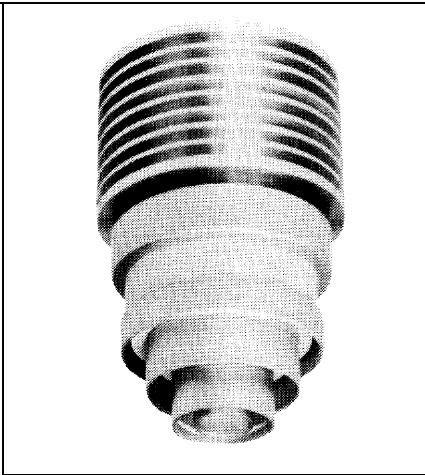


# 6884 Power Tube



## Beam Power Tube

- CERMOLOX®
- Oxide-Coated Cathode
- Forced-Air Cooled
- 80 Watts CW Power Output at 400 MHz
- 40 Watts CW Power Output at 1215 MHz

BURLE-6884 is a compact, forced-air cooled UHF beam power tube designed for use in aircraft, mobile and stationary equipment applications. The tube features Cermolox construction, a uni-potential, oxide-coated cathode, and an integral stacked-disc-type finned radiator.

The tube is rated as an AF power amplifier and modulator, and up to 1215 MHz as a linear RF power amplifier, an anode-modulated RF power amplifier in Class C telephony service, an RF power amplifier and oscillator in Class C telegraphy service, and an RF power amplifier in Class C FM telephony service. The 6884 may also be useful in a variety of other applications such as frequency multipliers, linear RF power amplifiers (AM or television), pulse modulators, pulsed RF amplifiers, regulators, or other special services.

This data sheet gives application information unique to the BURLE-6884. Information contained in the following publications will help to assure longer tube life and safer operation:

TP-105 Application Guide for BURLE Power Tubes

TP-118 Application Guide for Forced-Air Cooling of BURLE Power Tubes

TP-122 Screen-Grid Current, Loading and Bleeder Considerations

For copies of these publications, contact your BURLE representative or write BURLE INDUSTRIES, INC., Tube Products Division, 1000 New Holland Avenue, Lancaster, PA 17601-5688.

### General Data

#### Electrical

Heater for Oxide-Coated Unipotential Cathode:

Voltage (ac or dc) .....	26.5	typ.	V
	29.2	max.	V
Current at 26.5 volts .....	0.54		A
Minimum heating time .....	2		minutes
Mu-Factor, Grid No.2 to Grid No.1 .....	18		

Direct Interelectrode Capacitances<sup>1</sup>:

Grid No.1 to anode .....	0.065	max.	pF
Grid No.1 to cathode & heater .....	13		pF
Anode to cathode & heater .....	.013	max.	pF
Grid No.1 to grid No.2 .....	17.5		pF
Grid No.2 to anode .....	4.7		pF
Grid No.2 to cathode & heater .....	0.45	max.	pF

#### Mechanical

Operating Position .....	Any
Overall Length .....	1.93" max.
Greatest Diameter .....	1.265" max.
Terminal Connections .....	See Dimensional Outline

For Operation Up to 400 MHz

Socket, including Grid-No.2	
Bypass Capacitor .....	Erie* 2948-000, 9819-000, or equivalent

Grid-No.2 Bypass Capacitor .....	Erie* 2929-001, or equivalent
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For Operation at High Frequencies

See Preferred Mounting Arrangement .....	Figure 3
Weight (Approx.) .....	2 oz

#### Thermal

Terminal Temperature (Anode, grid No.2, grid No.1, cathode and heater) .....	250	max.	°C
Anode-Core Temperature .....	250	max.	°C

See Dimensional Outline for temperature-measurement points.

\* Erie Specialty Products, Inc., 645 W. 11th Street, Erie, PA 16512.

## AF Power Amplifier & Modulator - Class AB<sub>2</sub>

### Maximum CCS Ratings, Absolute-Maximum Values

DC Anode Voltage .....	1000	V
DC Grid-No.2 Voltage .....	300	V
Max.-Signal DC Anode Current .....	180	mA
Max.-Signal Anode Input .....	180	W
Max.-Signal Grid-No.2 Input .....	4.5	W
Anode Dissipation .....	115	W

### Maximum Circuit Values

Grid-No.1 Circuit Resistance Under Any Condition:

With fixed bias .....	30,000	ohms
With cathode bias .....	Not	recommended

### Typical CCS Operation

Values are for 2 tubes

DC Anode Voltage .....	650	850	V
DC Grid-No.2 Voltage .....	300	300	V
DC Grid-No. 1 Voltage:			
From fixed-bias source .....	-15	-15	V
Peak AF Grid-No. 1-to-Grid-No.1 Voltage .....	30	30	V
Zero-Signal DC Anode Current .....	80	80	mA
Max.-Signal DC Anode Current .....	200	200	mA
Zero-Signal DC Grid-No.2 Current .....	0	0	mA
Max.-Signal DC Grid-No.2 Current .....	20	20	mA
Effective Load Resistance (Anode to anode) .....	4330	7000	ohms
Max.-Signal Driving Power (Approx.) .....	0	0	W
Max.-Signal Power Output (Approx.) .....	50	80	W

## AF Power Amplifier & Modulator - Class AB<sub>2</sub>

### Maximum CCS Ratings, Absolute-Maximum Values

DC Anode Voltage .....	1000	V
DC Grid-No.2 Voltage .....	300	V
Max.-Signal DC Anode Current .....	180	mA
Max.-Signal DC Grid-No.1 Current .....	30	mA
Max.-Signal Anode Input .....	180	W
Max.-Signal Grid-No.2 Input .....	4.5	W
Anode Dissipation .....	115	W

### Typical CCS Operation

Values are for 2 tubes

DC Anode Voltage .....	650	850	V
DC Grid-No.2 Voltage .....	300	300	V
DC Grid-No.1 Voltage:			
From fixed-bias source .....	-15	-15	V
Peak AF Grid-No.1-to-Grid-No. 1 Voltage .....	46	46	V
Zero-Signal DC Anode Current .....	80	80	mA
Max.-Signal DC Anode Current .....	355	355	mA
Zero-Signal DC Grid-No.2 Current .....	0	0	mA
Max.-Signal DC Grid-No.2 Current .....	25	25	mA
Max.-Signal DC Grid-No.1 Current .....	15	15	mA
Effective Load Resistance (Anode to anode) .....	2450	3960	ohms
Max.-Signal Driving Power (Approx.) .....	0.3	0.3	W
Max.-Signal Power Output (Approx.) .....	85	140	W

## Anode-Modulated RF Power Amplifier - Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0.

### Maximum CCS Ratings, Absolute-Maximum Values

	<b>Up to 1215 MHz</b>	
DC Anode Voltage .....	800	V
DC Grid-No.2 Voltage .....	300	V
DC Grid-No.1 Voltage .....	-100	V
DC Anode Current .....	150	mA
DC Grid-No.1 Current .....	30	mA
Anode Input .....	120	W
Grid-No.2 Input .....	3	W
Anode Dissipation .....	75	W

### Typical CCS Operation

	<b>At 400 MHz</b>		
DC Anode Voltage .....	400	700	V
DC Grid-No.2 Voltage .....	200	250	V
DC Grid-No.1 Voltage .....	-20	-50	V
DC Anode Current .....	100	130	mA
DC Grid-No.2 Current .....	5	10	mA
DC Grid-No.1 Current .....	5	10	mA
Driver Power Output (Approx.) .....	2	3	W
Useful Power Output (Approx.) .....	16	45	W

### Maximum Circuit Values

Grid No.1 Circuit Resistance Under Any Condition ...	30,000	ohms
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## RF Power Amplifier & Oscillator - Class C Telegraphy and RF Power Amplifier - Class C FM Telephony

### Maximum CCS Ratings, Absolute-Maximum Values

	<b>Up to 1215 MHz</b>	
DC Anode Voltage .....	1000	V
DC Grid-No.2 Voltage .....	300	V
DC Grid-No.1 Voltage .....	-100	V
DC Anode Current .....	180	mA
DC Grid-No.1 Current .....	30 <sup>2</sup>	mA
Anode Input .....	180	W
Grid-No.2 Input .....	4.5	W
Anode Dissipation .....	115	W

### Typical CCS Operation

	<b>At 400 MHz</b>		<b>At 1215 MHz</b>	
DC Anode Voltage .....	400	900	900	V
DC Grid-No.2 Voltage .....	200	300	300	V
DC Grid-No.1 Voltage .....	-35	-30	-22	V
DC Anode Current .....	150	170	170	mA
DC Grid-No.2 Current .....	5	1	1	mA
DC Grid-No.1 Current .....	3	10	4	mA
Driver Power Output (Approx.) .....	3	3	5	W
Useful Power Output (Approx.) .....	23	80	40	W

### Maximum Circuit Values

Grid-No.1 Circuit Resistance Under Any Condition .....	3000	ohms
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## Linear RF Power Amplifier, Class AB<sub>1</sub> 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 1215 MHz

DC Anode Voltage .....	1000	V
DC Grid-No.2 Voltage .....	300	V
DC Grid-No.1 Voltage .....	-100	V
DC Anode Current at Peak of Envelope .....	250 <sup>3</sup>	mA
DC Grid-No.1 Current .....	30	mA
Anode Input .....	180	W
Grid-No.2 Input .....	4.5	W
Anode Dissipation .....	115	W

### Maximum Circuit Values

Grid-No.1 Circuit Resistance Under Any Condition:

With fixed bias .....	25,000	ohms
With fixed bias (In Class AB <sub>1</sub> operation) .....	100,000	ohms
With cathode bias .....	Not recommended	

Grid-No.2 Circuit Impedance .....	See Note 4
Anode Circuit Impedance .....	See Note 4

### Typical CCS Operation with "Two-Tone" Modulation

#### At 30 MHz

DC Anode Voltage .....	650	850	V
DC Grid-No.2 Voltage .....	300	300	V
DC Grid-No.1 Voltage .....	-18.5	-18.5	V
Zero-Signal DC Anode Current .....	40	40	mA
Effective RF Load Resistance .....	2200	3500	ohms
DC Anode Current at Peak of Envelope .....	100	100	mA
Average DC Anode Current .....	75	75	mA
DC Grid-No.2 Current at Peak of Envelope .....	8.2	4.2	mA
Average DC Grid-No.2 Current .....	3.6	1.7	mA
Peak-Envelope Driver Power Output (Approx.) ..	0.5	0.5	W
Output-Circuit Efficiency (Approx.) .....	90	90	%
Distortion Products Level:			
Third Order .....	35	30	dB
Fifth Order .....	40	36	dB
Useful Power Output (Approx.):			
Average .....	12.5	20	W
Peak envelope .....	25	40	W

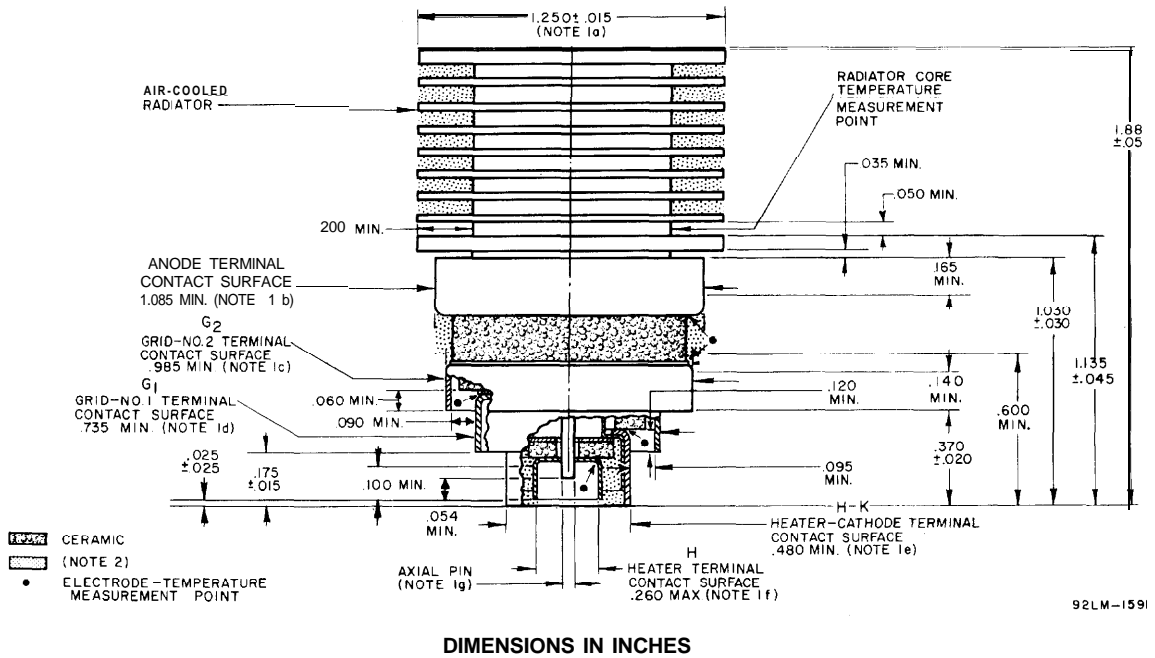
### Characteristics Range Values

	Min.	Max.	
Heater Current <sup>5</sup> .....	0.48	0.60	A
Direct Interelectrode Capacitances:			
Grid No.1 to anode <sup>1</sup> .....	0.065		pF
Grid No.1 to cathode & heater <sup>1</sup> .....	11.0	15.0	pF
Anode to cathode & heater <sup>1</sup> .....	0.013		pF
Grid No.1 to grid No.2 <sup>1</sup> .....	15.0	20.0	pF
Grid No.2 to anode <sup>1</sup> .....	4.2	5.2	pF
Grid No.2 to cathode & heater <sup>1</sup> .....	0.26	0.45	pF
Grid-No. 1 Voltage <sup>5,6</sup> .....	-6	-15	V
Grid-No.1 Cutoff Voltage <sup>5,7</sup> .....		-48	V
Grid-No.1 Current <sup>5,8</sup> .....	10	-	mA
Reverse Grid-No.1 Current <sup>5,6</sup> .....		8	uA
Grid-No.2 Current <sup>5,6</sup> .....	8	+2.0	mA
Peak Emission <sup>5,9</sup> .....		300 peak	V
Interelectrode Leakage Resistance <sup>10</sup> .....	1.0	-	Mohm
Useful Power Output <sup>11</sup> .....	80	-	W

1. Measured with special shield adapter.
2. In applications where the frequency is less than 80 MHz and the bias is less than -50 volts, the maximum value is 40 mA.
3. The maximum rating for a signal having a minimum peak-to-average power ratio less than 2, such as is obtained in "Single-Tone" operation, is 180 mA. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 250 mA.
4. See TP-105.
5. With 26.5 volts ac or dc on heater.
6. With dc anode voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc anode current of 115 mA.
7. With dc anode voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc anode current of 1 mA.
8. With anode and grid-No.2 floating and dc grid-No.1 voltage of +2 volts.
9. With grid No.1, grid No.2, and anode tied together; and pulse voltage source connected between anode and cathode. Pulse duration is 2 microseconds, pulse repetition frequency is 60 pps, and duty factor is 0.00012. The voltage-pulse amplitude is adjusted until a peak cathode current of 10 amperes is obtained. After 1 minute at this value, the voltage-pulse amplitude will not exceed 300 volts (peak).
10. With tube at 20 to 30 °C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two adjacent electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1.0 megohm, will be 1.0 megohm.
11. In a single-tube, grid-driven coaxial-cavity class C amplifier circuit at 400 MHz and for conditions with 24.0 volts ac or dc on heater, dc anode voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, grid-No.1 resistor adjustable between zero and 10,000 ohms, dc anode current of 180 mA maximum, dc grid-No.1 current of 30 mA maximum and driver power output of 3.3 watts.

### Warning - Personal Safety Hazards

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

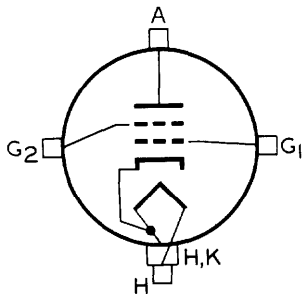


**Figure 1 - Dimensional Outline**

**Note 1:** The following diametrical space requirements accommodate the concentricity of the cylindrical surfaces of the radiator fins, axial pin, and each electrode terminal:

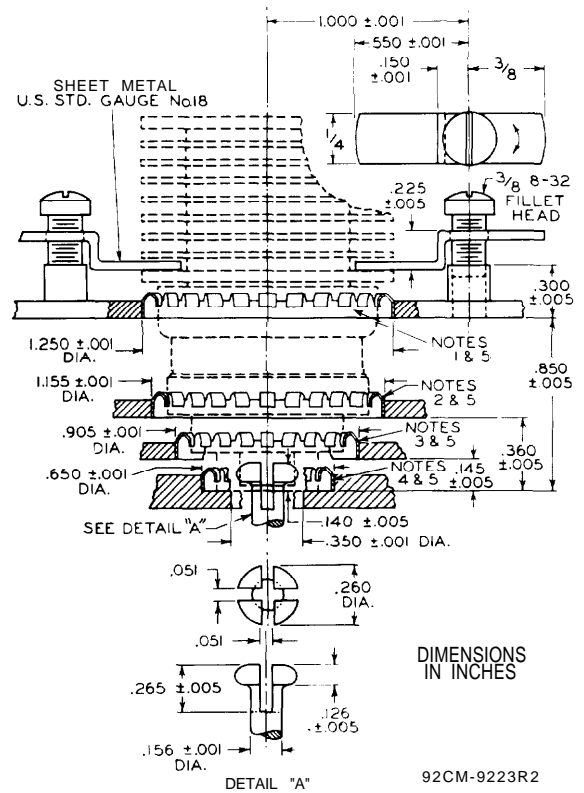
- a. Radiator Band - 1.317"
- b. Anode Terminal - 1.120"
- c. Grid-No.2 Terminal - 1.020"
- d. Grid-No.1 Terminal - 0.765"
- e. Heater-Cathode Terminal - 0.520"
- f. Heater Terminal - 0.238"
- g. Axial Pin - 0.072"

**Note 2:** Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.



**Figure 2 - Terminal Diagram**

See Dimensional Outline for Terminal Connections



**Figure 3 - Preferred Mounting Arrangement**

**Note 1:** Contact ring No.97-252 or finger stock No.97-380.

**Note 2:** Contact ring No.97-253 or finger stock No.97-380.

**Note 3:** Contact ring No.97-254 or finger stock No.97-380.

**Note 4:** Contact ring No.97-255 or finger stock No.97-380.

**Note 5:** The specified contact ring of preformed finger stock and finger stock No.97-380 provide adequate electrical contact, but the finger stock No.97-380 is less susceptible to breakage than the specified contact ring. Both types are made by Instruments Specialties Co., P.O. Box A, Delaware Water Gap, PA 18327.

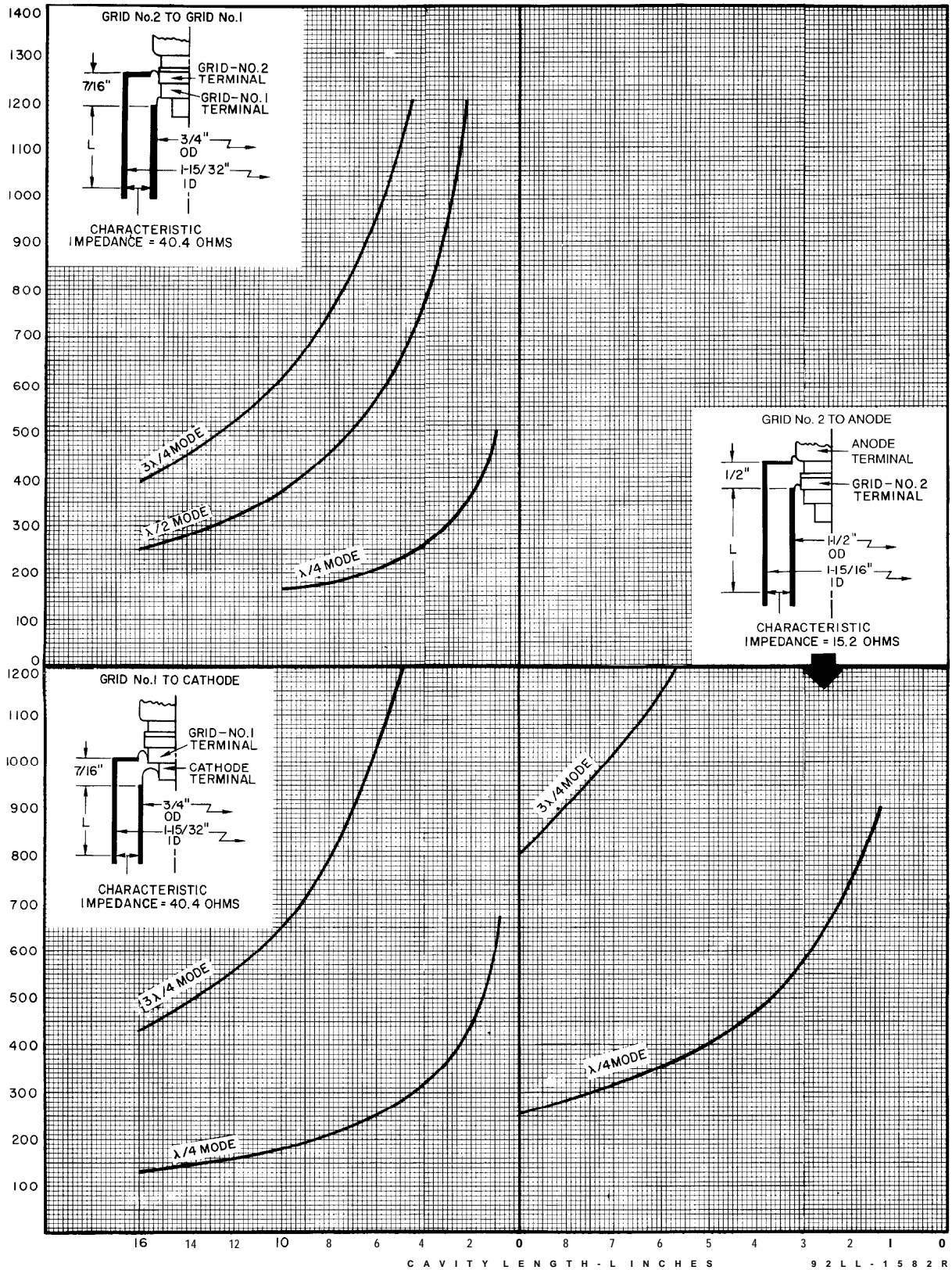
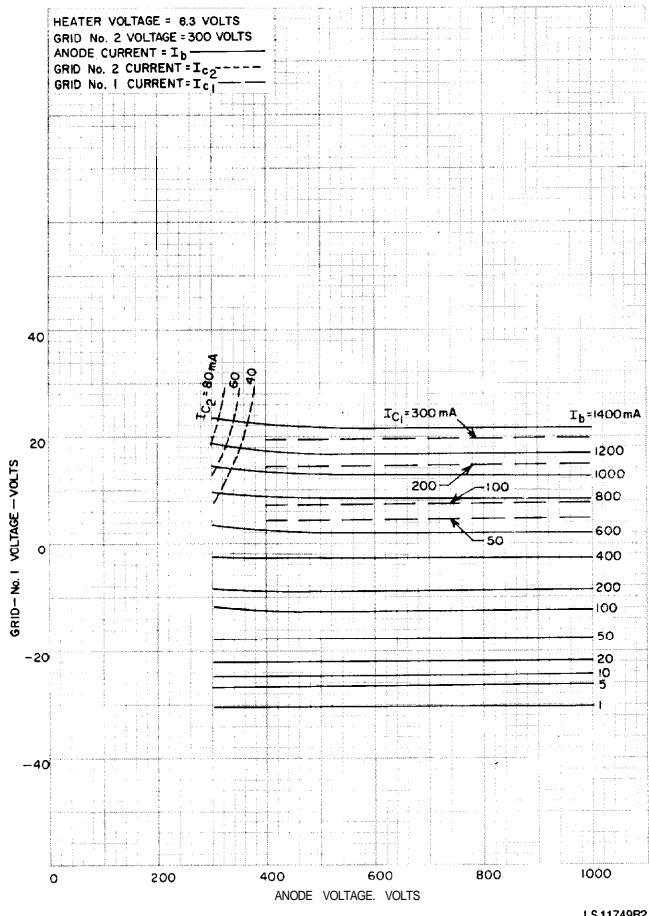
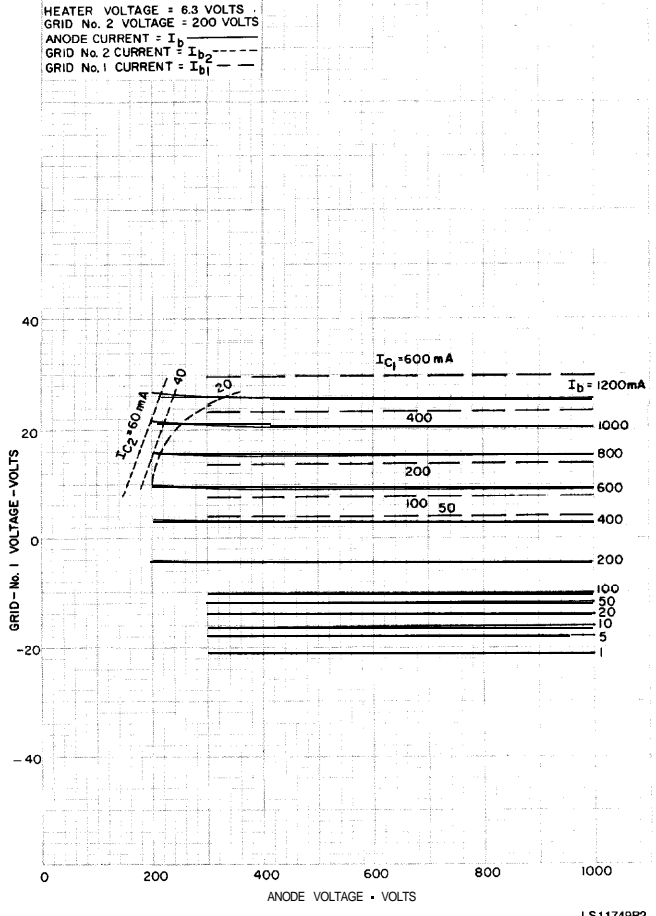


Figure 4 - Tuning Characteristics



LS11749R2

Figure 5 - Typical Constant-Current Characteristics  
With Grid-No.2 Volts = 300



LS11749R2

Figure 6 - Typical Constant-Current Characteristics  
With Grid-No.2 Volts=200

## Forced-Air Cooling

### Air Flow:

Through radiator - Adequate air flow to limit the radiator core temperature to 250° C should be delivered by a blower across the radiator before and during the application of anode, grid-No.2, and grid-No.1 voltages. Typical values of airflow directed across the radiator versus anode dissipation are shown in Figures 7 and 8.

To Anode, Grid-No.2, Grid-No.1, Cathode, and Heater Terminals - A sufficient quantity of air should flow across each of these

terminals so that their temperature does not exceed the specified maximum value of 250° C.

During Standby Operation - Cooling air is not normally required when only heater voltage is applied to the tube.

Anode power, grid-No.2 power, heater power, and air flow may be removed simultaneously.

At sea level, cooling requirements with air flow directed across the radiator with cowling as indicated may be met by use of blowers and associated motors manufactured by Rotron Mfg. Co., Inc., Woodstock, N.Y., or equivalent.

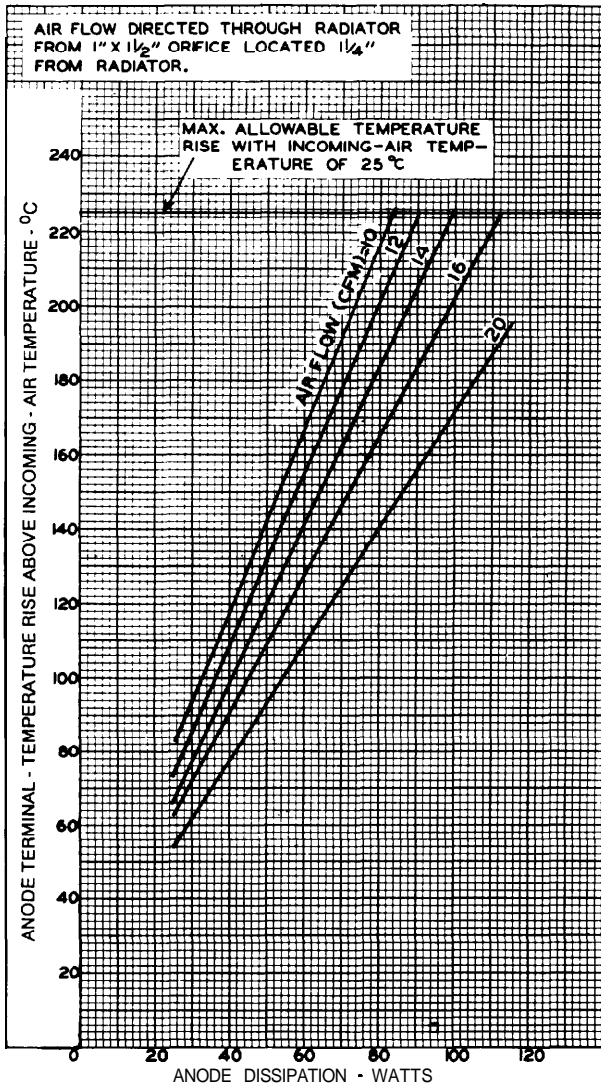


Figure 7 - Typical Cooling Requirements

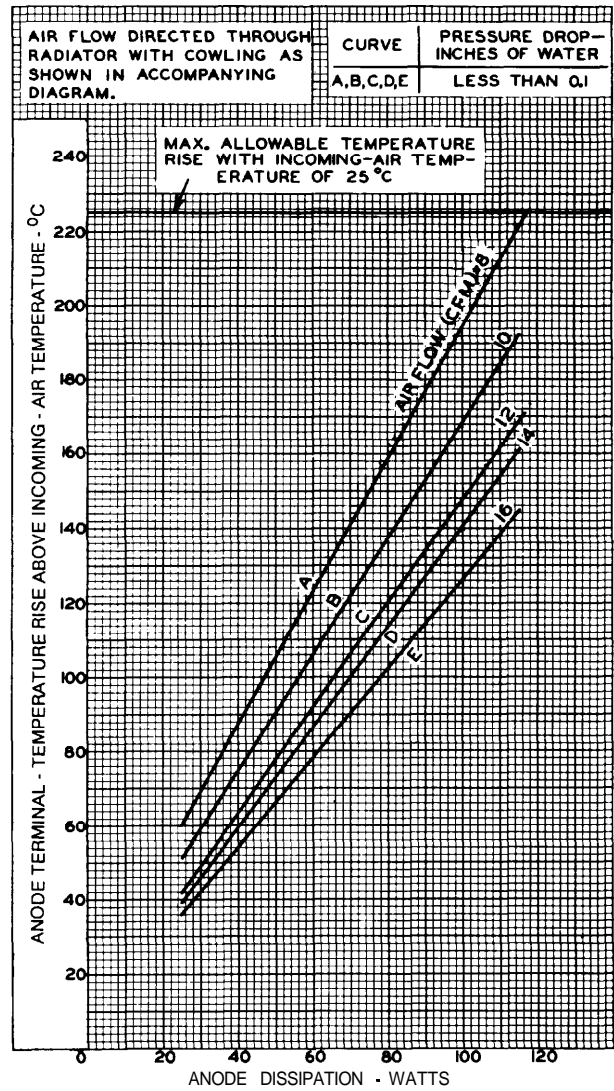
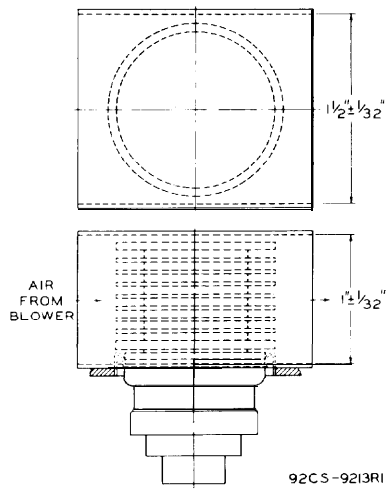


Figure 8 - Typical Cooling Requirements



**Figure 9 - Recommended Cowling  
For Directing Air Flow Through Radiator**

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