

# Beam Power Tube

CERMOLOX®

THORIATED-TUNGSTEN MESH FILAMENT

INTEGRAL LOUVERED-FIN RADIATOR

FORCED-AIR COOLED

*For Single-Sideband Service in Stationary and Portable Equipment. Rated as a Linear RF Power Amplifier in Class AB<sub>1</sub> Suppressed Carrier Service. Also Useful as AF Amplifier or Modulator, RF Power Amplifier and Oscillator in Class-C Telephony and Telegraphy and Other Special Services.*

## ELECTRICAL

Filamentary Cathode, Thoriated-Tungsten Mesh Type

|                                           |                     |  |
|-------------------------------------------|---------------------|--|
| Voltage (ac or dc) <sup>a</sup> . . . . . | { 4.5 to 4.75 typ V |  |
|                                           | 5.0 max V           |  |

Current:

|                                  |     |   |
|----------------------------------|-----|---|
| Typical value at 4.5 V . . . . . | 125 | A |
|----------------------------------|-----|---|

|                                                          |     |   |
|----------------------------------------------------------|-----|---|
| Maximum value for starting,<br>even momentarily. . . . . | 300 | A |
|----------------------------------------------------------|-----|---|

|                          |       |   |
|--------------------------|-------|---|
| Cold Resistance. . . . . | 0.005 | Ω |
|--------------------------|-------|---|

|                                |    |   |
|--------------------------------|----|---|
| Minimum heating time . . . . . | 15 | s |
|--------------------------------|----|---|

Mu-Factor, Grid No.2 to Grid No.1 for plate  
volts = 2000, grid-No.2 volts = 1375, and dc  
plate amperes = 9 . . . . .

10

Direct Interelectrode Capacitances

|                                           |      |        |
|-------------------------------------------|------|--------|
| Grid No.1 to plate <sup>b</sup> . . . . . | 0.60 | max pF |
|-------------------------------------------|------|--------|

|                                |    |    |
|--------------------------------|----|----|
| Grid No.1 to filament. . . . . | 60 | pF |
|--------------------------------|----|----|

|                                           |      |        |
|-------------------------------------------|------|--------|
| Plate to filament <sup>bc</sup> . . . . . | 0.11 | max pF |
|-------------------------------------------|------|--------|

|                                  |    |    |
|----------------------------------|----|----|
| Grid No.1 to grid No.2 . . . . . | 65 | pF |
|----------------------------------|----|----|

|                              |    |    |
|------------------------------|----|----|
| Grid No.2 to plate . . . . . | 13 | pF |
|------------------------------|----|----|

|                                              |     |        |
|----------------------------------------------|-----|--------|
| Grid No.2 to filament <sup>c</sup> . . . . . | 3.3 | max pF |
|----------------------------------------------|-----|--------|

## MECHANICAL

|                              |                         |
|------------------------------|-------------------------|
| Operating Position . . . . . | Vertical, either end up |
|------------------------------|-------------------------|

|                                  |         |
|----------------------------------|---------|
| Maximum Overall Length . . . . . | 5.65 in |
|----------------------------------|---------|

|                            |         |
|----------------------------|---------|
| Maximum Diameter . . . . . | 6.17 in |
|----------------------------|---------|

|                                |                         |
|--------------------------------|-------------------------|
| Terminal Connections . . . . . | See Dimensional Outline |
|--------------------------------|-------------------------|

|                    |                       |
|--------------------|-----------------------|
| Radiator . . . . . | Integral part of tube |
|--------------------|-----------------------|

|                            |       |
|----------------------------|-------|
| Weight (Approx.) . . . . . | 10 lb |
|----------------------------|-------|

## THERMAL

|                                |            |
|--------------------------------|------------|
| Terminal Temperature . . . . . | 250 max °C |
|--------------------------------|------------|

Plate, grid No.2, grid No.1,  
cathode-filament and filament

|                                  |            |
|----------------------------------|------------|
| Plate-Core Temperature . . . . . | 250 max °C |
|----------------------------------|------------|

See Dimensional Outline for temperature-measurement points

## Forced-Air Cooling<sup>f</sup>

### 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.



**Air Flow (Cont'd)**

*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 their 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.

**TERMINAL DIAGRAM (Bottom View)**

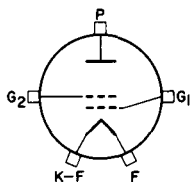
G<sub>1</sub> — Grid-No.1—Terminal Contact Surface

G<sub>2</sub> — Grid-No.2—Terminal Contact Surface

F — Filament—Terminal Contact Surface

K,F — Cathode—Filament—Terminal Contact Surface

P — Plate—Terminal Contact Surface

**LINEAR RF POWER AMPLIFIER<sup>9</sup>****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**

|                                                |      |    |
|------------------------------------------------|------|----|
| DC Plate Voltage . . . . .                     | 7500 | V  |
| DC Grid-No.2 Voltage . . . . .                 | 1650 | V  |
| DC Grid-No.1 Voltage . . . . .                 | -750 | V  |
| DC Plate Current at Peak of Envelope . . . . . | 4.0  | A  |
| DC Grid-No.1 Current . . . . .                 | 500  | mA |
| Grid-No.2 Input <sup>h</sup> . . . . .         | 150  | W  |
| Plate Dissipation . . . . .                    | 10   | kW |

**Maximum Circuit Values****Grid-No.1—Circuit Resistance (Under any Condition)**

|                                                           |                           |   |
|-----------------------------------------------------------|---------------------------|---|
| Fixed bias . . . . .                                      | 5000                      | Ω |
| Fixed bias (In Class AB <sub>1</sub> operation) . . . . . | 25,000                    | Ω |
| Cathode bias . . . . .                                    | Not recommended           |   |
| Grid-No.2 Circuit Impedance . . . . .                     | See footnote <sup>h</sup> |   |
| Plate Circuit Impedance . . . . .                         | See footnote <sup>j</sup> |   |

**Typical Class AB<sub>1</sub> CCS Operation with "Two-Tone" Modulation**

*In a grid-drive circuit, at 30 Mc/s*

|                                                    |      |   |
|----------------------------------------------------|------|---|
| DC Plate Voltage . . . . .                         | 7000 | V |
| DC Grid-No.2 Voltage . . . . .                     | 1500 | V |
| DC Grid-No.1 Voltage . . . . .                     | -200 | V |
| Zero-Signal DC Plate Current . . . . .             | 0.5  | A |
| Effective RF Load Resistance . . . . .             | 1200 | Ω |
| DC Plate Current at Peak of Envelope . . . . .     | 3    | A |
| Average DC Plate Current . . . . .                 | 2.15 | A |
| DC Grid-No.2 Current at Peak of Envelope . . . . . | 0.1  | A |



|                                                  |                           |    |
|--------------------------------------------------|---------------------------|----|
| Average DC Grid-No.2 Current . . . . .           | 0.07                      | A  |
| Peak-Envelope Driver Power Output (Approx.). . . | See footnote <sup>d</sup> |    |
| Output Circuit Efficiency (Approx.). . . . .     | 90                        | %  |
| Useful Power Output (Approx.)                    |                           |    |
| Average. . . . .                                 | 5000                      | W  |
| Peak Envelope. . . . .                           | 10                        | kW |

### LINEAR RF POWER AMPLIFIER<sup>f</sup>

#### AM TELEPHONY SERVICE

*Carrier conditions for use with a maximum modulation factor of 1*

#### Maximum CCS Ratings, Absolute-Maximum Values

|                                |      |    |
|--------------------------------|------|----|
| DC Plate Voltage . . . . .     | 7500 | V  |
| DC Grid-No.2 Voltage . . . . . | 1650 | V  |
| DC Grid-No.1 Voltage . . . . . | -750 | V  |
| DC Plate Current . . . . .     | 2    | A  |
| DC Grid-No.1 Current . . . . . | 500  | mA |
| Grid-No.2 Input. . . . .       | 150  | W  |
| Plate Dissipation. . . . .     | 10   | kW |

#### Typical Class AB<sub>1</sub> CCS Operation

*In a cathode drive circuit, at 400 Mc/s*

|                                              |                   |   |
|----------------------------------------------|-------------------|---|
| DC Plate Voltage . . . . .                   | 6500              | V |
| DC Grid-No.2 Voltage . . . . .               | 1250              | V |
| DC Grid-No.1 Voltage . . . . .               | -160 <sup>e</sup> | V |
| DC Plate Current . . . . .                   | 1.4               | A |
| DC Grid-No.2 Current . . . . .               | 0.005             | A |
| Driver Power Output. . . . .                 | 75                | W |
| Output Circuit Efficiency (Approx.). . . . . | 90                | % |
| Useful Power Output. . . . .                 | 2000              | W |

<sup>a</sup> Measured at tube terminals.

<sup>b</sup> With external flat metal shield 8 inches in diameter having a center hole 3 inches 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.

<sup>c</sup> With external flat metal shield 8 inches in diameter having a center hole 2-3/8 inches in diameter. Shield is located in plane of the grid-No.1 terminal, perpendicular to the tube axis, and is connected to grid No.1.

<sup>d</sup> Driver power output represents circuit losses and is the actual power measured at input to 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.

<sup>e</sup> Typical value for 1 ampere of DC plate current with carrier turned off.

The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at front of this section.

<sup>f</sup> See *Cooling Considerations—Forced-Air Cooling*.

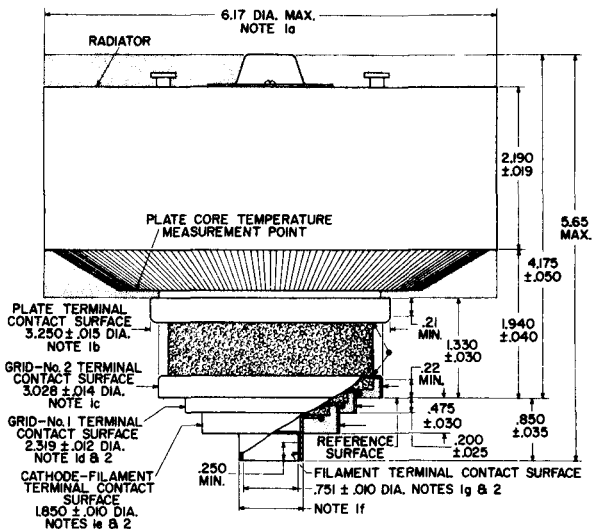
<sup>g</sup> See *Classes of Service*.

<sup>h</sup> See *Electrical Considerations—Grid-No.2 Voltage Supply*

<sup>j</sup> See *Electrical Considerations—Plate Voltage Supply*



## DIMENSIONAL OUTLINE



□ STIPPLED REGION NOTE 3

■ CERAMIC INSULATOR

• TERMINAL TEMPERATURE MEASUREMENT POINT

92CL-13039

## DIMENSIONS IN INCHES

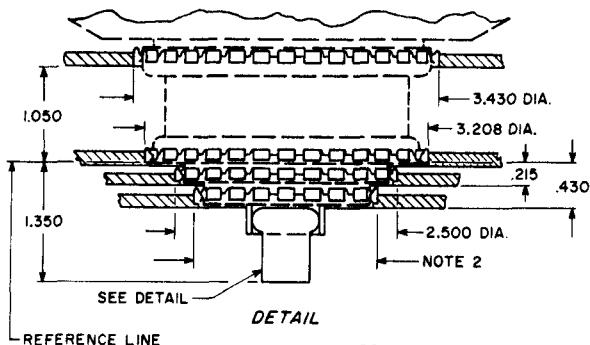
**Note 1:** Concentricity between the various diameters is such that the tube will enter a gauge having suitably spaced concentric apertures and posts of the following diameters:

- a. Radiator - 6.241
- b. Plate Terminal - 3.288
- c. Grid-No. 2 Terminal - 3.061
- d. Grid-No. 1 Terminal - 2.338
- e. Cathode-Filament Terminal - 1.878
- f. Filament Terminal (OD) - 0.908
- g. Filament Terminal (ID) - 0.722

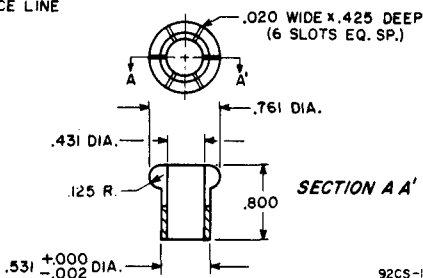
**Note 2:** The diameter of the terminal is held to the indicated value only over the contact surface length. The contact surface length of the cathode-filament and grid-No. 1 terminals extends from the edge of its terminal to the plane coincident with the edge of the adjacent larger terminal.

**Note 3:** Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular regions.

## PREFERRED MOUNTING ARRANGEMENT



## DETAIL



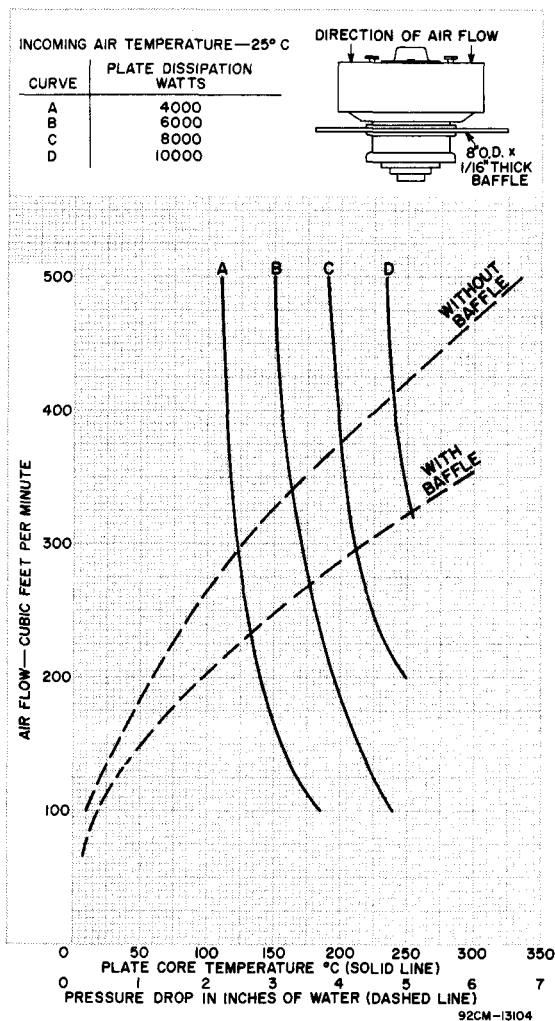
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**Note 1:** Finger stock is No.97-360 made by Instrument Specialties Co., Little Falls, N.J.

**Note 2:** Cathode ring dia. is 2.030 inches when using No.97-360 finger stock or 2.080 inches when using No.97-135 finger stock. Made by Instrument Specialties Co., Little Falls, N.J.

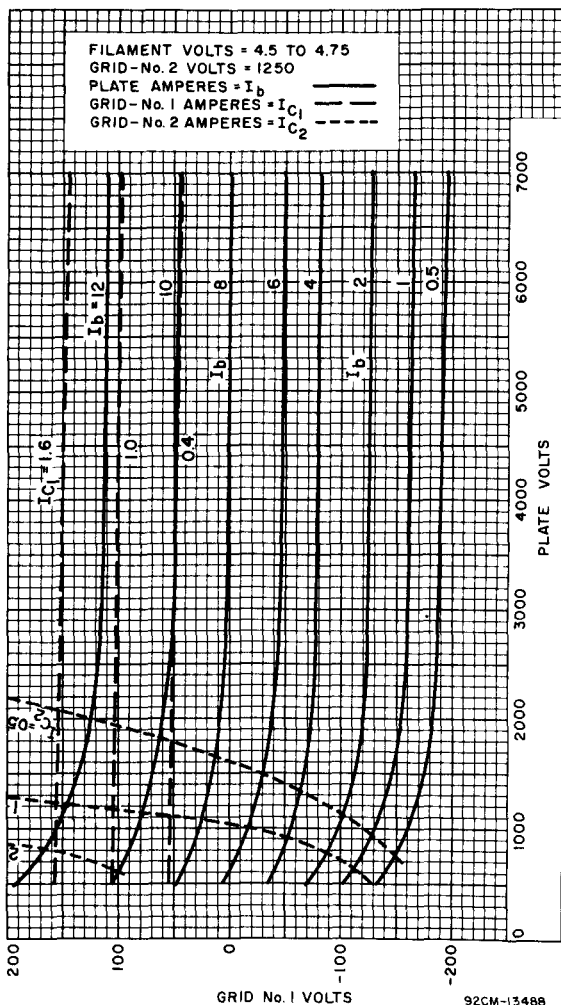


# Typical Cooling Characteristics



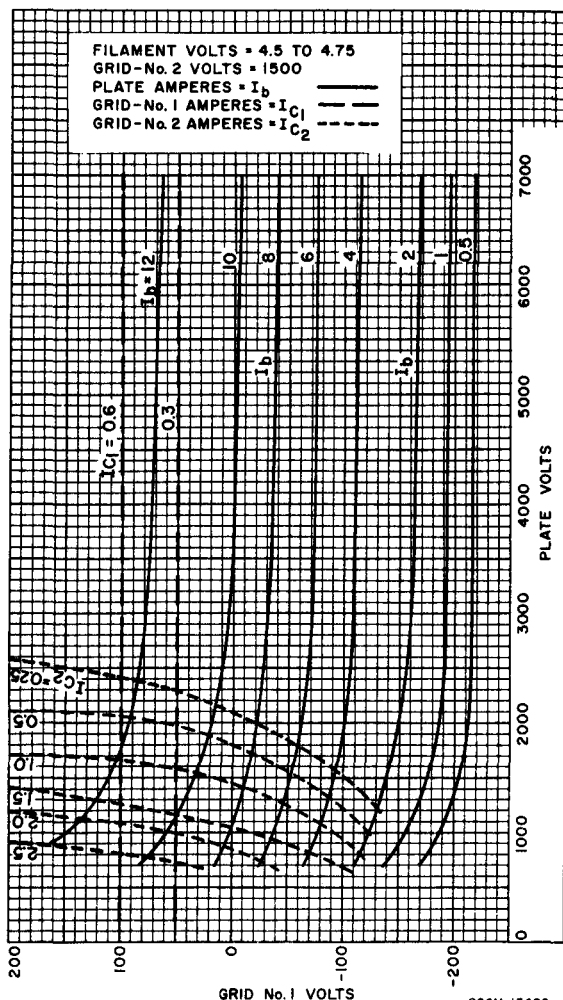
# Typical Constant-Current Characteristics

For Grid-No.2 Voltage = 1250 Volts

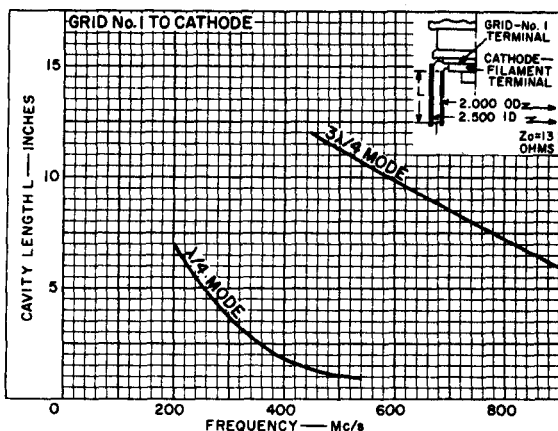


# Typical Constant-Current Characteristics

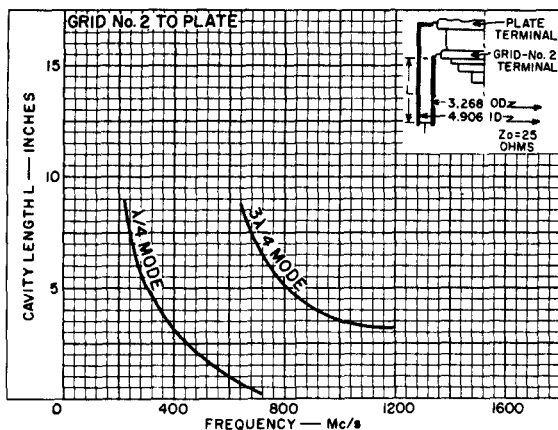
For Grid-No.2 Voltage = 1500 Volts



## Cavity Tuning Characteristics



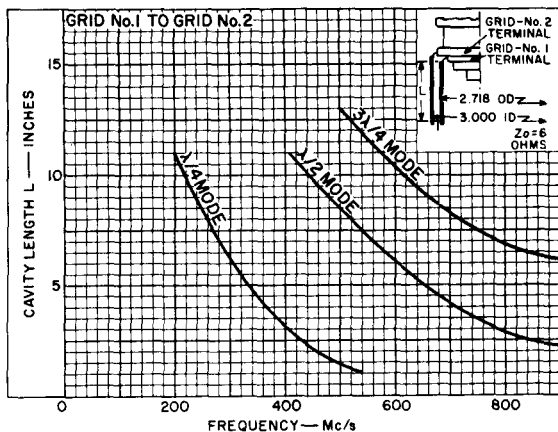
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92CS-13709



## Cavity Tuning Characteristics



92CS-13710