

# Super-Power Beam Power Tube

2-MW SHORT-PULSE POWER, 275-kW LONG-PULSE POWER

PULSE LENGTH  
TO 2500 MICROSECONDS

LOW FILAMENT POWER  
FOR AIRBORNE USE

WATER COOLED

*For RF-Pulse Power Amplifier at Frequencies from 195 to 600 MHz  
in Search Radar, Telemetry, and Particle Accelerator Service.*

## ELECTRICAL

Filamentary Cathode, Multistrand,  
Matrix-Type, Oxide-Coated—

Voltage: a, j

Maximum, with dc or 60-Hz ac excitation . . . . . 1.00 V

Maximum, with 400-Hz ac excitation. . . . . 1.05 V

Typical, with dc or 60-Hz ac excitation . . . . . 0.95 V

Current:

Typical operation value at 0.95 volt, with  
60-Hz excitation . . . . . 495 A

Minimum time to reach operating filament  
voltage. . . . . 30 s

Minimum time at normal operating filament  
voltage before other voltages are applied. . . . . 90 s

Mu-Factor, Grid No.2 to Grid No.1. . . . . 7

Direct Interelectrode Capacitances

Grid No.1 to plate. . . . . 0.15 max pF

Grid No.1 to grid No.2 and cathode. . . . . 500 pF

Plate to cathode and grid No.2. . . . . 30 pF

Grid No.2 to cathode (including bypass  
capacitors). . . . . 18000 max pF

## MECHANICAL

Operating Position . . . . . Tube axis vertical, either end up

Overall Length . . . . . 8.62 ± 0.31 in

Maximum Diameter . . . . . 11.25 in

Weight (Approx.) . . . . . 38 lb

Terminal Connections . . . . . See Dimensional Outline

## THERMAL <sup>k, m</sup>

Ceramic-Insulator Temperature. . . . . 150 max °C

Metal-Surface Temperature. . . . . 100 max °C

Minimum Storage Temperature<sup>k</sup> . . . . . -65 min °C

Water Flow

|                               | Max. Pressure |              |                               |
|-------------------------------|---------------|--------------|-------------------------------|
|                               | Absolute      |              | Differential                  |
|                               | Typ.<br>Flow  | Min.<br>Flow | for Typ.<br>Flow <sup>b</sup> |
|                               | g/m           | g/m          | psi                           |
| Through filament block. . . . | 1.2           | 0.8          | 18                            |
| Through dc cathode block. . . | 1.2           | 0.8          | 18                            |
| Through grid-No.1 block . . . | 1.2           | 0.8          | 14                            |
| Through grid.No.2 block . . . | 1.2           | 0.8          | 18                            |

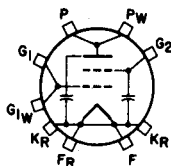


## Water Flow (cont'd)

|                                                          | Typ.<br>Flow<br>g/m | Absolute<br>Min.<br>Flow<br>g/m | Max. Pressure<br>Differential<br>for Typ.<br>Flow <sup>b</sup><br>psi |
|----------------------------------------------------------|---------------------|---------------------------------|-----------------------------------------------------------------------|
| Through plate:                                           |                     |                                 |                                                                       |
| For plated dissipations<br>up to 10 kW (Average) . .     | 14                  | 12                              | 30                                                                    |
| For plate dissipations of<br>10 kW to 30 kW (Average). . | 22                  | 20                              | 60                                                                    |
| Resistivity of water<br>at 25°C . . . . .                |                     |                                 | 1 min                                                                 |
| Water Temperature from any outlet. . . .                 |                     | 70 max                          | °C                                                                    |
| External Gas Pressure <sup>c</sup> . . . . .             |                     | 60 max                          | psi                                                                   |
| Water Pressure at an Inlet . . . . .                     |                     | 100 max                         | psi                                                                   |

## TERMINAL DIAGRAM (Bottom View)

- F—Insulated Filament Terminal and Coolant Connection  
 FR—Uninsulated Filament Terminal for DC Circuit Returns and Coolant Connection  
 G1—RF Grid-No.1 Terminal Contact Surface  
 G1W—DC Grid-No.1 and Coolant Connection  
 G2—DC Grid-No.2 and Coolant Connection  
 KR—RF Cathode Terminal Contact Surface for Circuit Returns  
 P—RF Plate Terminal Contact Surface  
 PW—DC Plate and Coolant Connection

PULSED RF AMPLIFIER<sup>n</sup>

For frequencies from 195 to 600 MHz and a maximum "ON" time as specified in any 2500-microsecond interval

## Absolute-Maximum Ratings

|                                                                 | "ON" time | 15 $\mu$ s | 2500 $\mu$ s |
|-----------------------------------------------------------------|-----------|------------|--------------|
| Peak Positive-Pulse Plate Voltage <sup>d</sup> . . . . .        | 55        | —          | kV           |
| DC Plate Voltage <sup>e</sup> . . . . .                         | 25        | 25         | kV           |
| Peak Positive-Pulse Grid-No.2 Voltage <sup>f, g</sup> . . . . . | 2.2       | 2.2        | kV           |
| DC or Peak Negative-Pulse Grid-No.1 Voltage. . . . .            | 400       | 400        | V            |
| Peak Plate Current . . . . .                                    | 80        | 30         | A            |
| Peak Grid-No.2 Current . . . . .                                | 15        | 2          | A            |
| Peak Rectified Grid-No.1 Current . . . . .                      | 15        | 2          | A            |
| DC Plate Current . . . . .                                      | 0.32      | 2.5        | A            |
| DC Grid-No.2 Current . . . . .                                  | 0.06      | 0.2        | A            |
| DC Grid-No.1 Current . . . . .                                  | 0.06      | 0.2        | A            |



## Absolute-Maximum Ratings (cont'd)

|                                       | "ON" time | 15 $\mu$ s | 2500 $\mu$ s |
|---------------------------------------|-----------|------------|--------------|
| Plate Input (Average) . . . . .       | 16        | 70 kW      |              |
| Plate Dissipation (Average) . . . . . | 8         | 30 kW      |              |

## Typical Plate-Pulsed Operation

*In Class B service at 425 MHz with a rectangular waveshape pulse of 13 microseconds and a duty factor of 0.004*

|                                                              |      |    |
|--------------------------------------------------------------|------|----|
| Peak Positive-Pulse Plate Voltage <sup>d</sup> . . . . .     | 50   | kV |
| Peak Positive Pulse Grid-No.2 Voltage <sup>f</sup> . . . . . | 2.1  | kV |
| Peak Negative-Pulse Grid-No.1 Voltage <sup>h</sup> . . . . . | 325  | V  |
| Peak Plate Current . . . . .                                 | 75   | A  |
| Peak Grid-No.2 Current . . . . .                             | 8    | A  |
| Peak Rectified Grid-No.1 Current . . . . .                   | 10   | A  |
| DC Plate Current . . . . .                                   | 0.3  | A  |
| DC Grid-No.2 Current . . . . .                               | 0.03 | A  |
| DC Grid-No.1 Current . . . . .                               | 0.04 | A  |
| Peak Driver Power Output (Approx.) . . . . .                 | 20   | kW |
| Useful Peak Power Output . . . . .                           | 2    | MW |

## Typical Grid-Pulsed Operation

*In Class B service at the frequencies shown with a rectangular waveshape pulse of 2000 microseconds and a duty factor of 0.06*

|                                                              | At 425 Hz | At 600 Hz |
|--------------------------------------------------------------|-----------|-----------|
| DC Plate Voltage <sup>e</sup> . . . . .                      | 20        | 21 kV     |
| Peak Positive-Pulse Grid-No.2 Voltage <sup>f</sup> . . . . . | 2         | 2 kV      |
| Peak Negative-Pulse Grid-No.1 Voltage <sup>h</sup> . . . . . | 350       | 350 V     |
| Peak Plate Current . . . . .                                 | 27        | 26 A      |
| Peak Grid-No.2 Current . . . . .                             | 1.6       | 1.6 A     |
| Peak Rectified Grid-No.1 Current . . . . .                   | 1.2       | 1.2 A     |
| DC Plate Current . . . . .                                   | 1.62      | 1.56 A    |
| DC Grid-No.2 Current . . . . .                               | 0.096     | 0.096 A   |
| DC Grid-No.1 Current . . . . .                               | 0.072     | 0.072 A   |
| Peak Driver Power Output (Approx.) . . . . .                 | 2.7       | 2.7 kW    |
| Useful Peak Power Output . . . . .                           | 275       | 250 kW    |

## Maximum Circuit Value

|                                        |              |
|----------------------------------------|--------------|
| Grid-No.1 Circuit Resistance . . . . . | 500 $\Omega$ |
|----------------------------------------|--------------|

<sup>a</sup> Because the filament voltage, when operated near the maximum value, provides emission in excess of any requirements within tube ratings, during life the filament voltage should be reduced to a value that will give adequate but not excessive emission. Careful attention to maintaining the value consistent with adequate emission will result in conserving the life of the tube. The filament voltage should be measured at the respective liquid coolant connections on the tube side of the threads. This procedure is essential for accurate measurement of the filament voltage. At 400 cycles some heating of the filament leads and rf cathode terminal (cathode heater) occurs; this condition is not detrimental to tube operation or tube life.

<sup>b</sup> Measured directly across cooled element for the indicated typical flow.

<sup>c</sup> This pressure is related to the output-cavity pressurization as required to prevent corona or external arc-over.

<sup>d</sup> The magnitude of any spike on the plate voltage pulse should not exceed its peak value by more than 4000 volts, and the duration of any spike when measured at the peak-value level should not exceed 10% of the maximum "ON" time. The output cavity must be pressurized as required to prevent corona or external arc-over at the ceramic insulator.

<sup>e</sup> High speed "fault" protection must be used with all grid-pulsed applications and with all plate-pulsed applications where the pulse length exceeds 20 microseconds.



<sup>f</sup> The magnitude of any spike on the grid-No.2 voltage pulse should not exceed its peak value by more than 250 volts, and the duration of any spike when measured at the peak-value level should not exceed 10% of the maximum "ON" time.

<sup>g</sup> A negative dc voltage of 300 volts maximum may be applied to grid No.2 to prevent any tube conduction between pulses.

<sup>h</sup> The grid-No.1 voltage may be a combination of fixed and self bias obtained from a series grid resistor.

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

<sup>j</sup> See *Electrical Considerations* - Filament or Heater

<sup>k</sup> See *Cooling Considerations* - Liquid Cooling

<sup>m</sup> See *Cooling Considerations* - Forced-Air Cooling

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

### CHARACTERISTICS RANGE VALUES

|                                      | Note | Min   | Max   |     |
|--------------------------------------|------|-------|-------|-----|
| Filament Current . . . . .           | 1    | 460   | 530   | A   |
| Input Strap-Resonant Frequency . . . | -    | 230   | 250   | MHz |
| Output Strap-Resonant Frequency. . . | -    | 240   | 260   | MHz |
| Direct Interelectrode Capacitances   |      |       |       |     |
| Grid No.1 to plate . . . . .         | 2    | -     | 0.15  | pF  |
| Grid No.2 to cathode . . . . .       | -    | 12000 | 18000 | pF  |

Note 1: At filament voltage of 0.95 volt and ac filament excitation at 60 Hz.

Note 2: Measured with special shield adapter.

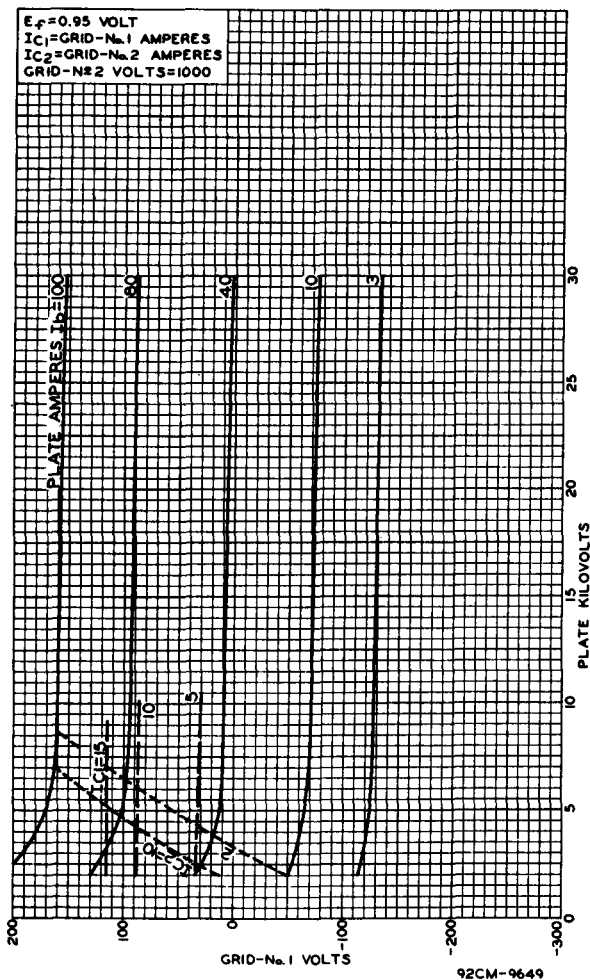
FOR ADDITIONAL INFORMATION ON THIS TYPE, WRITE FOR TECHNICAL BULLETIN AND APPLICATION GUIDE FOR RCA SUPER POWER TUBES, 1CE-279A AVAILABLE FROM:

Commercial Engineering  
Electronic Components and Devices  
Radio Corporation of America  
Harrison, New Jersey



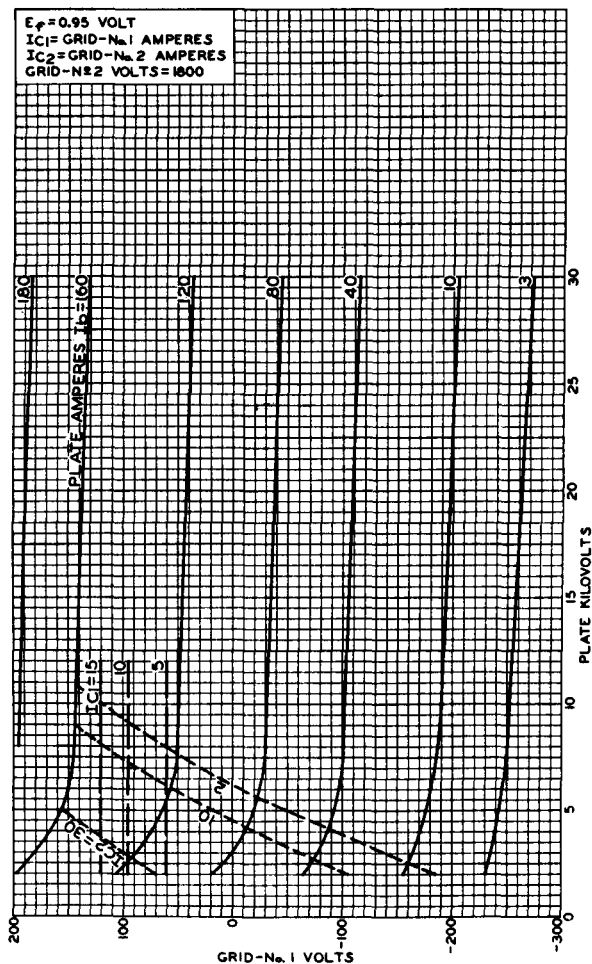
# Typical Constant-Current Characteristics

FOR GRID-No.2 VOLTAGE = 1000 VOLTS



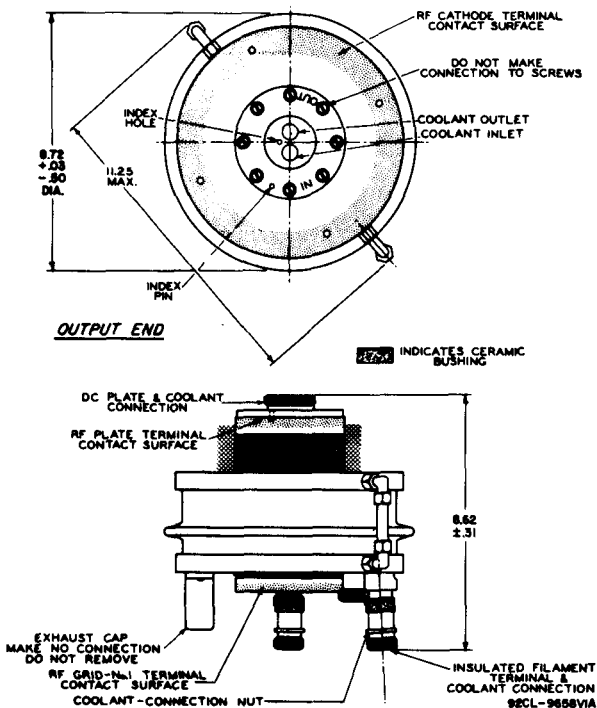
# Typical Constant-Current Characteristics

FOR GRID-No.2 VOLTAGE = 1800 VOLTS



92CM-9653



SIMPLIFIED DIMENSIONAL OUTLINE<sup>9</sup>

## DIMENSIONS IN INCHES

<sup>9</sup> A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.



## UNINSULATED FILAMENT TERMINAL & COOLANT CONNECTION

