watts
Power Gain - - - - -	20.0	15.7 times

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**AUDIO-FREQUENCY  
AMPLIFIER OR MODULATOR**

Class-B, Grid Driven

MAXIMUM RATINGS (Per Tube)

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

\*Approximate Values

## TYPICAL OPERATION, Two Tubes, Sinusoidal Wave

DC Plate Voltage	-	-	-	-	5000	7000 volts
DC Grid Voltage	-	-	-	-	0	0 volts
Zero-Sig DC Plate Current*	-	-	-	-	1.2	1.2 amps
Max-Sig DC Plate Current	-	-	-	-	10.0	10.0 amps
Max-Sig DC Grid Current	-	-	-	-	1.2	2.1 amps
Driving Power	-	-	-	-	290	560 watts
Peak AF Driving Voltage (Per Tube)	-	-	-	-	240	310 volts
Load Resistance, Plate-to-Plate	-	-	-	-	1030	1520 ohms
Max-Sig Plate Output Power	-	-	-	-	31,000	47,700 watts

**RADIO-FREQUENCY  
LINEAR AMPLIFIER**Carrier Conditions, Grounded-Grid, Class-B<sub>2</sub>

MAXIMUM RATINGS

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

\*Approximate Values

†Modulation Crest Conditions

## TYPICAL OPERATION

DC Plate Voltage	-	-	-	-	-	7000 volts
DC Grid Voltage	-	-	-	-	-	0 volts
Zero-Sig DC Plate Current*	-	-	-	-	-	0.6 amp
DC Plate Current	-	-	-	-	-	2.4 amps
DC Grid Current	-	-	-	-	-	0.25 amp
Driving Impedance†	-	-	-	-	-	32 ohms
Peak Driving Voltage†	-	-	-	-	-	310 volts
Driving Power	-	-	-	-	-	330 watts
Plate Output Power	-	-	-	-	-	5650 watts

**RADIO-FREQUENCY POWER AMPLIFIER  
OR OSCILLATOR, Class-C**

MAXIMUM RATINGS

DC PLATE VOLTAGE	-	-	-	-	7000 MAX. VOLTS
DC PLATE CURRENT	-	-	-	-	4.0 MAX. AMPS
PLATE DISSIPATION	-	-	-	-	20 MAX. KW
GRID DISSIPATION	-	-	-	-	500 MAX. WATTS

## TYPICAL OPERATION

DC Plate Voltage	-	-	-	-	-5000	7000 volts
DC Plate Current	-	-	-	-	4.0	4.0 amps
DC Grid Voltage	-	-	-	-	-210	-230 volts
DC Grid Current	-	-	-	-	840	775 mA
Peak RF Grid Voltage	-	-	-	-	510	555 volts
Grid Driving Power	-	-	-	-	420	530 watts
Plate Output Power	-	-	-	-	14	21.3 kW

**PLATE-MODULATED RADIO-FREQUENCY  
POWER AMPLIFIER, Class-C**

MAXIMUM RATINGS

DC PLATE VOLTAGE	-	-	-	-	5500 MAX. VOLTS
DC PLATE CURRENT	-	-	-	-	3.0 MAX. AMPS
PLATE DISSIPATION†	-	-	-	-	13.5 MAX. KW
GRID DISSIPATION	-	-	-	-	500 MAX. WATTS

## TYPICAL OPERATION

DC Plate Voltage	-	-	-	-	-	5000 volts
DC Plate Current	-	-	-	-	-	3.0 amps
DC Grid Voltage	-	-	-	-	-	-200 volts
DC Grid Current	-	-	-	-	-	775 mA
Peak RF Grid Voltage	-	-	-	-	-	490 volts
Grid Driving Power	-	-	-	-	-	380 watts
Plate Output Power	-	-	-	-	-	11.9 kW

†Corresponds to 20 kW at 100% sine-wave modulation

Note: "TYPICAL OPERATION" data are obtained by calculation from published characteristic curves and confirmed by direct tests. No allowance for circuit losses, either input or output, has been made. Adjustment of the rf grid drive to obtain the specified zero-signal plate current at the specified bias and plate voltage is assumed.



## APPLICATION

### MECHANICAL

**Mounting**—The 3CW20,000A7 must be operated vertically, base down or up. The tube must be protected from severe vibration and shock.

**Socket**—The SK-1300 socket is available for use with the 3CW20,000A7. Base cooling is accomplished by directing approximately 30 cfm of air at a static pressure of 0.1 inch through the socket and over the base seals.

**Cooling**—The anode of the 3CW20,000A7 is cooled by circulating water through the integral anode-water jacket. The table below lists minimum water-flow rates at various plate dissipation levels

Minimum Cooling Water-Flow Requirements		
Plate Dissipation (kW)	Water Flow (gpm)	Pressure Drop (psi)
10	6.3	4.9
15	9.0	9.2
20	12.0	15.0

\*Since power dissipated by the filament represents 750 watts and grid dissipation can reach 500 watts, 1250 watts has been added to anode dissipation in preparing this tabulation.

The cooling table assumes that the maximum outlet-water temperature will be below 70°C to preclude "spot" boiling. Further, inlet-water temperature must not exceed 60°C. In all cases, maximum system water pressure must not exceed 50 pounds per square inch. Water flow and air flow must be started before apply-

ing any voltages to the tube and may be stopped simultaneously with the removal of tube voltages. Suitable flow and temperature interlocks should be provided to protect the tube from inadequate flow rates.

### ELECTRICAL

**Filament**—The rated filament voltage for the 3CW20,000A7 is 7.5 volts Filament voltage, as measured at the socket, should be maintained at this value for consistent performance and maximum tube life. In no case should it be allowed to vary from 7.5 volts by more than plus or minus five percent.

**Input Circuit**—When the 3CW20,000A7 is operated as a grounded-grid rf amplifier, the use of a resonant tank line in the cathode circuit is recommended in order to obtain 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.

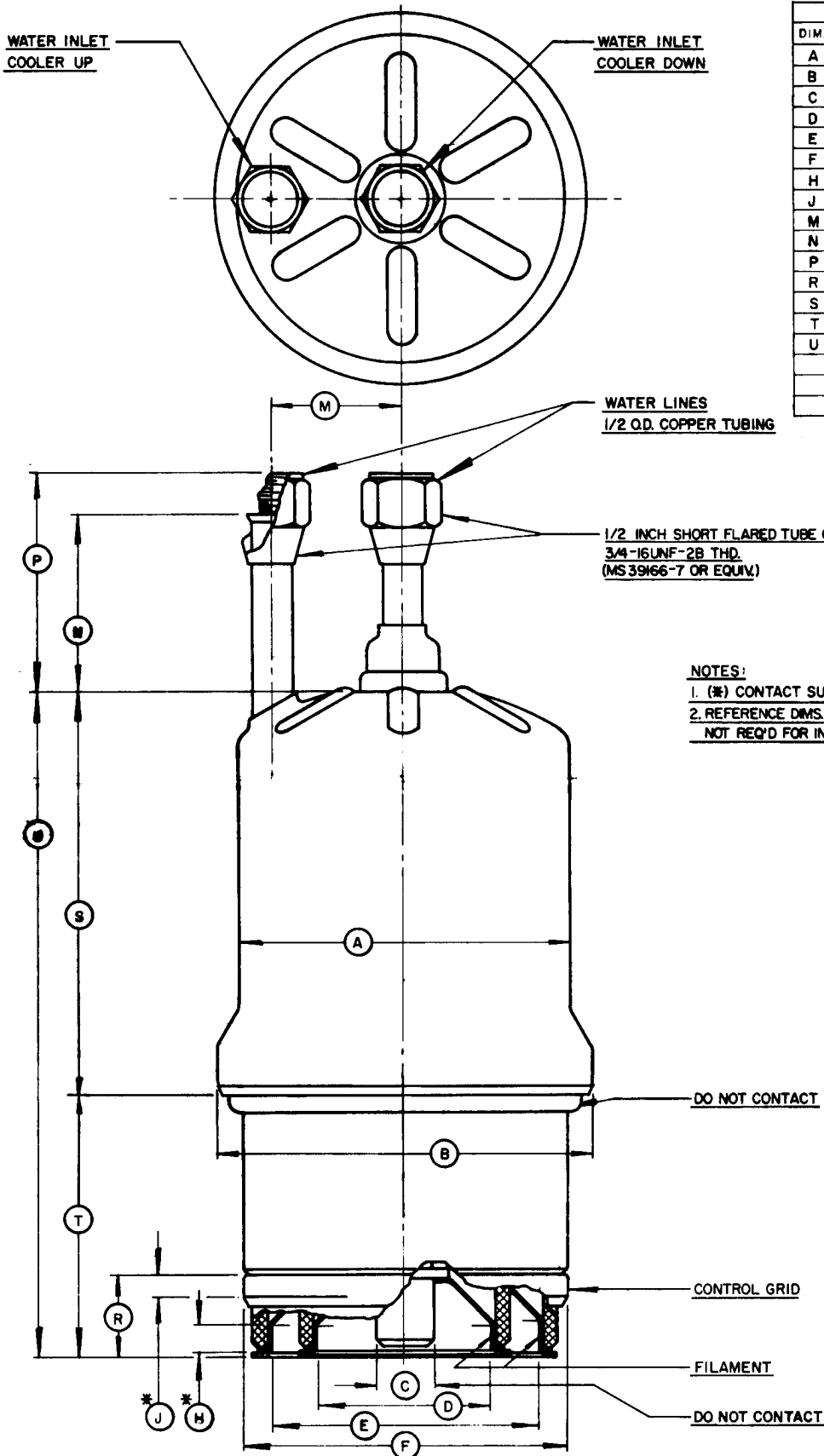
**Class-C Operation**—Although designed specifically for Class-B service, the 3CW20,000A7 may be operated as a Class-C amplifier or oscillator or as a plate-modulated radio-frequency amplifier. The zero-bias characteristic can be used to advantage in Class-C amplifiers by employing only grid leak bias. If driving power should fail, plate dissipation is then kept to a low value because the tube will be operating at normal, static, zero-bias conditions.

**Special Applications**—If it is desired to operate this tube under conditions widely different from those given here, write to Power Grid Tube Marketing, Eitel-McCullough, Inc., 301 Industrial Way, San Carlos, California, for information and recommendations.

DIMENSIONS IN INCHES

DIMENSIONAL DATA

DIM.	MIN.	MAX.	REF.
A	4.094	4.156	
B	4.594	4.656	
C	.720	.760	
D	1.896	1.936	
E	3.133	3.173	
F	3.792	3.832	
H	.188		
J	.188		
M	1.500	1.750	
N	1.937	2.187	
P	2.312	2.812	
R	.986	1.050	
S	4.780	5.025	
T	3.128	3.428	
U	7.903	8.403	



NOTES:

1. (#) CONTACT SURFACE
2. REFERENCE DIMS. ARE FOR INFO. ONLY & ARE NOT REQ'D FOR INSPECTION PURPOSES.

