TENTATIVE DATA

EITEL-McCULLOUGH, INC.

SAN BRUNO, CALIFORNIA

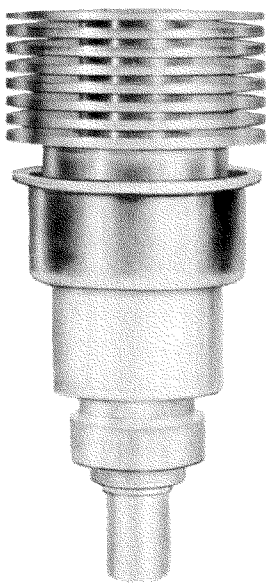
2C39B

HIGH-MU UHF TRIODE

Supersedes Types 2C38, 2C39, 2C39A

The Eimac 2C39B is a ceramic-and-metal UHF transmitting triode with a plate dissipation rating of 100 watts. It is useful as a CW amplifier or oscillator at frequencies up to 2500 mc., and in pulse applications at frequencies up to 3000 mc.

The terminals of the 2C39B are a graduated series of cylindrical surfaces, which fit conveniently into sockets made integral with coaxial circuit elements. The maximum envelope-temperature rating for the 2C39B is 200°C, and the tube is cooled by forced air. The 2C39B is the unilateral replacement for the 2C39A.



GENERAL CHARACTERISTICS

ELECTRICAL

Cathode: Oxide-Coated, Unipotential	
Heater Voltage	6.3 volts
Heater Current	1.025 amperes
Heating Time	60 seconds
Amplification Factor	100
Transconductance (Plate Current 70ma.)	25,000 μmhos
Direct Interelectrode Capacitances, (average)	
Grid - Plate	2.01 μμfds
Grid - Cathode	6.60 μμfds
Plate-Cathode	0.035 μμfds
Highest Frequency for Maximum Ratings	2500 mc.

MECHANICAL

Terminal Location	See Outline Drawing
Mounting Position	Any
Cooling	Forced Air
Maximum Envelope Temperature	CORRECTION: MAXIMUM ENVELOPE TEMPERATURE = 250°C. 200°C.
Maximum Over-all Dimensions:	
Length	2 3/4 inches
Diameter	1 17/64 inches
Net Weight	2.5 ounces
Shipping Weight (Approximately)	7 ounces

RADIO-FREQUENCY POWER AMPLIFIER, OSCILLATOR OR MODULATOR

MAXIMUM RATINGS (Per tube)

D-C PLATE VOLTAGE	1000 MAX. VOLTS
D-C CATHODE CURRENT	125 MAX. MA
D-C GRID VOLTAGE	—150 MAX. VOLTS
D-C GRID CURRENT	50 MAX. MA
HEATER VOLTAGE	SEE APPLICATION NOTES
INSTANTANEOUS PEAK POSITIVE GRID VOLTAGE	30 MAX. VOLTS
INSTANTANEOUS PEAK NEGATIVE GRID VOLTAGE	400 MAX. VOLTS
PLATE DISSIPATION	100 MAX. WATTS
GRID DISSIPATION	2 MAX. WATTS

TYPICAL OPERATION (Key-down conditions, per tube)
(Power-Amplifier Grid-Isolation Circuit, CW Operation, 500 Mc.)

D-C Plate Voltage	800 volts
D-C Grid Voltage	—20 volts
D-C Plate Current	80 ma
D-C Grid Current	32 ma
Driving Power (approx.)[1]	6 watts
Useful Power Output	27 watts

TYPICAL OPERATION
(R-F Oscillator, 2500 Mc.)[2]

D-C Plate Voltage	900 volts
D-C Grid Voltage	—22 volts
D-C Plate Current	90 ma
D-C Grid Current	27 ma
Useful Power Output	15 watts

PLATE-MODULATED RADIO-FREQUENCY AMPLIFIER OR OSCILLATOR

MAXIMUM RATINGS (Carrier conditions, per tube)

D-C PLATE VOLTAGE[3]	600 MAX. VOLTS
D-C GRID VOLTAGE	—150 MAX. VOLTS
D-C GRID CURRENT	50 MAX. MA
D-C CATHODE CURRENT	100 MAX. MA
PEAK INSTANTANEOUS POSITIVE GRID VOLTAGE	30 MAX. VOLTS
PEAK INSTANTANEOUS NEGATIVE GRID VOLTAGE	400 MAX. VOLTS
PLATE DISSIPATION	70 MAX. WATTS
GRID DISSIPATION	2 MAX. WATTS

TYPICAL OPERATION
(Plate-Modulated Radio-Frequency Power Amplifier Grid-Isolation Circuit, 500 Mc., Per Tube)

D-C Plate Voltage	600 volts
D-C Grid Voltage	—16 volts
D-C Plate Current	75 ma
D-C Grid Current	40 ma
Driving Power (approx.)[1]	6 watts
Useful Carrier Power Output	18 watts

[1]Driving power listed is the total power which must be supplied to a practical grid circuit at the frequency shown.

[2]These 2500 Mc. conditions conform to the proposed requirements of the USAF specification for the 2C39B.

[3]For less than 100% modulation, higher d-c plate voltage may be used if the sum of the peak positive modulating voltage and the d-c plate voltage does not exceed 1200 volts.

IF IT IS DESIRED TO OPERATE THIS TUBE UNDER CONDITIONS WIDELY DIFFERENT FROM THOSE GIVEN UNDER "TYPICAL OPERATION," POSSIBLY EXCEEDING THE MAXIMUM RATINGS GIVEN FOR CW SERVICE, WRITE EITEL-McCULLOUGH, INC., FOR INFORMATION AND RECOMMENDATIONS.

APPLICATION

MECHANICAL

Mounting—The 2C39B may be operated in any position. It should be held firmly in the socket by the contact fingers bearing on the terminal surfaces, and in cases of extremely heavy vibration or shock the tube can be clamped in place. Clamping forces may be applied only to the flange above the anode terminal surface. The under side of this flange should make contact with the stop which controls the vertical position of the tube in the socket. No other surfaces of the tube should be used for vertical reference points, nor should clamping forces be applied to any part of the tube other than the flange referred to above.

Connections—The tube terminal surfaces are in the form of concentric cylinders having graduated diameters, as illustrated on the outline drawing. Spring collets or fingers should be fitted to these cylindrical surfaces to make contact with the anode, grid, cathode and heater terminals. It is important to provide adequate contact area and spring pressure, and to maintain good contact by keeping the contact surfaces free of oxidation and accumulated dirt.

Cooling—The maximum rated temperature of the ceramic-to-metal seals used in the 2C39B is 200°C., and sufficient cooling air must be forced to flow over the envelope surfaces to maintain their temperatures below the maximum rated value.

The anode is cooled by forced air flow through the fins on the anode cooler. When the air cowling illustrated here is used, the air flow required to dissipate 100 watts at sea level, with the air at 25°C, is 12.5 cubic feet per minute.

The only criterion for cooling effectiveness is temperature. Under operating conditions involving less than the rated maximum power dissipation from the anode, reduced air-flow rates are permissible providing the temperatures are maintained below the maximum rating. This also applies when air cowlings, different from that type shown here, are used.

A convenient method of measuring temperature is the use of a temperature-sensitive paint, which melts and changes its appearance permanently above certain specified temperatures. One such product is "Tempilac" sold by the Tempil Corporation, 11 West 25th Street, New York, 10, N. Y.

The air flow-rate should be increased at high altitudes to obtain equivalent cooling. The flow rates in cubic feet per minute at 35,000 feet altitude will usually be double the sea level requirements.

ELECTRICAL

Heater Voltage—The maximum rated heater voltage for the 2C39B is 6.3 volts, which provides adequate cathode emission for applications requiring peak cathode currents in excess of 3.0 amperes.

When the 2C39B is used in applications requiring less than 3.0 amperes peak cathode emission, the heater voltage can be reduced to 5.6 volts, to prolong the life of the tube.

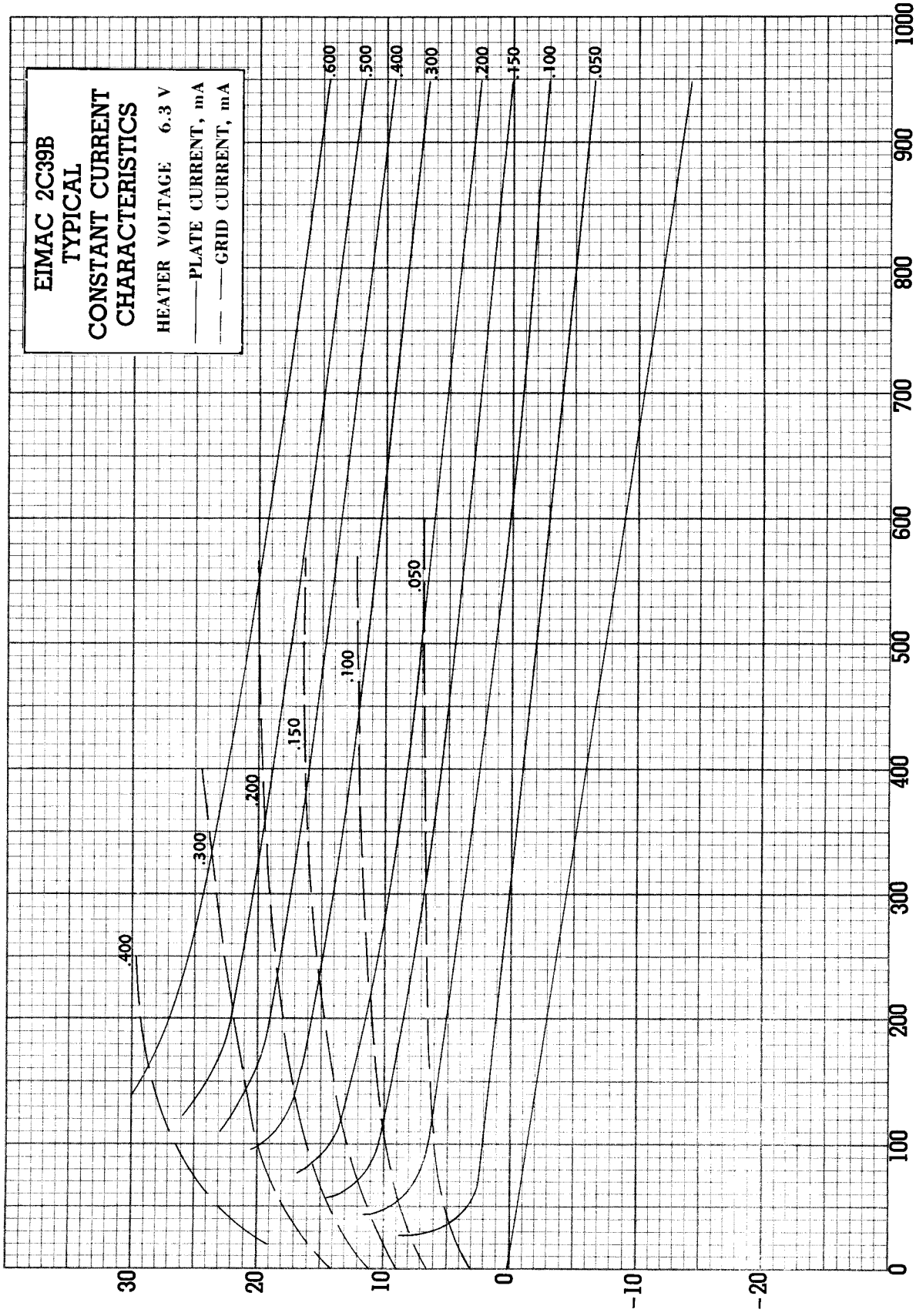
The heater voltage should be maintained within ± 5% of the selected operating voltage to maintain uniform circuit performance. For best tube life the heater voltages must be kept within the range from 5.1 volts to 6.9 volts, except in circuits where transit-time effects occur.

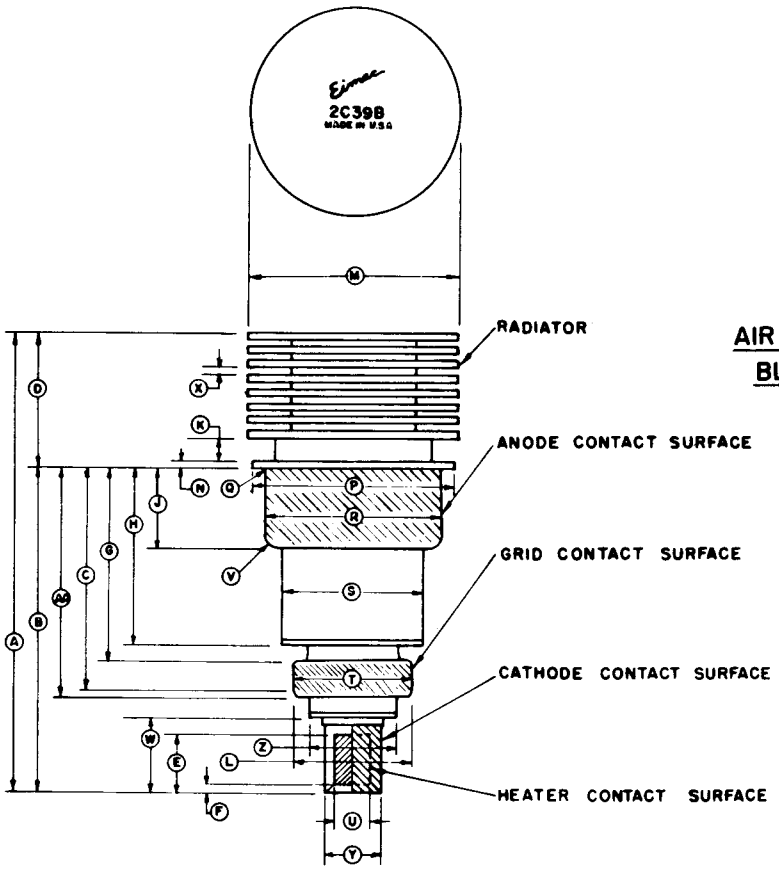
Transit-time effects can result in r-f heating of the cathode when the tube is operated near its upper useful frequency limit, with large driving power. The amount of r-f heating depends on the frequency, driving power, grid current and several other circuit variables whose effects can not be predicted reliably, so no fixed rule can be given by which these effects may be compensated. In each individual case it is necessary to systematically reduce the heater voltage until a point is identified where the circuit performance starts to deteriorate with further heater voltage reduction. The operating voltage should be ten percent greater than that voltage, but not less than 4.5 volts. In cases where the heater voltage is too low to permit immediate circuit operation, the heater voltage may be raised to 6.3 volts until dynamic operation of the circuit starts, after which the heater voltage can be reduced to the selected operating voltage.

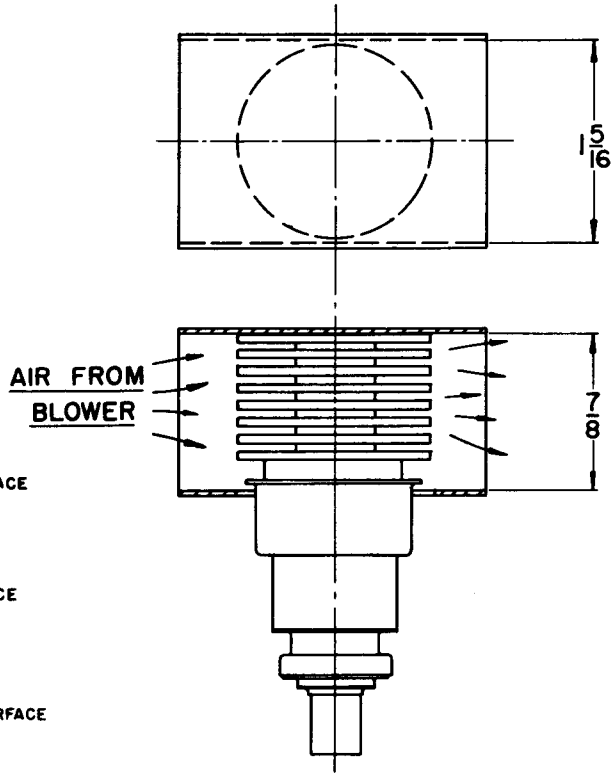
Operation—Longer tube life will be obtained when the tube is operated at low voltage and high current, instead of high voltage and low current. The plate circuit must always be kept adequately loaded and the grid driving power should be kept as low as possible, consistent with satisfactory efficiency.

The ratio of grid current to plate current is a good indicator of circuit conditions. Grid current in excess of half the plate current indicates that the driving power is excessive for the circuit conditions and should be reduced.

Equipment which relies on grid-leak bias to protect the tube should have effective plate-current overload protection when operating at more than 800 volts. Grid-leak resistors should be made variable, to permit adjustment of the bias and the plate current to the correct values under changing circuit conditions.


EIMAC 2C39B
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
HEATER VOLTAGE 6.3 V
——PLATE CURRENT, mA
— — —GRID CURRENT, mA
.600
.500
.400
.300
.200
.150
.100
.050
.400
.300
.200
.150
.100
.050
30
20
10
0
-10
-20
0
100
200
300
400
500
600
700
800
900
1000
GRID VOLTAGE – VOLTS
PLATE VOLTAGE — VOLTS





RECOMMENDED COWLING FOR FORCED-AIR COOLING OF ANODE

NOTES:

1. THE TRUE INDICATED RUNOUT OF THE ANODE CONTACT SURFACE AND THE GRID CONTACT SURFACE WITH RESPECT TO THE CATHODE CONTACT SURFACE SHALL NOT EXCEED .020.
2. THE TRUE INDICATED RUNOUT OF THE CATHODE CONTACT SURFACE WITH RESPECT TO THE HEATER CONTACT SURFACE SHALL NOT EXCEED .012.

	NOM.	MIN.	MAX.
A			2 3/4
B		1.805	1.875
C		1.258	
D		.736	.826
E		.341	
F			.086
G			1.135
H		1.000	
J		.459	.479
K		1/8	
L			.668
M		1 15/64	1 17/64
N	1/32		
P		1.175	1.199
Q			1/32
R		1.021	1.039
S			13/16
T		.652	.668
U		.213	.223
V			3/32
W		.400	
X		1/64	
Y		.312	.328
Z			.515
AA		1.289	1.329

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