8891
Power Tube

Beam Power Tube

- **20.0 Kilowatt Peak Sync. Output Thru VHF-TV Band at 13 dB Gain**
- **17.5 Kilowatt PEP Output for Single Sideband Service at 20 dB Gain**
- **Efficient Forced-Air Cooling**
- **Full Input to 400 MHz**
- **CERMOLOX® Construction**

The BURLE 8891 is designed specifically for use in high gain, high linearity equipments for VHF-TV service and for communicator networks to 400 MHz.

In VHF-TV service to 223 MHz, the 8891 can deliver up to a full 20.0 kilowatt peak sync output with 6.0 MHz bandwidth and 13 dB gain.

Rated for full input for theVHF-TV band and for other service to 400 MHz, the 8891 can be readily circuited for these frequencies. The terminals are coaxial for operation in the TEM_{00} mode and the radiator location avoids restricting the resonant cavity circuits in UHF operation. The 8891 assures high gain-bandwidth products for the full VHF-TV band. In addition, it is well suited for other applications such as single sideband, CW or pulsed RF and modulator service.

This data sheet gives application information unique to the BURLE 8891. General information covering installation and operation of this tube type is given in the "Application Guide for BURLE Power Tubes," TP-105. Close attention to the instructions contained therein will assure longer tube life, safer operation, less equipment downtime, and fewer tube handling accidents.

General Data

Electrical

Filamentary Cathode, Thoriated-Tungsten Mesh Type			
Voltage[1] (AC or DC)	9.5	typ.	V
	10.0	max.	V
Current			
Typical value at 9.5 V	147		A
Maximum value for starting even momentarily	300		A
Cold resistance	0.01		ohm
Minimum heating time	15		s
Mu Factor* (Grid No.2 to Grid No-l)	12.5		
Direct Interelectrode Capacitances:			
Grid No.1 to plate[3]	0.4	max.	pF
Grid No.1 to filament	100		pF
Plate to filament[3,4]	0.15	max.	pF
Grid No.1 to grid No.2	85		pF
Grid No.2 to plate	20		pF
Grid No.2 to filament[4]	4.0	max.	pF

BURLE Electron Tubes

General Data (Contd)

Mechanical

Operating Position	Vertical, Either End Up
Overall Length	180.3 mm (7.100 in) max.
Greatest Diameter	210.4 mm (8.285 in) max.
Radiator	Integral Part of Tube
Weight (Approx.)	10.0 kg (22 lbs)

Thermal

Seal Temperature[5] (Plate, grid No.2, grid No.1, cathode-filament, and filament)	250 max.	°C
Plate Core Temperature[5]	250 max.	°C

RF Power Amplifier

Class B Television Service[6,10]

Synchronizing level conditions per tube unless otherwise specified.

Maximum CCS Ratings, Absolute-Maximum Values

DC Plate Voltage[6]	9,000	V
DC Grid-No.2 Voltage[6]	2,000	V
DC Grid-No.1 Voltage[6]	-600	V
DC Plate Current	6.0	A
Grid No.2 Input	450	W
Grid No.1 Input	250	W
Plate Dissipation	See Note 8	

Calculated CCS Operation

In a cathode-drive circuit **at** 216 MHz and **a** bandwidth of 6.0 MHz[7].

DC Plate Voltage	6,580	V
DC Grid-No.2 Voltage	1,000	V
DC Grid-No. 1 Voltage	-115	V
Zero Signal DC Plate Current	1.0	A
Effective RF Load Resistance	660	ohms
DC Plate Current:		
Synchronizing level	4.82	A
Blanking level	3.68	A
DC Grid-No.2 Current:		
Synchronizing level	137	mA
Blanking level..	33	mA
DC Grid-No.1 Current:		
Synchronizing level	437	mA
Blanking level..	131	mA
Input Circuit Efficiency (Approx.)	92.5	%
Driver Power Output:		
Synchronizing level	865	W
Blanking level	504	W
Output Circuit Efficiency (Approx.)	92.5	%
Useful Power Output:		
Synchronizing level	18.8	kW
Blanking level	10.6	kW

Linear RF Power Amplifier[6,10]

Single-Sideband Suppressed-Carrier Service

Peak envelope conditions for a signal having **a** minimum peak-to-average power ratio of 2.

Maximum CCS Ratings, Absolute-Maximum Values

	Up to 400 MHz	
DC Plate Voltage[6]	10,000	V
DC Grid-No.2 Voltage[6]	2,000	V
DC Plate Current at Peak of Envelope	6.0	A
DC Grid-No.1 Current	500	mA
Grid-No.2 Input	450	W
Plate Dissipation	15	kW

Maximum Circuit Values

Grid-No.1 Circuit Resistance Under Any Condition:	
With fixed bias	5,000 ohms
With fixed bias (In Class AB, operation)	25,000 ohms
With cathode bias	Not recommended
Grid-No.2 Circuit Impedance	See Note 6
Plate Circuit Impedance	See Note 6

Linear RF Power Amplifier[6,10]

Class AB or Class B Telephony

Carrier conditions for use with a maximum modulation factor of 1.0.

Maximum CCS Ratings, Absolute-Maximum Values

DC Plate Voltage[6]	10,000	V
DC Grid-No.2 Voltage[6]	2,000	V
DC Plate Current	3.0	A
Grid-No.2 Input	300	W
Plate Dissipation	See Note 8	

Calculated CCS Operation

In a cathode drive circuit at 400 MHz.

DC Plate Voltage	8,000	V
DC Grid-No.2 Voltage	1,500	V
DC Grid-No.1 Voltage[11]	-235	V
DC Plate Current	2.47	A
DC Grid-No.1 Current	0	mA
DC Grid-No.2 Current	24	mA
Driver Power Output	500	W
Output Circuit Efficiency (Approx.)	80	%
Useful Power Output	5,000	W

Forced-Air Cooling

Air Flow:

Through Radiator - Adequate air flow to limit the plate-core temperature to 250° C should be delivered by a blower through the radiator before and during the application of filament, plate, grid-No.2, and grid-No.1 voltages.

For typical operation, the required air flow is as follows:

Plate Dissipation Kilowatts	Air Flow CFM	Pressure Drop Inches H_2O
12.5	350	1.75
15.0	425	2.50
17.5	550	3.50

To Plate, Grid No. 2, Grid No.1, Cathode-Filament, and Filament Terminals - A sufficient quantity of air should be allowed to flow past each of these terminals so that its temperature does not exceed the specified maximum value of 250° C.

During Standby Operation -Cooling air is required when only filament voltage is applied to the tube.

During Shutdown Operation - Air flow should continue for a few minutes after all electrode power is removed.

For further information on forced-air cooling, see TP-105.

1. Measured at the tube terminals. The filament may be subjected to RF heating as the frequency of operation is increased. It is recommended that the filament power be regulated at the lowest value that will give stable performance. For those applications where hum is **a** critical consideration, DC filament operation or hum bucking circuits are recommended.

2. For plate voltage 2000 V, grid No.2 voltage = 1250 V, and plate current = 15 A.

3. With external flat metal shield 200 mm (8') in diameter having a center hole 76 mm (3') in diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2.

4. With external flat metal shield 200 mm (8') in diameter having a center hole 60 mm (2-3/8') in diameter. Shield is located in plane on the grid No.1 terminal, perpendicular to the tube axis, and is connected to grid No.1.

5. See Dimensional Outline for Temperature Measurement Points.

6. See TP-105.

7. The bandwidth of 6.0 MHz is calculated at the -1.0 dB power points of a double tuned output circuit using two times the tube capacity and a damping factor of $\sqrt{1.5}$.

8. Permitted plate dissipation is a function of cooling. For specific ratings see **Forced** Air **Cooling** information in this Data Sheet.

9. Driver power output represents circuit losses and is the actual power measured at the input to the grid-No.1 circuit. The actual power required depends on the operating frequency and the circuit used. The tube driving power is approximately zero watts.

10. The maximum voltage and air flow rates must be modified to obtain adequate holdoff voltage and cooling at temperatures in excess of 35° C and altitudes above 7000 feet.

11. Obtained from a fixed supply with an internal impedance of 695 ohms to provide necessary increase in bias at crest of modulating signal.

Warning - Personal Safety Hazards

Electrical Shock - Operating voltages applied **to** this device present a shock hazard.

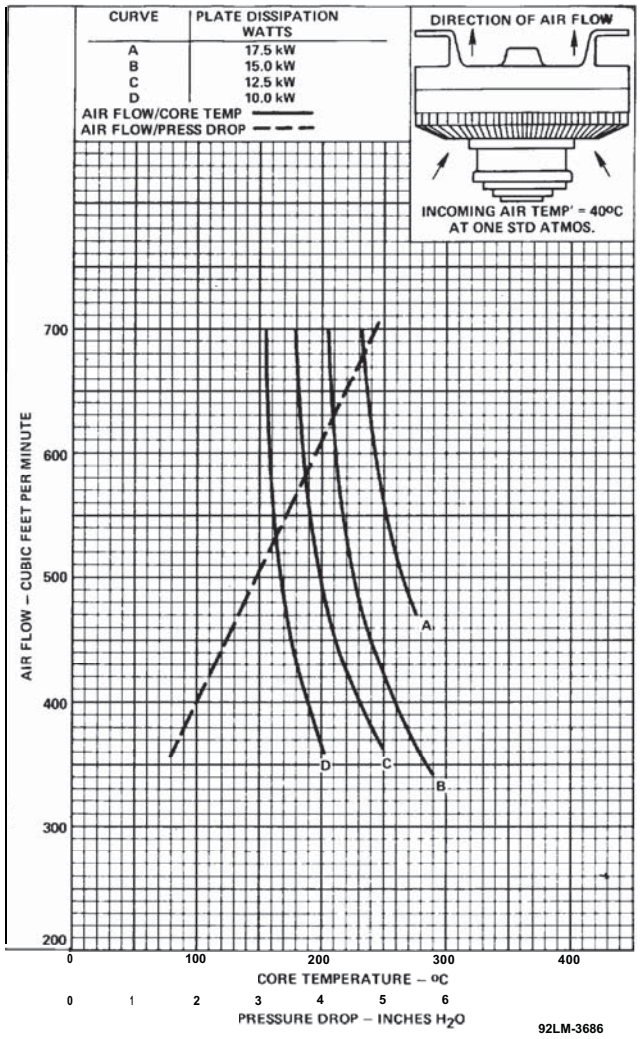

Figure 1 - Air Flow Characteristics

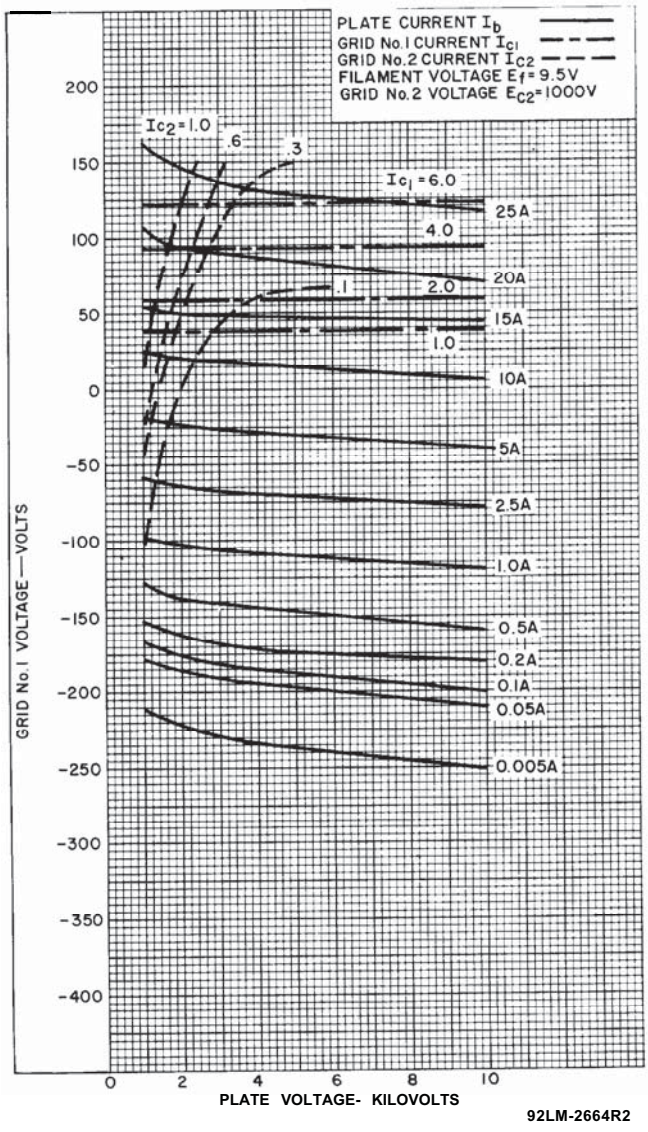

Figure 2 - Typical Constant Current Characteristics

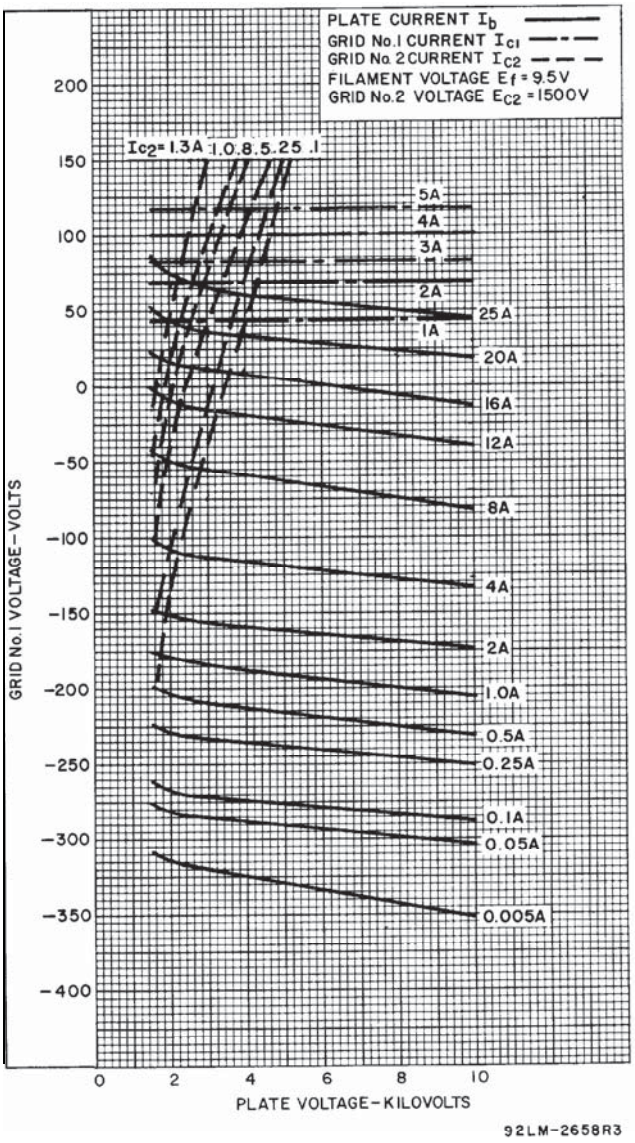

Figure 3 -Typical Constant Current Characteristics

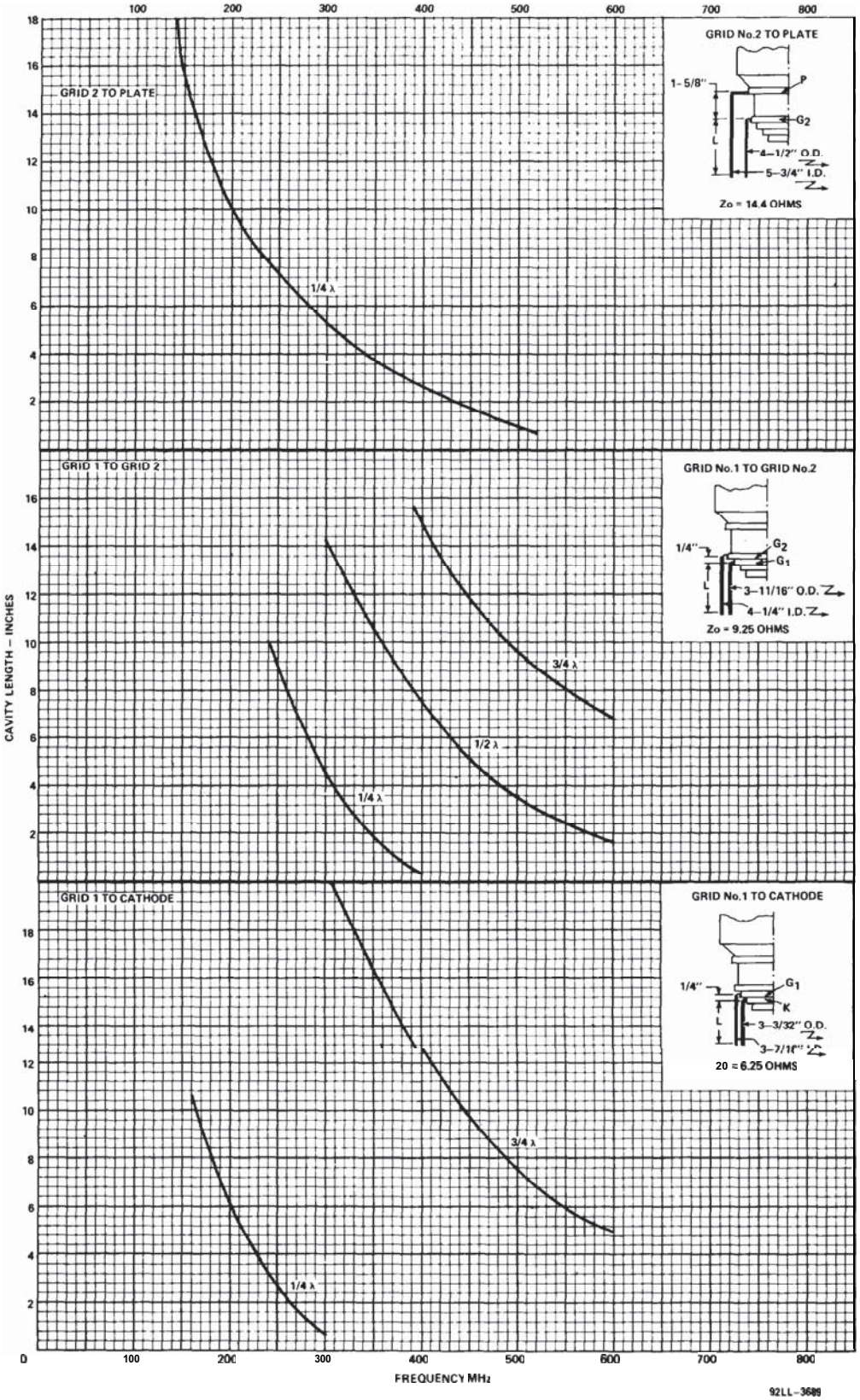

Figure 4 - Electrode Cavity Tuning Characteristics

Mounting

The preferred mounting arrangement is depicted in **Figure 5.** Other arrangements, such as cavity-type mounting, for multiple-ring terminal tubes may be constructed using either fixed or adjustable contact rings.

Tabulated Dimensions*

Dimension	Value		
A	33.53	(1.320)	
B	112.78	(4.440)	Dia.
C	104.02	(4.095)	Dia.
D	43.51	(1.713)	
E	8.38	(0.330)	
F	88.77	(3.495)	Dia.
G	76.20	(3.000)	Dia.
H	50.17 +0.05 -0.00	**(1.975 + 0.002) (-0.000)**	Dia.
J	20.57	(0.810)	Dia.
K	6.35	(0.250)	
L	7.92	(0.312)	
M	49.98	(1.812)	
N	15.88	(0.625)	
P	6.35	(0.250)	
R	6.63	(0.261)	Dia.
S	17.78	(0.700)	Dia.
T	23.32	(0.918)	Dia.
U	28.83	(1.135)	Dia.
V	44.11	(1.737)	Dia.
W	28.58	(1.125)	
AA	6668	(2.625)	Dia.
AB	45°		
AC	31.75	(1.25)	
AD	25.40	(1.00)	
AE	10.16	(0.40)	
AF	68.097 ± .05	(2.681 ± .002)	Dia.
AG	72.14	(2.840)	Dia.
AH	76.20	(3.000)	Dia.
AJ	22-1/2°		
AK	7.14	(0.281)	Dia.
AM	3.18	(0.125)	
AN	25.40	(1.000)	
AP	3.18	(0.125)	Radius

Note **1:** Finger stock is No.97-139 made by Instrument Specialties Co., P.O. Box A, Delaware Water Gap, PA 18327.

Note 2: Finger stock is No.97-360 made by Instrument Specialties Co., P.O. Box A, Delaware Water Gap, PA 18327.

Note 3: Round all corners.

* Dimensions in millimeters. Dimensions in parentheses are in inches.

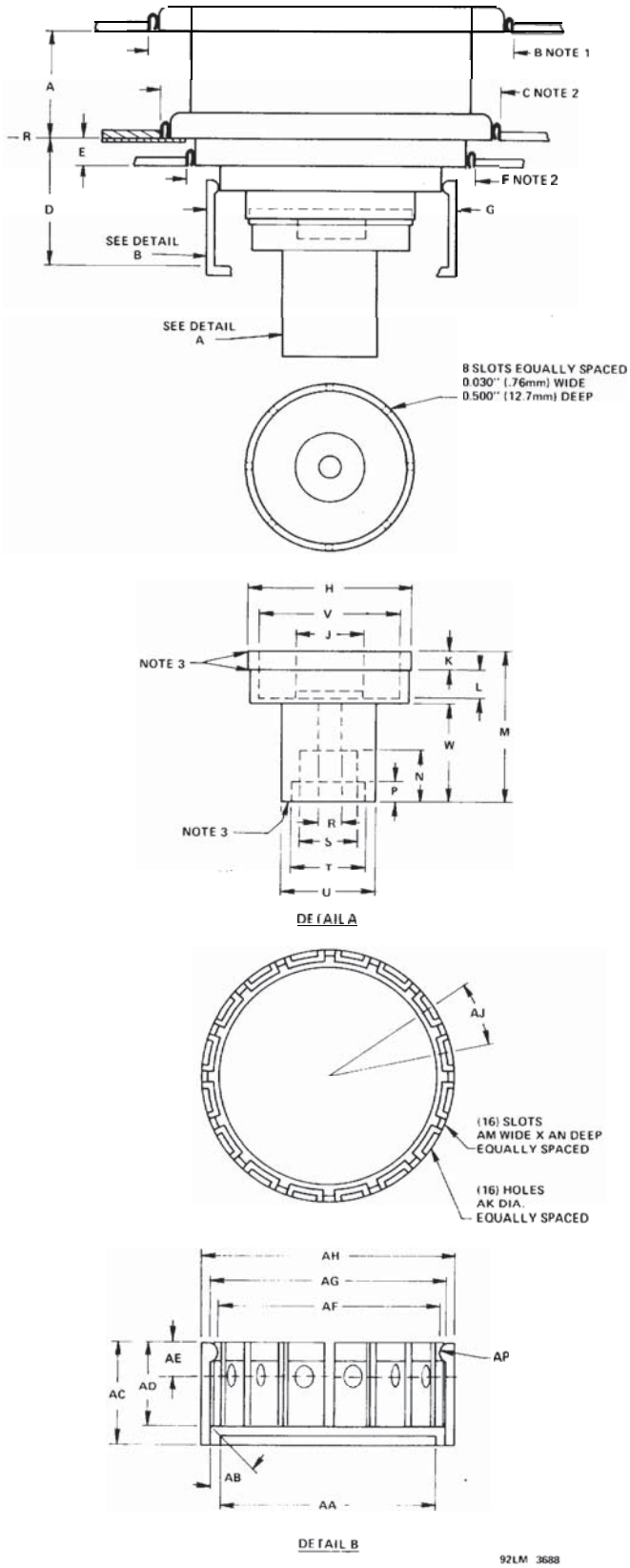

Figure 5 - Preferred Mounting Arrangement

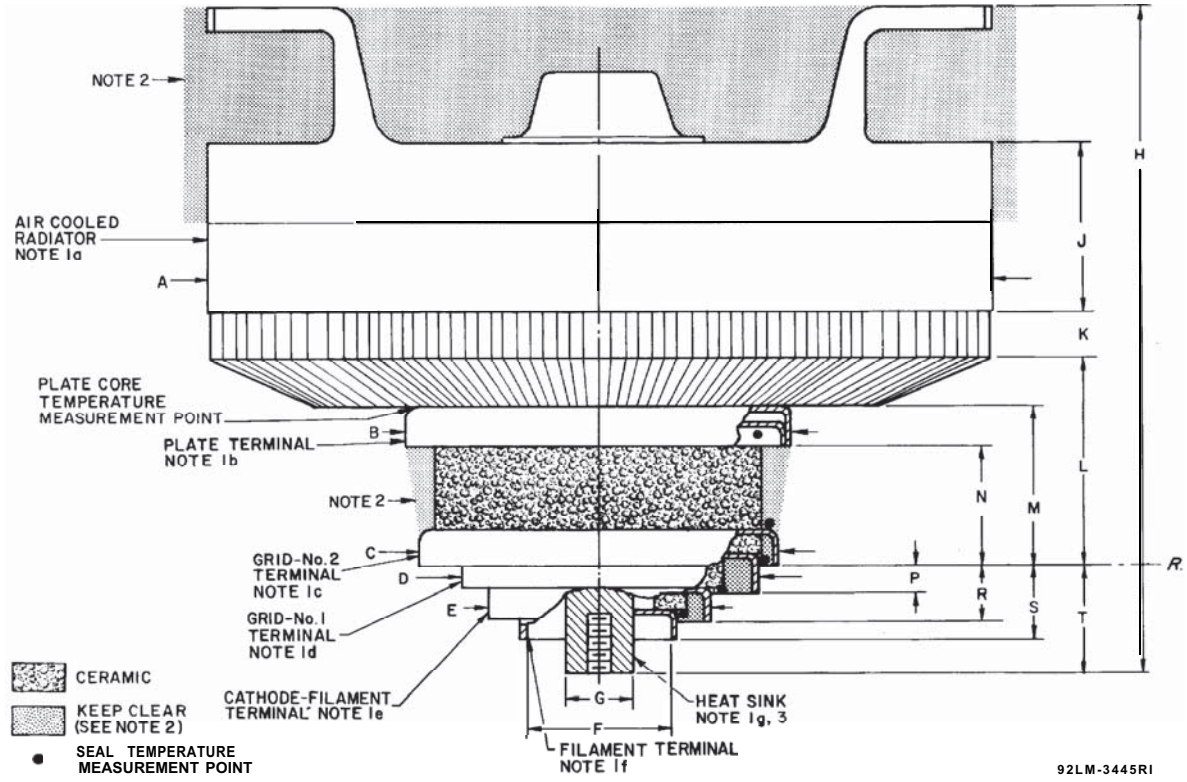

Figure 6 - Dimensional Outline

Tabulated Dimensions

Dimensions	Millimeters	Inches
A Dia.	209.5 ± .9	(8.250 ± .035)
B Dia.	106.58 ± .51	(4.188 ± .020)
C Dia.	99.44 ± .38	(3.915 ± .015)
D Dia.	84.20 ± .38	(3.315 ± .015)
E Dia.	68.48 ± .38	(2.696 ± .015)
F Dia.	49.78 ± .38	(1.960 ± .015)
G Dia.	20.57 max.	(0.810 max.)
H	180.3 max.	(7.10 max.)
J	44.5 ± .8	(1.750 ± .030)
K	12.7 ref.	(0.500 ref.)
L	54.6 ± 1.3	(2.150 ± .050)
M	45.1 min.	(1.775 min.)
N	36.1 ± .8	(1.420 ± .030)
P	8.4 ± .8	(0.330 2.030)
R	16.5 ± 1.0	(0.650 ± .038)
S	24.4 ± 1.3	(0.960 ± .050)
T	30.5 ref.	(1.200 ref.)

Note 1: The contact distance* listed is the minimum, uniform, indicated length as measured from the edge of the terminal.

	Contact Distance
1a. Radiator	20.32 (0.800)
1b. Plate Terminal	6.73 (0.265)
1c. Grid No.2 Terminal	6.73 (0.265)
1d. Grid No.1 Terminal	6.73 (0.265)
1e. Cathode-Filament Terminal	6.35 (0.250)
1f. Filament Terminal	6.73 (0.265)
1g. Heat Sink (post)	11.43 (0.450)

Note 2: Keep all stippled regions clear. In general do not allow contacts to protrude into these annular regions. If special connectors are required which may intrude on these regions, contact BURLE Power Tube Application Engineering, Lancaster, PA 17601.

Note 3: Tapped 1/4-20 NC x 12.7 mm (0.5 in) deep.

* Dimensions in millimeters, Dimensions in parentheses are in inches.

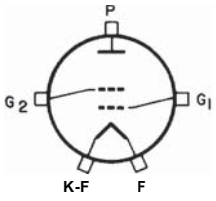

Figure 7 - Terminal Diagram